

Reforestation in Venezuela – current situation and future perspectives

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Abstract

The location of the Bolivarian Republic of Venezuela in the tropical region of northern South America, in the Northern Hemisphere, with a total area of 91.64 million ha, of which 49.6 million correspond to natural forests (54.12 % of the national territory). Venezuela shows a series of geographic advantages that allow a rapid growth and development of the trees in comparison with the temperate zones where the growth is extremely slow. However, the occurrence of deforestation processes has intensified in a sustained way in the recent history of the country.

In the period from 1920 to 2008, the loss of 26.43% of the forested area has been recorded. Likewise, in the period 1975-1988, deforestation was estimated at 216,000 ha year⁻¹, equivalent to 2.9 million ha in 13 years (Catalan 1992). Deforestation has now increased to worrying levels and according to FAO estimates (2010), in Venezuela, a forested area of more than 288.000 ha year⁻¹ is deforested.

In the middle of the 20th century several public and private institutions began an important effort to reforest areas of sandy soils of scarce depth on a bed of highly impermeable clay. With erosion processes generated as a result of strong winds that causes severe damage to the little existing vegetation. It was expected that with the passage of time this region could become a desert in the oriental plains of Venezuela. This is how the Maderas del Orinoco Companies (CVG - PROFORCA), the Venezuelan Corporation of Guayana (CVG), Smurfit Kappa Cartón of Venezuela, San Carlos Forestry Development, Masisa. Propulso, among others, started in different regions of the country the establishment of plantations for various purposes. For this they have used fast growing forest species such as: *Pinus caribaea* var *hondurensis*, *Eucalyptus Urophylla*, *Acacia magnium*, *Caraipa llanorum*, *Tectonia grandis*, *Hebea brasiliensis*, *Gmelina arborea*, *Erismia uncinatum*, among others. At present, a reforested area of 650.000 ha has been reached. This has favored the protection of natural habitats by reducing the pressure for exploitation and use of the forests.

The legal framework established in the new National Constitution, approved in 1998, is based on decrees of 1825-1829 of the Liberator Simón Bolívar and classifies the territory in diverse forest areas establishing a modern environmental conservation policy. A historical summary and the current legislation with the classification that promises a rational management of the national territory is presented.

Keywords

Deforestation; Reforestation; Desertification; Forest species; Venezuela

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1 Introduction

Forests play an important role in global climate dynamics. They influence the quality of life of the population, reduce poverty levels in rural areas and contribute to the production of a wide variety of goods and services of great importance to maintain the ecological and environmental balance of the planet. Forests encourage tourist services and offer alternatives for food security and green growth among others.

Reforestation is a very important forestry activity in a country such as the Bolivarian Republic of Venezuela, where high rates of deforestation occurred mainly during the period 1920-2008, resulting in the loss of 26.43% of the wooded area, equivalent to about 17,935,000 ha (Pacheco et al. 2011). Catalan (1992) estimated that during the period 1975-88 Venezuela had deforested around 216,000 ha year⁻¹ equivalent to 2.9 million ha in 13 years. Deforestation at present has increased to worrying levels and, according to FAO estimates (2010), in Venezuela, a wooded area of more than 288.000 ha per year is deforested. A figure that could be higher at present mainly due to the action of illegal mining activity in the states of Bolívar, Amazonas and Delta Amacuro. Venezuela being a country with a population of 30,206,207 inhabitants there is great pressure on all natural resources. In order to replace the losses of vegetal cover it would require reforestation of an area of 400 thousand hectares per year for a period of fifty years.

A number of institutions, public and private, have been making a great effort in order to reforest diverse sectors of our country with diverse purposes. A list of institutions that have operated in the last fifty years is: The company Maderas del Orinoco, the Corporación Venezolana de Guayana, Corporación de Desarrollo de la Región los Andes (Corpoandes), Universidad de los Andes, The Ministry of Environment and Natural Resources (today the Ministry of Ecosocialism and Water), National Reforestation Company (Conare), National Socialist Forestry Company, Mission Tree and private companies: Masisa, Propulso, Smurfit Cartones de Venezuela, Desarrollo Forestal San Carlos (Deforsa), Asoinbosques and Asoplant among others. It is estimated that the area reforested in Venezuela during the period 1960-2017 is somewhat higher than 650,000 ha. Reforestation is important for climate change mitigation due to the sequestering of greenhouse gas CO₂, the capture of the Sun's energy and its conversion to wood and biomass, useful products for human welfare. An estimation of the energy captured by the areas reforested in Venezuela with *Pinus caribaea* var *hondurensis* considered as a solar energy collector results in an annual capacity of 1710 MW and the sequestered of 113 million tons per year of atmospheric CO₂ (Greaves et al. 2015). This paper aims to describe the current situation of reforestation and future prospects of reforestation in the Bolivarian Republic of Venezuela.

