

Forestry sector, alternative for peace and sustainable development in Colombia. Coffee region case

Sector forestal, alternativa de paz y desarrollo sostenible en Colombia.
Caso región cafetera

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SUMMARY

The study focused on the potential role of the forest sector in Colombia's post-conflict processes based on the multifunctionality of forests and their components: communities that live in and close to forests, economic dynamics, social actors and sectoral policies. The analysis covered the national level and the coffee region, located in the center of the country. Materials and methods included semi-structured interviews with international and national forest experts. Experts agreed that the forest sector in Colombia represents an alternative pathway for increasing employment and improving the quality of life of local populations, especially in those regions where the post-conflict process is still in effect. In the case of the coffee region, there is a reforestation potential of 54,500 ha and, with minor restrictions, the potential for 164,130 ha of forest plantations. Less than 10 % of that potential has been achieved. Likewise, there are opportunities to implement ecosystem services programs in public and private natural forests that cover 55 % of the coffee region. These potentials are not currently part of the regional priorities, although they could generate income and employment for vulnerable coffee-growing families and for indigenous communities living near natural forests, for whom poverty is a constant due to structural deprivations.

Key words: rural poverty, indigenous communities, forest multifunctionality, post-conflict, life quality.

RESUMEN

El estudio se centró en el papel potencial del sector forestal en los procesos de posconflicto colombiano, basado en la multifuncionalidad de los bosques y sus componentes: comunidades que viven en y cerca de los bosques, dinámicas económicas, actores sociales y políticas sectoriales. El análisis involucró la región cafetera, situada en el centro occidente del país. Los materiales y métodos incluyeron entrevistas semi estructuradas con expertos forestales internacionales y nacionales. Los expertos coincidieron en que el sector forestal en Colombia representa una vía alternativa para aumentar el empleo y mejorar la calidad de vida de las poblaciones locales, especialmente, en aquellas regiones donde el proceso posterior al conflicto armado sigue vigente. En el caso de la región cafetera, existe un potencial de reforestación de 54.500 ha con la posibilidad de llegar a 164.130 ha de plantaciones forestales. Se logra menos del 10 % de ese potencial. Asimismo, existen oportunidades para implementar programas de servicios ecosistémicos en bosques naturales públicos y privados que cubren el 55 % de la región cafetera. Estos potenciales no forman parte de las prioridades regionales actuales, aunque podrían generar ingresos y empleo para las familias cafeteras vulnerables y para las comunidades indígenas que viven cerca de los bosques naturales, para quienes la pobreza es una constante debido a privaciones estructurales.

Palabras clave: pobreza rural, comunidades indígenas, multifuncionalidad de los bosques, posconflicto, calidad de vida.

INTRODUCTION

Colombia has endured a history of more than 50 years of armed conflict that has resulted in the displacement of around 7 million people (United Nations 2017) with an unequal distribution of land ownership and the consequent rural poverty (Faguet *et al.* 2020). That history has profoundly affected the dynamics of society, where vio-

lence leads to forced migration, deschooling and poverty, among other traumas (Justino 2011, Anderton and Brauer 2016). Some of the causes are based on income inequities, with poverty of 26.9 % in urban areas, increasing by 1.49 times in populated centers and rural areas. Colombia has one of the highest Gini coefficients in Latin America and low quality of public education; it is a fact that the poor quality of education has a negative impact and it is an

essential factor for social mobility (United Nations 2017). On the other hand, Colombia has significant forestry and agricultural potential that could serve as alternatives for employment and income for rural families. With a surface area of 114.2 million hectares (Mha) in the country, the 2018-2022 National Development Plan established specific goals for the forestry sector and increased the commercial reforestation to 572,000 hectares; however, there is insufficient information to characterize the productive potential of natural forests and of existing plantations. Similarly, there is a dearth of reliable statistical information on the forest industry; there is only partial information on the volume of processed wood, its source of origin and the number of jobs generated by this sector per annum.

Regarding land distribution in Colombia, Faguet *et al.* (2020) mention “Landowning elites grip on local power allowed them to undermine the distribution of public lands to landless and poor peasants in municipalities where they dominated, and divert land to themselves”. In addition, the country does not have a Forestry Law that guides the development of the sector. Although Law 1021 was promulgated in 2006, it was declared unenforceable for not having complied with the required prior consultation process with ethnic communities.

The weak forest regulations, along with the consequences of the armed conflict, have led to the deterioration in the life quality of forest-dependent communities. That is why the signing of the peace process with the FARC guerrillas in 2016 was an event of national importance. It also included, among its unapplied articles, the improvement of equity conditions in the rural area based on a comprehensive rural reform aimed at integrating regions, eradicating poverty, promoting equality, ensuring full enjoyment of citizens’ rights and as a consequence ensuring non-repetition of conflict and eradication of violence.

In this post-conflict stage in Colombia, special consideration must be given to the management of natural resources, especially forests, given their potential impact. According to Negret *et al.* (2017) during the current post-conflict stage, armed conflicts that negatively impact social and political systems have also seriously reduced the biodiversity of the environment, given the re-opening of areas that were previously off-limits. The vulnerability of the areas occupied by guerrillas should be noted; which, in general terms, are strategic ecosystems because of difficulty to access.

