Chapter 13
The Brazilian Legal Framework on Mixed-Planted Forests

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13.1 Introduction

Forests have been playing a very important role in the establishment of land-use policies worldwide. Forest cover changes directly affect biodiversity, global carbon budget, and ecosystem functions. In many countries in Latin America, historically there has been a contrasting dynamics between rates of deforestation and reforestation. From 2001 to 2010, Brazil lost hundreds of thousands of hectares of forests, and simultaneously the country witnessed the greatest expansion of woody vegetation gain (Aide et al. 2013). A significant part of this gain was likely due to planting forests with exotic and native species all over the country.

Planting forests in Brazil has two main motivations throughout history: as an economic activity, supplying raw materials for construction and furniture making, and as actions for the fulfillment of legal obligations. Landowners plant forests as an option to restore permanent preservation areas and legal reserves and so meet the legal requirements placed by the current legal framework on land use (Oakleaf et al. 2017). Recently, planted forests have also become relevant to mitigate the effects of climate change.

Natural and planted forests have multiple benefits, contributing to production, protection and conservation, and environmental and social services (SFB 2013;

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Yao et al. 2016). Additionally, different forms of reforestation may be used for many objectives (Baral et al. 2016), for instance, depending on the purpose (industrial use, environmental, agroforestry, and farm forestry) or species composition (monoculture or mixed species, hardwood or softwood, native or exotic species). Forest plantations can be used to restore biodiversity and to provide goods and services, but different goals require different strategies, planting, and management models as well, including the use of more or less species. In Brazil, most planted forests are tree monospecific plantations of exotic species, mainly *Pinus* and *Eucalyptus*.

According to Lamb et al. (2005), if we intend to supply goods and ecological services, tree plantation monocultures are efficient for timber or food production, but in most circumstances they are less successful in supplying services.[1] Mixed-species plantations with native species can potentially supply a wider range of goods and services than monocultures, since biodiversity gains are expected to be greater.

Whether for economic reasons or for requirement of legal compliance, there is a high demand and the enormous challenge of identifying opportunities offered by laws and public policies for the planting of mixed forests.

In this chapter, we discuss the legal framework of planted forests, focusing on federal Brazilian rules for use and management of forest plantations, with either exotic or native species. We intend to clarify when, where, and how those forests can be established according to legal rules, to a more effective provision of timber and non-timber products, and services as well.

We focus on the legal framework of the so-called multifunctional mixed-planted forests; neither native forest remnants nor monocultures will be the object of discussion.

13.2 Concepts

New definitions on "forest" have been necessary to have policies promoting effective forest conservation; minor changes in traditional definitions may distinguish native forests from plantations, ensuring that planted forests will protect biodiversity and contribute to sustainable development (Sasaki and Putz 2009).

For the Brazilian legal framework, the concept of forest has not been established yet. According to FAO, forest is as a "land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 %, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use"; planted forests are defined as being predominantly composed of trees established through planting and/or deliberate seeding (FAO, 2012).

[1] Services supplying means conserving ecological and hydrological processes.

Since FAO's definition is not suggested to meet the minimum requirements to attend public policies, a new definition was adopted under the Kyoto Protocol: "Forest is a minimum area of land of 0.05–1.0 hectares, with tree crown cover (or equivalent stocking level) of more than 10–30%, with trees with the potential to reach a minimum height of 2–5 m at maturity in situ." A forest may consist of either closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach either a crown density of 10–30% or tree height of 2–5 m are included under forest. Those are considered areas normally forming part of the forest area which are temporarily unstocked, as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest (Kant 2006).

During the World Congress of Forests in 1990, new concepts and management practices were proposed to distinguish the so-called forest plantations (simple trees cultivation/silviculture) from "planted forests" (which brings the comprehension of these forests as ecosystems):

> *The success of the forest plantations depends on the species fitness, its origin, and on their objectives. Further than the dogmatic controversial issues concerned to the introduction of exotic species, management priorities should aim the maintenance of soil productivity potential, as well of some biodiversity and sustainable income. The management of forest plantations must aim changing plantations into forests.*

In fact, this simple change of words brings distinct concepts: while "forest plantations" focus on timber production, "planted forests" are planned and managed for both forest production and ecosystem services, like water regulation and soil and biodiversity conservation.

