

Greater Climate Action Through Public-Private Collaboration on Forest Landscape Restoration

Case study of advances in Colombia

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CLIMATE FOCUS

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Background

Forest landscape restoration (FLR) can play a key role in achieving national restoration goals, deforestation-free commodity supply chains, and global climate objectives under the Paris Agreement. This brief presents advances in public-private collaboration on zero-deforestation¹ and restoration of natural and productive landscapes in Colombia, its potential to drive FLR implementation, and possible contribution to enhanced NDCs towards 2020.

This brief is targeted towards public, private, and civil society actors seeking to understand how public-private collaboration on sustainable commodity supply chains can benefit from FLR approaches and together support the revision and implementation of more ambitious and actionable Nationally Determined Contributions (NDCs) under the Paris Agreement.

The Forest Landscape Restoration (FLR)² approach encompasses a wide range of land-use activities for degraded and deforested lands to regain their ecological and productive functionality, with additional economic, environmental, and social benefits. FLR interventions may include activities such as planted forests and woodlots, natural regeneration, silviculture, agroforestry, improved fallows, increasing trees on farm, mangrove restoration, watershed protection, and erosion control measures. Cocoa agroforestry, for example, represents an opportunity for utilizing an FLR activity to enable sustainable commodity production (see Box 1 for opportunities to improve cocoa production systems through FLR approaches).

The potential of FLR activities to remove CO₂ from the atmosphere – and avoid emissions by reducing pressure on natural forests from unsustainable agricultural and other land-uses – is becoming increasingly important as policy makers, civil society organizations, and private companies are looking for pathways to meet the 1.5°C target agreed under the

Paris Agreement. Carbon stock enhancements from nature-based solutions, such as the FLR approach, are essential to advancing mitigation efforts at the scale and pace required to meet the 1.5°C target.^{3, 4}

Countries and other entities have recognized the multiple benefits that can result from FLR for meeting national restoration objectives and for achieving international commitments – such as Land Degradation Neutrality, Aichi Target 15, REDD+, or the Sustainable Development Goals, including those related to food and water security – and have pledged to bring more than 170 million hectares into restoration under the Bonn Challenge.⁵ In 2018, IUCN's Bonn Challenge Barometer of Progress found that from the 13 countries already reporting on area under restoration, 43.7 Mha are under restoration transition. This represents an implementation rate of 56% of these countries' Bonn Challenge commitments. Today, land-use transitions from unsustainable agricultural practices into agroforestry systems feature prominently in pledges and implementation activities, for instance in El Salvador and Rwanda.

In advancing nature-based solutions to operationalize national and international restoration priorities, IUCN has supported the application of the Restoration Opportunities Assessment Methodology⁶ (ROAM) in 40 jurisdictions in over 26 countries. ROAM has identified the potential for cost effective FLR interventions on at least 160 million of almost half a billion hectares assessed.

A range of countries have also taken the opportunity to include restoration targets in their NDCs. A third of all NDCs⁷ include mitigation and adaptation targets for activities encompassed in the FLR approach. Reforestation, silviculture and other restoration activities have a prominent role in NDCs in terms of quantifiable commitments, while agroforestry is broadly acknowledged but less often associated with specific targets. Collectively, NDC commitments that include FLR-aligned activities⁸ represent only a third of

¹ This document refers to 'zero deforestation' due to the usage in the sectoral agreements in Colombia which can be seen as synonymous with 'deforestation-free' that is used for many private sector commitments.

² <https://infoflr.org/>

³ <https://climatefocus.com/sites/default/files/CIFF%20Report.pdf>

⁴ Griscom et al., 2017. Natural climate solutions.

⁵ <http://www.bonnchallenge.org>

⁶ <https://www.iucn.org/theme/forests/our-work/forest-landscape-restoration/restoration-opportunities-assessment-methodology-roam>

^{7, 8} IUCN and Climate Focus (2018). FLR in NDCs analysis. <https://infoflr.org/what-flr/increasing-ambition-and-action-ndcs-through-flr>

the restoration pledges under the Bonn Challenge. This indicates an opportunity for countries to expand the scope of their NDCs to account for the full mitigation impact of ongoing and planned landscape restoration activities.

