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Original Paper

What does the list of Brazilian sociobiodiversity species of food value show us?

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Abstract

It is necessary understanding the species selected and classified based on sociobiodiversity with food value listed in Interministerial Ordinance n. 284/2018. The aim of the study is to investigate changes in the previously published ordinance and to analyze the current list of sociobiodiversity species based on aspects such as number of species, origin, distribution, species endangerment and plant parts used for consumption. Information available in the list of species published through Interministerial Ordinances n. 163/2016 and n. 284/2018, in technical documents, bibliographies and in the Virtual Herbarium of Flora e Funga do Brasil, were used as the starting point for the present research. It was possible observing that the current list has excluded six species and added 25 species in comparison to the previous one. Thus, the current list comprises 101 species. Although most of the listed species are native to Brazil, seven of them are exotic: one is cultivated for dietary purposes and six are naturalized. Diversity is well represented in Brazilian phytogeographic domains, mainly in Cerrado, Atlantic Rainforest and Amazon Rainforest biomes; however, five species fall into one of the endangered categories. Twelve plant parts used for consumption were reported to be used for dietary purposes, with emphasis of fruit.
Key words: edible plants, fruit trees, non-conventional food plants, public policies.

Resumo

Constatou-se a necessidade de conhecer as espécies que foram selecionadas e classificadas da sociobiodiversidade com valor alimentício listadas na Portaria Interministerial n° 284/2018. Objetivou-se com esse estudo detectar as alterações em relação à portaria anteriormente publicada, bem como analisar a atual lista de espécies da sociobiodiversidade quanto ao número de espécies, origem, distribuição, ao risco de extinção e às partes da planta usadas. Para isso teve-se como ponto de partida as informações que constam na lista das espécies publicada pelas Portarias Interministerial n° 163/2016 e n° 284/2018 e consulta a documentos técnicos, bibliografias e ao Herbário Virtual da Flora e Funga do Brasil. Em relação à lista anterior, ocorreu a exclusão de seis espécies e um acréscimo de 25 espécies. A atual lista contém 101 espécies. Embora a maioria das espécies listadas são nativas, há também sete exóticas: uma cultivada e seis naturalizadas. A diversidade está bem representada nos domínios fitogeográficos brasileiros, principalmente no Cerrado, na Mata Atlântica e na Floresta Amazônica, entretanto cinco espécies se enquadraram em alguma das categorias de ameaçadas de extinção. Verificou-se que doze partes da planta utilizadas para consumo foram citadas para fins alimentícios, contudo houve um predomínio sobre os frutos.
Palavras-chave: plantas comestíveis, frutíferas, plantas alimentícias não convencionas, políticas públicas.

Introduction

Brazil presents many traditional peoples and communities, such as farmers, *caboclos*, *caiçaras*, peasants, extractivists, indigenous, *quilombolas* and backwoods; this diversity of historical and cultural groups is called sociodiversity (Silva 2008). The relationship between biological diversity resources and the territory, knowledge and cultural practices of this sociodiversity is known as sociobiodiversity (Pinto *et al*. 2019).

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Several studies available in the literature have investigated the relationship between communities (either local or traditional) and biological diversity, with emphasis on plant species used as food. Almeida & Bandeira (2010) have investigated the local value of plants used by *quilombola* communities in Bahia state. They identified 14 plant species of dietary importance, but they also observed decreased intake and trading of wild fruits such as *murici* and *umbu*, due to the improved financial conditions of some families.

The survey conducted by Oliveira Júnior *et al.* (2018) in properties owned by family farmers in Iguapé County, São Paulo state, has cataloged 181 species of various uses of which 31 plant species with food value and with potential to form new productive sociobiodiversity chains. Pinto *et al*. (2019) have conducted a study in the indigenous territory of Tremembé, Ceará state, and found 36 sociobiodiversity native fruit species, which also had medicinal, artisanal and ritualistic value.

Some programs and public policies were implemented in the country to support and enhance sociobiodiversity. Among them, one finds the National Plan for the Promotion of Sociobiodiversity Product Chains (PNPSB), whose main aim is to promote and strengthen sociobiodiversity product chains (Brasil 2009a). Other measures also comprise the inclusion of sociobiodiversity products in the Food Acquisition Program (PAA), National School Feeding Program (PNAE) and Minimum Price Guarantee Policy for Sociobiodiversity Products (PGPM-Bio).