The evidence is emerging that deforestation is rising in post-conflict areas due to the expansion of the agricultural frontier, plantation of illicit crops, along with their consequential negative social, economic and environmental effects (Hoffmann *et al.* 2018). The national government is interested in generating strategies to restrain deforestation by implementing the Pact for growth and job creation in the forestry sector, 2018-2030, (Fedemaderas 2017). It would be important that this new policy strengthened forest governance to allow the identification and

participation of local communities and companies in the generation of sustainable alternatives.

Another key aspect is the inclusion of verifiable criteria of responsible forest stewardship through voluntary forest certification. Forest Stewardship Council (FSC) is the standard of voluntary, independent third-party forest certification schemes. A key requirement in the forest certification process is the legality and strengthening of governance in the forest management unit. FSC certification requires recognition of the customary rights of indigenous peoples and local communities and equitable treatment of all workers, whether directly employed or sub-contracted, in the management unit. These safeguards would help to promote peace and sustainable development. According to the Institute of Hydrology, Meteorology and Environmental Studies, the area of natural forest in Colombia gradually decreased from 56.4 % in 1990 to 51.6 % in 2014. This decrease in forested area is distributed among the Amazon (66.7 %), the Andean Region (17.8 %) and the Pacific Region (8.9 %).

The coffee region is the case study, under the hypothesis that this sector is under-developed and it can make a potential contribution to the economic, social and environmental development of this region. This article explores how the forest sector could be an alternative for peace and sustainable development, while avoiding land use conflicts and taking advantage of fast-growing tropical tree species. Nevertheless, strong regulations to strengthen the forest sector are required, as this article outlines.

The coffee region cultural landscape is located in the andean region and it is characterized by the presence of snow-capped volcanoes, moors, andean high forest, dry tropical forests and tropical rainforest, with high rates of biodiversity and endemism. The region was declared by UNESCO as a World Heritage Site in 2011. The area is formed by the departments of Caldas, Quindío and Risaralda (figure 1).

According to the national population and housing census of 2018 prepared by the National Administrative Department of Statistics (DANE 2018), the population in the departments of Caldas, Quindío and Risaralda total 2,481,560 inhabitants and the participation of this region in national GDP is 4 %. A good percentage of the land incorporated into agricultural activities is of forest aptitude, and its inadequate management has led to the loss of soil, lack of nutrients and erosion; in the case of the coffee region, the potential area for commercial reforestation without restrictions in Caldas and Quindío departments is 54,500 ha and the potential reforestation is 164,130 ha (FAO 2008).

In the coffee region there are plantation companies that take advantage of wood certified such as: Smurfit-Kappa and Duratex S.A. In addition, guadua (*Guadua angustifolia* Kunth) producers, like companies Yarima Guadua and Corguadua, which process it, have obtained certified chain of custody permits; however, it is important to men-



Figure 1. Study area, coffee region composed of the departments of Caldas, Risaralda and Quindío. Source: based on IGAC (2020).
 Área de estudio, región cafetera compuesta por los departamentos de Caldas, Risaralda y Quindío. Fuente: basado en IGAC (2020).

tion that in Colombia illegal logging remains a serious problem. According to World Bank Group (2015), 42 % of timber is illegally harvested. The drivers of illegality include a culture of illegal logging, ignorance and errors in the application of forest regulations, the demand pull and high prices of wood, high costs and long application procedures for harvesting permits, the technical, operational and articulation weakness of institutions with competences in forest control and surveillance, the lack of political interest among decision-makers in forestry and state corruption.

Literature on the forestry sector in the coffee region is minimal:

Zúñiga-Upegui *et al.* (2019) explore social-ecological systems in the transition from war to peace: they identify land-use planning scenarios in the post-conflict framework with the increase of agricultural crops in the country, including coffee, due to the opportunities opening up for new planning schemes. This study highlights that, to improve results, both sustainable and financially sound land policies are required to avoid ecosystem degradation.

On the other hand, although specialized articles about peace and forestry sector in the coffee region are not identified, studies that focus on the socio-economic conditions and limitations around coffee cultivation are important. Muñoz-Rios *et al.* (2020) identify how the rural-to-urban trend was correlated with the lack of State presence and the lack of education in the rural areas. Such situations are found in most of the rural areas and more specifically in the coffee region.

Fedemaderas (2017) show the pact for growth and job creation in the forestry sector and propose to carry out an action plan that includes the strengthening of the forestry production chain, the generation of value in the processing

of forest products and support for associations of small reforesters, especially for the commercialization of wood; whose importance is highlighted by Rodríguez-Zúñiga *et al.* (2019) in Mexico, by stating that the success of forestry should be reflected not only in a higher income for the members but also in the improvement of the community standard of living.