2 Historical visions of reforestation in the Bolivarian Republic of Venezuela

The Bolivarian Republic of Venezuela is located in the tropical region of the Northern Hemisphere between the coordinates 00°38'53"- 12°12'00" North Latitude and 59°47'50"- 73°22'38" West Longitude. It has a tropical climate characterized by the presence of very marked rainy and drought season. The drought is influenced by the presence of the High Pressure of the Atlantic, while the rains by the Intertropical Convergence Zone (ZCIT). Rainfall ranges from 40 mm in the arid and semi-arid regions of the coast to more than 4000 mm in the south of the territory (Amazonas and Bolívar state). The average temperature oscillates around 26°C (Pacheco 2011).

The total area of Venezuela is represented by 91.64 million ha, of which 49.6 million ha correspond to natural forests (54.12% of the national territory) which sustains a large proportion of the country's biodiversity. Venezuela is among the top ten countries with the greatest biological diversity in the world. The action of forest protection by the National Executive determined the creation of a national system of Areas under Special Administration Regime (ABRAE). The system is made up of 62.99 million ha of which 15.92 million ha are intended for permanent forest production under various legal figures: Forest Reserves, Forest Lots and Forest Areas Under Protection among others. There is also an area of 9.3 million ha with high potential for the establishment of forest plantations with fast growing species. At present there are 528,582.19 ha of forest plantations with fast growing species which was established in areas of savannahs with sandy soils and very low natural fertility. These are located mainly in Monagas, Anzoátegui Bolívar, Apure and Barinas states (MINEA 2013).

Archaeological studies locate the presence of the first settlers of Venezuela approximately 15,000 years ago. These human settlements were located in the vicinity of bodies of water and were characterized by having a nomadic way of life dedicated to hunting and fishing for more than 10,000 years.

Later they adopted a sedentary lifestyle depending on food of vegetal origin for their subsistence, practicing an extensive agriculture and in some cases intensive which included the construction of aqueducts and small works that facilitate the agricultural activities. This can be considered the initiation of changes in the use of land and the intervention of forests and nature in general (ULA 2016).

In colonial times land use was intensive with the emergence of colonial haciendas, which together with the exploitation of timber and the extraction of gold and diamonds, marked the most significant changes in the use of land in our Country (Abarca 2006, quoted by Pacheco 2011).

In the period of independence the devastation caused by the armed conflicts led to the abandonment of large estates and caused enormous damage to large regions of our national geography (Veillon 1977). The Liberator, Simón Bolívar, wrote a series of decrees and political documents pertaining to the subject of conservation among which stands out the Conservation Decree of Chuquisaca, written in the town of Chuquisaca, Bolivia on December 19 1825, in which it decrees:

"1. That the Slopes of the rivers and their courses be examined for the purpose of determining the places where water can be diverted to the lands that are deprived of them. 2. That at all points in which the land is promising for planting a species of any larger tree, a regulated plantation be undertaken at the expense of the State up to the number of one million trees, preferring the places where they are most in need. 3. That

the director general of agriculture propose to the government the ordinances that he deems appropriate for the creation, prosperity and destiny of the forests in the territory of the Republic “, (Flores 2008).

On July 31 1829, in Guayaquil, Ecuador, the liberator Simón Bolívar writes a decree related to the protection and exploitation of forest wealth which recognizes the public wealth contained in the forests of Colombia and the production of products such as: timber, dyes, drugs, medicines and products for the arts. The decree reaffirms the productive diversity and medicinal value of forests (Flores 2008).

These Decrees of the Liberator Simón Bolívar called the Precursor of Conservationism in Latin America were taken as a reference by the Government of the Bolivarian Republic of Venezuela for the incorporation of the environment as a mandate established in the Constitution of the Bolivarian Republic of Venezuela enacted in the year 1999. These decrees subsequently inspired the development of a series of documents of utmost importance among which stand out: Programa de Manejo Integral Comunitario de los Bosques (Comprehensive Community Management of Forests Program) (2005), Creación de la Misión Árbol (Creation of the Tree Mission) (2006), El Proyecto Nacional Simón Bolívar. Primer Plan Socialista de Desarrollo Económico y Social de la Nación (The Simón Bolívar National Project. First Socialist Plan of Economic and Social Development of the Nation) for the period 2013 - 2017 (2007), La Carta del Ambiente para América latina y el Caribe (Charter of the Environment for Latin America and the Caribbean) (2008), the creation of the Comisión Nacional de Demarcación de Hábitat y Tierras de las comunidades y Pueblos Indígenas (The National Commission for the Demarcation of Habitat and Lands of communities of Indigenous Peoples) (2011), Segundo Plan Socialista de Desarrollo Económico y Social de la Nación (Second Socialist Plan for Economic and Social Development of the Nation) 2013-2019 (2013), as well as international conventions and treaties on environmental issues among others.