PAA allows the federal government to purchase food produced by family farmers, agrarian reform settlers, extractivist workers, indigenous people, artisanal fishermen, *quilombola* people, as well as by other traditional peoples and communities, without bidding (Brasil 2012). PNAE enables the government to transfer supplementary financial amounts for school meals to states and municipalities (Brasil 2006); 30% of the amount transferred by the Program is used to purchase food produced by family farmers (Brasil 2009b). PGPM-Bio provides subsidy to producers who sell some fresh fruits or extractive products for values lower than the minimum price determined by the Federal Government. The extractive products included in the 2021 harvest were *açaí*, *andiroba*, babassu, *baru*, Brazil nut, *buriti*, cocoa, *juçara*, *macaúba*, *mangaba*, *murumuru*, *pequi*, piassava, pine nuts, *pirarucu*, rubber tree and *umbu* (Brasil 2021).

These public policies overall aim at protecting the environment, generating income and preserving the cultural identity of traditional peoples and communities (Sampaio Neto *et al.* 2020). Studies have shown that these policies helped strengthening Brazilian sociobiodiversity production chains, such as that of native oilseed species (Sampaio Neto *et al.* 2020) and *pequi* (*Caryocar brasiliense* Cambess) (Silva *et al.* 2020).

The Biodiversity for Food and Nutrition Project (B4FN 2020) aims to integrate biodiversity conservation and sustainable use to improve food and nutrition in Brazil (A4NH 2015). In this context, the Interministerial Ordinance n. 163 from May 11, 2016 (Brasil 2016) was instituted which lists the Brazilian native plant species with food value that are considered to be of sociobiodiversity nature and aims to encourage the marketing of in natura or derivative products, within the scope of operations carried out by the Food Acquisition Program (PAA).

According to this Interministerial Ordinance, sociobiodiversity products are biodiversity-derived goods and services aimed at the implementation of production chains by traditional peoples and communities. These chains generate income for these populations and enable their practices, knowledge and rights to be acknowledged.

The aforementioned Ordinance was revoked two years later and Interministerial Ordinance n. 284 was instituted on May 30, 2018 (Brasil 2018). Species listed in the Annex to the Ordinance can be used as food sources and stand out among other sociobiodiversity species, since they are part of programs mentioned above.

The following questions were asked in the amendment of the Interministerial Ordinance: which were the species suppressed from and which were the ones included in the current list? In addition, other questions were used as guiding factors to analyze the current Interministerial Ordinance, namely: what is the number of species mentioned in the list? Are all the listed species native to Brazil? How are species distributed in phytogeographic domains? Are any of these species inserted in the endangered list? What plant parts are used for dietary purposes?

Given the food and cultural importance of plant diversity and the knowledge spread to encourage the intake of plant parts and the commercialization of plant products, it is necessary understanding the species selected and classified as belonging to the sociobiodiversity category with

food value, and listed in Interministerial Ordinance n. 284/2018.

Thus, the aims of the current study were to identify changes in the previously published ordinance and to analyze the two lists of sociobiodiversity species based on aspects such as diversity, origin, distribution, species endangerment and plant parts used for consumption.

Materials and Methods

The starting point in the current study lied on comparing the two lists of Brazilian sociobiodiversity species with food value, namely: Interministerial Ordinance n. 163, from May 11, 2016 (Brasil 2016), which was revoked, and Interministerial Ordinance n. 284, from May 30, 2018, which remains in place (Brasil 2018). The aforementioned comparison aimed at identifying changes between the two Ordinances. Thus, the following aspects were analyzed: number of species, origin, distribution in phytogeographic domains, endangerment and plant parts used for consumption.

The analysis of these aspects was carried out by consulting technical documents and specialized bibliographies in the Google Scholar database (<http://scholar.google.com>). In addition, the Virtual Herbarium of Flora e Funga do Brasil (<http://floradobrasil.jbrj.gov.br>) was consulted in order to check species' origin (native, naturalized or cultivated), their incidence in Brazilian phytogeographic domains and their endangerment status. Endangered species were in compliance with the official national list of endangered plant species (MMA 2014).