Aldea Global (2005) presented a diagnosis of the forest sector in the coffee region, the 2005 National Development Plan identified a potential of 16 Mha to be exploited with forest crops under sustainable and competitive production schemes; after 15 years, these priorities continue to be valid in the coffee region; there has been little action to date due to the lack of commitment of forestry actors.

Despite the high potential of the forestry sector in the coffee region related to this, it is a potential alternative income source for coffee growing families who have experienced a decline in their life quality in the last three decades. Based on this, the research question is: Is the forestry sector an alternative source of income, quality of life and peace for the country and for the coffee region?

METHODS

Given the complexity of the social, economic and environmental situation surrounding Colombia forestry sector, a mixed methods approach was used in this study. First, archival and library research was carried out and twelve numbers of reports, articles and newspaper accounts were analyzed to develop the research questions and approaches.

The research objectives and questions were co-created by the research team, and included questions about cu-

urrent land use, forestry potential in the territory, colonization stories, opinions about the success and challenges of the voluntary and independent schemes of third-party forest certification, bottlenecks in marketing processes, contribution of the sector to the socio-economic and environmental development of the country, Colombia participation in the world forestry scenario; sector productivity, legality, forestry incentives, impact on economic dynamics and the purchasing power of producers, supply and demand dynamics for wood, future of forest plantations, opportunities in the peace process, benefits of reforestation activities for communities, jobs generated, strategic planning, role of the National Forest Development Plan, economic, social and environmental impacts and economic risks of plantations.

Three in-depth interviews were designed according to the type of actor: 1) Three international experts taking into account their contribution to forest planning in Colombia: a) Ernest Paul Zambón from the Netherlands, who was an international expert on the FAO Community Participation in the Forest Sector project carried out for seven years in the coffee axis; b) José Antonio Gómez, project coordinator Amazon Ecosystem Conservation Vision, and c) Alfred Buck, from Germany, who, through Ip Consult and the NIRAS program, works on governance and sustainable development issues in Colombia. 2) Four forestry experts, three of them representatives of the Environmental Authorities of the coffee axis departments, with a fundamental role in forestry decisions, according to Law 99 from 1993; among their functions are "... To grant permits and concessions for forest exploitation ... and manage the National Forest Reserves in the area of its jurisdiction". The fourth expert, representative of the German Technical Cooperation Agency - GIZ, currently develops the "ProBosques" program. 3) Forest companies in the coffee region, based on their representativeness; almost half of the planted area in the country is located in the coffee axis region (46.7 %), with a planted area of 144,884 ha (PROFOR 2017).

Among the companies interviewed are Smurfit-Kappa Carton of Colombia SA (SKC), with important developments in the forestry industry in more than 30 countries; which have a planted area of 42,055 ha, oriented to production of wood for pulp and paper, corresponding to 29 % of the planted area in the coffee region. Likewise, the companies Agroindustrias La Cristalina S.A.S (ALC), Forestal Tarcará S.A.S. (FT) and Yarima Guadua (YG).

Recruitment of participants for the key informant interviews about forestry practices and potential in the coffee region was done using purposive sampling. The individuals were selected by the research team (composed by the authors) based on literature review and its representation in the region. Criteria for inclusion in recruitment included: expert knowledge of the forestry sector in the coffee region and in the country, recent experiences with forestry and willingness to participate and support for the research goals.

Next, open-ended in-depth informant interviews were carried out with these leading specialists in the field. Initial one-on-one interviews were conducted during July 2018 and July 2019. Data generated during the interviews and participant observations were recorded using field notes, audio recordings and photographs. Data interpretation followed a grounded theory approach, which allows post-facto organizing of the data in thematic units and, afterwards, the interpretation of those results from their categorization and coding to facilitate robust and defensible analyses (Corbin *et al.* 2008). It involved sorting major concepts and themes, reflecting upon the data in repeated meetings among the research team.

Narrative data transcription was then carried out and analyzed, followed by discussion among team members. The interview data were triangulated with recorded observations and the extensive literature review. The interpretation and understanding of local realities were presented in the experiences and thoughts of social actors, from their different angles. The results presented here combine the documentary analysis on the forestry sector from a systemic point of view, and the descriptive information obtained through the in-depth interviews with informants based in the coffee region. The first author also participated in the 24th World Forest Week to FAO in Rome where he conducted interviews, all of which contributed to deepening the frame of reference and robustness of the discussion.

RESULTS

The tenure system in the coffee region cultural landscape has about 24,000 farms, with an average size of 4.6 ha, which classifies them as minifundia. It is characterized by the employment of family labor; the average age of coffee farmers was 53 years old. Thirty-three percent are older than 60, reflecting problems of generational replacement. Due to the migration of young farmworkers to the city, many farms have pivoted to the production of gourmet coffees and eco-tourism. This trend highlights the potential for the forestry sector in the region due to the presence of soil suitable for conversion to tree plantations (DANE 2018).

The poverty index reported by Unsatisfied Basic Needs is mainly in the department of Caldas, with a proportion of 15 % of people in poverty and 2.2 % of people in a situation of misery in rural areas (DANE 2018). Poverty mainly affects rural and indigenous communities.

