GENERATIONAL FORESTS AS ALTERNATIVES TO PERMANENT FOREST PRODUCTION

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Acronyms

APN	Amélioration des Peuplements Naturels
GF	Generational Forests
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza (Tropical Agronomy Center for Research and Teaching)
BDA	Convenio de Diversidad Biológica (Biological Diversity Agreement)
DBH	Diameter at Breast Height
MCD	Minimum Cutting Diameter
FLEGT	Combat against illegal logging
ISLS	Indonesian Selective Logging System
SFM	Sustainable Forestry Management
MUS	Malayan Uniform System
HSSSS	High Shade Shelterwood System
OIMT	International Tropical Timber Agreement.
PES	Payment for Environmental Services
PSLS	Philippine Selective Logging System
ASs	Agroforestry Systems
Sp.	Species
TSS	Tropical Shelterwood System
UNFF	United Nations Forum on Forests

Introduction

Forestry development models have evolved with management activities as well political adjustments in that sector. According to Kimmins (1997), this evolution has manifested in four stages: *Forest Land-use, Regulation, Sustainable Forest Management y Social Forestry.* While other authors state that forestry evolution is divided into six stages: *Original or natural Forests, Forestry Land-use, Traditional Methods, Sustained Production, Multiple Uses and Return to the Natural* (Gamborg & Larsen 2003). Under this panorama, the great majority of Latin American countries are still in the first stages of forestry evolution with the use of traditional methods and investing, although barely, in the regulation of the use of resources.

Traditional forestry has manifested problems such as the increase of areas under **clear-cutting forestry systems** that leave many areas stripped of *continuous forests*, the use of rudimentary forestry systems that affect the stability of the new generations of species of commercial interest (timber) or for domestic use (firewood), with pre-commercial thinning, commercialising problems, ands cash flows that are very difficult to maintain by companies, among other situations that increase the risk of significant economic and environmental losses in forest plantations and their producers.

Latin America has a growing potential in forestry development and its appeal to investment from different actors requires new modalities for technological development to sustain the production, transformation and commercialisation of the resource (FAO 2008); but also, that all the regulatory and institutional conditions that may enable the implementation of new technologies in the first link on the value chain of forestry products be laid out. The *Generational Forest* (GF) is a new forestry sector concept that emulates tropical nature and forest's natural processes. It seeks to find ecological stability and integrity, incorporate the wealth of species and generate great economic value, so as to offer the grower investment warranties derived from a competitive activity in the market.

The objective of this document is to venture into new approaches to forestry systems that can innovate in design, preparation, establishment, maintenance, management, utilisation, and regeneration of forest resources, starting with plantations where innovative forestry techniques will be implemented, generating benefits for growers who depend on this activity. This will also guarantee the ecological integrity of their forests; being that GF are an attractive investment alternative in forest production that offers society valuable environmental services.

This document is structured in its first part with the ecological conceptualisation and the general considerations of GF, followed by a technical justification of the proposal of GF, and finally, a description of the enabling conditions - technical, institutional and legal - that can sustain this concept; however, a solid concept must continue to be built linked with research and the inclusion of forestry policies that make its use and practical implementation viable.

1. Conceptual Framework of Generational Forests

Forests contribute to the economic development of countries, generating commercial opportunities, as well as promoting employment in different links on the forestry productive chain. The forest is a natural, complex and heterogeneous ecosystem, comprised of a great diversity of species and an endless number of ecological successions distributed in a landscape. Its analysis is centred in three components: *composition, structure and function* (FAO 2008).

There are three types of forests. *Natural Forests* are forests that with or without human intervention maintain their natural characteristics and ecological integrity; whereas *Secondary Forests,* according to Finegan (1992), are made up by woody vegetation that grows after the land has been abandoned, usually after agricultural use or where there has been a strong intervention upon its natural structure. In the case of *Forestry Plantations,* they are stands that establish themselves through planting or harvesting native or introduced tree species. The science of forestry classifies forests according to their origin: natural forests (primary, intervened or secondary) and plantations (reforestation or planted forests) (FAO 2003).