FAO's recommendation in the 1990s may be seen as a way of integrating forestry production (through plantations) to the maintenance of ecological and hydrological processes, i.e., to social and environmental values (ensured by planted forests, in this case). As we can see, there is not a clear relationship between "forest plantations" (single-tree cultivation) and "planted forests," since the concept of planted forests is suggested to aggregate social and environmental issues into planning, decision-making, and forest management (Lima and Zakia 2006).

Anyway, a new concept has been proposed: *multifunctional forests* are suggested to embrace issues further than structure, concerning species composition and ecological functioning of forests, closely related to the provision of ecosystem services, as described in Fig. 13.1. As suggested in Fig. 13.1, a mixed plantation consisting of *Eucalyptus* and *Acacia* (only two species and both exotic) is not expected to provide multiple functions (or services) to the environment.

The Brazilian legal framework (Federal Decree 8375/2014) defines planted forests as those "consisting predominantly of trees, established by planting or seedling, cultivated with economic purposes and for trades, out of permanent preservation, restrict use and legal reserve areas."

Planted forests in Brazil are placed by legislation according to two aspects: the portion of either the landscape or the rural property they are located on, and the

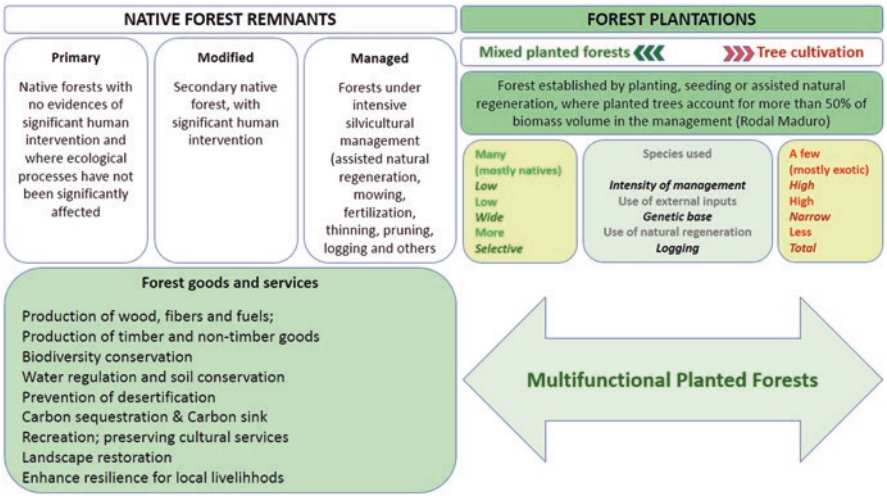

Fig. 13.1 Framework to introduce the concept of multifunctional mixed forests (adapted from Thiel, 2017). Hans Thiel, Close to Nature Planted Forests (CTNPF). World Bank/FAO Collaborative Program (CP) Initiative. Report, 2017 (not published)

objectives of planting forests. Forests can be planted on permanent preservation areas and legal reserve, which are mandatory protected natural areas (Silva and Ranieri 2014); on areas of restricted use; and on areas available for agriculture and forestry with no restrictions. Legal definitions of each type of area described below, as well as their closeness to different kinds of planted forests, are given below:

- *Permanent Preservation Area (APP)*: A protected area, covered or not by native vegetation, with its environmental functions of preserving water resources, landscape, geological stability, and biodiversity; improving the fauna and flora gene flow; protecting the soil; and ensuring the well-being of human populations.
- *Legal Reserve*: An area located within a property or a rural possession, under the terms of article no. 12, with the purpose of ensuring the economic and sustainable use of the rural property's natural resources, keeping and restoring ecological processes, and promoting biodiversity conservation, which includes shelters, and protection of wild fauna and native flora.
- *Consolidated Rural Area*: A rural property area occupied by human beings, existing prior to July 22, 2008, with its buildings, improvements, or agricultural and forestry activities, which may include a fallow system.
- *Areas of Restricted Use*: Areas with specific characteristics, which are:
  - Pantanal areas and plains, and areas where ecologically sustainable exploitation is allowed, and where technical recommendations from official research authorities must be observed. New removals of native vegetation for alternative use of the soil will depend on the approval of the state's environmental authority.