Land tenure in this region is mostly private with some variables; communal or collective ownership is the tenure form in indigenous communities, as noted in table 1.

Land tenure is in the form of legal title, both for individual producers and for collective lands. The latter are owned by indigenous communities, which have special protection under a legal regime since the 1991 Constitution, which considers indigenous reserves as territorial entities governed by their own authorities. The indigenous communities in this area are the Embera ethnic group,

Table 1. Tenure system in the coffee region.

Sistema de tenencia en la región cafetera.				
Department	Freehold or private property %	Rented or leased %	Communal ownership %	Mixed %
Caldas	79.9	5.4	3.6	5.0
Quindío	81.8	8.4	1.1	5.3
Risaralda	74.0	8.8	4.8	6.5

Source: based on DANE (2018).

with an approximate population of 58,371 people. Altogether the Embera own a total of 59,417 ha of territory in 16 indigenous reservations (Paisaje Cultural Eje Cafetero 2012). The Embera people had been pressured to dissolve their organizations during the last century, which caused the loss of their lands and the prevailing of the minifundia. The historian Nancy P. Appelbaum presents the situations of misery and poverty that this population has experienced, most indigenous children do not go on to finish high school. Their families grow coffee and food crops on ever-smaller, ever-more-eroded plots of land that have not supported the booming population (Appelbaum 2003).

Small landowners dedicated their primary effort to coffee production and, secondarily, had dispersed agroforestry systems as part of natural forest on their properties. According to the Federación de Cafeteros (2018), the coffee production in the three studied departments is 131,600 ha. The larger proportion is in the hands of small producers whose property size averages 5 ha, and of which each coffee grower cultivates 1.6 ha on average. The economy of the coffee region is complemented by agricultural products, with the presence of agroforestry systems that have been promoted by different programs. Among them are the Magdalena River Forestry Program, the result of an agreement between the National Federation of Coffee Growers and the German bank KfW, whose focus is the intervention of more than 20,000 ha in rural communities through forest plantations for production, forest conservation and agroforestry systems.

The study area covers 1,281,202 ha, primarily dedicated to agriculture (898,568 ha) and natural forest areas with the following data:

The Green Growth Mission in Colombia identified for the year 2017 in all the coffee region departments, a planted area of 144,884 ha with a predominance of pine and eucalyptus species, (*Pinus patula* Schl and Cham., *Eucalyptus* spp.), with an annual production of 3.6 million m³ of round wood. Processing industries were also identified for the production of pulp, paper and boards (Fedemaderas 2017).

Based on the review of forest management plans available from companies and the results of performed interviews, the compendium is shown in table 2.

There are also smaller companies in this area such as Agroindustrias La Cristalina S.A.S. and Forestal Tarcará S.A.S., which have implemented forestry and wood extraction projects. The largest forestry company is Smurfit-Kappa, which is self-sufficient in raw materials for pulp production. According to the company representative, the company, reforesters, contractors and transporters participate in establishing the price of the wood; thus, forest harvesting costs are established with the specifications required by the company, transport costs from origin to the industrial plant and wood costs. The value of the wood depends on its location, the costs of forest extraction and transportation, and the road infrastructure required. Regarding administrative arrangements and forest governance, Colombian forest management is part of the National Environmental System with the participation of actors such as the Ministries of Agriculture and Rural Development, the Ministry of Environment and Sustainable Development, and 41 Environmental Agencies. There is significant support from the European Union, through the Forest Law Enforcement, Governance and Trade (FLEGT) mechanism which, since 2009, has been providing resources to strengthen forest governance through instruments and strategies such as the Single National Safeguard for the Control of Legal Timber, the Guide for Responsible Timber Purchasing and Consumption and the Intersectoral Pact for Legal Timber. In the case of the coffee region, these strategies play an additional role in guaranteeing the sustainability of coffee agroforestry that has achieved a premium price in the external market as “specialty coffees”.

Environmental NGOs, governments and industry will need to create institutional designs that support both certified and non-certified farms, that take into account the long-term ecological and economic sustainability of the coffee sector as a whole, including its ability to recover from natural or economic shocks, and that address the ever-increasing role of consumers around the globe in changing local land uses (Rueda and Lambin 2013).

- The stakeholders in the coffee region.

International Actors:

European Union and FAO. FLEGT project objective: strengthen forest governance in partnership with Environmental Agencies.

Organizations supporting forestry research and development processes supported by Smurfit-Kappa:

- Central America and Mexico Coniferous Resources Cooperative

- Forestry and Agricultural Biotechnology Institute, University of Pretoria

- International Union of Forest Research Organizations
- North Carolina State Forest Nutrition Cooperative

National Actors:

National Association of Industrialists

Cauca Trade Council

Table 2. Compendium of information from the main forestry companies of the coffee region.

Información consolidada de las principales compañías forestales de la región cafetera.