3 Current state of reforestation in the Bolivarian Republic of Venezuela

The Bolivarian Republic of Venezuela is a country with a great forest potential. The national territory is 91.64 million ha. This does not include the aquatic spaces, the territorial sea, the contiguous zone and the projection of the exclusive economic zone. The forests occupy 67.84 million ha representing 65% of land areas and the area occupied by shrub vegetation is 7.47 million ha, representing 8.16% of the country's land area (Figure 1).

3.1 Natural forest resources

A notable important feature of the government of the Bolivarian Republic of Venezuela is the concern for the conservation and recovery of natural forests due to their important role in global regional and local climate change. The National Executive through the Ministry of Environment and Natural Resources (now the Ministry of Ecosocialism and Water) created a set of subsystems for the management of forest resources called Areas Under the Special Administration Regime (ABRAE), which are of great importance related to the integral ecosystemic vision of the Venezuelan society (Figure 2, (MPPAM 2007); Table 1, (MPPAMB 2011)).

The Constitution of the Bolivarian Republic of Venezuela, approved in 1999 grants a constitutional character to the conservation and protection of natural spaces. They are included in the chapter on Environmental Rights and also in the chapter on

Latin America integration processes. It recognizes the importance of protected areas in the processes of sovereignty, justice and social equity.

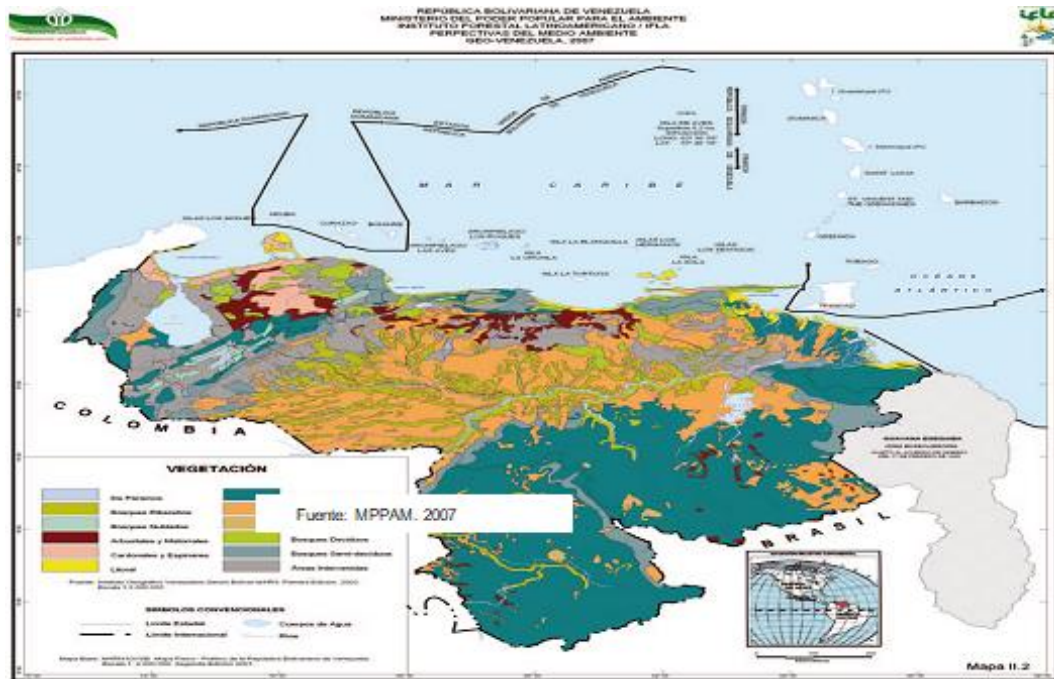


Figure 1.