Colombia's NDC includes the AFOLU (Agriculture, Forestry and Other Land Use) sector in its economy-wide reduction target of 20% against business-as-usual (BAU) by 2030, and further reductions up to 30% subject to international support. While the NDC refers to the role of reducing deforestation and enhancing carbon stocks through forestry, agroforestry and silvo-pastoral systems as important components to

meeting the economy-wide target, it does not define specific land-based targets aligned with FLR or any other AFOLU-sector activities. Colombia's NDC also refers to the prospect of public-private partnerships, collaboration with the financial sector, and foreign direct investment as playing a vital role in implementation and achievement of its economy-wide target. The development of a new or updated NDC by 2020 could capture ongoing, planned, and future activities aligned with the FLR approach for the AFOLU sector, and further advancing public-private collaboration could be instrumental to better reflect the scale of Colombia's actions for climate change mitigation.

Box 1. Cocoa production in alignment with the FLR approach

Cocoa is a commodity with significant potential from an FLR perspective given its suitability to be grown in agroforestry systems. Agroforestry includes a diverse range of production systems that integrate trees and other non-tree plant species into production systems that can deliver the multiple economic, environmental, and social benefits targeted by the FLR approach including the enhancement of biodiversity, soil fertility and water retention, while boosting crop productivity to maintain or improve farmer income.⁹ Agroforestry systems also have the potential to sequester large volumes of carbon in biomass from a climate perspective.

While agroforestry alone does not constitute the FLR approach, transition to agroforestry systems can be a key component of a broader mosaic of interdependent land uses that could also include agriculture, improved fallows, ecological corridors, and leaving remnant areas of forests and woodlands.¹⁰ A ROAM assessment carried out by IUCN and the Humboldt Biological Resources Research Institute in the Department of Antioquia^{11,12} identified agroforestry systems as a restoration opportunity in erosion-prone areas where cattle production may not be a viable option.

Taking into account broader landscape connectivity and functions, cocoa agroforestry systems are promising solutions in the context of FLR to:

1. Restore degraded land including pastures for agroforestry production; and
2. Transition cocoa monocultures to agroforestry systems.

⁹ <https://portals.iucn.org/library/sites/library/files/documents/2015-034.pdf>

¹⁰ Kumar, C., Begeladze, S., Calmon, M. and Saint-Laurent, C., (eds.). (2015). Enhancing food security through forest landscape restoration: Lessons from Burkina Faso, Brazil, Guatemala, Viet Nam, Ghana, Ethiopia and Philippines. Gland, Switzerland: IUCN. pp. 5-217. <https://portals.iucn.org/library/sites/library/files/documents/2016-078.pdf>

¹¹ Beatty, C.R., Raes, L., Vogl, A.L., Hawthorne, P.L., Moraes, M., Saborio, J.L. and Meza Prado, K. (2018). Landscapes, at your service: Applications of the Restoration Opportunities Optimization Tool (ROOT). Gland, Switzerland: IUCN, vi + 74pp. <https://portals.iucn.org/library/sites/library/files/documents/2018-031-En.pdf>

¹² IUCN (March 31, 2017). Tapping into the potential of Colombia's degraded landscapes. <https://www.iucn.org/news/forests/201703/tapping-potential-colombias-degraded-landscapes>

Colombia is a signatory to the New York Declaration of Forests (NYDF) and has a Joint Declaration of Intent with Norway, Germany, and the United Kingdom to reduce deforestation. In 2017, Colombia was the first Latin American country to join the Tropical Forest Alliance 2020 (TFA 2020), a global umbrella partnership that brings together governments, the private sector, and civil society organizations to eliminate deforestation from commodity production.

At the national level, a key pillar of government programs is to provide economic alternatives to avoid deforestation and to transition to more efficient and diversified land-use practices. This includes programs such as Visión Amazonía,¹³ supported by the REDD+ Early Movers (REM) program¹⁴ and the World Bank's BioCarbon Fund Initiative for Sustainable Forest Landscapes (ISFL).¹⁵

Supply chain companies at the national level are also making ambitious commitments to transition to sustainable land uses in ways that are broadly aligned with the FLR approach.¹⁶ In addition to reducing deforestation, many companies have declared ambition to restore degraded lands for sustainable production to “produce more on less land,” thereby making better use of non-forest land while reducing pressure on remaining forests.