Company	Area - Location	Objective	Observations
Smurfit-Kappa Colombia - SKC	The company is located in 6 departments of the country.		It has forest certification.
Information obtained through an interview and from the Forest Management Plan summary	<i>Pinus patula</i> and <i>Eucalyptus</i> spp. plantations and research areas: 42,055 ha.		
2020-2025.	Natural forests: 22,194 ha	Production of wood for pulp and paper, with a focus on the packaging industry; For multiwall sacks, corrugated packaging and for lumber.	Jobs generated by the Forestry Division: 2,613.
https://docs.google.com/document/d/1XprMS2sQYggzw72BC4FsfD2sih31R_z_UpvAZAy0cGU/edit#	The supply of own wood for the manufacture of pulp was 100 % achieved in 2019 (336,979 tons in long fiber (pines) and 98 % in short fiber (eucalyptus), equivalent to 570,889 tons.		
Duratex S.A.	Plantations up to 2019: 8,910 ha. 7,449 ha are on own land and 1,461 ha are on leased land.	Production of particleboard and fiber chipboard	It has forest certification.
Source of information: 2020 forest management plan.	5,675 ha are under forest plantation coverage.		Forest plantations supply approximately 50 % of raw material for the production of boards.
https://duratex.com.co/empresa-verde/	<i>Pinus patula</i> , <i>Eucalyptus</i> spp. and <i>Pinus maximinoi</i> H.E. Moore.		Jobs generated: 200.
Pro Oriente S.A.S			
Information source: Intersectoral pact for legal timber. https://www.elijamaderalegal.com/agents/pro-oriente-s-a-s/	3,500 ha of plantations <i>Pinus patula</i> and <i>Pinus maximinoi</i>	Reforestation, extraction and commercialization of wood for construction	Jobs generated: 600 directly and 200 indirectly
Agroindustrias La Florida.	1,215 ha of forest plantations, of species; <i>Pinus patula</i> , <i>Pinus maximinoi</i> , <i>Eucalyptus globulus</i> Labill and <i>Cupressus lusitanica</i> Mill.		Generation of 64 jobs.
Source: Forest management plan summary http://agroindustriaslaflorida.com/data/documents/Resumen-Publico-Plan-de-Establecimiento-y-Manejo-Forestal-2014.pdf	370 ha are in natural forest.	Wood production.	
Corguadua	34 ha guadua <i>Guadua angustifolia</i> Kunth	Wood production for constructions and crafts.	It has forest certification.
Source: interview with producer from Yarima guadua.			Jobs generated: 18

Source: Agroindustrias La Florida 2014, Pro Oriente 2019, SKC 2020, Duratex 2020

National Coffee Research Center
 Federation of Woodworking Industries
 National Federation of Coffee Growers
 Working Group on Voluntary Forest Certification
 National government:
 Environmental Agencies
 National Planning Department
 Colombian Agricultural Institute
 Ministry of Environment and Sustainable Development
 Ministry of Agriculture and Rural Development
 National Learning Service
 Universities in the region with an emphasis on environmental or forest issues.

NGOs:

There are many organizations that work in the coffee sector on forest and environmental issues; those that have been linked to the process of strengthening forest governance are highlighted through the accompaniment or signing of the Inter-sectorial Pact for Legal Timber in Colombia.

To facilitate the analysis process and to identify critical issues and opportunities, the primary data obtained were transcribed and compared, highlighting the key themes of the study, arranged under analytical categories. The following topics were salient at national and in the coffee region level.

Colombia has an immense area of land suitable for reforestation or afforestation (where only 3 % is effectively used for forest plantations), in addition to having an impressive area under natural forest, generating important ecosystem services to the country and the world. The future development of the forestry sector depends largely on an enabling legal and institutional framework, effective and transparent governance and on access to resources. A promising framework for revising the forest legal regime must be created. At this moment, investment and management of the forest estate are not supportive. The forest sector requires a strong investment in some strategic areas of the country to establish forest production units at significant scales. Clear processes for consolidating and strengthening collective production units with local communities and ensuring equitable benefit-sharing are required. Some projects have tried to go in that direction: they have not all worked, although it is worth continuing to strengthen the issue of local forestry ventures.

Colombia is well-placed to achieve favorable outcomes in legal and sustainable forest stewardship. Some processes are: Forest Law Enforcement, Governance and Trade and voluntary, independent third-party certification of responsible forest stewardship and of forest products. Hence, there is a need to have a well-developed wood tracking system and compliance with international quality standards. Investment in the further development of the forestry sector should include forest plantations, an under-rated though very promising opportunity. A program is needed

to encourage both the establishment and maintenance of small-scale forest plantations. With its suitable soil types and the favorable climate, Colombia would have competitive advantages over many countries if it were to support a basket of forestry ventures, including State investment in the modernization of infrastructure. An increase in long-term global market share would contribute significantly to the national economy if processed products are sold with the added value of independent certification.

Research should be strengthened to facilitate opportunities for forest production models with more local, native species. Production units should encompass from landscape management tools through to agroforestry systems; regional examples in Latin America provide references on how to better position the role of communities in these conflict sites and above all to see forest management as an important business opportunity for local development.

