Socioeconomic Factors Influencing Knowledge and Consumption of Food Plants By a Human Group in a Mountainous Environment in The Semi-Arid Region of Bahia, Northeast Brazil.

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Abstract

Background: The relationship of people with natural resources is guided by different socio-cultural, ecological and evolutionary factors. Regarding food plants, it is not different. Studies around the world have evaluated the effects of socioeconomic factors, such as age, gender, income, profession, education level, time of residence, ethnic diversity, religion, festive rituals, access to urban areas and migrations. In this sense, the objective of the present study was characterize the diversity of knowledge and use of food plants by people from Serra dos Morgados and evaluate if the socioeconomic factors influence knowledge and consumption of food plants in the community.

Methodology: This research was conducted in the village of Serra dos Morgados, municipality of Jaguarari, Bahia, with the purpose of evaluating the factors that influence in the knowledge and use of food plants. Socioeconomic data such as age, gender, time of residence, and monthly income were collected. The free list technique was applied during the collection of ethnobotanical data in order to analyze the preference of the plants based on the salience index (SI). To analyze the factors that influence knowledge and use forms, we used GLM Lasso.

Results: A total of 33 people were interviewed, 8 men and 25 women, their age ranged from 30 to 82 years. People cited 93 ethnospecies of plants, of these 41 species of spontaneous occurrence. The plant with the highest salience index (SI) was *cheirosa* (*Psidium ganevii)* (SI = 0.5679), followed by *massaranduba* (*Manilkara* sp.) (SI = 0.4323); *araça* (*Psidium* sp.) (SI = 0.3320); *cambuí* (*Myrcia* sp.) (SI = 0.3144).

Conclusions: The main factors that influence knowledge and use forms in the locality, were family income and the collection site, with homegardens cited as the preferred area for collection of food plants. This study provided an overview related to potentially important species for a community located in a region where there are few ethnobiological studies. The results presented here can be used in future studies, providing clues for investigations. the ethnoculinary and nutritional aspects of food plants. Also, there is a contributes to the conservation of biocultural aspects related to the use of food plants in a community living in mountainous regions

Background

The relationship between people and food plants is influenced by many socioeconomic factors such as age, gender, income, education level, time of residence, religion, access to urban centers and migrations [1–5]. Furthermore ecological aspects such as the abundance of resources, availability and species richness, also influence the use of food plants [4, 6, 7]. Despite an increased interest in the study of food plants, much remains to be known about the diversity of use in this cultural domain, especially in the northeast of Brazil [8]. In this sense, Jacob and Albuquerque [9] point out four gaps in studies with food plants that still need to be resolved; they are: 1) inaccessibility of data about plant biodiversity; 2) need

for interdisciplinary methods and interprofessional research teams; 3) lack of culinary data and; 4) nutritional composition data.

Despite an increase in research that analysis of socio-ecological factors involved in the selection and use of plant resources, it is still necessary to investigate, in detail, the influence of certain variables to the detriment of others. For example, Sansanelli et al. [10] only studied the influence of gender on plant use, while Çakir [11] evaluated the influence of age, more specifically the maintenance of knowledge and use of resources throughout age groups. Considering that most studies were developed using medicinal plants as a model, as pointed out by Campos et al. [12], reinforces the importance of expanding this debate to other cultural domains. In addition, conducting studies with food plants in a different of ecosystem is pertinent.

Therefore, in the present study, we consider mountainous environments. These environments, which provide sustenance to about 12% of the world population, have a wide variety of complex and interrelated ecological systems [13]. They are mosaics of plant biodiversity that foster the development of much knowledge about natural resources [14]. This makes it interesting to conduct studies about the dynamics of knowledge and use of these natural resources. So, the objective of the present study was twofold: (i) to characterize the diversity of knowledge and use of food plants by people from Serra dos Morgados, highlighting the methods of preparation, preferential places for the collection and sale of food plants and (ii) to evaluate if the socioeconomic factors influence knowledge and consumption of food plants in the community.

Methods

Research area

Research was conducted in the community of Serra dos Morgados, municipality of Jaguarari, Bahia, Brazil. The municipality of Jaguarari present the estimated population of 33.746 inhabitants in 2020, and an area of 2.466,009 Km² based on data collected in 2020 [15]. The demographic density was 12,35 Hab/Km² and the MHDI - Municipal Human Development Index was 0.659 [15]. The climatic type of the municipality of Jaguarari is semi-arid and susceptible to prolonged periods of drought or water scarcity.

The village of Serra dos Morgados (Fig. 1), also known as Serra de Baixo, is located 9 km from of the municipality of Jaguarari, at coordinates 10º14'18.7S and 40º14'31.2W, and an approximate altitude of 980 meters. The community consists of 97 families and 307 inhabitants. There are two associations in the village, one is for residents of Serra dos Morgados with 86 members, and the other is exclusively for women. There is a healthcare unit with one healthcare worker. There is an elementary school (first to fifth grades) that has two teachers.

Ethnobiological study

Initially, a meeting was held at with members of the the Community Residents Association in order to describe the project. Those who agreed to contribute to the study were asked to sign the Informed Consent Form (ICF). This study was submitted to and approved by the ethics committee for research with human beings at the Federal University of Vale do São Francisco (CAAE: 80902217.2.0000.5196).