Tropical climate conditions and soil composition are optimal for forest growth (Wadsworth 2000). The behaviour of tropical forests is very dynamic, marking important differences in their successional states. Disturbances, natural regeneration and succession are natural characteristics of tropical forests (Bloomfield s.f., Finegan 1992).

Box **1. Key Concepts in Forest Resource Management**

Forests/other wooded lands with conifer predominance: Forest land on which more than 75% of the crown cover is formed by species belonging to the botanical category gymnosperms. On occasion they may also be called “softwoods”.

Forests/other wooded lands with broadleaf predominance: Forest land on which more than 75% of the crown cover is formed by species belonging to the botanical category of the angiosperms. On occasion also called “hardwoods”.

Forests/other mixed wooded lands: Forests/other wooded lands on which neither conifers nor broadleaf nor palms nor bamboos represent more than 75% of the crown cover.

An initial conceptual approximation to Generational Forest (GF) can be defined as the forest cycle that precedes a forest stand harvest, made up of emergent species of commercial and/or domestic interest. GF by definition can emerge in a natural forest, a secondary forest or a forestry plantation. Each generation of the forest will be defined by the population limit of the given generation as well as its physiognomy, as stated by Louman (2001). Such a limit will also be conditioned by phenotypic characteristics such as tree diameter, height, canopy, biomass, amongst others.

GF are considered a form of efficient use of forest resources under a time scale (continuous use) and a spatial scale (better use of land cover in different strata) (Lamprecht 1990). From this perspective, GF can be considered conversion or transformation forest systems between each reproductive cycle of tree species, from their juvenile to adult states, applied to every type of forest aforementioned.

Without a doubt, this system enables de utilisation of wood of commercial interest and its products in shorter periods of time. A similar practice is associated with a German system proposed at the turn of the last Century by Alfred Moller, known as *Dauerwald* focus, or "continuous forest", which was later picked up by Helliwell (1997). This method consists of avoiding clear-cutting and continually maintaining the forest conditions instead; giving special attention to trees with high use potential and eliminating those of little interest; as well as abandoning traditional concepts such as making decisions about utilisation based on the age of trees, rotation and yield calculations beyond forestry criteria.

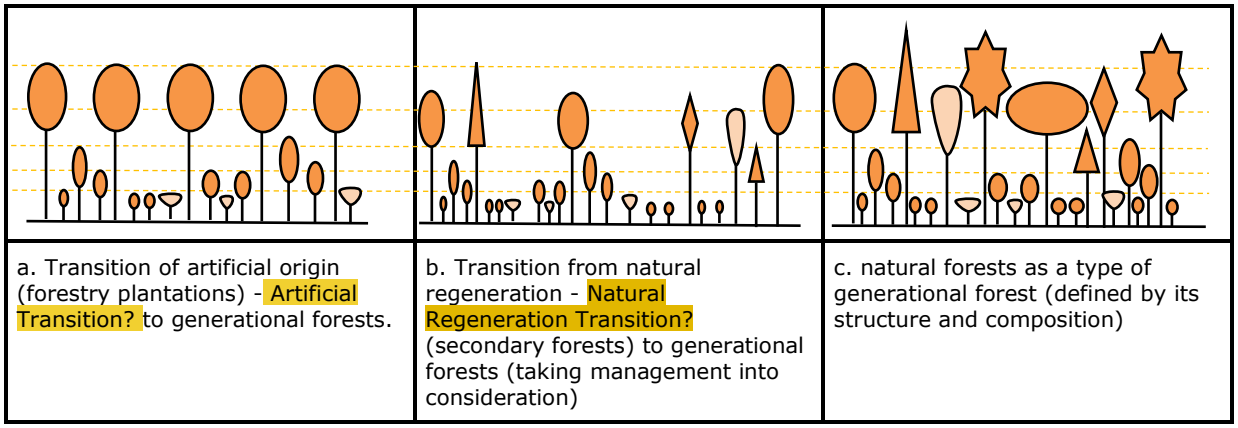
1.1. Characteristics that define Generational Forests

