

Original Research Article

AGROBIODIVERSITY OF HOMEGARDENS IN MARANHÃO, BRAZIL

ABSTRACT

There is limited information available on the agrobiodiversity of homegardens in Brazil. This research was initiated to investigate this aspect of agrobiodiversity of homegardens in the state of Maranhão (Brazil) during 2016. We visited twenty-five homegardens, and catalogued 105 specimens, distributed among 47 genera and 29 families being catalogued. The families with the largest most representative 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. This study further elucidated how much households use for these species studied in the homegardens and found that, 52% are used for food, 35% for medicinal and 13% for ornamental use. It is mostly women who were the primary care takers of the agroforest homegardens, as and they had a good working knowledge of about culturalization and garden maintenance in general. The survey also revealed that the homegardens had a strong cultural character, thus highlighting their value as an important community resource for the creation and transmission of traditional knowledge, thus serving as a source of information management for the preservation of community identity.

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Keywords: Agroecosystems, Plant cultives, Food safety.

1. INTRODUCTION

The Agrobiodiversity constitute an agricultural system that associate conservation and management with sustainable development, and consists of the diversification of plants, animals and microorganisms used directly or indirectly for food and agriculture [1]. This definition includes all planned agrobiodiversity and the natural biodiversity of agroecosystems, as well as ecological services, interactions between living beings and way of dealing with the land and technologies of the social groups involved [2].

Domestic homegardens in rural or urban communities are an agrobiodiversity reservoirs in rural or urban communities are the domestic homegardens [3,4]. These garden, and are also used intentionally for the *in situ* conservation of germplasm of species of commercial interest [5]. The genetic variability maintained in these homegardens, represent a considerable amount of genetic conservation of resources, improving the sustainability of the homegardens in relation to the environment [5]. According to Paiva [6], homegardens encompass a set of plants with arboreal, shrub, climbing and herbaceous species, providing species a diversification and varied growth, forming multiple strata that, resembling the structure of tropical forests [7]. The genetic variability maintained in these homegardens, altogether represent a considerable amount of genetic variation and conservation of resources, improving the sustainability of the homegardens in relation to the environment [5].

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

In this sense, homegardens constitute links between rural and urban settlements through products, germplasm and resident members [10]. Urban agriculture is an activity of tradition among the families, being exercised in residences where the destination of the products is predominantly for autoconsumption self-consumption, with little trade [11]. As highlighted by Nair [12], homegardens are considered an "economic mystery", because even with the economy showing a market superiority,

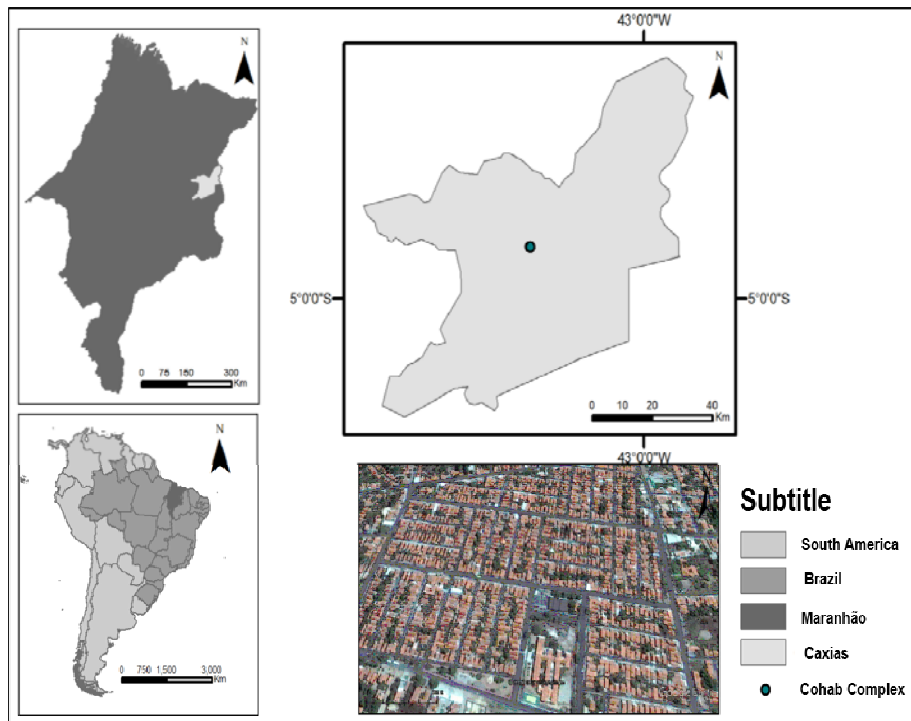
homegardens have long stood out as the basic function of livelihood sustainability, especially in times of economic stress.