At coffee region level

Ten of the eleven interviewees classified reforestation as requiring an economy of scale. In their view, small-scale reforestation would not be profitable, although some trees could be planted. Only one of the interviewees considered reforestation as a profitable business opportunity. "Although this is a difficult business, especially in the calculation of the internal rate of return, it provides a high internal rate; it all depends on the area of reforestation, economy of scale and proper technical management." (Caldas Environmental Agency). For the rest of the interviewees, there is low productivity. "At the industrial plantation level Smurfit productivity is high, however, if this company is excluded from a regional balance sheet, productivity is considered to be very low" (German Technical Cooperation Agency). Globally, there are many examples of successful small-scale reforestation and this topic merits further research.

The subject of support for the administration of the commercialization and processing of timber urgently requires enabling actions that go beyond the control and surveillance work currently carried out by environmental authorities. At the governmental level, the only mechanism that is in force is the Forest Incentive Certificate. However, the current regulations governing awards and amounts for commercial plantations are not attractive. The financial resources set aside by the national government for this type of project are inadequate compared with local needs. Furthermore, they are distributed only by some states, hence budgets are also short for those who request them. Each successful applicant must commit to carry out the reforestation, buy the requisite materials and do the maintenance.

In terms of financial mechanisms such as carbon capture, to date there are very few projects in Colombia under the UN Clean Development Mechanism, or the voluntary carbon market. The coffee region does not qualify under the Reducing Emissions from Deforestation and forest degradation mechanism because of the current low rates of deforestation. Its complexity and the approach through

national and sub-regional strategies require a high governance level for implementation.

The large plantation companies performed business plans; the small reforester did not. The companies interviewed highlighted the great diversity in their forest management processes. For example, in relation to recruitment, they reported between 20 and 2,600 employees per year, generating an average of 7 permanent jobs per 100 ha reforested.

DISCUSSION

In the coffee region, there are social, environmental and territorial conflicts over land use and correspond to discrepancies between current uses and appropriate uses, in accordance with the environmental, ecological, cultural, social and economic potentialities and restrictions. However, these discrepancies provide an opportunity for land planning policies and strategies that build on knowledge of resources and on land use and suitability as framework tools for decision-makers and for building public policies that strengthen the forestry sector (World Bank 2015). As a result of the analysis of our research data, we present below the main categories that seek to provide a comprehensive look at the country forest development and the coffee region and its potential contribution to the country post-conflict processes.

The interviewees identify gaps in form and substance in the forestry sector, which explain why the country has not fulfilled its potential to date. Colombia needs to improve its forestry planning and implementation processes for the internal and external markets. The report of the World Bank (2015) points how the contribution to the national GDP of the forest sub sectors decreased from 1.4 % in 2005 to 1.1 % in 2014. To date, this figure is lower and the National Development Plan 2018-2022 aims at achieving that the percentage of participation of the forest economy in GDP goes from 0.69 % to 1 %. This report highlights the enormous potential for new plantations, new sawmills and plywood plants in the coffee region and in the Caribbean Region. This requires: a forestry legal regime that sets out rationalized parameters for producers and regulatory institutions, technical and specialized training of operators, support for generation of value-added products for external market and proof of legality and voluntary forest certification. These actions would also combat the problem of illegal timber and strengthen the participation of local communities. The report also identifies the need to improve incentives which currently is limited to the certificate created in 1993; the budget under this program between the years 1993-2018, only benefited 174 owners with the maintenance of 13,598 ha, worth US 2,367,197 (World Bank 2015).

The loss of valuable forest ecosystems due to the expansion of agricultural frontier is becoming increasingly evident. According to Laurance *et al.* (2014), these losses are occurring in the tropics, mainly in South America and sub-Saharan Africa; in Colombia case, it is due to illicit

crops, which have increased since the signing of the peace agreement. Deforestation is also fostered by the growth in oil palm cultivation: Colombia is the fourth largest producer in the world and largest in Latin America, with its negative environmental impacts such as soil erosion, water pollution, loss of biodiversity, deforestation, among others (Potter 2020).

Since the implementation of the FLEGT Action Plan by the European Union in 2003, aimed at forest law enforcement and governance in forest trade, the international trade of forest products by Colombia has become progressively more limited. Colombia could improve its forest potential by positioning itself not only in the international but also domestic market. The adoption of voluntary forest certification processes by entrepreneurs would fulfil a key requirement for entry to American and European markets. However, of 200,738.995 ha certified worldwide, the country has only 151,936 ha certified in 8 Forest Management Units as shown in figure 2:

According to Bulkan (2020) “where there is demand for Forest Stewardship Council -certified wood and wood products- there is increasing incorporation of association(s) of smallholders into Forest Stewardship Council national or global commodity chains”. However, if Colombia wants to develop as a country of sustainable forest management, it should modernize the political-legal context, establish a modern chain-of-custody system by at least ensuring compliance with the rules of the EU Wood regulation, negotiate and sign a Voluntary Partnership Agreement with the EU to sell legal timber products and advance a FLEGT process at the country level. Such processes would enable Colombia to address all the FLEGT requirements, recognizing the progress made by various governmental actors, like environmental agencies and non-governmental actors in recent years; implement a participatory forest investment program among the Government of Colombia, the private sector and rural communities, based on the signing of a Memorandum of Understanding on duties, rights and benefit-sharing, generating income for all these actors, creating employment in the rural and urban areas, and focusing on the creation of added value and the provision of wood products for the domestic and foreign market. Monsalvez (2017) raises similar proposals when mentioning the importance of advancing in the design of institutional mechanisms, associativity policies and strengthening of social capital between companies, which allow progress towards cooperation and knowledge infrastructures that stimulate the possibilities of innovation and technological development in the wood processing industry.

