

AGROBIODIVERSITY OF HOMEGARDENS IN MARANHÃO, BRAZIL

ABSTRACT

This research aimed to **assess** the agrobiobiodiversity of homegardens in the state of Maranhão/Brazil. We visited 25 homegardens, and catalogued 105 specimens, distributed among 47 genera and 29 families. The families with the largest species numbers were Rubiaceae, Malvaceae and Lamiaceae, with four species each, followed by the Solanaceae, Euphorbiaceae (three species each), Myrtaceae, Crassulaceae, Anacardiaceae (two species each) and other families had only one species each. **Use of the species grown in the homegardens included** ~~How much household use for these species studied in the homegardens~~, 52% for food, 35% medicinal and 13% ornamental use. **Women were** the primary care takers of the agroforest homegardens, and they had good knowledge about **general cultivation** and garden maintenance. The survey revealed that the home gardens had a strong cultural character highlighting their value as an important community resource for the creation and transmission of knowledge, **thus** serving as a source of information management for the preservation of community identity

Keywords: Agroecosystems, Plant cultives, Food safety.

1. INTRODUCTION

is an integral component of **s**
The Agrobiobiodiversity constitute an agricultural system that associate conservation and management with sustainable development and consists of the diversification of plants, animals and

14 microorganisms used directly or indirectly ^{for} to food and agriculture [1]. This definition includes all
15 planned agrobiodiversity and the natural biodiversity of agroecosystems, as well as ecological
16 ~~services, interactions between living being and way of dealing with the land and technologies of the~~
17 social groups involved [2].

18 An agrobiodiversity reservoir in rural or urban communities are the domestic homegardens [3,4], and
19 are also used intentionally for the *in situ* conservation of germplasm of species of commercial interest
20 [5]. According to [6], homegardens encompass a set of plants with arboreal, shrub, climbing and
21 herbaceous species, ^{growth} providing species a diversification and varied growth, forming multiple strata,
22 resembling the structure of tropical forests [7].

23 The genetic variability maintained in these homegardens, altogether represent a considerable amount
24 of genetic variation and conservation of resources, improving the sustainability of the homegardens in
25 relation to the environment [5].

26 Theodoro et al. [8], suggest that the use of homegardens and other agroforestry systems as models
27 of family agricultural production associated with conservation are essential for a link between scientific
28 and popular knowledge. Agroforestry homegardens are related to cultural factors, since they can be
29 results of information, or traditional knowledge passed down by generations [7,9].

30 In this sense, homegardens constitute links between rural and urban settlements through products,
31 germplasm and resident members [10]. Urban agriculture is an activity of tradition among the families,
32 being exercised in residences where the destination of the products is predominantly for
33 autoconsumption, with little trade [11]. As highlighted by Nair [12], homegardens are considered an
34 "economic mystery", because even with the economy showing a market superiority, homegardens
35 long stood out as the basic function of livelihood.

36 In Brazil, there is a considerable amount of floristic studies on homegardens, where the majority
37 presents qualitative data with descriptions of structure, composition, organization and maintenance of
38 these practices [13,14,15]. In this sense, the objective of the research was to asses the
39 agrobiodiversity of the homegardens in the municipality of Caxias, Maranhão, Brazil.

2. MATERIAL AND METHODS

The community is

The study was conducted in the homegardens of the Cohab complex (figure 1), Nova Caxias neighborhood, municipality of Caxias, in the state of Maranhão/Brazil. at coordinates 04° 52' 10" Latitude South and 43° 20' 26" Western Longitude. Is characterized by 58.82% of households living in houses or similar and 41.18% on buildings or residential units [16], with daily access to potable and electricity. The economy is well developed with enterprises from different sectors.

The natural

The climate is of the sub humid to semi-arid type, with annual rainfall between 1,300- and 1,500-mm. Vegetation cover has been devastated to give way to agriculture and subsistence agriculture, and is represented by the contact of the cerrado with the forest, with the predominance of the former (Montes, 1997). the rainfall regimes are divided into two well-defined periods: rainy, centralized in the months of january to april and a drought mainly in the months of June and July. The rainy season usually begins in December and lasts until April or May. In these months, the monthly rainfall totals are between 120 and 500 mm, resulting in moderate excess of water in the soils that are available for surface runoff and flooding of the river.