Public-private collaboration can be an important success factor in realizing the mitigation potential of forest landscape restoration by bringing together private climate and sustainability objectives with public national and international climate and restoration pledges. This is not only because of limited public resources for implementation but also in recognition that the vast majority of landscape restoration opportunities would be realized on the ground on non-state lands. These restoration opportunities will rely on private individuals and companies to finance, produce, process, trade, and market products in increasingly global value chains. Subject to effective implementation, public-private dialogue and alignment, such company strategies and activities could directly support the achievement of countries' landscape restoration goals.

This brief explores the status quo and recent advances in public-private collaboration efforts in Colombian cocoa, palm oil, beef, and dairy value chains that have the potential to accelerate forest landscape restoration and simultaneously achieve climate and sustainable production objectives if production systems are aligned with the FLR approach. The cocoa sector is used to illustrate the business case and mitigation potential. Finally, the brief will discuss how these advances could be leveraged to enhance NDCs towards 2020.

¹³ Vision Amazonia. Distribution of Resources.

¹⁴ KfW. REDD Early Movers (REM) Programme. <https://www.kfw-entwicklungsbank.de/International-financing/KfW-Development-Bank/Topics/Climate/REDD/>

¹⁵ Biocarbon Fund. Colombia Orinoquia Sustainable Integrated Landscape Program. <https://www.biocarbonfund-isfl.org/colombia-program>

¹⁶ Examples of existing commitments can be found in the following reports:

FAO 2018: “Zero-Deforestation Commitments, A new avenue towards enhanced forest governance.”

Climate Focus 2016: “Progress on the NYDF: Eliminating Deforestation from the Production of Agricultural Commodities: Goal 2 Assessment Report.

Forest500 2018: “Fourth Annual Forest 500 Report,” <http://www.fao.org/3/i9927en/i9927EN.pdf>

Colombia's restoration potential in productive lands

Colombia holds significant potential to restore degraded lands and landscapes through activities encompassed in the FLR approach, including the establishment of forestry and agroforestry systems on degraded or deforested land. Improvements in pasture and cattle management as well as the conversion of degraded pastures to sustainable cocoa, timber, or palm oil plantations represent significant opportunities.

Colombia has pledged to bring 1 million hectares into restoration under the Bonn Challenge in alignment with its National Restoration Plan, with total national restoration targets estimated at 2,017,984 hectares.¹⁷ The Rural Agricultural Planning Unit (UPRA) has developed a series of suitability maps for a range of land-use types including agriculture, agroforestry, timber plantations, and cocoa, based on physical, social, and economic parameters. Figure 1 (next page) shows suitable areas for various crops, including cocoa, timber, and palm oil, as well as a map of current land-use in agriculture and pastureland. While not exhaustive of the FLR potential in the country, these maps can serve as an initial guide to investigate specific opportunities in cocoa agroforestry or timber plantations that could serve as part of a larger FLR approach.

Across the country, the vast majority of areas with high suitability for cocoa, timber and palm oil plantations are currently used for extensive cattle grazing (see Figure 1.d.), highlighting a significant opportunity for a sustainable land-use transition. Cocoa provides a particularly attractive opportunity given its income generation potential for smallholder producers and its suitability to be grown in agroforestry systems. These types of systems can enhance climate resilience, sequester significant amounts of carbon in biomass, and deliver biodiversity benefits that

would be compatible with an overall FLR approach across Colombia.

However, there are several other factors that must be considered aside from technical suitability to grow. For example, the signing of the peace agreement with FARC rebels in 2016 has resulted in opportunities and challenges to drive sustainable land-use in Colombia. While the prospect of enhanced security makes investments more attractive, former FARC territory remains structurally weak and prone to deforestation both as a result of agricultural activities and from illegal land accumulation (having increased by 44% in 2016 compared to 2015).¹⁸ These and other issues with land tenure, governance, and legality issues may slow sustainable land-use transitions.