In the first moment of the interview socioeconomic data were collected, containing questions such as age, gender, time of residence in the locality and monthly income. In the second moment, the free list technique [16] was applied with the adult(s) present at the residence at the time of the visit, which we call "head of household". It is noteworthy that only informants over 18 years of age were interviewed. At this stage, participants were asked to list the food plants known and/or used by them. Researchers recorded each plant in exactly the order it was mentioned. After citing the last recalled plant, we proceeded with the non-specific induction technique, it was made a the “new reading” technique to stimulate the recall of other plants [17]. From the list provided by each informant, researchers then asked the following questions about the plants mentioned: Which part is used? What form of consumption do you know? What are the places where food plants are collected? Why this location? What is the collection frequency? Have you ever consumed this plant? When did you last consume this plant? Is this food plant commercialized? Is there another use for this plant? If so which? What part of the plant is used for this new use? Are there any plants that you no longer consume?

It is important to note that the collection sites were also categorized into: 1) homegardens: as spaces located near one`s residence; 2) the swiddens: as areas of territorial extension, usually larger than the homegardens, in which agricultural activities are developed; 3) the vegetation areas: are areas apparently little urbanized which may be located in low areas, on the slopes and/or at the top of the mountains.

Data analysis

After general questions about the uses and possession of free lists, the preference of the plants was analyzed based on the salience index (SI), which considered the frequency of citation and the average position of the items in the lists obtained [16]. The protocol proposed by Chaves, Nascimento and Albuquerque [18] was applied, which allowed the verification of significantly more prominent plants. Thus, the plants were divided into three groups: 1) plants that obtained significantly high salience values and were distinct from the null scenario; 2) plants whose observed values did not differ from the null model; 3) plants with the lowest salience values, which differ significantly from the null model. These analyzes were performed using the software R version 4.0.5 [19]. For graphical representation of uses, a string diagram was applied using the “ethnoChord” function of the “EthnobotanyR” package. The plants mentioned were herborized, photographed and identified by comparing with exsiccates deposited in a herbarium, and through consultation with specialists and specialized literature.

In order to assess the influence of socioeconomic factors on the knowledge, we used the sum of the salience index (SI) of the plants mentioned by the informant, was used to quantify the knowledge. The number of citations of forms of consumption of food plants per informant was also quantified and used to assess knowledge. For these analyses, we follow the protocol suggested by Finch and Finch [20], GLM

lasso, but to calculate the value of "p", the lassopv function of the "lassopv" package was used. The explanatory (independent) variables were: time of residence, family income, gender, preferred place of collection (vegetated area close to the village and areas of high anthropic intensity, such as homegardens, being binary variables, 1 for vegetation area and 2 for anthropogenic areas), retired (binary variable, retired 1 and not retired 0) and number of residents in the house. There were two response (dependent) variables: the sum of the SI, of the plants mentioned per informant and the number of forms of consumption cited per informat. All variables were also standardized prior to the analyzes. The analyzes were performed using the software R 4.0.5 [19], used packages “scales”, “glmnet” and “lassopv”.

Results

Diversity of known and used food plants

Of these, 33 families, one informant per family, called househoulder were interviewed, being eight (8) men and 25 women (Table 1). Regarding the known plant diversity, people cited 98 ethnospecies of food plants, of these 38 were identified as being of spontaneous occurrence. The average number of plants cited by men and women was approximately 23 and 19, respectively. Most food plants in the community have the fruit as the preferential part used, especially for fresh consumption (79.8% of respondents), followed by juice (18.12%), cooked (9.97%), sweets (3.78%) and spices (3.47%) (Fig. 2).

Table 1
Socioeconomics informations.

Socioeconomic category	Class	Number of informants (%)
Gender	Female	25 (76%)
	Male	8 (24%)
Age	31-40	1 (3%)
	51-60	2 (6%)
	>60	30 (91%)
Education	primary school I	21 (63%)
	primary school II	8 (25%)
	higher education	2 (6%)
	illiterates	2 (6%)
Occupation	Retired	19 (56%)
	Farms	7 (22%)
	housemaids	4 (13%)
	Salaried	3 (9%)
Time in the community	Since childhood	21 (62.5%)
	Lived, for some time, in other places.	12 (38.5%)
Monthly income (individual)*	Up to a minimum wage	25 (76%)
	Up to two minimum wages	8 (24%)
Monthly income (Home)*	Up to a minimum wage	15 (45%)
	Up to two minimum wages	13 (39%)
	Above two minimum wages	5 (16%)
Government assistance	Receive	6 (19%)
	No receive	27 (81%)
* The minimum wage in Brazil on 10/18/2020 is R$ 1,045.00 (US$ 184,96).		