Collected data were organized in tables prepared in Microsoft Office Excel for frequency analysis and data presentation purposes.

Results and Discussion

Comparison between the two Interministerial Ordinances

Six species mentioned in the previous list (2016) were excluded from the second one, namely: *Anacardium corymbosum* Barb.Rodr., *Opuntia dillenii* (Ker Gawl.) Haw., *O. ficus-indica* (L.) Mill., *Passiflora actinia* Hook, *P. nitida* Kunth and *P. quadrangularis* L.

It was not possible checking the reason why these species were excluded from the list; thus, the current study addresses some features that may be associated with their exclusion. It is known that these species were initially chosen by researchers from the "Plants for the Future" Project, based on criteria such as social, cultural, nutritional and economic potential values (B4FN 2020). The reason for launching an updated list in 2018 lied on the expansion in the use of some species (Oliveira *et al*. 2020).

Anacardium corymbosum is one of the species known by the popular name *caju-do-cerrado*, whose incidence is only confirmed in Mato Grosso state (Silva-Luz *et al*. 2020). Its collection record is available in the database of Virtual Herbarium *species*Link (CRIA 2020) for Acre, Brasília and Goiás states. The species has nutritional and medicinal uses, in addition to be classified as having economic and potential value for the Midwestern Region (Vieira *et al*. 2018). Thus, its exclusion from the list may due to its small and restricted population.

The two Cactaceae species removed from the list are naturalized plants known as *arumbeva* or palm: *Opuntia dillenii* naturally grows in Northeastern Brazil and is used as forage; whereas *Opuntia ficus-indica* grows in Northeastern, Southeastern and Southern Brazil, despite standing out as forage and medicinal plant, in addition to be used for dietary, mystical-religious, hygiene, cosmetic and dye purposes (Silva 2015; Zappi & Taylor 2020a, b).

Three species belonging to family Passiforaceae were native vines known as passion fruit; they were also excluded from the list. *Passiflora actinia* fruits are only used at local level; however, they have economic potential due to their abundance in Southeastern and Southern Brazil (Kinupp *et al*. 2011). *Passiflora nitida* is native to the Amazon region and its fruits are sold in 80% of street markets in Manaus City (Rabelo 2012). *Passiflora quadrangularis* fruit is the only one among *Passiflora* species whose mesocarp tastes like melon and can be easily damaged during processing (Martin & Nakasone 1970).

Despite the exclusion of six species from the 2018 list, 25 new species (23.2% increase) were added to it, with emphasis on *Campomanesia phaea* (O.Berg) Landrum (*cambuci*) and *Myrciaria floribunda* (H.West *ex* Willd.) O.Berg (*cambuí*).

Interestingly, species such as *Manihot esculenta* (cassava), *Paullinia cupana* (guarana), *Theobroma cacao* (cocoa) - which are nationally known and used as Brazilian regional food - and *Ananas comosus* (L.) Merril (pineapple) - which is widely accepted by Brazilian consumers and grown

in five different continents (Crestani *et al.* 2010) - were only included in the list in Interministerial Ordinance n. 284/2018. This fact has evidenced deficient species selection criteria, which can hinder the valorization, as well as the nutritional and economic potential of native species to be used at local or regional scale.

Furthermore, other species could be included in the aforementioned list since several ethnobotanical studies have mentioned and featured species of paramount importance for traditional peoples and communities living in the country, such as Oliveira *et al.* (2018), Souza *et al.* (2018), Utumy & Leão (2018) and Pinto *et al.* (2019).

What is the number of species in the lists?

The Brazilian sociobiodiversity list, which was established by Interministerial Ordinance n. 163, 2016, comprises 82 species, 48 genera and 25 botanical. The predominant families were Myrtaceae (16 species), Arecaceae (16) and Anacardiaceae (seven), with 47.6% of the total number of species.