To address these challenges, Colombia is currently developing sustainable landscape programs in the Amazon (Visión Amazonía), Orinoquia (ISFL), Pacific, and Caribbean regions with international cooperation support and in alignment with REDD+ readiness and implementation processes and financing.

The private sector is expected to play a key role in the envisioned transition to sustainable land-use and low-emissions development objectives. While the public sector can put in place the enabling environment and reduce investment risk, the private sector plays the crucial role of building efficient value chains, facilitating investment, and professionalizing production. The development of sector agreements on zero-deforestation and restoration in palm oil, beef, dairy, and cocoa (through the Cocoa, Forest, and Peace Initiative)^{19,20} is a logical step for private sector engagement and cementing public-private collaboration on zero-deforestation commitments.

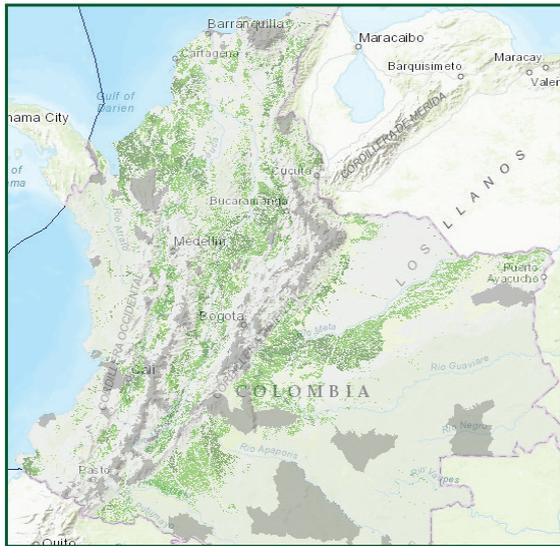
¹⁷ InfoFLR. Colombia. <https://infoflr.org/countries/colombia>

¹⁸ IDEAM, 2017.

¹⁹ World Cocoa Foundation. Cocoa, Forests and Peace. <https://www.worldcocoafoundation.org/blog/cocoa-forests-and-peace>

²⁰ World Resources Institute (7/18/2018). Colombia Becomes First Country in Latin America to Commit to Deforestation-Free Chocolate. <https://www.wri.org/news/2018/07/release-colombia-becomes-first-country-latin-america-commit-deforestation-free>