According to Richter & Calvo (1995), the general structure of a forest consists of the following characteristics:

- Predominance of woody trees.
- Continuous crowns (closed forests).
- Discontinuous crowns (altered forests or open forests in savannahs).
- Energy capture, nutrient recycling, accumulated carbon in its biomass.
- According to their composition, forests are homogeneous when more than 80% of their trees belong to the same species (species adapt to specific environmental conditions); and heterogeneous when one can find different types of species per unity of area.

- Even-aged Forest: a forest with little variation in the individuals' ages.
- Uneven-aged Forest: a forest with marked age differences between its individuals.

Characteristics such as age of a species, its composition, structure and function determine the origin of GF. In this sense, as observed in Figure 1, GF can be especially considered in the space-time transition of tree species, defined in plantation forests as well as natural forests and secondary forests.



a. Transition of artificial origin (forestry plantations) - Artificial Transition? to generational forests.	b. Transition from natural regeneration - Natural Regeneration Transition? (secondary forests) to generational forests (taking management into consideration)	c. natural forests as a type of generational forest (defined by its structure and composition)

Figure 1. *Profile of Generational Forests under three types of forest classification.*

- *Transition of artificial origin (forestry plantations) - Artificial Transition? to generational forests.*

In this transition cycle starting from an artificial plantation (forestry plantation), its composition corresponds to a usually monospecific and even-aged form, with a monocyclic system and continuous crowns, which will turn into a generational forest with mixed species and various strata (Figure 1a).

- *Transition from generational forests to natural forests*

This cycle starts from the natural regeneration - secondary forest - that includes a monospecific or mixed composition (in the case of secondary forests) and even-aged in monocyclic systems with continuous crowns that favour native species, which turn into generational forests (Figure 2a).

- *Transition from natural regeneration (forestry plantations, secondary and natural forests) to generational forests.*

In this cycle, the transition manifests in the presence of the generational forests that turn into natural forests. It stems from natural regeneration - established in the artificial plantation, secondary or natural forest - whose

composition is characterised by being monospecific and mixed, even-aged and uneven-aged, in polycyclic systems and with continuous crowns, with a final transformation that is the closest it can get to a natural forest in its final succession phase (Figure 1c).

Box **3.** Silvicultural systems for forestry plantations and natural forests

Monocyclic Systems: The wood harvest is characterised by the clear-cutting of a complete unit of managed forest. After such a cut, a new management cycle begins on an "open field" and the natural regeneration that establishes is of a single age. At the end of the cycle the timber trees reach maturity at the same time and the second harvest is once again a clear-cut. This way, all the trees are part of a single management cycle.

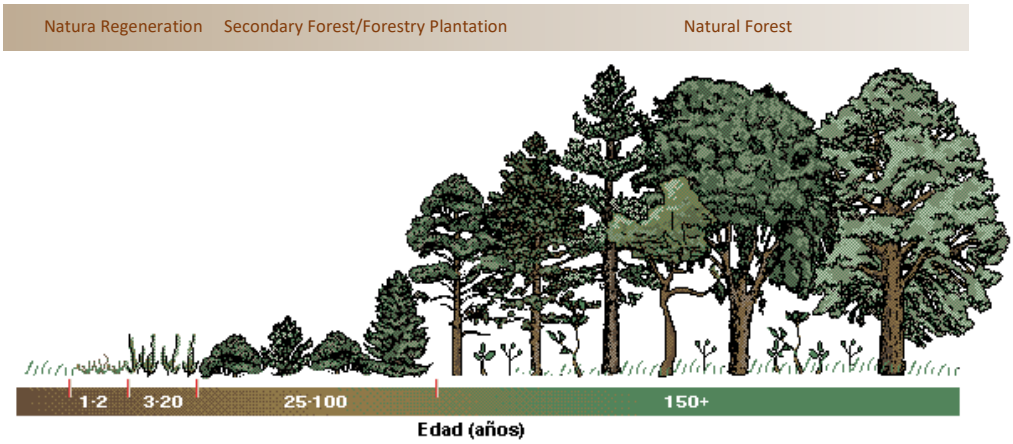
Polycyclic Systems: Also known as selection systems. They are characterised by the use (or selection) of a few mature trees in a unit of managed forest, leaving most of the immature trees standing. After a set time frame (perhaps between 15 to 40 years), commercial trees have matured and can be made use of. Meanwhile, the natural regeneration necessary for future harvests, will be established in the clearings left behind by the previous harvest.