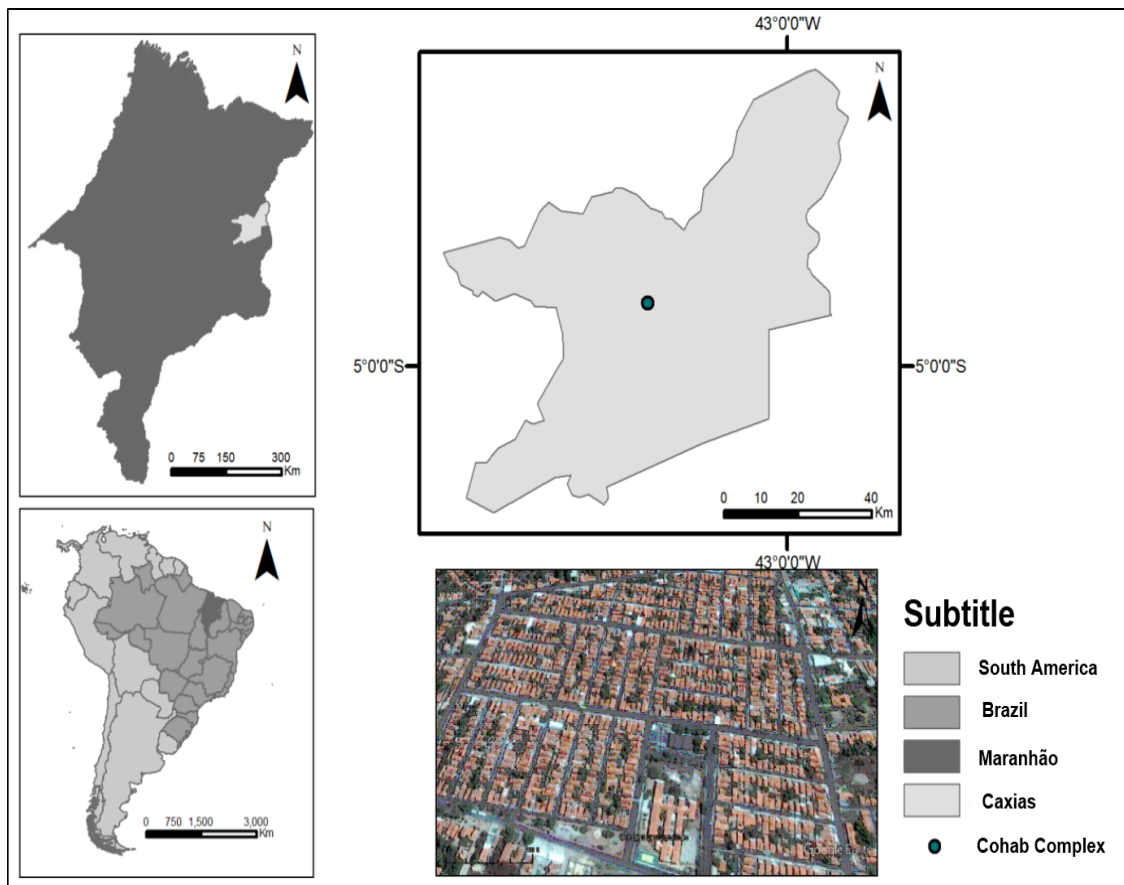


Figure 1. Map of municipality of Caxias with reference to the Cohab complex, Maranhão/Brazil

We randomly visited 25 homegardens with the consent of residents, with the starting point at 01 avenue. A form was applied in the resident's own residence, with preference for the leader of the family group, regardless of the gender, when it was not in the place the same was applied to another member of the family group that presented the necessary conditions to answer the questions Prior to the application of the form, the participant signed the free and informed consent term. Subsequently, the methodological processes consisted of long were interviews with residents with socioeconomic questions, such as: How old are they; How have you resided in this place; Gender; What profession; How many people live in the house; What is the main source of income. In addition, we asked questions about the management techniques used in the homegardens, namely: inputs, and if so what were they; criteria used for selecting the plants to be grown and Who is responsible for maintaining the homegardens.

The answers were tabulated and expressed in form of graphs and tables. The plant specimens were photographed in their growing habitat. The botanical identification was carried out in the field, when possible and / or with the help of specialized literature.