  - Slope areas between 25° and 45° where sustainable forest management and farming, cattle breeding, and forestry activities are allowed, as well as the maintenance of the physical infrastructure connected to the development of these activities, provided that good agricultural practices are observed. The conversion of new areas is forbidden, except when declared of public interest.

- *Area for Common Use*: Non-protected area, available for agriculture, cattle raising, and forestry (alternative soil uses).

An overview of the evolution of legal framework on forests may allow understanding how the regulatory environment affects the perception on the alternatives for the use and management of forests in rural properties. To meet the main objective of this book, it is necessary to state that mixed *Eucalyptus* and *Acacia* planted forests are not allowed to fulfill legal environmental requirements (to recover permanent preservation areas or legal reserves, for instance). The legal framework related to native and planted forests in Brazil, in a historical perspective, is presented below.

13.3 Brazilian Federal Legal Framework

The historical development of legal system regulating the use and management of forests in Brazil may be divided into historical periods.

The first regulatory mechanisms on forests in Brazil were based on the Portuguese legal system. The Colonial period, from 1500 to the beginning of the nineteenth century, was characterized by an unsustainable exploitation of timber products. A good example was the intense withdrawal of the valuable "pau-brasil" (Brazil wood), exclusively traded with the Portuguese Crown that adopted the first legal acts (as the "Pau-Brasil Act, in 1605) to protect natural resources, basically with economic purposes (Medeiros 2006; Bacha 2004). By the end of the eighteenth century, a Royal Charter stated the need to conserve native forests and prohibited the unauthorized cutting of valuable hardwood tree species (Medeiros 2006). From that period to the end of the nineteenth century the plantation of forests had basically ornamental and scientific purposes (Hora 2015).

During the Imperial period (nineteenth century), Brazilian Atlantic Forest faced an intense deforestation for coffee farming expansion, which led to the creation of command and control policies. In the first decades of the Brazilian Republic, established in the end of the nineteenth century, the government promoted the forest sector with economic purposes, by introducing *Eucalyptus* (the potential of native tree species was poorly known) plantations, which resulted in great deforestation.

Following this period, government initiatives showed some concerns on environmental aspects, and created the Brazilian Forest Service, in the 1920s, and the first Forest Code, in 1934, which proposed four categories of forests: protective, remnants, model, and production (Thomas and Foleto 2013; Bacha 2004). The 1934 forest code implied the "obligation of large consumers of forest products (such as

steel companies and transportation) to keep the cultivation of forests for firewood or charcoal supply (spare)" (Bacha 2004). Imprisonment, detention, and fines were some of the penalties imposed by the 1934 forest code to those responsible for deforestation, burning forests, and invading public lands (Moretto et al. 2010).

Environmental concern increased during the 1960s, when an intensification of command-and-control regulation to stop deforestation was observed. No tools to stimulate the conservation of native forests were created though. A second version of the Brazilian Forest Code was passed in 1965, replacing the 1934 version. Some modifications of the first version included the requirement of authorization of the public authorities to explore all native forests, the requirement for forest replacement for all consumers of forest products, and the requirement for management plans to explore the forests in some regions of the country (Bacha 2004). From the beginning of the twentieth century to the 1960s, although forests were planted for economic purposes, planted forest expansion had not promoted the development of forestry (Hora 2015).

Despite requiring forest replacement in deforested areas, legal framework had not defined which species could be planted (Moretto et al. 2010), which resulted in the intense introduction of exotic and invasive species. By that time (1960s), there was a conflict between the legal framework related to forests and other laws, like the Land Statute, which stated that the landowner could benefit from deforestation (Bacha 2004). Consequently, rural landowners were authorized, even when funded, to replace native forests by homogeneous stands (Moretto et al. 2010; Bacha 2004). It resulted in the expansion of *Eucalyptus* and *Pinus* plantations over native forests (Moretto et al. 2010).

The area of planted forest faced a great expansion from 1965 to 1986, due to public financial incentives and strengthening of the legal framework (Hora 2015); in 1970, planted forests covered 1.66 million hectares, reaching up to almost six million hectares in 1985 (Bacha 2004). There were no clear concerns on the costs of planting forests in that period (Hora 2015).