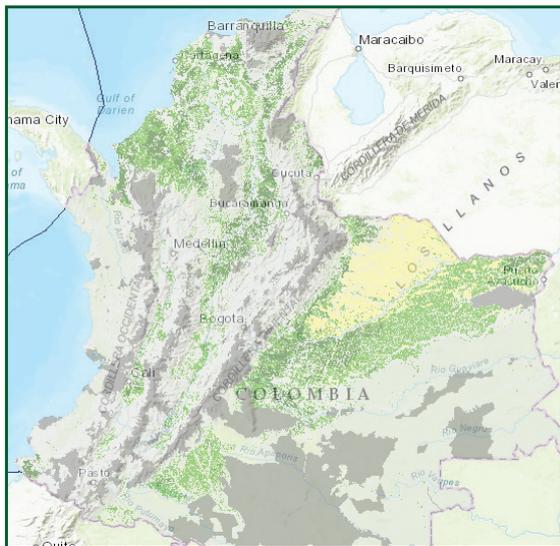
(a) cocoa highly suitable on 4.7 Mha



(b) timber highly suitable on 7.5 Mha



(c) palm oil highly suitable on 5.2 Mha



(d) current land use

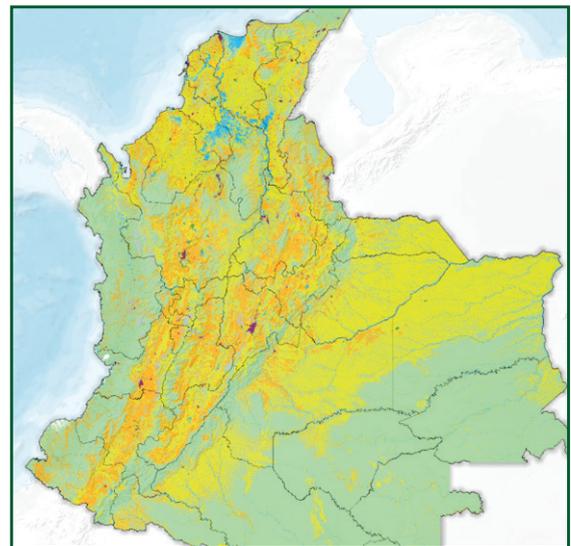


Figure 1: Land suitability for cocoa (a), timber (b), and oil palm plantations (c) with dark green areas showing high suitability),^{21,22} and current land use (d) with agriculture in orange and pastures in yellow.

²¹ SIPRA. Planificación nacional. <https://sipra.upra.gov.co/>. Accessed 14 November 2018.

²² UPRA (2015). Planificación del ordenamiento productivo y social de la propiedad.

Advancing public-private collaboration

Since 2017, Colombia has become increasingly involved in international initiatives aimed at using public-private collaboration to end deforestation and drive sustainable land-use. As a result, the country has advanced public-private alliances and agreements in key agricultural sectors at the national level.

Recognizing the private sector as a key ally, the Colombian government is embracing public-private collaboration as a core component of its dual strategy to halt deforestation and restore forest landscapes.

Under the leadership of the Ministry of Environment and Sustainable Development (MADS) and the Ministry of Agriculture and Rural Development (MADR) and in collaboration with various stakeholders, the government is leading the development of zero-deforestation agreements in key sectors including palm oil, cattle, and cocoa to drive sustainable growth.

This orientation towards engaging the private sector has already resulted in a zero-deforestation agreement for palm oil in 2017, for cocoa in 2018, and an upcoming agreement for the cattle sector, including beef and dairy, in 2019. The sectoral agreements represent cornerstones in the government's strategy to

Table 1: Summary of zero-deforestation agreements in Colombian chains.

	Palm	Cocoa	Cattle (beef/dairy)
Year signed	2017	2018	Expected 2019
Status	Being implemented	Being implemented	In development
Deforestation goals	Zero deforestation by 2020. Palm oil produced on areas deforested 1 January 2011 must ensure compensation to be considered deforestation-free.	Zero deforestation by 2020. Cocoa produced on areas deforested 1 January 2011 must ensure compensation to be considered deforestation-free.	Zero deforestation in the Amazon by 2020 and the whole country by 2030. Beef & dairy produced on areas deforested 1 January 2011 can only be considered deforestation-free if a conservation / restoration agreement is in place.
Landscape restoration activities	-Restoration of natural forests -Promote sustainable production	-Forest restoration -Sustainable production including agroforestry and intercropping	-Restoration of natural forests -Consideration of silvopastoral production systems
Signatories	39 signatories (22 growers, 2 buyers, 7 NGO, 4 government institutions, 2 main federations)	6 signatories (2 ministries, 1 buyer, 1 cocoa grower's federation, 2 NGO)	Total numbers to be determined but expected to include main ministries, federations, buyer, producers, and retailers.
Co-benefits	Positioning of Colombian palm oil in international markets	-Income diversification -Illicit crop substitution -Contribution to peace agreement	Positioning of Colombian beef for exports

meet its zero-deforestation objectives under national programs such as Visión Amazonía and international commitments such as the NYDF.²³ Table 1 provides a summary of the agreements.

The *Acuerdo de Voluntades para la deforestación cero en la cadena de aceite de palma en Colombia*²⁴ is a zero-deforestation agreement for palm oil signed in late 2017. The agreement seeks to reach zero-deforestation by 2020, and includes a suite of public and private partners including MADS, MADR, the Ministry of Commerce, Industry, and Tourism and the Institute of Hydrology, Meteorology, and Environmental Studies.