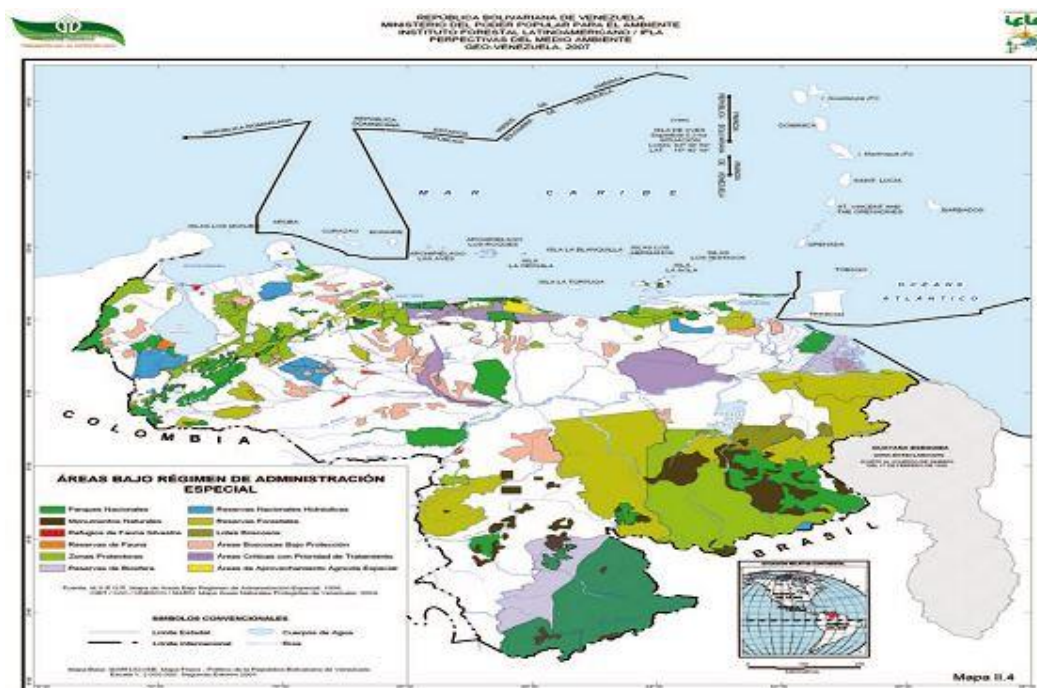


Figure 2.

Table 1. Categories and coverage of protected area systems in the Bolivarian Republic of Venezuela.

Generic category	ABRAE's name	Number of areas	% of the total number of areas	Surface (Hes)	% Regarding the total area of ABRAE	% Regarding the total area of Venezuela
Strictly protective, scientific, educational and recreational purposes	Nacional Parks (PN)	44	10.89	13,066,640.0	19.53	14.26
	Natural Monuments (MN)	36	9.11	4,276,178.00	6.39	4.67
	Wildlife Refuge (RFS)	7	1.77	251,261.53	0.44	0.32
	Wildlife Sanctuary (SFS)	1	0.25	72.24	0.00	0.00
Protective purposes through regulated uses	Protective areas (ZP)	64	16.20	16,216,258.3	24.30	17.74
	Biosphere Reserve (RB)	2	0.51	9,602,466.00	14.35	10.48
	National Hydraulic Reserves (RNH)	14	3.54	1,740,783.00	2.60	1.90
	Wild Wildlife Reserves (REFA)	7	1.77	293,486.85	0.38	0.27
	Critical areas with priority treatment (ACPT)	7	1.77	3,599,146.00	5.38	3.93
	Areas of protection of public works (APOP)	18	4.56	116,425.00	0.17	0.13
	Reserved areas for the construction of dams and reservoirs (ZRCE)	2	0.51	7,043.00	0.01	0.01
	Areas of protection and environmental recovery (APRA)	6	1.52	20,859.06		0.02
	Areas of tourist interest (ZIT)	22	5.57	505,649.63	0.76	0.55
	Historic cultural heritage site (SPHC)	2	0.51	3,609.00	0.01	0.00
Producing and geo-strategic purposes	Forest reserves (RFR)	15	3.80	12,843,500.2	19.20	14.01
	Forest Vocation Areas (AVF)	39	9.87	3,387,889.00	5.06	3.70
	Agricultural Use Areas (ZAA)	6	1.52	357,955.00	0.53	0.39
	Integrated rural development areas (ARDI)	5	1.27	1,010,546.00	1.51	1.10
	Deep sea marine coasts (CMAP)	1.0	0.25	26,338.32	0.04	0.03
	Security areas (ZS)	97	24.56	218,406.56	0.33	0.24
	Border security zones (ZSF)	6	1.52	294,315.52	0.44	0.32
Total		401		67,838,828.2		65.00

Source: MPPAMB 2013

The importance of ABRAE is expressed by the functions it fulfills in our society. These are: the conservation and preservation of the natural environment, the protection and controlled exploitation or productive management, recovery and environmental restitution of lands and the protection and development of strategic infrastructures, security and defense. Also included are the functions defined in international treaties (MPPAMB 2011).

The Constitution of the Bolivarian Republic of Venezuela, approved in 1999, grants a constitutional character to the conservation and protection of natural spaces. They are included in the chapter on Environmental Rights and also in the chapter on Latin America integration processes. The Constitution recognizes the importance of

protected areas in the processes of sovereignty, justice and social equity. Worldwide Venezuela occupies a preeminent place in the conservation and protection of natural forests and natural areas. This is due to its mechanisms of integration and adaptation of the national territory to the ecological realities and to the principles and strategic objectives of sustainable development. This includes the participation of the population and the planning of the endogenous, economic and social development of the nation (MPPAMB 2011).

In 2006, the National Government created the “Misión Árbol”¹ with the purpose of developing reforestation programs for protective agro forestry and industrial commercial uses in degraded areas. Its purpose is to facilitate the integral and sustainable management of watersheds by incorporating communities according to the model of economic development established in the Simón Bolívar National Project. The Integral Watershed Management Program implemented by the “Misión Árbol” has managed to reforest 326 ha with the plantation of 169,887 trees of different forest species. It has carried out 90 training activities with the participation of 2,175 trainees. Also it has created 244 eco-socialist brigades with the incorporation of 15,000 volunteers.