For the natural forest area, it appears as urgent to establish a law that only allows logging if the Forest Management Unit is certified according to a certification system for sustainable forestry and promote the sustainable use of natural forest through the responsible use of Non-wood forest products and a payment for ecosystem services scheme, including co-management, with clear rules, signed by

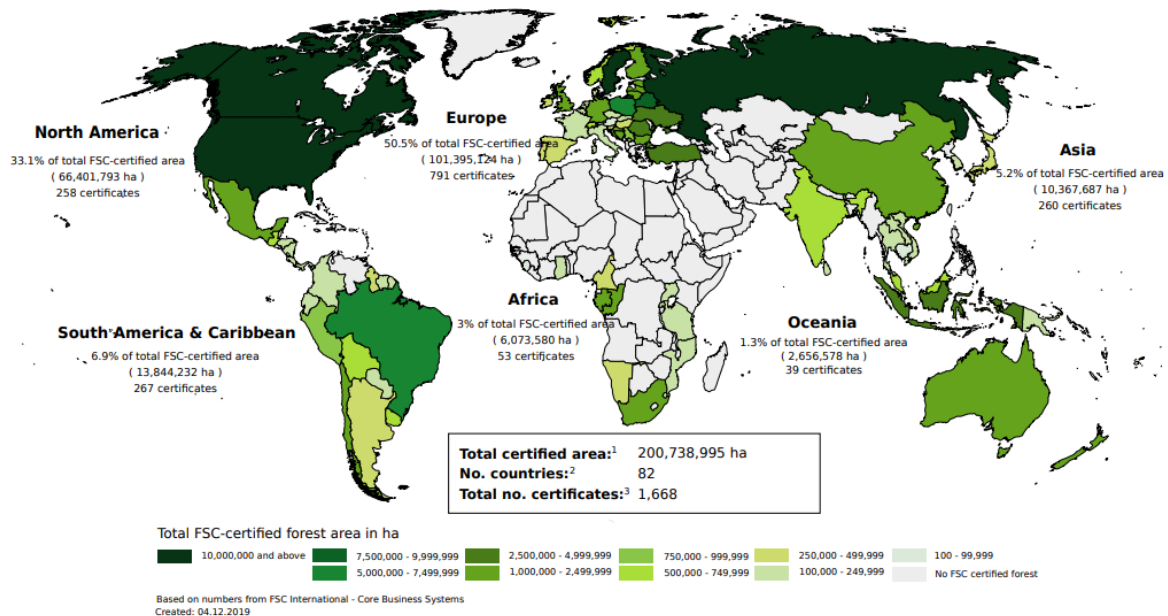


Figure 2. Global Forest Stewardship Council certified area. Global Forest Stewardship Council certified area, 2021. Source. www.fsc.org.
 Área certificada por el Global Forest Stewardship Council. Fuente. www.fsc.org.

all the member parties, specified duties, rights and distribution of benefits, seeking the conservation of the resource and at the same time contributing to the creation of employment, well-being and poverty eradication.

National studies for the development of the forestry sector in Colombia through forest hubs do not prioritize the coffee region as one of the axes of development and expansion of the sector. One element to keep in mind is that the opportunity cost of land is high, which makes it difficult for reforestation. It is important to note that there are no major commercial reforestation projects planned, since landowners expect projects that generate profitability in the short term which is not feasible for the sector; there is no business model at regional or national levels. This is why the process of reforestation is uncertain, the market for timber and non-timber products is highly informal, and potential business opportunities are not on the authorities' agenda.

At present there are only a few plantations of commercial interest, and all belong to private companies, indicating a closed production model. The forestry sector is invisible in the coffee region, therefore determining its share of regional GDP is very difficult. Forestry activities provide only marginal income for rural communities, and there are no recent studies on this issue, despite the high potential for developing forest plantations in the ecoregion. With regard to commercialization, there are few advances in the region: short-term exploratory studies have been carried out although the subject of governmental and external support for commercialization and processing of wood businesses is urgent. Few people interested in reforestation are connected to the subject by family tradition

and some small-scale individual enterprises have invested resources in reforestation projects.

Given the priorities of the National Government, there is no clear future for further development of the forestry sector in the coffee region. The government concentrates on maintaining the operation being carried out by companies such as Smurfit-Kappa. The guadua sector is a resource with high potential especially for the use of guadua as construction material. However, its development requires a total reengineering of the sector and the development of public policy instruments to energize the sector to generate the multiple ecosystem services that could be supplied.