The expansion of forest-planted area in Brazil from 1975 to 2000, however, was about 5% of the deforested area in Amazonia, in the same period (Bacha 2004). In summary, forest plantations were used in that period as a tool for economic development, putting aside other benefits forests can provide, especially those related to biodiversity conservation and ecosystem service delivery.

The economic development approach in that period was evidenced by the creation, in 1967, of the Brazilian Institute of Forest Development (IBDF), to regulate afforestation and reforestation activities, evaluating projects applied to access public funds. Most of the reforestation projects supported by the IBDF had economic purposes and used mostly exotic species. Only by the end of the 1980s the legal framework brought the concern on prioritizing native species in reforestation made by legal compliance (Moretto et al. 2010).

In 1988, the new Brazilian Constitution allowed states to also create specific laws and legislate on the management and use of forest resources. On the other hand, public policies for the economic development remained a great threat to forest conservation, and deforestation indices remained high (Bacha 2004). As the destruction of forest

resources could affect the economic development of the country, new policies based on command and control have been established to reduce deforestation (Bacha 2004). During the Earth Summit in 1992, in Rio de Janeiro, intergovernmental and international agreements were made to use sustainable development to protect forests (Nazo and Mukai 2001).

The lack of financial incentives, although forestry was considered a profitable activity, was followed by a reduction in the planted area, to almost five million ha in 2000. As it was difficult to expand planted forests, the sector invested, from 1990 to 2000, in the development of tools and techniques to improve efficiency in forestry (Hora 2015).

Up to 2006, Brazilian legal frames targeting forest remained excessively protectionist, but the Law 11284/2006, which aimed to protect the Atlantic Forest, promoted sustainable use and conservation in public forests. That law provided the basis of a forest-based development model, by taking into account several issues, like ecosystem and biodiversity protection, rights of traditional communities, an efficient and rational forest use, and conditions to stimulate long-term investment (Bustamante et al. 2018). Importance of economic goals (e.g., profitability, productivity, efficiency) became most visible when the responsibility for and coordination of planted forests were transferred from the Ministry of the Environment to the Ministry of Agriculture (Bustamante et al. 2018).

There is a clear expansion of planted forests over the last decades in Brazil (Hora 2015), and a concern that forestry expansion may negatively affect biodiversity. The current Brazilian legal framework provides a system for the protection and forestry regulation with laws mostly focusing on native vegetation (Brazil holds six biomes[3]), water resources, and climate. Four legal tools,[2] as below, rule planted forests:

(a) The National Policy on Climate Change (Federal Law 12187/2009), established to consolidate and expand protected areas, fostering reforestation and revegetation of degraded areas.
(b) Conflicts between biodiversity conservation and social and economic interests pushed the establishment of the most recent legal framework in Brazil: the Law for the Protection of Native Vegetation (12651/2012). This law establishes rules for the protection, restoration, and compensation of native vegetation, and defines rules for forest exploitation and controls the origin of forest products. It regulates extractive activities and management of wood and non-wood products in native and planted forests, in conformity to a previously approved sustainable forest management plan (Oliveira and Sais 2017; Zakia and Guedes Pinto 2013; Kuntschik 2012). Forest plantation in non-protected areas is considered as agriculture.
(c) Most recently, Brazil has established an Agriculture Policy for Planted Forests (Decree 8375/2014), and the National Policy for the Recovery of Native Vegetation (Decree 8972/2017). Both policies offer interesting opportunities for the development and expansion of planted forests in Brazil.

[2] Federal laws can be consulted in http://www4.planalto.gov.br/legislacao/

13.4 The National Plan on Climate Change, the Federal Law and the National Policy for the Protection of Native Vegetation, and National Policy on Planted Forests: Opportunities and Challenges

The goals placed by legal framework and forest-based Brazilian policies offer significant opportunities for the expansion of multifunctional mixed-planted forests, but some bottlenecks need to be addressed.

One policy that has a great potential in fostering the expansion of mixed-planted forest is the Brazilian National Climate Change Plan (NCCP), which aims "to make the economic and social development compatible with the protection of the climate system and to promote the reduction of greenhouse gas emissions by encouraging the use of clean energy" (Brasil 2008). One of the goals of the NCCP was to eliminate the net loss of forest coverage in Brazil by 2015, which meant avoiding deforestation, and upscaling of forest plantations to 11 million ha in 2020; two million ha have been expected to be plantations of native species to replace degraded pastures (Brasil 2008).