The Cocoa, Forests, and Peace Initiative is a global initiative led by the World Cocoa Foundation to drive forward public-private collaboration to rid cocoa supply chains of all deforestation while also promoting forest protection and restoration. MADS and MADR are joined by the National Federation of Cocoa Producers and Casa Luker Cacao as initial signatories.²⁵ The initiative supports the use of cocoa in contributing

to forest protection and restoration as part of larger land-use planning and in areas designated as the agricultural frontier and it supports agroforestry where applicable as an activity to diversify household incomes while supporting larger restoration efforts, therefore representing an opportunity for advancing FLR implementation within public-private efforts.²⁶

While zero-deforestation is a main component and driving force behind these agreements, elements of restoration and sustainable production are included for each sector. This illustrates the positive linkages between achieving zero-deforestation goals and the need to restore and efficiently utilize non-forest or degraded landscapes, including for agricultural production when appropriate.

²³ New York Declaration on Forests Global Platform. About the Declaration. <https://nydfglobalplatform.org/declaration/>

²⁴ Ministry of Environment. Acuerdo de Voluntades para la Deforestación Cero en la Cadena de Aceite de Palma en Colombia.

^{25, 26} IDH. Cocoa, Forests and Peace Initiative in Colombia, Joint Framework for Action. <https://www.idhsustainabletrade.com/uploaded/2018/07/Colombia-Cocoa-Forests-and-Peace-Initiative-Joint-Framework-for-Action-English.pdf>

The business case for cocoa

Improving the sustainability of existing cocoa production areas and establishing new cocoa plantations on degraded lands as part of a larger FLR approach for productive and integrated landscapes, represents an attractive business opportunity for farmers and a growing number of investors.

Colombia's climate and soils exhibit the ideal growing conditions for cocoa (see Figure 1), yet the country only produces about 1% of the global cocoa volume.²⁷ Of this, the majority (80%)²⁸ is consumed locally. Despite some price fluctuations, there is strong and growing international demand for cocoa. As such, Colombia may be missing out on an attractive export market opportunity.

National production has been steadily growing in recent years, reaching 60,535 tons in 2017, a 43% increase since 2010. The current national plantation area – largely composed of smallholder production systems – is estimated to be around 175,430 hectares,²⁹ which suggests an average productivity of 345kg/ha/yr. In 2017 there was estimated 46% of

plantation area in need of renovation due to age and low productivity,³⁰ but this has improved gradually with the support of the National Cocoa Grower's Federation (FEDECACAO). In 2018, MADR expects production volumes of 62,000 tons on a plantation area of 178,500 hectares.

UPRA identified up to 4.7 million hectares that could be considered highly suitable for cocoa production.³¹ FEDECACAO has a much more conservative estimate of 700,000 hectares, as well as a potential productivity of >2,000 kg/ha/yr. Compared to current production, these estimates highlight the growth opportunity both in improving productivity of existing plantations and establishing new plantations on degraded and deforested lands.

Economic analysis of new plantation establishment on degraded land (largely from pastures) and renovation of existing plantations confirms the attractiveness of cocoa production. Table 2 summarizes results of the analysis. The table indicates economic returns, but the decision to renovate an existing plantation or establish a new plantation will vary depending on soil and climatic conditions, management regime,

Table 2: Estimated average cost, revenues, and returns of cocoa investments (per hectare).

	New plantation		Renovation*	
Year	Year 1	Year 2-15	Year 1	Year 2-15
Productivity (t/ha/yr)	-	1.51	-	0.81
Price (US\$)	2,333	3,177	2,333	3,177
Revenue (US\$)	-	4,929	-	2,600
Costs - establishment (US\$)	7,894.17	-	4,503.02	-
Costs - maintenance (US\$)	-	2,234.15	-	1,568.65
Net income (US\$)	(7,894.17)	2,694.66	(4,503.02)	1,031.50
IRR (20 years)	17.38%	-	15.69%	-

*Incremental cost and production

²⁷ FAO. Data. <http://www.fao.org/faostat/en/#data>

^{28, 29} Federacion Nacional de Cacaoteros. National Economy. <https://www.fedecacao.com.co/portal/index.php/es/2015-02-12-17-20-59/nacionales>

³⁰ El Universal (08/05/2018). Se envejecen cultivos de cacao, urge renovar 70 mil hectáreas. <http://www.eluniversal.com.co/economica/se-envejecen-cultivos-de-cacao-urge-renovar-70-mil-hectareas-284416>

³¹ <https://sipra.upra.gov.co/>. Access 14 November 2018.