3. RESULTS AND DISCUSSION

In the 25 homegardens visited, 105 specimens were identified belonging to 44 species, 41 genera and 29 botanical families, being six trees, ten herbs, 13 shrubs and 16 subshrubs (Table 1). With two or more plant species found on each homegarden, only a botanical variety was found in three homegardens. The plant families with the greatest number of species were: Rutaceae, Malvaceae, Lamiaceae, with four species, followed by Solanaceae, Euphorbiaceae, with three species each; and Myrtaceae, Crassulaceae, Anacardiaceae, with two species, while the other families presented only one specie (Figure 2). The representativeness of these families is closely related to the various resources that they provide ~~them~~. In relation to the genera, the most representative were *Citrus* (Rutaceae) with four species, followed by *Hibiscus* (Malvaceae) and *Capsicum* (Solanaceae) both with two species. The other genera presented only one species each.

Table 01. Inventoried plant species in homegardens agroforestry. Cohab complex, Nova Caxias neighborhood, Caxias, Maranhão, Brazil, 2016.

Family	Scientific name	Popular name	Use	Habit of Life
Anacardiaceae	<i>Mangifera indica</i> L.	Manga	Food	Tree
	<i>Anacardium occidentale</i> L.	Caju	Food	Tree
Ancanthaceae	<i>Chenopodium ambrosioides</i> L.	Matruz	Medicinal	Herb
Anonaceae	<i>Annonas quamosa</i> L.	Ata	Food	Shrub
Aracaceae	<i>Dypsis lutescens</i> L.	Palmerinha	Ornamental	Tree
Bignoniaceae	<i>Arrabidaea Chica</i> Verlot	Pariri	Medicinal	Herb
Bromeliaceae	<i>Ananas comosus</i> L.	Abacaxi	Food	Subshrub
Cactaceae	<i>Euphorbia ingens</i> L.	Cacto	Ornamental	Subshrub
Canaceae	<i>Canna indica</i> L.	Cana da Índia	Medicinal	Subshrub
Caricaceae	<i>Carica papaya</i> L.	Mamão	Food	tree
Convovulaceae	<i>Ipomoea batatas</i> L.	Batata	Food	Shrub

Crassulaceae	<i>Bryophyllum calycinum</i> Salisb.	Fortuna	Medicinal	Herb
	<i>Bryophyllum calycinum</i> L.	Folha santa	Medicinal	Herb
Cucurbitaceae	<i>Cucurbita pepo</i> L.	Abóbora	Food	Subshrub
Euphorbiaceae	<i>Manihotes culenta</i> Crantz.	Mandioca	Food	Subshrub
	<i>Jatropha gossypifolia</i> L.	Pião roxo	Medicinal	Subshrub
	<i>Manihot</i> sp.	Macaxeira	Food	Subshrub
Lamiaceae	<i>Rosmarinus officinalis</i> L.	Alecrim	Medicinal	Herb
	<i>Venonia condensata</i> Baker	Boldo	Medicinal	Herb
	<i>Ocimum basilicum</i> L.	Alfavaca	Medicinal	Herb
	<i>Lippia alba</i> L.	Erva cidreira	Medicinal	Herb
	<i>Plectranthus amboinicus</i> Andrews	Malva do Reino	Medicinal	Herb
Liliaceae	<i>Aloe vera</i> L.	Babosa	Medicinal	Subshrub
Lomariopsidaceae	<i>Nephrolepis</i> sp.	Samambaia	Ornamental	Subshrub
Malpighiaceae	<i>Malpighia glabra</i> L.	Acerola	Food	Shrub
Malvaceae	<i>Hibiscus sabdariffa</i> L.	Vinagreira	Food	Shrub
	<i>Hibiscus esculentus</i> L.	Quiabo	Food	Shrub
	<i>Gossypium arbadense</i> L.	Algodão	Medicinal	Shrub
	<i>Morus alba</i> L.	Amora	Food	Subshrub
Moraceae	<i>Musa paradisiaca</i> L.	Banana	Food	Subshrub
Musaceae	<i>Psidium guajava</i> L.	Goiaba	Food	Tree
Myrtaceae	<i>Eugenia uniflora</i> L.	Pitanga	Food	Shrub
	<i>Averrhoa carambola</i> L.	Carambola	Food	Tree
Oxalidaceae	<i>Passiflora edulis</i> Sims.	Maracujá	Food	Subshrub
Passifloraceae	<i>Piper aduncum</i> L.	Pimenta de macaco	Medicinal	Shrub
Piperaceae	<i>Cymbopogon citratus</i> (DC) Stapf.	Capim Santo	Medicinal	Herb
Poaceae	<i>Punica granatum</i> L.	Romã	Medicinal/ food	Shrub
Punicaceae	<i>Rosa</i> sp.	Rosa	Ornamental	Subshrub
Rosaceae	<i>Citrus limonum</i> L.	Limão	food / Medicinal	Shrub
Rutaceae	<i>Citrus aurantium</i> L.	Laranja	food / Medicinal	Shrub
	<i>Citrus nobilis</i> Lour.	Tangerina	Food	Shrub
	<i>Citrus aurantifolia</i> L.	Lima	Food	Shrub