In 2010, the “Empresa Nacional Forestal Socialista” was created. An institution attached to the “Ministerio del Poder Popular de Ecosocialismo y Agua” (Ministry for Ecosocialism and water). One of the objectives of this company is to develop activities for sustainable management of the country’s forest resources, specifically in the Imataca Forest Reserve. This institution contemplates the participation of the local population and organized society for the production, processing and commercialization of goods and services obtained from the use of natural forests within the framework of the Simón Bolívar Project. First Socialist Plan for Economic and Social Development of the Nation 2007-2013.

3.2 Forest plantations

Due to its geographic location in the tropics, north of the equator, Venezuela presents a series of geographical advantages that allow rapid growth and development of trees compared to slow growth in countries with a strong forest economy located in temperate zones. These advantages led to the introduction of fast growing forest species in the national territory. In 1932 in the city of Mérida in the state of Mérida, began the establishment of forest plantations whose purpose was ornamental and for soil protection. In the Upper Chama River Basin were planted trees of the *Causarina* species and was established a small plantation of *Eucalyptus glóbulus*.

In 1948 the Ministry of Agriculture and Livestock (MAC) started small-scale reforestation programs with the species *Pinus caribaea* in the localities of Mucuruba, Morocon and Cacute in the state of Mérida. The purpose of these plantations was to recover degraded areas produced as a result of the application of bad agricultural practices. These reforestation program initiatives for various purposes were continued by the Forestry Institute of the Universidad de los Andes in the Mucuy and the upper basin of the Santo Domingo river in the Mérida state (Finol 1988, cited by Lucena 1988).

¹ **Misión Árbol** (Mission Tree. announced June 2006) – program that seeks to recover Venezuelan forests and to involve the rural population to stop harm to forests through slash/burn practices by promoting more sustainable agriculture, such as growing coffee or cocoa. The projects aim to achieve this through self-organization of the local populations.

Pinus caribaea var *hondurensis* was introduced in Venezuela more than 50 years ago. This species was used in pioneer projects in the development of large-scale forest plantations in our country, particularly in soils with high acidity.

One of the most important initiatives at national and international level is the plantations of *Pinus caribaea* var *hondurensis* developed from 1961 in the southern states of Monagas and Anzoátegui in the east of Venezuela. The Ministry of Agriculture and Livestock (MAC) established an experimental plot of 0.5 ha in the vicinity of the city of Maturín in the north of the Monagas state and that year the Corporación Venezolana de Guayana (CVG) established an experimental plot of 0.5 ha on land bordering the town of Uracoa (southern Monagas state) with seeds of this species from the island of Trinidad located just to the East of the coast of Venezuela.

In 1966 The Ministry of Agriculture and Livestock establishes an experimental plantation of 15 ha in the town of Cachipo (northern Monagas state), and in 1968 began in Uverito (southern Monagas state) the most important program of large-scale forest plantations in Venezuela. It began with a plantation of 750 ha of the species *Pinus caribaea* var *hondurensis* in areas characterized by the presence of sandy deserts of scarce depth on a bed of highly impermeable clay. In these places the erosion processes generated as a consequence of the strong winds caused severe damage to the scarce existing vegetation. With the exception of some trees that showed some adaptation to these environments it was foreseen that with the passage of time this region could become a great desert in the Eastern Plains of Venezuela.

In 1972, the Ministry of Agriculture and Livestock started the second forestry plantation project in Venezuela, establishing in 1973, in Chaguaramas (south of Monagas) a plantation with the species *Pinus caribaea* var *hondurensis* of 2,035 ha. In that same year the National Agrarian Institute (IAN) established a 511 hectare plantation with the species *Pinus caribaea* var *hondurensis* in the town of Centella (southern Monagas state). In 1975, the National Government created the National Reforestation Company (CONARE) which assumed the forestry projects of the Ministry of Agriculture and Livestock and of the National Agrarian Institute. This company established its own forestry projects in the localities of Coloradito and Mesa de los Hachos, both in the south of Anzoátegui state.

In 1974, the Corporación Forestal Guayamure C.A. began its forestry plantation project with the species *Pinus caribaea* var *hondurensis* in the town of El Aceital, Anzoátegui state, while in 1978 the Corporación Forestal Imataca C.A. began planting the species *Pinus caribaea* var *hondurensis* in the locality of Imataca Monagas state.

In 1988, the company CVG - Productos Forestales de Oriente C.A. (CVG - PROFORCA) was created. This company unifies the forestry operations maintained by the Corporación Venezolana de Guayana in the south of Monagas and the Compañía Nacional de Reforestation (CONARE). In the states Monagas and Anzoátegui becoming the largest forest company in the country and one of the most important forestry projects in Latin America.

In year 2000 CVG – PROFORCA began a large scale plantation with the *Eucalyptus Urophylla* species in southern Anzoátegui state with the purpose of producing pulp for paper. Forest plantation projects continued to expand particularly in the Apure - Orinoco Range. In its activities in 2010 it creates a forestry project in the Apure state, in 2011 in the Bolivar state and in 2012 in the Barinas state.