The Brazilian sociobiodiversity list, which was established by Interministerial Ordinance n. 284, 2018, comprises 101 species, 59 genera and 34 botanical families. The Gymnosperms group only comprises family Araucariaceae; the Angiosperms group comprises 33 families, with emphasis on Myrtaceae (20 species), Arecaceae (17) and Anacardiaceae (six); altogether, they account for 42.6% of the total number of species (Fig. 1). Angiosperms is the only group of plants capable of producing fruits; it corresponded to approximately 0.2% of the diversity observed in this group in Brazil (BFG 2015).

Myrtaceae is one of the ten largest Angiosperm families in Brazil (BFG 2015). In addition, it stands out for the variety of species with edible fruits, such as *araçás* (Franzon *et al*. 2009). However, many species belonging to family Myrtaceae are not yet cultivated and fruit trading is restricted to the local market. Therefore, the domestication and dissemination of species, such as *Psidium guajava* L. (Pereira & Nachtigal 2002), are necessary.

Family Arecaceae consists of palm trees observed in almost all plant formations in the country. This family has also prevailed (32 species) in the inventory of food plants grown in Mato Grosso do Sul state, where the use of palm hearts and fruits to produce oils, flours and drinks stood out (Bortolotto *et al*. 2018).

Several cashew and *cajuí* species belong to genus *Anacardium*, family Anacardiaceae, and they produce edible fruits and pseudofruits. Many varieties of these species remain poorly known and consumed at national level, except for the population living in Midwestern Brazil. However, their aspect, aroma and nutritional quality favor their economic potential (Agostini-Costa *et al*. 2010).

It is worth highlighting Fabaceae, which is the botanical family accounting for the largest total number of species in Brazil (2,756 spp.) (BFG 2015). It also comprises significant number of edible and native species globally (625 spp.) (Ulian *et al.* 2020), which stand out among biodiverse food plants due to their nutritional quality, and energy and protein potential (Jacob *et al.* 2020). However, only four species belonging to this family are mentioned in the list (Fig. 1). It is not clear whether the reason for such an omission lies on their current disuse, as observed by Tomchinsky & Ming (2019) for several native species, or on the non-inclusion of some species in the lists in Interministerial Ordinance n. 284/2018.

The promotion of sociobiodiversity species is linked to two different aspects, namely: the scientific knowledge about the Brazilian flora and associated knowledge of traditional peoples and communities.

Scientific knowledge about plants has significantly improved, mainly due to research programs and projects (such as Lista de Espécies da Flora Brasileira and Flora do Brasil 2020). However, scientific and governmental actions, altogether, play essential role in fulfilling the objectives and goals

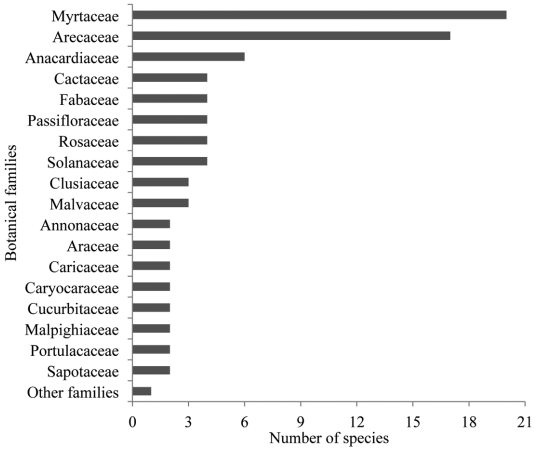

Figure 1 – Botanical families comprising the largest number of species in the sociobiodiversity species list.

set by the Global Strategy for Plant Conservation (GSPC) (BFG 2018).

Although the understanding of traditional knowledge about native species has expanded, the use of this information by companies and researchers, without proper acknowledgement and profit sharing, has been the target of severe criticism. Moreover, established laws, such as the Biodiversity Law (Law n. 13123/2015) regulated by Decree n. 8772/2016, were not enough to safeguard the rights of traditional peoples and communities or to protect genetic heritage and associated traditional knowledge (Moreira & Conde 2017; Magni *et al.* 2020).

Are all the species in the list native to Brazil?

Although the list mentions that all species are native to Brazil, consultation carried out in the database of Flora e Funga do Brasil (continuously updated) has shown that seven species mentioned in it are not considered native to the country.