The attractiveness and growing interest in cocoa is confirmed by an increasing number of specialized funds and value chain companies investing both in larger plantations and smallholder production models.³² Even though attractive returns are achievable, the shift in production represents a significant risk for producers and therefore calls for targeted financial incentives and technical assistance from the public and private sector to transition their production systems.

FEDECACAO and major buyers such as Casa Luker and Nacional de Chocolates maintain technical assistance programs and demonstration farms that could be expanded through the design and deployment of suitable financial mechanisms. FINAGRO, the national fund for financing the agricultural sector, has significant experience in stimulating plantation development in the forestry sector through the Forestry Incentive Certificate (CIF) and can be engaged for specific incentives for the cocoa sector.³³

Programs such as Visión Amazonía and ISFL in the Orinoquía region are leveraging climate finance³⁴ and collaborating with FINAGRO to explore financial and technical support mechanisms. One example is the Sustainable Production Transformation Instrument (ITPS) that aims to provide credit for intensifying cattle production and other financial incentives to reserve areas for alternative productive use, such as cocoa, as well as conservation.³⁵ This type of collaboration that

brings together international cooperation programs, public and private financial institutions, and value chain companies will be essential for the expansion of sustainable cocoa production to reach the national potential while also transitioning to more efficient land-use systems.

In sum, the business case for cocoa is grounded on a high likelihood of increasing levels of public and private support in both technical and financial assistance; the presence of zero-deforestation agreements that favor forest protection, cocoa agroforestry, and sustainable intensification of cocoa; positive return projections on a per-hectare basis for new or renovated cocoa; and an overall attractive outlook for international export opportunities. Private sector stakeholders, including farmers, landowners, value chain actors, and potential investors, should consider investigating specific opportunities in suitable landscapes and engage with potential partners in the public or private spheres at national, regional, and local levels.

³² Examples include investments by Casa Luker, Acumen, and Andean Cacao

³³ Ministry of Agriculture (07/02/2018). Certificado de Incentivo Forestal - CIF 2018. <https://www.minagricultura.gov.co/tramites-servicios/apoyos-incentivos/Paginas/Certificado-de-Incentivo-Forestal-CIF-2013-v2.aspx>

³⁴ From REM and the World Bank's BioCarbon Fund

³⁵ Earth Innovation Institute. Colombia Workshop on FINAGRO's New Sustainable Farm Finance Program. <https://earthinnovation.org/2018/06/colombia-workshop-on-finagros-new-sustainable-farm-finance-program/>

Potential emission reductions and removals from FLR approaches in cocoa production systems

The establishment of cocoa agroforestry systems on non-forest or degraded landscapes can sequester significant volumes of additional carbon in biomass and reduce atmospheric CO₂ concentrations. Cocoa production can provide alternative economic opportunities in regions with high deforestation pressure, such as the Amazon, supporting reduced deforestation and further negative emissions.

Potential carbon removals from cocoa production can vary depending on the management regime, which includes the types and number of species, the rotation length, and the level of shade from non-cocoa trees. For the purpose of this brief, emission removals were estimated for land-use transition from degraded

pastures to new cocoa agroforestry systems. Significant changes in carbon stocks associated with this transition were expected to occur in aboveground biomass, while changes in belowground biomass have been conservatively excluded. GHG emissions from fertilizer and pesticides applied in cocoa plantations were included. Emissions associated with livestock management on degraded pastures were conservatively excluded to avoid overestimation of mitigation benefits.

Colombia's NDC confirmed the ambition to develop specific emission and removal factors for agroforestry and silvopastoral systems. Given the current lack of nationally determined emission and removal factors for such agroforestry systems, the analysis relies on recent academic literature.

Table 3: Estimated carbon stocks changes, GHG emissions, and net removals per hectare.

