

TOWARDS SUSTAINABLE CITIES: FLORA GROWN AND TRADED IN SALVADOR, BRAZIL

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ABSTRACT

The 1988 Constitution of Brazil gives all citizens the possibility to democratically have a say in the design of the urban planning. The paper discusses good examples of urban agriculture practices in front yards, including museum houses, one of the writers Jorge Amado and Zelia Gattai, as well as survey results of food, spice, medicines and aromatic plants traded in Salvador. This case study focuses on a culturally rich Brazilian city, the first Portuguese colonial capital in the South American country. The materials used were twofold: (1) Old manuscripts, such as the letter of Pero Vaz de Caminha, who accompanied and recorded the first historically recognised trip of a Portuguese navigator to Brazil. In fact, Pedro Álvares Cabral is accepted as the official discoverer of the new colony, having arrived at Porto Seguro in 1500, located south of Salvador; (2) Flora records from a scientific mission conducted by the author in August 2023, at the service of CTROP, the Tropical College of the University of Lisbon. The aim of this study was to gather the flora grown and traded in the capital city of Bahia and compare it to the early colonisation records. It totalled 50 interviews with urban gardeners and traders. Results show that 151 taxa were both traded and gardened in Salvador, 51.7% consumed as food in natura or in traditionally cooked dishes, and 19.2% applied or ingested as medicines. A second objective is to add data to the database initiated in the Tropical Institute aiming to compare results from several locations colonised by the Portuguese, in order to evaluate the sustainability of local flora.

Keywords: Salvador, Brazil, urban agriculture, trade, sustainability.

1 INTRODUCTION

According to Dias et al. [1], Brazilian universities play an important role in the discussion of public policies, conducted by elected governments. That is because the 1988 Constitution of this South American country gives all citizens the possibility to democratically have a word in the design of the urban planning. Thus, several Bahia state universities use their educational capacity to research the social, juridical, educational, and environmental dimensions of city design. In this context operate both the UniFG Observatory, located in the semi-arid Guanambi municipality, as well as the Federal University of Salvador, located in the capital city of this northern-Brazilian state [2]. The low environmental quality of the squares in small sized towns has been the target of the UniFG Observatory of Guanambi, for example, permitting the academia to propose better greening options to solve the problem [1].

The city of Salvador also possesses some squares without quality, because the planners involved in urban development frequently made the option to introduce statues in their design, and a small layer of grass, without trees to shade the tropical city environment, where frequently they are welcomed by strollers (see Fig. 1 – ‘the fat girls’). City sustainability is promoted with tree and bush plantations and overall, the increase in green areas, because they are infiltration spaces that produce oxygen, reducing air pollution, drought, and floods when there is heavy rainfall. The paper will also introduce good examples of urban agriculture practices in front yards, including museum houses, as well as one of the writers Jorge Amado and Zelia Gattai, the best in examination in the following pages (Fig. 2). Recent actions designed to preserve the cultural heritage for the old centre of Salvador, as program





Figure 1: Square, Milton Santos Avenue, Ondina neighbourhood.
(Source: Author, 2023.)

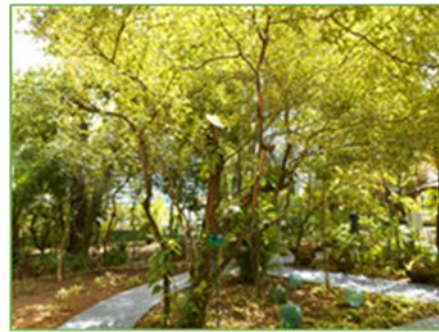


Figure 2: Amado's Brazilian grape tree, Rio Vermelho neighbourhood.
(Source: Author, 2023.)

Revitalize, proved not to have totally met their goals, due to inefficient tax incentives [3]. Nevertheless, the museum house of the Brazilian writers stands as an excellent result of the cultural and architectural heritage renovation and touristification in the first capital city of Brazil. It is in the Rio Vermelho neighbourhood, and not exactly in the old centre of the city.

2 THE HISTORICAL HERITAGE OF SALVADOR, BAHIA

Most of the buildings targeted by revitalisation have been using international developers' funds, such as five-star hotel entrepreneurs, because Salvador is a highly sought touristic northeastern urban site in Brazil. That is because of its slave heritage (food, music, and religion), of its typical Portuguese architecture, inherited from the colonial days (1500–1822), as well as its carnival and music festivals. International projection of several Bahia musicians (Caetano Veloso, Maria Bethania, Dorival Caymmi, for example) bring national and international tourists to the urban settlement. The survival of religious plant aspersions is part of the municipality heritage preservation (*candomblé*) effort because the immaterial culture is as important as the material. The African cultural practices use flora and divinise nature. The material heritage is in the coloured Portuguese buildings, recovered in the old centre of the city of Salvador, as well as in the walking promenade floors, also typical of times when horses and carriages were moving around the royal capital of Brazil (see Fig. 3).