Plant species can be native or exotic; exotic species can be found in the environment because they are cultivated and/or because they were naturalized. Species naturalization takes place when plant populations are introduced and consolidated in non-native environments, although they do not expand their occupation zone due to their dispersion mechanism and to the ecological role played by them (Espínola & Júlio 2007; Moro *et al*. 2012). However, they can also be invasive species capable of affecting ecological processes and of damaging the local economy (Espínola & Júlio 2007); these plants are exotic invaders.

Of the six species contained only in the previous list (2016), two are naturalized - *Opuntia dillenii* and *Opuntia ficus-indica* - which were mentioned (Topic 1). Six non-native species in the list in Interministerial Ordinance n. 163, 2016 were naturalized, namely: *Acmella oleracea* (L.) R.K.Jansen, *Arachis hypogaea* L., *Physalis angulata* L., *Portulaca oleracea* L., *Psidium guajava* L. and *Theobroma cacao* L.

There was evident illicit appropriation of Amazon indigenous peoples and traditional communities' knowledge about the medicinal, culinary and shamanic uses of species *Acmella oleracea* (*jambu*) (Miranda 2018). Species *Arachis hypogaea* (peanut) is native to Bolivia; it is a cultivated species with great international economic value because it can be consumed in different ways (Fávero & Veiga 2008).

Species *Physalis angulata* (gooseberry) is native to Tropical America and it is used to treat 26 different disease types in several countries (Rengifo-Salgado & Vargas-Arana 2013). Although *Portulaca oleracea* (duckweed) is classified as naturalized species (Santos & Hassemer 2020), Madeira *et al*. (2018) have described it as native species widely distributed in Brazil, whose leaves and stems are often used for medicinal, forage and ornamental purposes, as well as in areas experiencing salinization issues.

Psidium guajava (common guava) is an invasive exotic species that is naturally distributed between Southern Mexico and Northern South America. It is capable of killing other plants due to allelopathy at the initial ecological succession stage, as well as of invading open environments, such as agricultural or degraded areas (Instituto Hórus 2020). Species *Theobroma cacao* (cocoa) was likely naturalized in the Amazon region in the pre-Colombian period (Colli-Silva & Pirani 2021); cocoa trees grown in this region are different from the cultivated ones, since they involve the way of life of traditional communities, have high fat content and show intense aroma and flavor (ICMBio 2018).

Sicana odorifera (sikana) was the only species classified as cultivated (Lima 2020). However, Madeira (2018) has described it as native vine species often observed in Midwestern and Southern Brazil, although it is currently rare in states where it was often collected before.

It is well-known that native plants are fundamental resources for the livelihood of several local communities. In addition, they likely have greater versatility and larger number of use categories than exotic plants. According to Albuquerque *et al.* (2009), native *Caatinga* plants presented up to eleven use categories, whereas exotic plants were concentrated in three categories (food, ornamental and medicinal use). It is worth highlighting that native plants' consumption enables implementing sustainable diets, since it improves local economy and food diversification processes, integrates the cultural heritage of local populations and favors food sovereignty (Jacob *et al.* 2020).

How are the species listed in Interministerial Ordinance n. 284/2018 distributed in the Brazilian phytogeographic domains?

The species in both lists are found in all Brazilian phytogeographic domains, most of them

are widely distributed in the Cerrado, Atlantic Rainforest and Amazon Rainforest biomes. The current study has found proportional similarity in the total number of Angiosperm species registered for each domain in Brazil (Tab. 1).

Moreover, most of the investigated plants often grow in more than one phytogeographic domain. Five species grow in all domains, namely: *Anacardium occidentale* L. (cashew tree), *Arachis hypogaea* L. (peanut), *Melothria pendula* L. (creeping cucumber), *Passiflora quadrangularis* L. (passion) and *Talinum paniculatum* (Jacq.) Gaertn. (fameflower).