The most important Brazilian law on forestry (Federal Law 12651/2012) establishes that no previous authorization is necessary for reforestation, using either exotic or native species (Brazil 2012). In 2017, the decree 8.972/2017 created the National Policy for Native Vegetation Recovery (Proveg), to articulate, integrate, and promote policies, programs, and actions that encourage forest recovery and other native vegetation forms. In order to implement that policy, the National Plan for Recovery of Native Vegetation (Planaveg) aims to have at least 12 million ha of forests and other forms of native vegetation restored in Brazil, up to 2030. Among the guidelines of Planaveg are the following: to foster society's awareness of the benefits of recovering native vegetation, and to improve the regulatory environment and increased legal certainty for the recovery of native vegetation with economic exploitation (Brazil, 2017).

The principles of the National Plan on Climate Change are to stimulate the production of forest goods and services for the social and economic development of the country, and mitigate the effects of climate change (Brazil, 2014). The Brazilian Ministry of Agriculture is in charge of creating the "National Plan for the Development of Planted Forests," which will establish forest production goals in Brazil, and the actions to be taken to achieve them.

Principles, objectives, and goals above are assumed as voluntary commitments from Brazil for the restoration of degraded areas, which may result in the expansion of planted forests. Multifunctional mixed forests have the conditions to fulfill legal requirements, provide adequate environmental services, and deliver economic benefits. An overview on the regulation of multifunctional mixed forests in Brazil is summarized in Table 13.1.

According to the Brazilian legal framework, multifunctional mixed forests consisting exclusively of native tree species can be planted to recover all these sites in rural properties: permanent preservation areas (within small, medium, and large properties), legal reserves, restricted-use areas, and areas that do not need any specific regulation (Table 13.1).

Table 13.1 Summary of permissions and possibilities placed by Brazilian legal framework for the implementation of multifunctional planted forests in rural properties

	Recovery of APP in small properties (see Box 13.1)	Recovery of APP in medium and great properties (see Box 13.1)	Recovery of legal reserve	Recovery of restricted-use area	Non-protected area (suitable for agriculture)[a]
Plantations of exotic trees only	Not allowed	Not allowed	Not allowed	Not allowed	Allowed
Plantations combining native and exotic trees	Allowed	Not allowed	Allowed	Allowed	Allowed
Plantations of native trees only	Allowed	Allowed	Allowed	Allowed	Allowed
Agroforestry systems with exotic trees only	Not allowed	Not allowed	Not allowed	Not allowed	Allowed
Agroforestry systems with native trees only	Allowed	Allowed	Allowed	Allowed	Allowed
Agroforestry with native and exotic species	Allowed	Not allowed	Allowed	Allowed	Allowed
Plantations for economic purposes	Allowed	Not allowed	Allowed	Allowed	Allowed
Environmental function established by legal framework	Preserve water resources, landscape, geological stability and biodiversity, facilitate gene flow of fauna and flora, protect soil	Preserve water resources, landscape, geological stability and biodiversity, facilitate gene flow of fauna and flora, protect soil	Assist the conservation and rehabilitation of ecological processes and promote the conservation of biodiversity, as well as shelter and protection of wildlife and native flora	Assist the conservation and rehabilitation of ecological processes and promote the conservation of biodiversity, as well as shelter and protection of wildlife and native flora	Water and soil conservation
Eligible for the payment of ecosystem services	Yes	Yes	Yes	Yes	No legal prediction

(continued)

Table 13.1 (continued)

	Recovery of APP in small properties (see Box 13.1)	Recovery of APP in medium and great properties (see Box 13.1)	Recovery of legal reserve	Recovery of restricted-use area	Non-protected area (suitable for agriculture)[a]
Legal rules	Federal Law 12.651/2012 Federal Decree 7850/2012	Federal Law 12.651/2012 Federal Decree 7850/2012	Federal Law 12.651/2012 Federal Decree 7850/2012	Federal Law 12.651/2012	Federal Law 12.651/2012; Federal Decree 8.375/2014
Allowed use and management for economic purposes	Needs regulation	Not applicable	Needs regulation	Needs regulation	–