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

2. MATERIAL AND METHODS

The study was conducted during 2016 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. The study area is characterized by 58.82% of households living in residing houses or similar and 41.18% in buildings or residential units [16], with daily access to potable water and electricity. The economy is well developed with enterprises from different sectors.

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.



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

62 We randomly visited twenty five 25 homegardens were randomly visited with the consent of
63 residents, with the starting point at 01 Avenue. A form was applied in the resident's own residence,
64 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 were interviews with residents with on socio-economic issues as well as 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 analyzed via descriptive statistics, tabulated and expressed in form of graphs and tables. The plant specimens were photographed in their growing habitat. The initial botanical identification was carried out in the field, where possible and / or with the help of specialized literature. The plant specimens were photographed in their growing habitat for later identification.

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 10 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-largest number of species were Lamiaceae, with five species; Rutaceae, Malvaceae and Lamiaceae had, with four species each, followed by Solanaceae, Euphorbiaceae, with three species each; and Myrtaceae, Crassulaceae, Anacardiaceae, with two species, while the other families presented only one species (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 each. The other genera were 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 (Spanish)	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 cchica</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
Laminaceae	<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
	<i>Hibiscus sabdariffa</i> L.	Vinagreira	Food	Shrub

Malvaceae	<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 esculentum</i> L.	Tomate	Food	Subshrub

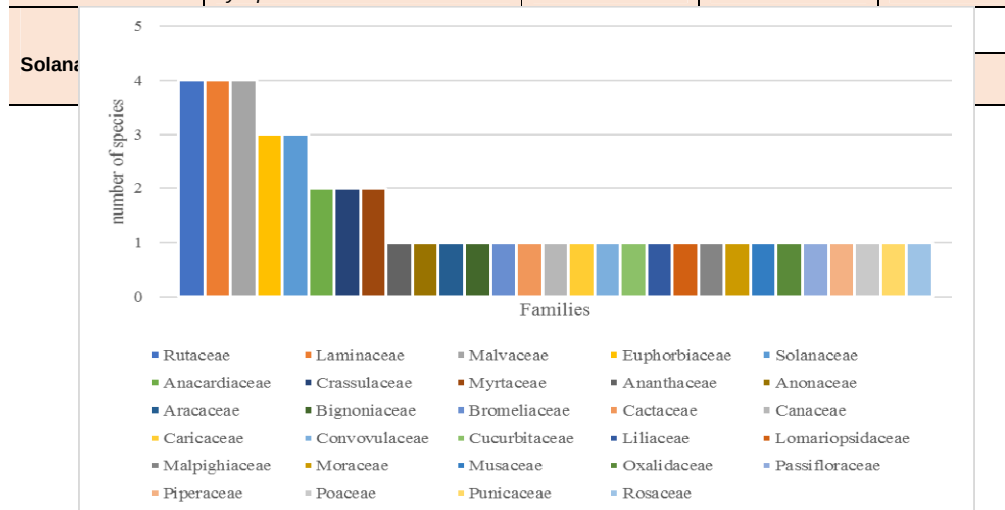


Figure 2. Number of species per botanical family found in agroforestry homegardens in Maranhão, Brazil, 2016.

Lamiaceae with five species were the most cultivated taxa. The importance of the species in this family is mainly due to(Lamiaceae is an aromatic family mainly used to spice and flavor food??) The representatives of the Rutaceae family cataloged in the research are of great economic importance, mainly by the fact of catalog only because of the number of *Citrus* species being cultivated, such as with cultivation of their representatives (lemon, orange, tangerine and lime. These species) that in the state of Maranhão is not indicated the cultivation, due to the low rainfall rates, since they do not suffer water deficiency during the inflorescence phase [17], a condition that affects other taxa.

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 arboreum* (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.

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

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

The age of homegardens care-takers have ages ranging from 26 to 86 years old, with an average age of 64 years old. Being the majority women (22 people) who had lived in the neighborhood for 10 and 30 years. The income ranges from 1 to 5 minimum wages, obtained mainly through retirement income and occupation mainly in positions of public sectors. Women are mainly responsible for the management of the agroforestry homegardens, corroborating earlier studies [23,3,7]. The majority of women (n=22) lived in the neighborhood for between 10 and 30 years. The homegarden structure relates to each owner's cultural experiences and life history. The particular background and history of an individual gardeners defines allows to better understand the conformations of the homegardens, which vary according to cultural aspects, available space, function and history of community formation.

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

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