However, there are also species with restricted geographic distribution, which were mentioned in only two states - *Licaria puchury-major* (*puxuri*) [AM, PA] and *Matisia cordata* (*sapota*) [AC, AM] - and in three states - *Butia capitata* (Mart.) Becc. (jelly palm) [BA, GO, MG], *Butia catarinenses* Noblick & Lorenzi (*butiá*) [PR, RS, SC], *Butia eriospatha* (Mart. *ex* Drude) Becc. (*butiá*) [PR, RS, SC], *Campomanesia phaea* (O.Berg) Landrum (*cambuci*) [MG, RJ, SP], *Paullinia cupana* Kunth (guarana) [AC, AM, PA], *Solanum sessiliflorum* Dunal (*cubiu*) [AM, AP, PA] and *Xanthosoma riedelianum* (Schott) Schott (*mangarito*) [MG, RJ, SP].

It is noteworthy that geographically concentrated species are more likely to be endangered than the widely distributed ones (Pimm *et al*. 2014). More than 80% of Neotropical Angiosperm species present small distribution range. Approximately 100 restricted endemic species are extinct on a yearly basis due to loss of forest areas (Morawetz & Raedig 2007).

The concern increases because they are plants of commercial interest, since fruit exploitation at large amounts affects individuals' height and 21, as well as population size and community composition (Brites & Morsello 2016). Species management and domestication, as well as synthetic substitutes' production, are some alternatives to this deadlock (Homma 2010).

Are there any species in the endangered list?

Five species fell into one of the endangered categories, although this number could be higher, since 78.1% of listed species in Ordinances n. 284/2018 were not yet assessed for this purpose. The situation is similar to what happens in Brazil, where approximately 36,400 native plant species; however, only 15.5% of them were assessed for endangerment and half of this rate fall into one of the endangered species categories (Martins *et al*. 2018). There are no threatened species among those evaluated by researchers in the list of Ordinance n. 163/2016.

Species *Araucaria angustifolia* (common name: Paraná pine) belongs to the Gymnosperms group. It grows in the Atlantic Rainforest and was classified as endangered species (EN), based on its population reduction by approximately 80% due to logging. Nowadays, the construction of hydroelectric power plants poses an additional threat to this species (CNCFlora 2020a).

Its seed (called *pinhão*, in Portuguese) is highly consumed by wild animals and humans. Besides, it plays relevant role in the economy, for integrating a productive trading chain; in the social sphere, for contributing to family income; and in communities' culture, due to its association with the origin of cities and with June Festivals (Santos *et al*. 2002; Balbinot *et al*. 2008). Its low price is likely associated with its abundance in collection regions (Santos *et al*. 2002).

Table 1 – Comparison between the total number of Angiosperm species in Brazil and the number of sociobiodiversity species with food value in different Brazilian phytogeographic domains.

Phytogeographic domains	Number of Angiosperm species (BFG 2018)	Number of sociobiodiversity species with nutritional value	
		Brasil (2016)	Brasil (2018)
Atlantic Rainforest	15,179	65	50
Cerrado	12,113	67	56
Amazon Rainforest	11,846	60	46
Caatinga	4,702	37	33
Pampa	1,816	11	12
Pantanal	1,299	12	10

It is essential conducting population dynamics studies to help regulating seed collection to avoid affecting the natural regeneration of the species and its extinction (Paludo *et al*. 2011). The Environmental Institute of Paraná state has taken measures to control the exploitation of this species, such as allowing pine nut collection and trading from April 1 onwards, forbidding the sale of green seeds and suggesting that only fallen strobiles should be collected (IAP 2015).

Four species were categorized as vulnerable (VU) were found in different phytogeographic domains, namely: *Bertholletia excelsa* Bonpl. (Amazon), *Butia capitata* (Mart.) Becc. (Cerrado), *B*. *eriospatha* (Mart. *ex* Drude) Becc. (Atlantic Rainforest) and *Euterpe edulis* Mart. (Cerrado and Atlantic Rainforest). It may have happened due to great extractive pressure to obtain seeds, as in the case of *Bertholletia excelsa* (Brazil nut), and to the destruction of their habitats for agricultural purposes (CNCFlora 2020b). However, Schwartz *et al*. (2008) carried out population inventory of this species in Nova Ipixuna County, Pará state, and observed that its high population density enables sustainable chestnut exploration based on appropriate management techniques.

Species *Butia capitata* (jelly palm) is endemic to the Cerrado region. It was categorized as vulnerable due to intense extraction and deforestation activity in its habitats, which makes it hard to recruit and establish new individuals (CNCFlora 2020c). *Butia eriospatha* (*butiá*) naturally grows in High Altitude Rupestrian Fields, although only in Southern Brazil, where their habitats are replaced by agricultural areas (CNCFlora 2020d).