APP permanent preservation areas

[a]Here is a bill under discussion in the Brazilian Congress (6411 PL/2016) that proposes that silvicultural activities should not require environmental licensing, in case of planting and management of either native or exotic trees, for logging and forest resource extraction, in consolidated rural areas, located in APP, or in degraded lands due to human activities, since those lands are not located on the APP or the legal reserve area

Brazilian rural properties may be classified into small, medium, or large, according to the corresponding fiscal modules (in units of area—see Box 13.1). Small properties and familiar-based farmers have some extra benefits related to the use and management of their lands in Brazil. There is no legal restriction for native planted forests to meet ecological requirements, but no exploitation is allowed in recovered permanent preservation areas (APP) located in medium and large properties. As we can see, Brazilian current legal framework allows small farmers (Box 13.1, below) to manage planted forests in their APP.

The use of noninvasive exotic species in planted forests to meet legal requirements is allowed for the recovery of APP only in small farms and to recover legal reserves, always combined with native species. No systems consisting exclusively of exotic trees—like the so-called *Eucalyptus-Acacia* system—are allowed to recover legally protected areas. This indicates a great concern on the potential invasiveness of some exotic species, as *Acacia* species.

Plantations for economic purposes are also allowed for the recovery of restricted-use areas and legal reserves, which enhances the potential multifunctionality of the models designed for those areas (Fig. 13.2). These plantations are allowed in restricted-use areas only if the use of area is consolidated (according to Federal Law 12651/2012), and under the adoption of water and soil conservation practices that include the *Eucalyptus-Acacia* system.

Since it is mandatory, the recovery of legal reserve areas offers the best opportunity for the expansion of multifunctional mixed-planted forests, since environmental functions and economic benefits can be obtained simultaneously. It is important to notice that mixed-planted forests in the legal reserve may contain noninvasive

Box 13.1 Zakia and Guedes-Pinto (2013)

Rural Module?

A rural module is calculated for each rural property, and its area reflects the kind of exploitation or utilization prevailing in the rural property.

Fiscal Module

A *fiscal module* is a land measuring unit in Brazil, established by Law no. 6746 of December 10, 1979. It is expressed in hectares, is variable, and set for each municipality according to:

- Kind of exploitation prevailing in the municipality
- The income brought in by the main exploitation business
- Other existing exploitation businesses in the municipality which, even if not prevailing, are significant for the income they bring, or the area they use
- Concept of family property

A *fiscal module* should not be confused with a *rural module*.

A fiscal module equals the minimum area required for a rural property to run a viable exploitation business. Depending on the municipality, a fiscal module may vary from 5 to 110 ha. In metropolitan regions, a rural module is usually quite smaller than in rural areas farther away from major urban centers.

A fiscal module also serves as a standard to define beneficiaries at PRONAF (small family farm producers, owners, sharecroppers, legal holders, partners, or tenants of up to four (4) fiscal modules).

PROVISION OF FOREST GOODS AND SERVICES	PLANTED FORESTS			
	Mixed planted forests ⟨⟨⟨			⟩⟩⟩ Tree cultivation
	Recovered Permanent Preservation Areas	Recovered Legal Reserve Areas	Mixed plantations (Forestry, Agroforestry)	Silviculture (monocultures)
	Economical use allowed only for small landowners (under specific rules)	Economical use allowed under specific rules (Forest Management Plan is required)	Economical use allowed. In the case of using native trees, the plantation needs to be registered	
Production of wood, fibers and fuels	MEDIUM	HIGH	HIGH	HIGH
Production of timber /non-timber goods	MEDIUM	MEDIUM	HIGH	LOW
Biodiversity conservation	MEDIUM	MEDIUM	MEDIUM	LOW
Water regulation and soil conservation	HIGH	HIGH	MEDIUM	LOW
Prevention of desertification	HIGH	HIGH	HIGH	MEDIUM
Carbon sequestration	MEDIUM	MEDIUM	MEDIUM	HIGH
Carbon sink	LOW	MEDIUM	MEDIUM	MEDIUM
Recreation; preserving cultural services	MEDIUM	LOW	HIGH	LOW
Landscape restoration	HIGH	MEDIUM	MEDIUM	LOW
Enhance resilience for local livelihoods	MEDIUM	HIGH	HIGH	LOW

Fig. 13.2 Opportunities of economic uses in planted forests and potential of providing forest services and goods according to the legal framework (adapted from Thiel, 2017). Hans Thiel, Close to Nature Planted Forests (CTNPF). World Bank/FAO Collaborative Program (CP) Initiative. Report, 2017 (not published)

exotic species, which still needs legal regulation, especially for the management and use of native trees.