- ***Ecological conditions of Generational Forests***

Richards (1976) mentions that one of the characteristics of tropical forests is the continuous growth and production of plants. This mainly follows the behaviour of species within forests, where one can find pioneer species as well as shade tolerant species (climax species) (Mabberley 1983 and Whitmore 1984, quoted by Louman 2001).

The patterns of forest species wealth and dominance are influenced by tropical biogeographical conditions that cause forest vegetation to recolonise new areas. Under these parameters, ecologically speaking, the intermediate disturbance model holds that species diversity reaches its maximum under these conditions (Asquith 2002). This is the characteristic that ecologically explains the existence of GF, the same condition related to processes of succession.

In order for GF to be successful, an abundant regeneration is required. This takes place through the process of forest succession which, as its definition explains, departs from a process of disturbance - generally anthropogenic - and is recolonised by fast-growing, resistant pioneer species. These plants are replaced by bushes and trees in a more prolonged period of time.



Source: Tangient LLC (2015)

Figure 2. *Outline of a secondary succession*

Finegan (1993) asserts that succession generally is composed of different vegetation communities with different physiological characteristics such as height or biomass. Succession follows a pattern that is possible to predict.

Regeneration is an important characteristic of tropical forests and an important condition for GF. Bioclimatic conditions such as water, temperature and light favor the germination and establishment of species (Lapmrecht 1990). Experiences in lowland moist forests in Venezuela indicate the existence of an average regeneration of between 4000 to 12000 individuals, with less than 10 cm of DBH (Finol quoted by Lamprecht 1990).

Shade tolerant species develop in densely shaded forests and maintain their latent state for a prolonged period of time. On the other hand, heliophytes develop better in forest clearings, as do nomadic species. Durable heliophytes develop with high light intensity, so they can stand extreme climatic events (quote pending).

1.2. Silvicultural Systems for Generational Forests

Silviculture enables one to manage and take advantage of the opportunities that forests give, by manipulating vegetation with the sole purpose of improving the production of goods and services that favour the economies of communities and forest owners. In natural forest silviculture the objective is to impact the composition and structure of these forests, increasing the production of desirable tree species, both in quantity and quality; this, of course, based on the ecological principles of each species (Matthews 1989; Louman et al. 2001).

In order to understand the silvicultural methods applied traditionally in different types of forests, Box 1 shows a synopsis of silvicultural methods used worldwide, taking into account the type of forest utilisation and the key considerations that each of them contributes to the development of generational forests.

Box 1. Potential opportunities for the establishment of Generational Forests, on the basis of silvicultural methods applied in three types of forest classifications.

Production	Origin	Composition Generational Forests	Characteristics	Treatment to Maintain a GF
Artificial Plantation	Even-aged forest plantation Even-aged secondary forest	Even-aged Monocyclic Monospecific Non-continuous	Monospecifi Exotic Species	
Natural Regeneration	Even-aged forest plantation Even-aged secondary forest Even-aged natural forest	Even-aged Monocyclic Monospecific/mixed Continuous	Monospecific / mixed Native species Pioneers (heliophytes) Tropical conifers	*Shelterwood* - High shade shelterwood - Homogenisation through thinning - Amelioration des peuplements naturels Improve thinnings **Seed tree**
Natural Regeneration	Even-aged forest plantation Even-aged /un-even aged secondary forest Un-even aged natural forest	Policyclic Un-even aged Mixed Continuous	Mixed Native species Monospecific / Mixed Even-aged / Monospecific	*Conversion System* - Individual Selective System - Group Selective System