Although *Euterpe edulis* (*palmito-juçara*) is widely distributed in the Atlantic Rainforest and Cerrado biomes, its vulnerability results from its slow growth, from the death of many individuals due to palm heart removal - which even causes its local extinction - and from the degradation of the remaining Atlantic Rainforest (CNCFlora 2020e). Oliveira Junior *et al*. (2010) have conducted a survey with *E. edulis* populations in Iguape County (São Paulo state) and concluded that traditional populations are able to carry out the sustainable management of palm hearts, although it is necessary adopting an efficient management plan and restocking the area.

Thus, it is clear that changes in land use and direct species exploitation associated with illegal trade of wood, plants of high interest, as well as with wood collection for firewood and charcoal production, are the main factors leading these species to extinction; moreover, they represent the global scenario (Lughadha *et al.* 2020).

Although the aforementioned species fall into one of the extinction-risk categories, Ordinances n. 284/2018 and n. 163/2016 have authorized the use of non-timber forest products deriving from species classified in the endangered and vulnerable categories by MMA Ordinance n. 443/2014, as long as planned measures and amendment certificates are adopted.

What are the plant parts used?

Twelve plant parts were mentioned to be used for dietary purposes; however, fruits prevailed in 78.2% of the total number of species (Fig. 2) in Ordinance n. 284/2018. Of the species listed only in Ordinance n. 163/2016, there is use the fruit in five species and the use of chestnut and pseudofruit in *Anacardium corymbosum*.

Five species among the ones only listed in Ordinance n. 163/2016 have their fruit consumed, whereas *Anacardium corymbosum* has its chestnut and pseudo-fruit consumed.

Tropaeolum pentaphyllum Lam. (crem) and *Pereskia aculeata* Mill. (lemonvine) were the species presenting the largest number of mentioned parts (four), whereas seven other species presented three edible parts.

If seeds are taken into consideration as part of the fruits, the percentage relative to fruits gets even higher, since seeds, rather than the entire fruit, are the only edible part of peanut (*Arachis hypogaea* L.), guarana (*Paullinia cupana* Kunth) and *urucum* (*Bixa orellana* L.). Pequi seed pulp (*Caryocar* spp.) consumption was also mentioned, although this pulp is the mesocarp of drupe-type fruits (Gonçalves & Lorenzi 2007).

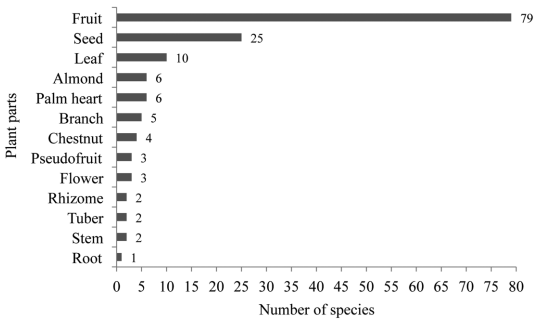

Figure 2 – Parts of sociobiodiversity plant species used for dietary purposes.

Almond was the term used for seeds with high oil content, such as *chichá* (*Sterculia striata* A.St.-Hil. & Naudin) (Chaves *et al*. 2004). However, non-almond species, such as *tucumã* (*Astrocaryum aculeatum* G.Mey.), may also have seeds (Barbosa *et al*. 2009). Chestnut refers to the edible seeds of Brazil nuts (*Bertholletia excelsa* Bonpl.) and cashew (*Anacardium* spp.) fruits. In addition, edible pseudofruits belonging to genus *Anacardium* are structures that did not derive from the ovary of flowers (Gonçalves & Lorenzi 2007).

Leaves recorded the second highest consumption rate. Traditional communities have significant knowledge about the diversity of edible leaves, which are added to their culture and form the basis of family diets. Some examples of this relationship were recorded in the backyards of homes in traditional rural communities in Rio de Janeiro (Machado & Boscolo 2018) and Minas Gerais states, where leaves are mostly used in preparations such as salads and stews (Tuler *et al*. 2019).