In 2012 CVG - PROFORCA changed its commercial name to Maderas del Orinoco. The forest heritage of this company is 322,170.19 ha with two seed orchards

located in Santa Cruz de Bucaral, Falcon state (165 ha) and San Antonio de Maturín, Monagas state (33 ha), (Maderas del Orinoco 2016; Table 2).

Table 2. Forest patrimony of Maderas del Orinoco as of 12/31/2017.

Species	Surface in each state (ha)					Total (ha)
	Monagas	Anzoátegui	Apure	Bolívar	Barinas	
<i>Pinus Caribaea</i> var <i>hondurensis</i>	132,401.87	121,274.28	658.06	7,101.27	----	261,435.48
<i>Acacia Magnium</i>	2,186.29	5,509.11	8,648.49	6,594.59	-----	22,938.47
<i>Eucalyptus Urophylla</i>	228.30	11,110.71	-----	605.47	-----	11,944.48
<i>Caraipa llanorum</i>	-----	-----	5,095.64	-----	-----	5,095.64
<i>Tectonia grandis</i>	-----	15.57	300.87	27.98	188.33	532.75
<i>Swietenia macrophylla</i>	-----	-----	-----	22.13	-----	22.13
<i>Causarina equisetifolia</i>	33.37	58.01	-----	-----	-----	91.38
Total plantaciones	135,245.17	137,967.68	14,703.05	14,401.34	188.33	302,505.57
Bosques naturales de <i>Caraipa llanorum</i>	-----	-----	19,664.62	-----	-----	19,664.62
Total	135,245.17	137,967.68	34,367.67	14,401.34	188.33	322,170.19

These successful experiences in establishing forestry projects in the East of Venezuela were national references for public and private institutions to carry out similar projects in other regions of the country.

Thus in 1976, in the town of Casadero, Táchira state, an environmental recovery project for areas degraded by charcoal mining activities was developed using *Pinus caribaea* var *hondurensis*, *Eucalyptus camaldulensis*, *E. oocarpa* and *E. tereticornis* (Franco 1986).

In 1986 the Corporación Venezolana de Guayana (CVG) rescues the rubber project (*Hebea brasiliensis*) carried out by CODESSUR - MARNR in San Fernando de Atabapo, Amazonas state. A project is proposed for the establishment of 10.000 ha of *Hebea brasiliensis* over a period of 20 years with an initial goal of 3.000 ha in the first 7 years. However, problems of various kinds have motivated the slow development of this project. Currently it has progressed to approximately 375 ha in Amazonas state and 30 ha in Bolivar state.

CVG maintains since 1989 forest plantations projects with the species *Eucalyptus Urophylla* in the Delta Amacuro state with an area of 3.250 ha and in the localities of Maripa and Sipao Bolivar state where there is a planted area of 700 ha.

The transnational Company Masisa, whose main shareholder is Grupo Nueva (Chile), is dedicated to the production and commercialization of wood boards and products in the international market. Its presence in Venezuela dates back to 1997, when it acquired 59.000 ha of forest land from CVG – PROFORCA, and began the construction of an industrial complex consisting of a board plant (Fibranova C.A.), a sawmill and a drying plant (Andinos C.A.). In 1999 Oxinova C.A. was established as an industrial plant for the production of resin to supply the production of boards from Fibranova CA, in the town of Macapaima in the south of Anzoátegui state.

In 2000, Terranova International S.A. (Shareholder of Oxinova C.A.) materialized the purchase of 76.000 ha of forest plantations from the company Manufacturas de Papel S.A. (Manpa). In 2005 the companies Terranova and Masisa were merged creating

the second largest forestry group in the region. The new company was renamed Masisa S.A. At the present time this company owns a forest patrimony of approximately 100.000 ha of plantations with the species *Pinus caribaea* var *hondurensis* and *Acacia magnium* located in the southern states of Monagas and Anzoátegui.

The species Teak (*Tectonia grandis*) was introduced in the country in 1936. Experimental studies were developed in the period 1959-1963 by the Universidad de los Andes and later, in the period 1972-1995, by public and private enterprises that established medium and large-scale forest plantations in the plains of Venezuela. These developments are in areas of forest reserves and there is currently a planted area of more than 10.000 ha. Teak plantations have continued to develop at small and medium scale in the form of live fences in agricultural and livestock production units in various regions of the country (Schargel and Hernando 2014).