ADBHtado from Smith (1986), Matthews (1989) & Lamprecht (1990)

2. Legal and economic considerations for Generational Forests

International legal frameworks provide general guidelines regarding the definition of forest use alternatives that favour their utilisation and contribute to the economic development of countries in a sustainable fashion (CATIE 2004). The creation of national units that are responsable for forest management and administration, the legalising of land appropriate for forestry, concessions and land-use permits, land-use and management planning instruments, as incentives that promote this activity are improvements that get implemented on a nation level in some countries.

Each country's forestry management policy varies in the definition of forest type classification and in many cases, such definitions are too broad and ambiguous. After a simple revision of regulations, the concept of Generational Forest or a similar term for it does not exist in tropical Latin America.

In our analysis of a legal framework that supports GF in countries, we defined the main forestry management tools that are implemented: (1) Forest utilisation and management plans, (2) Licensing schemes, (3) Authorisations, (4) Permits and (5) Concessions.

Box 2. Forest policies and forest management tools that favor generational forests

Forest management tools				
Countries in the Tropics	**Legal norm**	**Forest Plantation**	**Natural Forest**	**Generational Forest/ homonym**
Panama	- Forest Law of the Republic of Panama 1998. Articles: 5, 26, 27, 42, 43, 58, 60, 65, 66 - Article 68 of the agrarian code - Law 22 of 1996 - Law 14 of 1995 - Law of November 24th and 23rd of 1992 on incentives and regulations on reforestation activities. - Ruling JD 01-98 by INRENARE on fees for the services that INRENARE provides on forest resource management, use and exploitation	Forestry use: -Subsistence logging permits - Concessions - Direct State Management	- Concessions (short term) - Direct State Management - Special permits	
Costa Rica	-Forestry Law 7575 Article 24 -Law 7509 of 1995 -Law 7543 of 1995 - Organic Law on the Environment No. 7554 of 1995 - Biodiversity Law No. 7888 of 1998		-Utilisation with management plan - Sustainability Standards for the Management of Natural Forests in Costa Rica (Criteria and Indicators, Code of Pracitce de Prácticas and the Manual of Procedures)	Polycyclic management

Guatemala	- Forest Act Decree 101-96. Articles: 28, 34, 43, 46, 53 - Regulation of the Forest Act Resolution of INAB 01- 43-2005 of December 6th, 2005 - Regulation of the Forestry Regents. Resolution of INAB 02-43-2005 of December 6th, 2005 - Rules for Transportation of Forest Products, Resolution of INAB 01-13-2004 of April 21st, 2004 - Rules of Forestry Incentive Program (PINFOR) Resolution JD-01-01-2007, January 9th, 2007 - Protected Area Law Decree No. 4-86 - Protected Area Law Reforms Decree No. 110-96		Utilisation in protected areas: -Commercial forestry management plans -Permit for family forestry utilisation	Natural forests under management
Nicaragua	- Law for Conservation, Promotion and Sustainable Development of the Forestry Sector; Law No. 462 - Rules of Law No. 462 - Administrative Resolution INAFOR No. 35-2004 about Administrative Dispositions for the Sustainable Management of Tropical Broadleaf, Conifer Forests, and Forestry Plantations - Law for the ban of cutting, exploiting and commercialising of forest resources. - Law No. 585 June 20th, 2006 - General Environment and Natural Resources Law i - Law No. 217 of May 2nd, 1996 - Law for Forestry Use and Services Fees - Law No. 402 of October 8th,2001	Authorisation with an environmental impact study included in the Management Plan when dealing with large areas. Plantations can be implemented in areas that are apt for forestry activities.	No Use Permit with Management Plan is required when the land is under 10 hectares,	
Peru	Law 27.308 Wildlife and Forestry Law		-Forestry Concessions -Permits and Authorisations	Permanent production forests
Argentina	1. National Law 13.273 Law of the Defense of Forest Wealth of Argentina 2. Law 26.331 Minimum Budget for Environmental Protection of Native Forests.		- Authorisations - Approvals - Concessions	-Permanent Forests -Production Forests