Two species were mentioned as having their stems consumed. Branches of herbaceous-habit species are consumed when they are young or when they have edible marrow, such as wild mango species - *Jacaratia spinosa* (Aubl.) A.DC. and *Vasconcellea quercifolia* A.St.-Hil.

Modified stems can be of the following types: tuber, which is the swollen stem containing starch; palm heart, which is the upper part of the stem of some palm trees; and rhizome, which is a stem presenting horizontal growth (Gonçalves & Lorenzi 2007).

The tuber of crem potato species *Tropaeolum pentaphyllum* Lam. has nutritional potential due to high carbohydrate values, incidence of vitamin C and linoleic fatty acid (Braga *et al*. 2018). The rhizome of *mangarito* species *Xanthosoma riedelianum* (Schott) Schott is a culinary delicacy with abundant starch content; it has market potential, as well as potential to be used for family farming due to its low production cost (Madeira *et al*. 2015).

Palm heart was found in six of the mentioned species - *Astrocaryum aculeatum* G.Mey., *Bactris gasipaes* Kunth, *Euterpe edulis* Mart., *Euterpe oleracea* Mart., *Euterpe precatoria* Mart. and *Syagrus oleracea* (Mart.) Becc. - which play important role in traditional communities. According to Oliveira Junior *et al*. (2010), *palmito-juçara* species *E. edulis* is the main food source of *caiçara* populations, to the detriment of hunting and fruit collection. According to Fanelli *et al*. (2012), *E. edulis* is also planted in backyards by *quilombola* communities in some cases.

Encouraging the consumption of wild native edible plants by promoting different ways of preparing meals can help conserving different ecosystems and improving rural communities' knowledge about the use and management of certain species (Cruz *et al*. 2013). The importance of public policies aimed at providing food and nutritional security to traditional peoples and communities is associated with the use of their territories (Conti & Coelho-de-Souza 2013).

Based on the analysis applied to the lists of Brazilian-native plant species with food value and considered to be of sociobiodiversity nature, which was put in place by Interministerial Ordinance n. 163/2016 and n. 284/2018, allowed to verify that there was an exclusion of six species and an addition of 25 species. The exclusion and selection criteria adopted in different studies could be more explicit to help better understanding the socioeconomic and environmental context of the country and substantiating future governmental actions.

Species are present in all phytogeographic domain, however, the rate of species included in the aforementioned Ordinance remains significantly small in comparison to the plant diversity observed in Brazil, such as species used by traditional communities and the ones with food and economic potential disclosed in scientific publications. The acknowledgement of other plant species in public policies can give visibility and add value to products deriving from them.

As for cultivated or naturalized species, they can only threat biodiversity if they prove to be invasive in the environments they are inserted in, since not all exotic species lead to changes in the environment. Thus, it is necessary monitoring these species to avoid such issues.

Species widely distributed in all Brazilian states and phytogeographic domains can be commercially exploited, unlike species with occasional incidence that require studies focused on investigating their population dynamics, management, cultivation and/or domestication. The same process should be applied to endangered species and to the ones whose endangerment status in the country is yet to be assessed - in other words, most of them.

The variety of plant parts mentioned in the investigated list has evidenced the important

role played by them as food resource, as well as the knowledge acquired and maintained over generations by traditional peoples and communities.

Ordinances are among mechanisms adopted in governmental policies and programs to value sociobiodiversity; however, they present several gaps and need to be improved. Species promotion depends on integrative actions substantiated by multidisciplinary research, as well as on traditional knowledge records, policy effectiveness and on incentives for sustainable species using.

The current study has contributed to better understand the botanical and ecological profile of prioritized species and highlighted gaps found in Ordinances n. 163/2016 and n. 284/2018. It is expected to guide the inclusion of other sociobiodiversity species in the next updates to the list of Brazilian sociobiodiversity species and in social programs, in order to strengthen production chains and integrate biodiversity to food and nutrition security.

A survey on species registered in ethnobotanical research carried out in Brazil should be conducted, with emphasis on their scientific name, on the wide disclosure of different ways of consuming them and on the nutritional, socioeconomic and environmental benefits provided by socio-biodiversity fruits.

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