The peace process should allow the structuring of forestry projects that follow well defined business models. The forest management should allow the obtaining of timber products in the short and medium term and the use and commercialization of non-timber forest products, which could improve the family unit income through agroforestry production. By structuring models and business plans, it will be possible to determine what kinds of support are required from the different stakeholders involved in the forestry process.

A robust linkage between the academy and forest producers serves to improve research, and it is important to explore how international agencies can support these processes (business models and plans) and identify necessities in the forestry sector. It is also required to perform statistics and analyses of reliable markets and to be compared with profitable alternatives. At the present time, forestry is at disadvantage, when compared to other sectors (cocoa, coffee, banana and livestock).

The other countries experience that have had post-conflict processes and peace treaties show that the pressure on forest resources increases substantially; which is currently observed in Colombia. However, there is enormous potential for the forestry sector as a development source for the region and the country. It is important to take into account such alternatives as payment ecosystem services projects in the coffee region, which has an area of 55.56 % of natural forest in public and private property. It is important to analyze experiences such as the Bolsa Floresta program in Brazil which should benefit both indigenous and peasant communities. According to Pinho *et al.* (2014), "Ecosystem services and poverty alleviation are a reflection of societal needs and aspirations that have profound effects in land use change".

The studied region encompasses all aspects that should be considered in forestry development such as: lands with good reforestation and afforestation potential, proximity to markets for forest products, good road infrastructure and mobilization and transportation services, highly trained professional and technical staff with training centers. The urgent needs are for sources of funding and the standards for both forest stewardship and wood processing.

The wood use has been changing. Consumer preference was for fine woods such as cedar (*Cedrus*), for furniture. Now, furniture is made using lesser-known species such as *Pinus patula* or *cupressus*. In addition, *Eucalyptus* is starting to be used due to the lack of natural resources. The industry is learning to take advantage of *Eucalyptus* plantations as a substitute that offers similar benefits and profits. The business culture is moving towards the use of cultivated woods.

It is important to note that commercial reforestation programs provide benefits over the long term; consequently, rural communities generally lack the financial capacity to invest in them. For companies such as Smurfit-Kappa, forest plantations are profitable because the company has a complete chain of production and marketing. However, in the case of an individual private property, reforestation represents a good business only if it is established for a maximum production time.

CONCLUSIONS

The coffee region has enormous potential for the implementation of forest plantations. However, there are no policies or financial incentives to support plantation development or sustainable management of natural forest. Altogether these factors have limited the generation of critical mass of support for the marketing of forest products and by-products in the internal and external market, as a real alternative for socioeconomic development.

Experts agree on the potential contribution to the economic development through the generation of income and employment in forest plantations in the coffee region. The experts also highlight the potential role of natural forests in

payment for ecosystem services schemes that benefit both ecosystems and local populations. This potential is one of the factors that led to the declaration of the 'coffee cultural landscape' by UNESCO. The authors recommend continuous research and scientific studies of the forestry sector to promote its development.

To achieve the sustainable use of natural forest, on which indigenous peoples depend, it is important to develop a policy oriented towards this sector and implement programs that favor income generation for vulnerable rural populations in the coffee region by taking advantage of the ecosystem services of forests. Payment for ecosystem services programs require long-term accompaniment, practical and daily experience, the adoption of appropriate technologies or the improvement of existing ones. Also required are the political or institutional will to uphold participatory processes in relation to the management and sustainable use of natural resources and the environment.

The increase in deforestation shows a lack of alternatives for the forestry sector which could be a key factor for development and peace for the communities that live in and close to forests. This situation is aggravated in the post-conflict context with the emergence of illicit groups with high rates of murders, which show the urgent need for a more important intervention of the government in the management and direction of the forestry sector.

The Decree Law aimed at implementing the comprehensive rural reform agreed in the Peace Agreement identifies alternatives such as the creation of a single land fund, as well as the procedure for access and formalization, with elements of social inclusion. However, there are gaps in the law; although it provides guidelines for areas to be dedicated to conservation and rational forest use, to be considered as part of the area eligible for a forest concession award, the law does not consider the instruments required for new bidders to carry out sustainable forest harvesting in terms of incentives, technical assistance and forest management plans.

The main cause of the decrease in the contribution to the GDP by forestry sector in the country is that commercial reforestation projects are not currently being driven by policies, due to lack of legal clarity to take advantage of forest plantations. In the post-conflict context, the strategies to harness the potential of forests need to include the strengthening of forest regulations, as well as implementation of a campaign to raise awareness of the use of wood. Such support is necessary to promote the forestry sector as a generator of wealth, employment and peace. It is important that entrepreneurs and communities advance in independent forest certification processes for planted and natural forests. Certified forest management and chain of custody are proofs of legality, governance and robust stakeholder processes at local, departmental and national levels. Academy can push research and improve management for the forestry sector, similarly national and interna-

tional alliances can facilitate international cooperation in forestry development projects.

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