The illustrated old centre of Salvador was occupied with landowners' houses from 1549 to the Imperial times (1822–1889), mostly sugarcane producers and African slave owners.



Figure 3: Pelourinho, the historical square. (Source: Author, 2023.)

From then onwards, low-income residents and slave descendants replaced the prosperous traders and nobles that migrated to modern adjacent palaces and green boulevard neighbourhoods, which slowly deteriorated the historical city areas. The functionality of old city centres was recovered or altered from the 1980s onwards, for reasons of the re-democratisation of Brazil (1988 Constitution, as said), but in case of Salvador the revitalisation of the historical centre and its transformation in museum site for tourists was the work of a governor (A.C. Magalhães), in his last mandate 1991 to 1994 [3].

From 1991 to 2006, all the city centre residents suffered gentrification as low-income tenants were replaced by restaurants and souvenir shops, bars, cafes, museums, and hotels, because 95% of them have been given meagre compensation to live elsewhere in Salvador. In 2013, due to the lack of authenticity in this historical area, the municipality instated the Revitalize Program targeting old residents [3], giving them incentives to occupy public spaces to trade their produce (markets and fairs), or even to route their trade cars to the historical city centre, without being bothered by the police. According to Guimarães [4], ‘the tourist search for authenticity and the construction of this authenticity by the diverse range of businesses (...)’ also happened in old Lisbon neighbourhoods, such as Mouraria.

In Brazil, the 2017 Law 9.215 proposed sanctions to all landowners that did not comply with the norms of giving a social function to their building, in the central and limitrophe neighbourhoods of Salvador. This includes both Ondina (Fig. 1) and Rio Vermelho (Fig. 2). However, so far only 30 buildings were revitalised. Current research also collected evidence about food gardening and trade in Barra, a touristic beach neighbourhood. In the following section the materials and methods are exposed. The results from the survey will be presented in the next pages, and urban sustainability discussed, towards a conclusion. Two research objectives were previewed for this case study: (1) to gather the flora grown and traded in the capital city of Bahia and compare it with the early colonisation records; and (2) to add data to a database initiated in the Tropical Institute aiming to compare results from several locations colonised by the Portuguese, in order to evaluate the sustainability of local flora [5].

3 MATERIAL AND METHODS

This paper is a case study focusing on a sustainable and culturally rich Brazilian city. Materials used were twofold:

- (i) Old manuscripts, such as the letter of Caminha [6], who accompanied and recorded the first historically recognised trip of a Portuguese navigator to Brazil. In fact, Cabral is accepted as the official discoverer of the new colony, having arrived at Porto Seguro in the year 1500, located south of Salvador.
- (ii) Flora records from a scientific mission conducted by the author, in August 2023, at the service of CTROP, the Tropical College of the University of Lisbon. This survey totalled fifty semi-structured interviews to urban gardeners and traders, including four interviews to front yard gardeners in Ondina and Barra neighbourhoods (see map in Fig. 4).

The vegetable plants existent in food gardens and in the museum house garden of writers Amado and Gattai, located in Rio Vermelho neighbourhood, were identified using the online platforms of Botanical gardens, such as the Missouri Botanical Garden [7], the Global Biodiversity Information Facility [8], the *Trás-os-Montes* and Alto Douro University, in Portugal [9] and the Food and Agriculture Brazilian Research Public Enterprise [10]. The online databases also identified several of the traded food and medicinal plants registered during the survey, in 2023. Salvador possesses a Tropical climate, registering average temperatures 25.6°C and 1,235 mm annual rainfall.





Figure 4: Map of Salvador, the capital city of northeastern Bahia state, Brazil. (Source: Pinterest online.)

4 RESULTS

Table 1 presents the top-ranking plant species registered in 2023. These were the most consumed plant species, from a total of 151, distributed as follows: (1) 51.7% consumed as food in *natura* or in traditionally cooked dishes; (2) 19.2% were curative plants, either ingested or applied externally; (3) 14.6% applied as cosmetics or perfumes; (4) 10.6% were spices. The remainder were nutraceuticals and ornamental flora from the front yards. Food dishes are part of Bahia cultural heritage as most of them use palm oil (*Elaeis guineensis*) brought to Brazil together with the African slaves [11]. Delicacies such as fish or shrimp *Moqueca*, *Vatapá* or *Bobó* use this oil instead of the olive, corn or sunflower oils preferred elsewhere in Brazil. These dishes also contain coconut milk, the top-ranking species (Fig. 5),



onions, and local pepper, and frequently peanuts and cashew (Fig. 6). *Munguzá* is another sweet delicacy made of corn, sugar, cinnamon, clove, and coconut milk, again, while salty *Acarajé* uses ginger and black-eyed peas with palm oil.