Private company Smurfit Kappa Carton de Venezuela (a subsidiary of the Smurfit Kappa Group) and Desarrollo Forestal San Carlos (DEFORSA) are developing important large-scale industrial forestry projects in western Venezuela. The Smurfit Kappa Cartón de Venezuela's forestry project is located in the states of Portuguesa, Lara and Yaracuy. It has an area of 27,057 ha with *Eucalyptus* spp. *Pinus caribaea* var *hondurensis* and *Gmelina arborea*, among others. DEFORSA has a forest plantation project located in Cojedes State with the species *Eucaliptus* spp and *Acacia magnium* from genetically modified clones. In general terms, the areas of forest plantations with industrial purposes established in Venezuela currently total an area of 528,582.19 ha where the state has invested 76% and private companies 24%. Table 3 contains a summary of plantations for industrial purposes.

The actions undertaken by the National Government, through its corresponding body, the Ministerio del Poder Popular de Ecosocialismo y Agua (MINEA) to protect forests and forest resources have been to prohibit the exploitation and any use in the entire national territory of the Mahogany species (Caoba) (*Swietenia macrophylla*), Cedar (Cedro) (*Cedrella* spp.), Samán (*Pithecelobium samán*), Jobo (*Spondias mombin*), Mijao (*Anacardium excelsum*), Saquiquiqui (*Bombacopsis quinata*), Linnet (Pardillo) (*Cordia alliodora*), Puy (*Tabebuia serratifolia*), Mureillo (*Erismia uncinatum*), Acapro (*Tabebuia spectabilis*), among others. (León González, José de Jesús 2006).

The company Maderas del Orinoco has managed to supply 95% of the domestic market of sawn timber and other forest products with the species *Pinus caribaea* var *hondurensis*, which has led to the progressive reduction of pressure on the exploitation of natural forests in the country. The company Maderas del Orinoco has also given a broad support to the program: Gran Misión Vivienda Venezuela (GMVM), a program of social inclusion undertaken by the National Government to facilitate decent housing for people with limited economic resources.

Table 3. Area of forest plantations for industrial purposes in Venezuela (ha).

Location	Surface area (ha)	Species	Owner	Processing industries
Monagas, Anzoátegui, Bolívar, Apure and Barinas States	322,170.19	<i>Pinus caribaea var hondurensis</i> , <i>Eucalipto Urophylla</i> , <i>Acacia magnium</i> , <i>Caraipa llanorum</i> , <i>Tectonia grandis</i> entre otras	Maderas del Orinoco	Sawmill, Pulp and paper Boards
Monagas and Anzoátegui States	100,000.00	<i>Pinus caribaea var hondurensis</i> , <i>Acacia magnium</i>	Masisa	Sawmill and Boards
Anzoátegui State	10,000.00	<i>Pinus caribaea var hondurensis</i>	Propulso	Sawmill and Boards
Estado Anzoátegui	10,000.00	<i>Eucalipto Urophylla</i> , <i>Acacia magnium</i>	Forestor	Pulp and paper
Monagas and Anzoátegui States	5,000.00	<i>Pinus caribaea var hondurensis</i> y <i>Eucaliptus Urophylla</i>	Various	Sawdust, Pulp and paper Boards
Delta Amacuro State	3,250.00	<i>Eucaliptus Urophylla</i>	CVG	Aserrió, pulpa y papel
Bolívar State	730.00	<i>Eucaliptus Urophylla</i> , <i>Hebea brasiliensis</i>	CVG	Sawmill, pulp and paper and unprocessed rubber
Amazonas State	375.00	<i>Hebea brasiliensis</i>	CVG	Without processing
Portuguesa, Lara and Yaracuy States	27,057.00	<i>Eucaliptus spp</i> , <i>Pinus caribaea var hondurensis</i> , <i>Gmelina</i> . among others	Smurfit Kappa	Pulp, paper and cardboard
Cojedes State	5,000.00	<i>Eucaliptus spp</i> , <i>Acacia magnium</i>	Deforsa	Tissue paper
Forest reserves	45,000.00	<i>Tectonia grandis</i> , <i>Gmelina arbórea</i> and <i>Erismia uncinatum</i>	Dealerships	Sawmill
Total	528,582.19			

Source: Ministerio de Planificación y Desarrollo (2003), CVG (2017), Maderas del Orinoco (2016).

4 Legal framework for reforestation in the Bolivarian Republic of Venezuela

The 17th and 18th centuries marked a milestone in the beginnings of environmental legislation in the Republic of Venezuela, the “Leyes de Indias” (Spanish colonial Laws) and the conservationist decrees of the Liberator Simón Bolívar in Chuquisaca, Bolivia (1825), regarding conservation measures and good uses of the waters and the Guayaquil decree, Ecuador (1829), related to the protection and better use of our forest wealth, are global references of the concern for the conservation and protection of the environment and the basis for later legislation.

At the beginning of the 20th century, a number of legal instruments were approved, such as: the Ley de Bosques (Forestry Law) (1910), the Ley de Montes y Aguas (Forestry and Water Law) (1966) and its regulations (1977), the Decree 1660: Program of National Forest and Multipurpose Plantations (1992), Ley Orgánica del Ambiente (Organic Law of the Environment) (1976), Normas para la protección de Morichales (Morichales Protection Rules) (1990), Decree 2,715, Lineamientos para el financiamiento de desarrollo forestal (Guidelines for the financing of forest

development), (1989), Ley penal del ambiente (Criminal law of the environment) (1992), Decree 2.715: Normas sobre evaluación ambiental de actividades susceptibles de degradar el ambiente (Rules for evaluation of activities that may harm the environment), (1989), Plan Nacional de Ordenación del Territorio (National Plan for Land Management), (1998), among others.