	<i>Lycopersi cumesculentum</i> L.	Tomate	Food	Subshrub
Solanaceae	<i>Capsicum chinense</i> Jacq.	Pimenta de Cheiro	Food	Subshrub
	<i>Capsicum frutescens</i> L.	Pimenta malagueta	Food	Subshrub

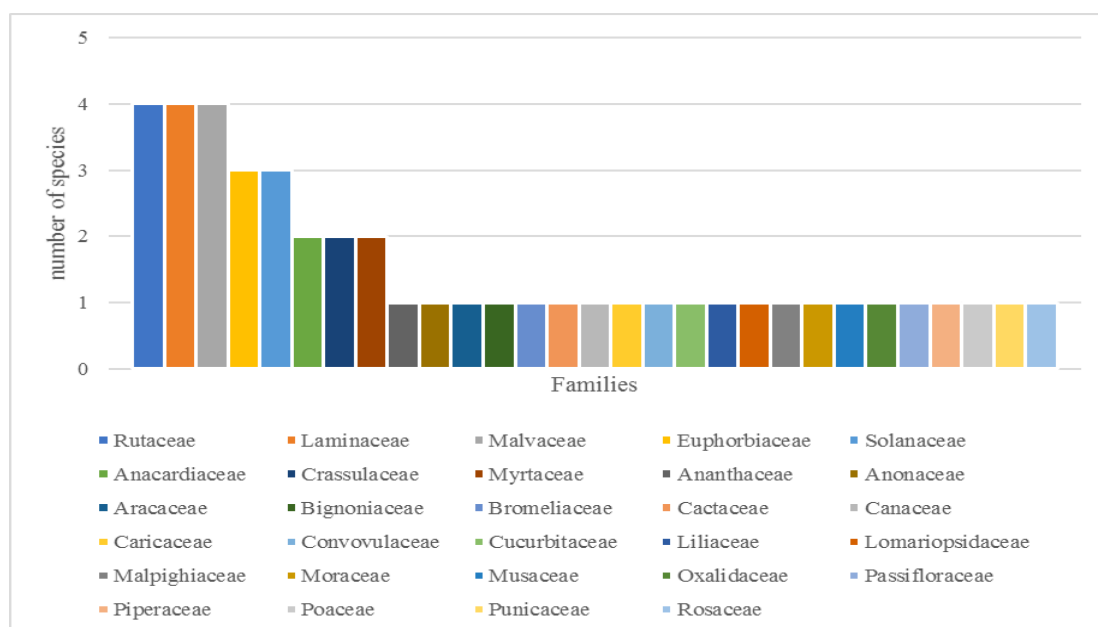


Figure 2. Number of species per botanical family found in agroforestry homegardens in Maranhão, Brazil, 2016.

The representatives of the Rutaceae family cataloged in the research are of great economic importance, mainly by the fact of catalog only *Citrus* species, with cultivation of their representatives (lemon, orange, tangerine and lime) that in the state of Maranhão is not indicated the cultivation, due to the low rainfall rates, since they can not suffer water deficiency during the inflorescence phase [17].

Another family that stands out is the Malvaceae, with its representatives having cultural, economic and medicinal importance [18]. Species of the genus *Hibiscus* (*H. sabdariffa* and *H. esculentus*) listed

in the homegardens, are used to prepare typical dishes the region. The cuxá, for example, a Maranhense delicacy is made with vinegar leaves (*H. sabdariffa*), and caruru is typical food prepared with okra (*H. esculentus*). Other species of the family, *Plectranthus amboinicus* (Malva do reino) and *Gossypium arbadense* (cotton) stand out for their medicinal use. Regarding the percent use of species found in homegardens were ornamentals (13%), medicinal 35%) and mainly food (52%) (Figure 3).