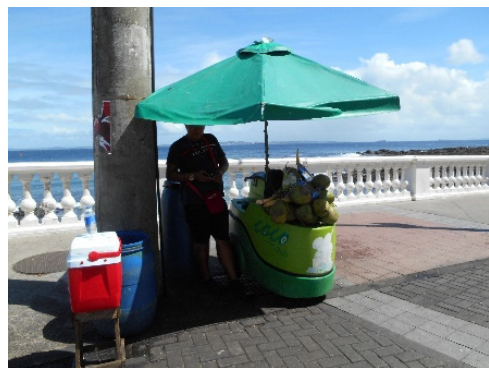


Figure 5: Street trade of coconut water. Figure 6: Cashew tree from garden.
(Source: Author, 2023.)

Table 1: Top-ranking flora registered in Salvador. (Source: Author's survey, 2023.)

Flora recorded	Botanical identification and records		
Vernacular name	Scientific name	Botanical family name	No.
1. Coconut	<i>Cocos nucifera</i> L.	Arecaceae	26
2. Onions	<i>Allium cepa</i> L.	Amaryllidaceae	15
3. Cassava	<i>Manihot esculenta</i> Crantz	Euphorbiaceae	14
4. Banana	<i>Musa paradisiaca</i> L.	Musaceae	14
5. Cashew	<i>Anacardium occidentale</i> L.	Anacardiaceae	12
6. Local pepper	<i>Capsicum frutescens</i> L.	Solanaceae	10
7. Peanuts	<i>Arachis hypogaea</i> L.	Fabaceae	10
8. Corn	<i>Zea mays</i> L.	Poaceae	9
9. Passionfruit	<i>Passiflora edulis</i> Sims	Passifloraceae	9
10. Oranges	<i>Citrus sinensis</i> L.	Rutaceae	9

Cassava, mentioned by Caminha in the year 1500, and potatoes are American flora, also preferred in Salvador. The four food gardens researched possessed several fruit trees: coconuts, bananas, cashews, guavas, custard apples, climbing passionfruit bushes and mango trees. The Amado and Gattai food garden also had Brazilian grape trees (Fig. 2), chicle trees, and Brazilian cherries, together with spices. Jazmin was also a flourishing bush existent in this museum garden as well as in Rio Vermelho neighbourhood. Because this was a museum, no interview was taken from the staff, as the aim were the food gardeners. Barra and east neighbouring Ondina were selected for being middle-income residential areas with flourishing front and backyards (see map in Fig. 4).



Regarding medicinal plants and religious practises, native flora is frequently used to prevent diseases or to cope with chronic illnesses, even though in Salvador the usage of European plants such as rue (*Ruta graveolens*), lavender (*Lavandula angustifolia*) and rosemary (*Rosmarinus officinalis*) was recorded. More often the Brazilian pepper tree leaves (*Schinus terebinthifolius*) and corn (*Zea mays*) were used in religious aspersions in Candomblé. The mixed usage of native and exotic species was also registered in Recife in 2000 [5], as well as in Belem, Brazilian Amazon area in 2023 [12] and back in 1998 [13]. Table 2 presents the top-ranking curative species from Salvador, collected during the 2023 survey. The preferred species is a native nutraceutical, used in infusions against urinary problems and in traditional religious practices by African–Brazilian residents.

Table 2: Medicines grown and traded in Salvador. (Source: Author’s survey, 2023.)

Flora recorded	Botanical identification and records		
	Scientific name	Botanical family name	No.
Corn	<i>Zea mays</i> L.	Poaceae	9
Lavender	<i>Lavandula angustifolia</i> L.	Lamiaceae	7
Rosemary	<i>Rosmarinus officinalis</i> L.	Lamiaceae	4
Brazilian pepper	<i>Schinus terebinthifolius</i> Raddi	Anacardiaceae	3
Peppermint	<i>Mentha piperita</i> L.	Lamiaceae	3
Linen	<i>Linum usitatissimum</i> L.	Linaceae	3

As to the first objective of this case study – to gather the flora grown and traded in the capital city of Bahia and compare it with the early colonisation records – Table 3 presents the results gathered. As observed, nine plant species registered nowadays already existed in the year 1500, when Brazil was officially discovered by the Portuguese Cabral. Coconuts and cassava are the most consumed species nowadays, either. Rice and wheat were transported in the caravels, and linen was the main textile used in European clothes. Wine and grapes were unknown, yet the drink was quite appreciated by the Indians.

