

A legal compliance as a forest inductor? The possible role of non-timber forest products in ecological and economic forests in Brazil

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Abstract

In Brazil, a recent legal requirement (Federal law 12.651/2012) provides for the allocation of at least 20% of rural properties to form Legal Reserve areas (RL) – destined to ensure the sustainable economic use of natural resources and also assist in the rehabilitation and preservation of ecological and biodiversity processes. However, a large part of the properties does not have enough vegetation to meet this requirement. Therefore, more than just a legal compliance, its deployment is a powerful instrument to promote the planting of new forests, planned for both purposes. In this context, this study was carried out to identify and address the hindrances for deploying these native forests for the *Cerrado* (Brazilian savanna) and Atlantic Rainforest biomes, with the participation of representatives of the governmental, production, and technical and scientific sectors. A survey of non-timber forest products (NTFP) was carried out on biological, silvicultural and economic aspects, through a bibliographical survey, technical scientific meetings, and technical visitations to sectors of ornamental plant, foodstuffs, and biochemical product supply chains. The group of 70 species pointed out so far is quite heterogeneous under several aspects, e.g. level of knowledge and silvicultural experience, and market soundness. From an economic standpoint, the NTFP's pointed out have provided the proposed forest models with greater feasibility, with the advantage of early and continuous payback (2-3 years) compared to the exclusive logging model. From an ecological standpoint, NTFP species can provide the forests with a significant increase in structural complexity and forest dynamics in several ways, enabling their natural development. The relevance of NTFP's in RL forests lies in their contribution to reconciling ecological and economic aspects and thus effectively relativizing the antagonism between the preservation of native forest resources and income generation.

Keywords: non-timber forest product, savanna forest, atlantic forest, native forest, economic forest

Introduction, scope and main objectives

In Brazil, the recently established legal requirement (Federal law 12.651/2012) provides for the destination of at least 20% of the area of rural real estate to constitute Legal Reservations (LR) – areas destined to ensure the sustainably economical use of natural resources and, at the same time, assist in the rehabilitation and preservation of ecological and biodiversity processes.

However, part of the properties does not have enough vegetation to meet this requirement. Therefore, more than a legal requirement, its deployment is a powerful instrument to promote the planting of new forests, planned for economic and ecological purposes. In such context, this study was carried out to identify and address the hindrances of deploying native forests with ecological and economic purposes

for the biomes Cerrado (Savanna) and Mata Atlântica (Atlantic Rainforest), with the participation of representatives of governmental, production, and technical-scientific sectors. One of the topics addressed was the deployment potential of Non-Timber Forest Products (NTFP) in the restoration of the Legal Reservation.

In the 1980's, the interest in the loss of tropical biodiversity due to deforestation led to the acknowledgment of the value of non-timber forest products (NTFP) from tropical forests (de Beer; McDermott 1989; Peters *et al.* 1989). Therefore, these products started to be seen as a feasible choice to exploit the biological richness of tropical forests without harming the latter and, at the same time, encouraging rural development [Gentry 1990, Prance 1987)

Nowadays, NTFP's might have another prominent role. Given the intensive process of forest fragmentation in the Brazilian rural setting, associated to the mandatory deployment of legal reservations in properties, restoration of forests is a pressing issue, and not only for ecological purposes. It creates demand for selecting species and products that might encourage this process, and also the acceptance of the forest component as an economic alternative to rural properties (Carvalhoes 2008 *et al.*). Therefore, NTFP's represent a great contribution since one of the objectives of restoration is the formation of native forests for economic purposes and it might mean a step forward in reversing the intensive process of fragmentation.

Therefore, the role of NTFP's is emphasized not only in native forests but also in forests planted for ecological and economic purposes. They represent an alternative that enables the economic use of resources such as fruits, resins, leaves, and they maintain vegetation structure, which is in line with the objectives of the Legal Reservation, in particular.

This study is part of the project "Formulation of a Forest Plan with Native Species with Economical and Ecological Purpose", demanded by the State Environment Secretariat of São Paulo and developed by the Forestry Science and Research Institute, and other institutions as Embrapa.

Methodology/approach

In the present study, any product of plant origin but timber deriving from whole tree trunks (for sawmill and large pieces of wood for other uses), which might be obtained from natural forests, planted forests, and/or agroforestry systems, for subsistence and/or commercialization, was considered NTFP.

The survey on non-timber forest products (ntfp) that comprise forests was carried out through a bibliographical survey, technical and scientific meetings, and technical visitations to production chain sectors of ornamental plants, foodstuffs, and biochemical products.

Results and Discussion

From a set of 70 species pointed out as potential species to be used in LR, five species were selected as flagships - those species on which forestry knowledge is already consolidated or at least advanced, whose market already exists and provides financial return, and which might be used together with less exploited native species, thus leveraging the production of the latter and assisting in the environmental functions of LR's. These were the 5 species that provided the proposed restoration models with improvement in economic feasibility, with the advantage of early (2 to 5 years) and continuous payoff compared to the use of species that are exclusive for timber products.

***Euterpe edulis* (Arecaece) Palmeira-juçara - Main product: Fruit**

After years of unsustainable exploitation of its heart of palm, the use of *E. edulis* fruits for the production of pulp - very similar to that of açai in Amazonia - brought new economic perspectives for its great potential for diversifying the income source of rural producers. This is considered the product with the greatest potential in the list. It is a concrete possibility of changing the species preservation *status*, which is endangered today (Farias, 2009) due to intensive harvesting of its heart of palm, which necessarily implies in the death of the individual, and has led to the delicate situation of preservation *in situ*, almost extinct in its natural environment (Reis, 2000; Bourscheid et al., 2007). The first fruiting bodies occur at 6 years in plantations (Carvalho, 2003).