The presence of native forest remnants has been costly and sometimes punitive to rural landowners. Brazilian laws historically have restricted the use and management of native forests, resulting in an understanding that "an overprotective approach may fail in effective protection." The management practices and uses recently allowed in legal reserve are a chance to change that paradigm.

In the definition of legal reserve given by the Federal Law 12651/2012, the economic purposes are not allowed just to mitigate costs of the reforestation (restoration), but also to offer new incomes for the landowner. In this new approach, the ecological function of the legal reserve concerns rather to ecosystem services than the biodiversity conservation or community structure. The model that better fits to the new objectives (as to restoration purposes) of the legal reserve is that related to the concept of multifunctional planted forest (see Table 13.1).

The law states that economic-based alternatives to be proposed for the use and management of legal reserve must target the maintenance of ecological functions. As other legal tools also require the legal reserve to attend ecological functions, there is no reason to avoid the sustainable use of forest resources in the legal reserve. It is a matter of searching a balance between biodiversity, conservation, and economic sustainability, and enabling the dual functions of the legal reserve.

In São Paulo state, this is especially challenging. Most of the rural properties do not have enough native vegetation and need reforestation actions to fulfill the minimum requirements of a legal reserve. Landowners may either protect, restore, or offset the legal reserve to meet the legal requirements (Oakleaf et al. 2017). The restoration of legal reserve to comply with the legal framework may be done by either assisting natural regeneration or planting forests in the rural properties. The combination of restoration and offset may offer a great opportunity to allow the expansion of forest cover in strategic areas for water conservation and to reconnect isolated forest remnants (implementation of ecological corridors). Lands in São Paulo state have the greatest opportunity costs of land use in Brazil, both in the Atlantic Forest and in Cerrado, resulting in high costs of restoration of native forests as well. A proper regulation may provide economic sustainability to multifunctional planted forests in the legal reserve, independent of legal obligations.

13.5 Final Comments

Brazilian legal framework places a good range of opportunities for the expansion of planted forests. However, environmental threats, such as global warming and biological invasions, recommend extreme care on the use of exotic and invasive tree species, as is the case of the *Eucalyptus-Acacia* consortium; their use must be planned considering rather a multifunctional approach. For the establishment of public policies, however, mixed-planted forests should be multifunctional and pri-

oritize the use of multiple native species in mixed combinations (diversity is always welcome!). This is an opportunity for the development of the silviculture of native species.

Planting mixed forests for the recovery of permanent preservation areas in small properties and legal reserves needs regulation to enable the delivery of economic benefits to landowners, as well as environmental services to the landscape.

Governance is also a key issue. The opportunities discussed in this chapter, considering all the possible uses and services from multifunctional forests, will only be achieved if governments maintain and support the legal framework and public policies listed here.

Government actions must support the consolidation of the legal environment, and new policies should avoid conflicts with formerly published policies. Conflicts can affect the effectiveness of regulation, hindering the achievement of policy-related goals. Further, since most of Brazilian forest-related policies are associated to international agreements concerning global issues, governance should contribute to a collective international effort, and try not to favor specific sectors.

It should be noted that government actions must *always* strengthen sustainable development policies and strategies and that all care must be taken to avoid changes in government and/or political directions negatively affecting them (unfortunately, recent decisions of the Brazilian Government apparently have pointed in another direction). It is also a duty of Brazilian civil society to watch out for any misconduct in this regard.

Finally, it is important to remember that the forest cover, hopefully fulfilled with the so-called multifunctional forests, is located in multiple and heterogeneous rural landscapes, where the socioeconomic and cultural aspects are essential for the permanence (or not) of these forests, and their participation in the effectiveness of rural development in Brazil.

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