Table 3: Comparison of 1500 records from the 2023 survey. (Source: Filgueiras and Peixoto [6], Caminha [14] and the author’s survey, 2023.)

Flora recorded	Botanical identification and records		
	Scientific name	Botanical family name	No.
Coconut	<i>Cocos nucifera</i> L.	Arecaceae	26
Cassava	<i>Manihot esculenta</i> Crantz	Euphorbiaceae	14
Heart-of-palm tree	<i>Euterpe edulis</i> Mart.	Arecaceae	7
Rice	<i>Oryza sativa</i> L.	Oryzaceae	5
Figs	<i>Ficus carica</i> L.	Moraceae	4
Linen	<i>Linum usitatissimum</i> L.	Linaceae	3
Grapes	<i>Vitis vinifera</i> L.	Vitaceae	3
Cotton	<i>Gossypium herbaceum</i> L.	Malvaceae	2
Wheat	<i>Triticum aestivum</i> L.	Poaceae	1



Linen is nowadays ingested as an energetic food supplement and in nutraceutical dishes both by children and adults. Gardens are biodiversity spaces that contribute to regulate the climate, because they reduce the heat island and produce moisture, favouring pluviosity. The preservation of native plants is frequently done in front and back yards, as seen in six Brazilian cities already investigated (Table 4) and all over the urban world researched over 25 years. Additionally, food sovereignty is enhanced by food gardens [15], where spices, staples and horticulture species are planted, in order to give households food security. In Salvador as elsewhere in Latin America and Asia, urban gardens can be pharmacies used to cure head and stomach aches (rosemary and sage), to solve influenza (peppermint) and coughs (pot marigold), as well as to treat chronic diseases (lavender) [16]. Cotton leaves favour breast milk production in young mothers. Back in 1998, these were found in Belém home gardens, used to treat asthma [13]. Table 4 presents the Latin American locations researched.

Table 4: Database from the Portuguese Tropical Institute (IICT) and the University of Lisbon surveys. (Source: Madaleno [15] and the author's survey, 2023.)

Latin American cities and countries	IICT and Repository of the University of Lisbon		
	Semi-structured interviews (no.)	Urban farmers and gardens (%)	Years
1. Belem, Brazil	570	97.3	1998, 2005
2. Presidente Prudente, Brazil	280	100	1999
3. Recife, Brazil	50	6.0	2019, 2020
4. St. Luís, Brazil	100	90.0	2010
5. Santarém, Brazil	50	64.0	2006, 2007
6. Salvador, Brazil	50	8.0	2023
7. Santiago Metropolis	132	84.1	2002, 2003, 2005
8. Iquique	75	64.0	2012
9. Central Mexican Metropolis	100	42.0	2004, 2006
10. Lima, Peru	34	0.0	2006
11. Piura, Peru	40	0.0	2016
12. Habana, Cuba	50	94.0	2009
13. San José, Costa Rica	43	69.7	2010
14. Rio Cuarto, Argentina	100	80.0	2011
15. Colonia del Sacramento, Uruguay	50	48.0	2011
16. Panamá City, Panama	50	6.0	2017
Total or average	1,774	53.1	–

Regarding the second objective – to add data to the database initiated in the Tropical Institute aiming to compare results from several locations colonised by the Portuguese, so as to evaluate the sustainability of local flora – coconuts were also the top-ranking plant registered in Recife, followed by cashews, bananas, and mango trees [5], because they are tropical flora from a similar northeastern environment. Local pepper was also the preferred spice, yet butter was more used to fry and cook local delicacies in Recife, located 809 km north of Salvador. Whereas Belem's findings were like the ones gathered in St. Louis, a



neighbouring northern state, as well as those of Santarém, from the Amazon riverine areas, Presidente Prudente, located in S. Paulo state (south) had evidence of lesser usage of native species [17]. The standing outcome from Salvador (see Fig. 7) was the African heritage, found in food dishes and flora consumed daily by Bahia residents (Fig. 8).



Figure 7: Salvador panoramic view. Figure 8: The typical food shop.
(Source: Author, 2023.)