At the international level several agreements were signed among which are the Approving Law on Biological Diversity, Rio de Janeiro, Brazil, 1992, and the Law of the Treaty of Amazonian Cooperation, Brasilia, Brazil 1978. These treaties were antecedents that were taken into consideration for the formulation of the most important environmental policies in the period 1961-1998 (Leon González José de Jesús 2006).

Starting in 1999, Venezuela began a long process of change, establishing the basis for a new legal framework based on a new development model. This model, contained in the new constitution of 1999, is declared as "sustainable development". It guarantees ecological balance and environmental legal rights as a common and inalienable heritage of humanity. By giving constitutional status to Sustainable Development, Venezuela is consistent with the commitment assumed at the Rio 92 conference and ratified at the Johannesburg Summit 2002 (León González, José de Jesús 2006).

In 2013 The Forest Law was approved, whose objective are to guarantee the protection and conservation of forests and forest resources, as well as other forms of vegetation under the premise of sustainable and endogenous development for the enjoyment of present and future generations (Bolivarian Republic of Venezuela 2013).

5 Future perspectives of reforestation in the Bolivarian Republic of Venezuela

In the Bolivarian Republic of Venezuela, there are a number of comparative advantages that can be harnessed for sustainable forest development for the benefit of the population and of future generations. These are: an important skilled workforce, institutionality of the forest sector, existence of a legal framework, growing national and international demand for forest products, access to international markets, a favorable climate and approximately 9.3 million ha of land suitable for the establishment of multi-purpose forest plantations. Additionally in the Apure - Orinoco Axis there are approximately 30 million ha with vocation for forestry and agricultural uses.

A system of Areas under Special Administration Regime (ABRAE) has been defined, with an area of over 67.84 million ha, in order to protect important areas of natural forests from deforestation. These are national parks, forest reserves, forest lots and forest vocation areas. A further recent decision has been to grant millions of ha to indigenous populations as recognition in the National Constitution of their ancestral origin.²

One fact that is of great importance for the conservation of biodiversity for the benefit of sustainable development and future generations of our nation, is that Venezuela has been the first country in the world to establish a national policy for the conservation of biological diversity. This strategic national action aimed at the

² The allocation system consisted in the following: a number of community heads were brought to Caracas and trained in the operation of GPS units. They were then returned to their homelands and instructed to record waypoints all across the limits of their ancestral territories. From this data the areas were allocated to the indigenous groups.

conservation of biological diversity is governed by three fundamental principles: socialist ethics, sovereignty and social inclusion. It represents for our country an important advance in the conservation and protection of our biological and forest genetic resources for the benefit of future generations (MPPAMB 2014).

Regarding forest plantations, the state company Maderas del Orinoco plans to incorporate 1,624,000 ha in the Apure - Orinoco axis in the next few years, to reach 2,061,000 ha distributed nationwide during the period 2013 – 2030 (Table 4).

Table 4. Targets of the forest plantations program 2013 - 2030 of the company of Socialist Production Maderas del Orinoco.

Projects	Surface (ha)	Goals (ha to be planted)		Totals (ha)
		2013 - 2019	2020 - 2030	
Monagas – Anzoátegui axis	1,600,000.00	56,000.00	110,000.00	166,000.00
Bolívar – Caroní axis (under study)	1,400,000.00	36,000.00	220,000.00	256,000.00
Bolívar – Maripa axis	600,000.00	64,000.00	106,000.00	170,000.00
Meta – Cinaruco axis	800,000.00	67,000.00	118,000.00	185,000.00
Apure axis	1,110,000.00	40,000.00	166,000.00	206,000.00
Barinas axis	220,000.00	23,000.00	44,000.00	67,000.00
Barinas – Guárico axis (under study)	1,100,000.00	34,000.00	230,000	264,000.00
Guárico – Anzoátegui axis (under study)	1,700,000.00	60,000.00	250,000.00	310,000.00
TOTAL	8,530,000.00	380,000.00	1,244,000.00	1,624,000.00

This program of increase of the forest plantations is accompanied by a complementary agro forestry production project that allows the generation of 150,000 tons of food to benefit more than 165,000 people. In addition to establishing cooperation agreements with countries that are part of the ALBA, MERCOSUR and ALLIED COUNTRIES to promote the development of the forestry sector and create markets for our products. Likewise, it is planned to strengthen cooperation relations with universities and specialized training institutes for the training and strengthening of workers. These are direct and indirect job opportunities that benefit the local populations (Maderas del Orinoco 2013).

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