Most Latin American laws make reference to the preservation and conservation of forest resources, with a longterm objective of attaining their permanence in terms of sustainability. Although it is true that in many countries' forestry law there is no explicit category that defines a GF, their implementation and putting into practice depends on the type of permission or use that is sought. Legislation in some Latin American countries does, however, recognise the categories of planted or artificial production forests in which GF could be sustained. For example:

- Peru's forestry legislation, in article 27, section a), numeral 1 recognises planted forests as a category of forests, highlighting the objective of

sustainable timber production and the use of the ecosystem services they provide.

- The Forestry Law in Costa Rica recognises modes of land use combinations and production systems that are subjects of this recognition: forest protection, reforestation and natural forest management. Also, they are currently discussing the standards of secondary forest management.

- Article 5 of the forestry law of Panama defines **artificial forest** as any vegetation, wooded or arboreal formation established or created by humans; and **production forest** as natural or artificial forests in which it is possible to take advantage of economically valuable forestry products in an intensive or rational way, with sustained yield.

- In Guatemala planted forests are understood as plantations that are derived from forestry incentives (article 71). The forestry law classifies forests by: a) natural forests without management, b) managed natural forests, c) natural forests under forestry management. The definition of forestry management is the set of administrative, economic, legal, social, cultural technical and scientific aspects related to **natural** or **planted forests** which implies various levels of human intervention, improving the production of goods and services, and ensuring the derived values from the present and continuous availability for future needs (article 11, numeral 35).

- Chilean legislation recognises the category of artificial forests.

- In Argentina, the National Law No. 13.273 classifies forests as follows: a) protector, b)permanent, c) experimental, d) special mounts, e) production forests.

Given that most countries recognise, in an implicit manner, that a forestry plantation can be installed with the purpose of making perpetual use for the goods and services that these plantations provide. The execution of such a utilisation system muy be described, in a general sense, in the forestry management plan, and more specifically in the operational plans that accompany the management plan.

This indicates that forestry laws have great information gaps in the management of natural or planted forests, which lies at the core of the need to include diverse silvicultural forms and techniques in the laws, which would enable the production, extraction and commercialisation in a competitive and legally protected manner.

1.1. Generational Forests in Forestry Management

Forestry management has been established as a normative component within governmental policies in most Latin American countries, which provides the mechanisms and guidelines for adequate forest management (PROARCA/APM 2015). However, forest legislation is not able to solve certain important issues that limit the continual utilisation of the resource. In this sense, if the forest dynamic is continuous, spacial and temporal it is necessary that the technical, legal and human mechanisms be in tune with the dynamic of forests' natural processes.

Within forest management the use of methods that favour the growth of trees of high commercial value is considered and authorised, as is the case of thinning. However, there is a lack of delving into forest dynamics during ecological phases where biological interactions occur that favor the growth of new forest successions under the canopy of adult trees; these ecological phases are possible due to pollination systems, seed dispersal, among others; which in turn promote the generation of natural forest species (FAO 1995)

Complimentary plantations produced by forest regeneration are a rather attractive alternative, as they maintain saplings that have great use potential when they reach their optimal state in the future. In some countries, this natural opportunity that forests offer has been taken advantage of significantly, as in the case of Peru, where production forests are included in the Forestry Law as a modality called *Permanent Production Forests*, defined as areas with natural primary forest that are made available to individuals for use - preferably for timber, other forest resources and wildlife species (Law No. 27308. 2000). The same law promotes *Forests for Future Usage* - defined as areas that due to their biotic and abiotic characteristics, are in the process of development to become permanent timber production along with other forest services.