5 DISCUSSION

A sustainable development policy must valorise the natural capital (soils, land, climate, and vegetation), the physical capital (landscape planning, green buildings) and the human capital (trade, manufacture, services, tourism, and cultural heritage). One of the main objectives of sustainable urban planning is ‘to orient a territory’s development harmonically with its surroundings’ [18]. Recently, the sustainable development concept is seen as sharing prosperity and benefits in a co-evolutionary perspective with the ecosystem [19]. The concept of sustainability has three pillars: economic growth, environmental protection, and social equity.

Urban sustainability requires an equilibrium between the above-mentioned pillars, aimed to assure citizens life quality. That can only be achieved whilst preserving the natural and cultural values, as seen in Salvador, Brazil, because urban agriculture practised, and the cultural food habits come together in the home gardens (Figs 2 and 6). Brazilian Queiroz [20] furthers the sustainability concept adapting it to the touristic activity and the development of touristic destinations in his South American country. Sustainability is a multidimensional conception that demands the joint integration of the environment, the economy, the society, the culture, and the politics: ‘basic infra-structure and services offered by a tourism destination can be considered ordinary components, when compared to the social and cultural manifestations of the groups involved, as they establish the real connections of the activity’ [20].

As observed in Salvador, low-income African descendants, involved in the *touristification* of the historical city centre (see Fig. 3), are essential to give authenticity to the economic activity. However, the fact that they no longer live in this neighbourhood contributes ironically to the absence of impacts on the urban environment, now gentrified and inhabited by high-income earners, but benefits the social and economic balance, whilst valuing low-income earners cultural heritage, and integrating them in the touristic activities. It is also essential to stress that being sustainable means to satisfy present and future needs. Therefore, all the agents involved in this economic activity are indispensable for the satisfaction of the visitors (the tourists), from the hotels’ staff to the street traders.

The ability of the public powers to conciliate all stakeholders involved, providing security instead, will dictate the sustainability of the diversity of services, products and people engaged. Today's balance among low-income earners displaced and high-income tourists served, is the key to achieve sustainability. The proposal is to keep all agents involved and safe, using both private and public security forces, because only the ability to harmonise tourism with other local economic activities and residents can give sustainability to urban development, still being promoted in the capital city of Bahia state, Brazil.

As to the environmental protection, urban agriculture promotion by city management is always a must in order to achieve sustainability. The maintenance of beautiful waterfronts is promotional for any coastal city (see Figs 5 and 7). In another case study from Europe, Cumo et al. argued: 'that gardens are spaces for the senses, from touch to hearing and sight, through the insertion of coloured and aromatic essences, and as a connective space given by paths and vegetation' [21]. Urban agriculture furthers the green initiatives in the cities because the activity provides food, spices, and medicines for households, simultaneously benefiting the natural, physical, and human capitals. Food gardens are infiltration spaces, thus preventing both floods and drought, providing oxygen, and diminishing air pollution, whilst preserving biodiversity and favouring, most particularly, the reproduction of native plant species.

6 CONCLUSION

Urban agriculture practised in front and back yards is a solution encountered for environmental, economic, and cultural sustainability, all over Latin America. As seen in Table 4, a proportion of 53% of the semi-structured interviews was conducted in six Brazilian cities, and ten more from Spanish-speaking countries, using the same questionnaire. Supply chains also provide numerous examples of local food, brought to the markets and fairs from nearby peri-urban farms, in Brazil [15]. City planning and urban growth of Salvador was described to be developed using trees and greenery along several neighbourhoods (Fig. 7), even though municipal programs and local universities should work better on the circular economy principles, both by providing technical assistance and by giving away compost tanks to urban gardeners, already recorded in Presidente Prudente, in 1999 [17]. Those recycling practises would give even more environmental sustainability to Salvador.

The African oil palm was documented in Ghana, one of the sites from where the slave trade started back in the 15th century, as well as *Capsicum annum* that the Portuguese settler's latter introduced in the Western African environment [11]. The opposite was also true, as the Portuguese navigators dispersed and planted African palm trees in America, and Asian spices like ginger, sweet oranges (*Citrus sinensis*) from China, and cinnamon trees, from Ceylon [13]. Many medicinal plants were taken from Europe and are nowadays part of local pharmacies available in the household gardens.

The first Brazilian colonial capital, Salvador is the most remarkable cultural heritage site in the country, where the Atlantic triangular trade of the 16th century meets (Africa, America, and Europe). It even goes further away into southern and eastern Asian environments [16]. The paper adds data to the quest for the routes taken by flora, around the world, with the help of travellers and settlers, including the forced slaves from Western Africa. This case study argues that Salvador is being planned and managed to become environmentally but also cultural and socially sustainable, whereas integrating African–Brazilian residents in touristic activities.

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