	Degraded pasture	Cocoa agroforestry
Carbon stocks		
Above ground biomass (t/CO ₂ /yr)*	assumed negligible	4.03
Below ground biomass (US\$)	conservatively excluded	conservatively excluded
Long-term average over 20-year rotation (tCO ₂)		42.35
GHG emissions		
Fertilizers & Pesticides (t/CO ₂ e/yr)**	conservatively assumed zero	0.46
Total over 20-year rotation		9.23
Net emission removals on 20-year rotation (tCO ₂)		33.12

*converted to CO₂ from publication as CO₂=C * (44/12)

**application only, excludes manufacturing and transport

Andrade et al (2013)³⁶ estimated annual carbon sequestration rates in cocoa agroforestry systems in Tolima at 1.1 tC/ha (4.03 tCO₂), comparable to sequestration rates found in similar systems in Guatemala. The long-term average carbon stock over a 20-year rotation cycle was estimated as 42.35 tCO₂/ha. Charry et al (2017)³⁷ estimated average annual emissions from fertilizer and pesticide application in cocoa plantations over 18 years as 0.46tCO₂e/ha. The total net emission removals per hectare over the course of 20 years was therefore estimated as 33.12 tCO₂e.

To illustrate national emission removal potential, we considered an optimistic growth scenario under which national plantation capacity would reach 350,000 hectares by 2030 - only 50% of the area considered highly suitable to cocoa cultivation by FEDECACAO but highly ambitious as it would effectively double current plantation area and require adding roughly 14,290 hectares of new plantations annually. Considering average historic plantation capacity growth of 5,000 hectares per year (2010-2017), an annual growth rate of 14,290 hectares would require a significant

increase in investment volumes (see Section 4) and strong collaboration for implementation through sector agreements and landscape programs.

Under this scenario, the potential emission removals via carbon sequestration from new cocoa agroforestry to be achieved through 2050 would amount to an estimated 5.68 MtCO₂e. This would correspond to roughly 8.5% of the 2030 unconditional emissions reduction target included in Colombia's NDC.

Through supporting cocoa farmer and community livelihoods, cocoa cultivation could also contribute to reduced deforestation by reducing pressures on existing forests. As such, this production system can contribute to additional emission reductions.

³⁶ Almacenamiento De Carbono En Cacaotales (Theobroma Cacao) En Armero-Guayabal (Tolima, Colombia)

³⁷ "Estrategia Sectorial de la Cadena de Cacao en Guaviare con Enfoque Agroambiental y Cero Deforestacion"

Enhancing NDCs through public-private collaboration

Colombia's NDC revision and implementation could be further enhanced by including – and aligning - ongoing and future initiatives on restoration and zero-deforestation. Colombia is advancing a range of initiatives compatible with the FLR approach, including public-private agreements in the cocoa, beef, dairy, and palm sectors, and in sustainable landscape programs. These activities directly contribute to emissions reductions.

Colombia's NDC includes the AFOLU sector in its economy-wide target. The NDC also specifically references the crucial role of private investment and public-private partnerships (PPP) in reaching declared emission reduction targets. This means that landscape programs and sectoral agreements discussed in Section 3 may be important tools to achieve Colombia's climate goals.

By driving sustainable landscape development through public-private collaboration, existing landscape programs and sectoral agreements have the potential to significantly contribute to the achievement of the country's NDC. By aligning commitments between stakeholders towards sustainable production, sector agreements provide a unique platform for public-private dialogue and a shared basis for the definition of concrete collaboration measures to address current barriers for large-scale land-use transitions. This includes the necessary improvements on landscape governance and in the enabling environment,

mobilizing private investment capital for sustainable production and restoration, and building local implementation capacity.

The definition of such concrete collaboration measures, public-private action plans and implementation targets could provide a basis for estimating emissions reduction and removal potential of national efforts aligned with the FLR approach, and inform NDCs revisions, including for 2020 and future iterations. The development of sustainable and productive landscapes has the potential to generate significant mitigation and adaptation benefits but remains conditional on the mobilization of finance and development of human, technical and monitoring capacities.

This brief has illustrated that public-private collaboration on cocoa agroforestry and sustainable cocoa production systems in alignment with the FLR approach can result in attractive returns and deliver important environmental and social benefits. Highlighting these specific contributions of cocoa production through activities encompassed in FLR can further raise awareness of the opportunity of transitioning to sustainable cocoa production as the Colombian government and private actors seek to implement their commitments in a collaborative manner.



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