3. Opportunities in the permanent production of Generational Forests

GF offer social, economic opportunities that favor the forestry sector. A continuous timber production system under rational and integral use conditions during growth or forest species generation stages, ensures permanent financial returns in all the segments of the value chain. GF become an attractive investment as they guarantee a continuous volume of timber, as well as other ecosystem services which, if given value, add to the forestry economic activity.

In Central America there is a forest cover of approximately 22.411.000 hectares, made up of natural forests and plantations (FAO 2008), while in South America there is an estimated 864.351.000 hectares of forest cover (FAO 2010). The availability of lands suitable for forestry is vast and due to their biogeographic conditions, forest dynamics are in constant dynamic, favouring the conception of generational forests in this territory.

The opportunities inherent in the utilisation of new generations of potentially useful species is sufficiently significant, especially in authorised areas. As shown in Figure 3, Guatemala for instance, manages an important certified forest area as well as plantations; Honduras has the largest number of hectares authorised for forestry utilisation; Costa Rica and Panama are the countries with the most amount of forest plantations, even though Panama holds one of the lowest ratings in yearly authorised utilisation.

País	Superficie Terrestre (000 de ha)	Cobertura Forestal (000 de ha)	Porcentaje de Cobertura [c] (%)	Aprovechamiento Anual Autorizado [a] (m³/año)	Bosques Certificados [b] (ha)	Plantaciones Forestales [c] (ha)
Guatemala	10,843	3,938	36.3	800,000	512,321	133,000
Belice	2,283	1,653	72.5	60,145	104,888	3,000
El Salvador	2,072	298	14.4	300,000	-	3,000
Honduras	11,189	4,648	41.5	920,200	49,151	37,112
Nicaragua	12, 140	5,189	42.7	210,720	20,766	5,513
Costa Rica	5,106	2,391	46.8	446,363	76,547	52,038
Panamá	7,443	4,294	51.7	95,000	11,680	42,124
Total	**51,073**	**22,411**	-----	**2,832,428**	**777,362**	**275,787**

[a] Varias fuentes principalmente de algunos documentos de los servicios forestales de la región. [b] Forest Stewardship Council (FSC) Certified Forests; Marzo del 2007. [c] PROARCA. 2005. Centro América en el límite forestal. CCAD/EFCA.

Fuente: FAO 2008

Figure 3. *Forestry Information of Central America*

Among the best ecological and environmental opportunities GF provides is the ensurance of maintenance and increase of forest coverage, which favours biodiversity conservation as ecological integrity is maintained, and guarantees the supply of ecosystem services such as carbon and water cycling, hydrological regulation and soil protection, as well as various ecosystem functions necessary for human well-being (FAO 2015).

4. Gaps in the Implementation of Generational Forests in the Region

The great gaps found in implementation of Generational Forests are seen as opportunities yet to be developed and implemented from a research perspective, as a vision for political incidence that will enable their realisation. Here are some of these gaps:

- Detailed investigation of the ecological and biophysical characteristics on the development of GF, as well as the analysis and development of technological packs for their execution.

- Definition of standards, both for production management as for utilisation stages.

- Estimating the reduction of the negative impacts caused by inadequate exploitation techniques, starting from the incorporation GF forestry use practices.

- Valuation of the ecosystem services that are maintained and increase with this new technique of forestry use, both in natural and planted forests.

- Accreditation of GF within forestry offices to give permits and promote their use in a legal way.

- Adaptation of rules, policies and procedures that incorporate the concept and practice of GF in countries.

- Scarce regulation and technical assistance that favour reforestation programs with species of commercial interest.

- Regulations established within management plans are directed towards returns in volume, without considering the silvicultural conditions of the forests.

- The incentives that are offered and assigned in time are directed to certain species, ignoring commercial species that reach their optimal state during longer periods of time than those assigned for the incentives.

- The disarticulation of forestry activity within the industrial sector of a country.