***Hevea brasiliensis* (Euphorbiaceae) – Seringueira. - Product : Rubber, multiple use**

Although this Brazilian species doesn't occur naturally in São Paulo, it has its largest Brazilian production in this state, as well as the highest annual productivity per area: 1,300-1,500 kg per hectare (Apabor, 2013). It is a multiple-use species: its timber can be extracted when the tree is no longer producing latex, when it reaches around 100 cm DBH with approximately 1 m³ of wood. From its seeds, oil is produced for industrial use and the pie obtained from oil extraction can be used as animal feed. Its honey can also be produced at the rubber plantation. The latex production might start at 6-7 years. The tree can remain productive for 30-35 years.

***Dipteryx alata* Vogel (Fabaceae) - Baru – Products: fruits; multiple-use**

The baru fruits represent an important source of food for the fauna during dry months. Due to the exploitation of baru for its high durability timber, to the use of its seed, and to the Cerrado fragmentation for conversion into areas for agriculture, the species is classified as vulnerable in the IUCN Red List of Endangered Species (WCMC, 1998). With its raw almond, it is possible to make the roasted almond or obtain the oil, pie, bran, or butter, by mechanic pressing or hot extraction. With the wood residues, coal, firewood acid, tar, and other volatile acids can be produced (Carazza; Ávila, 2010). In plantation conditions, its first fruit bodies occur at 6 years (Carvalho, 1994),

***Campomanesia phaea* (O. Berg) Landrum (Myrtaceae) - Cambuci Product: Fruit**

Cambuci is an endemic species of Brazilian Atlantic Forest phytophysiology located in the southeastern region of Brazil (Sobral *et al.* 2013). Its restricted distribution, associated to high urbanization, has led the species to be classified as *vulnerable* in the endangered species list by (WCMC, 1998). Its fruit production is higher when sun grown and with good availability of water; however, it is also grown under shade and with little water, which makes it an optimal option for consortiums with timber species. It has several uses: medicinal (bark of the trunk and fruits); wood for small parts; essential oils, flavonoids and leaf tannins; and food (fruits) (Kawasaki; Landrum, 1997; Adati, 2001; Silva *et al.*, 2012). However, its production of fruits is currently the focus of its culture. They might be sold *in natura* or processed into ice creams, alcoholic drinks, jelly, truffles, and pulp. Their first fruit bodies occur at 5 years in average, but in hotter and more humid places, the harvest might extend and the first fruit body occurs earlier, at 2 or 3 years.

***Caryocar brasiliense* Cambess (Caryocaceae) – Pequi – Product: Fruit; multiple use**

It is a very important species from the sociocultural standpoint in the Brazilian countryside. The fruit pulp of this pioneer species is used in human feeding and its almond is used in oil production (Carvalho, 2003). Although its wood is considered good quality wood, it has been banned by the Cutting, storage, and commercialization Law (Oliveira Scariot, 2010). In the Brazilian savanna, there are usually 25 pequi trees per hectare, and they might reach 100 in more enclosed areas (Oliveira; Scariot, 2010). The commercialization of natural fruits and derivatives is consolidated and based on extraction activities, and there is market demand. The pequi fruit, a traditional NTFP, is one of the products contemplated by the National Policy for Minimum Prices of Sociobiodiversity Products (Conab, 2013). The fruit production starts at 5-6 years.

The prominent role of NTFP's in economic forests is ecological, due to the possibility of increasing the species richness in the system and maintaining the arboreal structure in the long term, in most cases; and socioeconomic, due to the possibility of having early and continuous economic payoff compared to the exclusively logging species; moreover, due to the extraction of many products from native forests, there already is market for many of these products.

Out of the group of 70 species, few have been considered flagships so far. This occurs because, despite the great socioeconomic importance of NTFP's, there generally is little systematized information on the amount, value, production processes, industrialization, and commercialization of these products (Fieheldler et al 2008). This might be a reflection of temporality and variability of products and markets, and it is an obstacle to the development of the market strategies required for the growth and development of NTFP's, whether from extraction activities or from forests planted for this activity.

In addition, silvicultural knowledge of native species, especially regarding NTFP's, is very scarce, or dispersed, which greatly hinders the selection and proposition of species to compose the forest models for ecological and economic purposes. The variety of plant parts (flowers, fruits, barks, leaves) used by the different species makes it even more difficult to generate knowledge and, consequently, to establish sustainable criteria for the use of NTFP's in economic forests.

Long-term monitoring of these forests is one of the means for these parameters to be measured, adjusted, and assessed so that the models and arrangements are improved, as well as the crop handling methods employed.

CONCLUSIONS/OUTLOOK

For forests in LR areas, planning the integration of timber and non-timber forest products is extremely important so that products might continue to be obtained in the medium and long terms, maintaining profitability and the economy. Multiple-use species are of great interest, because non-logging products are used along their cycle and timber is only used in the end.

The reduction of ecological impacts on vegetation populations through economic exploitation must be achieved with clear planting and harvesting standards, adapted to each species and to the product to be exploited. For instance, fruit harvest rates must take into consideration the part to be left as a resource for the local fauna; and also, NTFP species whose exploitation results in removing the whole individual shall be considered as an impact on timber species.

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