Carneiro et al. [19], emphasize the importance of homegardens, mainly due to the presence of fruits and vegetables, which allow the population to maintain a food autonomy, causing minimal impacts on the environment, conserving plant resources and cultural richness, based on the knowledge and culture of using natural inputs and promoting the recycling of natural elements.

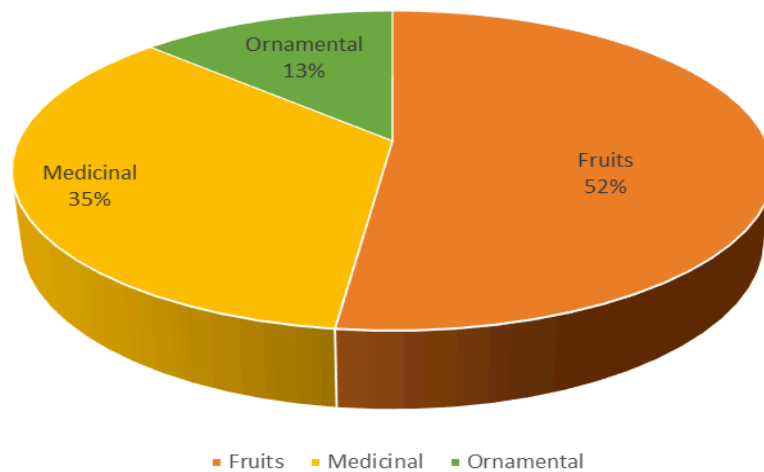


Figure 3. Distribution of plant species according to the category of use in the agroforestry yards in Maranhão / Brazil, 2016.

130

131 In the research, fruit species were the most frequent, among them *Malpighia glabra* (acerola) 12 trees
132 present in 11 homegardens, followed by *Pasidium guajava* (guava) with seven trees in seven
133 homegardens, *Mangifera indica* (mango) with five individuals in five homegardens. These species
134 play an important role in feeding communities. According to [20], the presence of fruit trees in
135 agroforestry homegardens generates additional profits in the family income, as well as contributing to
136 the increase of biodiversity and the recovery of degraded and / or abandoned areas so that it is
137 possible to achieve sustainability in family production. According [21], fruit species provide food
138 sources to growers and places of refuge, shelter and food for animals, especially birds [22].

139

140 The homegardens care-takers **have** ages ranging from 26 to 86 years old, with an average of 64
141 years old. Being the majority women (22 people) who had lived in the neighborhood for 10 and 30
142 years. The income ranges from 1 to 5 minimum wages , obtained mainly through retirement income
143 and occupation mainly in positions of public sectors.

144 Women are mainly responsible for the management **of the** agroforestry homegardens, corroborating
145 earlier studies [23,3,7]. The homegarden structure relates to each owner's cultural experiences and
146 life history. The particular background and history of individual gardeners allows to better understand
147 the conformations of the homegardens, which vary according to cultural aspects, available space,
148 function and history of community formation.

(NEW SENTENCE)

cultivation practices

149 The home gardeners have a good knowledge about **practices cultivation**, with daily time spent on
150 activities in the homegardens the time spent daily in homegardens by different households is difficult
151 to quantify, which according to the owners takes place during their **leisure.** As in most of the homegardens
152 the person in charge does not perform gardening activities outside the property because the time
153 dedicated to homegarden already compete with the daily household chores. **Perfecto [24], reveals**
154 **that the benefits of planned agrobiodiversity are more easily perceived where there is care. Therefore,**
155 **the benefits of natural and unplanned (associated) agrobiodiversity require dedication and proper**
156 **stewardship of the agroforestry gardens.**

157 **The plants and trees grown in the home gardens were either managed manually with the use of hand**
158 **tools, or the plants, such as fruit trees, were left unmanaged, with periodic harvests. The home-**
159 **gardeners were in general satisfied with the demands for hand labor to manage the gardens such as**

watering

the need for periodic manual watering during periods drought. For the control of the materials such as pests there are minimal interventions other than the manual removal of insects, infected leaves and weeds. Fertilization of the soils was done with organic fertilizers, such as coal ash, aged or composted manure plant residues such as dead palm trunks, as well as kitchen food-scrap [25].

4. CONCLUSION

The homegardens surveyed, presented a considerable diversity of botanical species, with the fruit tree species category in their predominance. However, it is noted that homegardens are spaces for growing fresh food, providing the family of growers with greater food security, providing a better lifestyle, and a family income alternative.

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