6. Enabling conditions that provide legal security and economic instruments for investments in Generational Forests in Panama

In order to provide GF with legal and political backup, it is necessary to propitiate certain conditions that enable their development in Latin America. Box 3 presents an approximation of the conditions that enable GF under four large dimensions: political, institutional, economic and technical. Each dimension explains the minimum enabling factors to be considered.

Box 3. Minimum conditions that enable the establishment of Generational Forests in Latin American countries.

Generational Forests' Enabling Conditions	
Dimension	**Factor**
Political	Policies that favor the use of forest resources permanently
	Controlled and sustainable policies for the management and operation of forest resources
	Inclusion of new forest management schemes in the policies and procedures for forest resource utilisation
	Reforms to the rules and guidelines of forest utilisation
	Political will to boost the management of continuous forests
	Assertive land use planning
Institutional	Granting harvest licenses, reducing procedures and wasteful requisites
	Legalising land tenure
	Mechanisms to control illicit activities
	Efficient institutional capacity
	Recognition of new focuses on sustainable and permanente forestry production on an institutional level
Economic	Short, mid and long term economic investment

	Continual increase of the harvestable volume of commercial species
	Increase of the rentability of permanent production
	Expansion of the national and international market
	Strategic alliances and new partners in all the phases of production and commercialisation
Technical	Appropriate forest management schemes
	Code of forest harvest practices adapted to permanent production
	Appropriate forestry systems that reduce impact and favour forest species in their different successional states

Particularly in Panama, the regulations referring to forest management offer legal protection to the rules of use of forests, forest production control, financing and incentive system to promote private and foreign investment - mainly with the reduction of taxes towards immovable assets, materials and equipment, as well as commercial transactions (FAO 2004). However, these efforts are still insufficient, given that forestry activity has not yet integrated as a potential source of income in the industrial sector. This disintegration is limiting the opportunities that forestry activity generates for the country, regarding economic growth and openness towards large international markets.

To offer longterm legal security, the recommendation is to incorporate the following instruments of forest management and planning:

1. Participation in the elaboration of forest management instruments
2. Prolong the length of time of forest concessions, making GF attractive investment options for concessionaires.
3. Include new and innovative silvicultural systems in existing forest management instruments: forest inventories, management plans and environmental impact studies.
4. Establish rules that promote the repopulation of areas with forestry vocation, hence avoiding land use changes.
5. External investments should respond to national interest agendas, as long as these are clear and consensual.
6. Integrate forestry activity into the national account.
7. Reduce the costs of taxes and high requisites for forest exploitation.

8. Position forest resources as a productive component of the forest.

9. Promote policies that create value with the ecosystem services that GF provide during their development period, which in turn promote new business opportunities on an international level, where charges and payment transfers to the user-owner are possible.

10. Establish a mechanism for Payment for Environmental Services (PES) that will function as an incentive to the owner to raise the area of forest cover, and that GF be a viable activity for this incentive.

11. Establish a market strategy on a national and international level that will ensure production volume and product output.

12. Support technological innovation (sophisticated materials and equipment) to guarantee efficiency in wood extraction and reduce economic losses.

13. Control the changes in the use of soil apt for forestry to other extraction activities such as mining development.

14. Facilitate access to land, both to the soil and forest cover.

On the management plan level, recommendations are:

15. Have Forest Registry that will provide management and utilisation guarantee to the forest owner, a registry that will also guarantee the permanence of forests in time and space.

16. Establish the Principles, Criteria and Indicators, and codes of good forestry practices that guarantee acceptable structure and minimal composition thresholds.

17. Establish the Principles, Criteria and Indicators, and Code of good practices to minimise environmental impact.

18. Deregulation of the activity: Minimal administrative procedures and documents that prevent the discretion of the AFE personnel. (create a plantation record to emit transport guides that are also sales invoices for the payment of forestry taxes/sales.

19. Tax exemption on land apt for this type of management while the forestry system is being established.

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