The collection of plants takes place mainly in anthropic areas (56.74% of citations), such as in a homegarden or in "swidden areas", followed by areas of vegetation located near the community (37.32% of citations), both areas (anthropic and vegetation) (4.64% of citations) and purchased at markets and street markets (1.29% of citations). Among the plants found in homegardens stand out: abacate (*Persea*

americana L.) (50% of citations), goiaba (*Psidium guajava* L.) (46.9%), banana (*Musa paradisiaca* L.) (43.7%), jaca (*Artocarpus heterophyllus* Lam.) (43.7%), manga (*Mangifera indica* L.) (37.5%), laranja (*Citrus* sp.) (34.4%) and café (*Coffea arabica* L.) (31.25%). In homegardens, 59.4% of respondents market the resources that are managed in these areas in addition to direct use for consumption. The sale of these products takes place in the community itself, as well as in the local market in the main town, Jaguarari.

Analysis of cultural salience (CS) of food plants of Serra dos Morgados

Based on the salience analysis of the free lists (Table 2), the following species stand out among those with the highest salience indices (SI): “cheirosa” (*Psidium ganevii* Landrum & Funch) (SI = 0.5683) (cited by 90.9% of informants), followed by “jaca” (*A. heterophyllus*) (SI = 0.4611) (cited by 60.6% of informants); “massaranduba” (*Manilkara sp.*) (SI = 0.4319) (cited by 99% of informants); “abacate” (*P. americana* L.) (SI = 0.3962) (cited by 57.6% of informants); “laranja” (*Citrus sp.*) (SI = 0.3554) (cited by 51.5% of informants); manga (*M. indica* L.) (SI = 0.3440) (cited by 48.5% of informants); banana (*M. paradisiaca* L.), (SI = 0.3338) (cited by 51.5% of informants), “araça” (*Psidium* sp.) (SI = 0.3316) (cited by 54.5% of informants); “goiaba” (*Psidium guajava* L.) (SI = 0.3202) (cited by 54.5% of informants) and “cambuí” (*Myrcia* sp.) (SI = 0.3137) (cited by 48.5% of informants), emphasizing that all are fruit trees, consumed mainly fresh (Table 2). The most prominent family, in relation to the number of species, is the family Myrtaceae. Spontaneously occurring plants are collected in areas of vegetation and fields, among which the most frequently mentioned were “araça” (*Psidium sp.*) (SI = 0.3316), “umbuzeiro” (*Spondias tuberosa* L.) (SI = 0.1630) (cited by 30.3% of informants) and “maracujá de boi” (*Passiflora cincinnata* Mast.) (SI = 0.1579) (cited by 36.4% of informants).

Table 2
Food plants mentioned by people from the Serra dos Morgados Village, Bahia Northeastern Brazil.

Ethnospecies	Scientific name (Família)	Consumed part	Form of consumed	SI* (valor de p)
Abacate	*Persea americana* Mill. (Lauraceae)	Fruit	In natura/smoothie	0.3959 (0.0000)
Abacaxi	*Ananas comosus* (L.) Merr. (Bromeliaceae)	Fruit	In natura/juice	0.0979 (0.4672)
Abóbora	*Cucurbita sp.* (Cucurbitaceae)	Fruit	Cooked	0.0731 (0.2459)
Acerola	*Malpighia emarginata* DC. (Malpighiaceae)	Fruit	In natura	0.1399 (0.2030)
Alface	*Lactuca sativa* L. (Asteraceae)	Leaf	Salad	0.1210 (0.3327)
Alho poro	*Allium ampeloprasum* L. (Amaryllidaceae)	Leaf (“Stalk”)	Spice	0.0163 (0.0067)
Amora	*Rubus sp.* (Rosaceae)	Fruit	In natura	0.0416 (0.0587)
Andu	*Cajanus cajan* (L.) Huth (Fabaceae)	Fruit	Cooked	0.0424 (0.0618)
Anoma	*Annona sp.* (Annonaceae)	Fruit	In natura/juice	0.0035 (0.0006)
Araçá	*Psidium sp.*(Myrtaceae)	Fruit	In natura	0.3316 (0.0000)
Araucária	*Araucaria angustifolia* (Bert.) O. Kuntze (Araucaraceae)	Fruit/seeds	Cooked/roasted	0.0052 (0.0009)
Banana	*Musa sp.* (Musaceae)	Fruit	In natura/smoothie/roasted	0.3339 (0.0000)
Batata doce	*Ipomoea batatas* (L.) Lam (Convolvulaceae)	Root	Cooked/roasted	0.0820 (0.3212)
Beterraba	*Beta vulgaris* L. (Quenopodiaceae)	Root	Raw/cooked	0.0983 (0.4703)
Bredo	*Amaranthus viridis* L. (Amaranthaceae)	Leaf	Cooked/in natura	0.0230 (0.0141)
Bruto da grota	*Annona sp.* (Annonaceae)	Fruit	In natura	0.2567 (0.0016)

*Salience index

Ethnospecies	Scientific name (Família)	Consumed part	Form of consumed	SI* (valor de p)
Budinho	*Amaranthus spinosus* L. (Amaranthaceae)	Fruit	In natura	0.0959 (0.4368)
Burra leiteira	*Sapium Sp.* (Euphorbiaceae)	Leaf	Cooked	0.0015 (0.0001)
Café	*Coffea arabica*.L. (Rubiaceae)	Fruit	Roasted	0.1438 (0.1608)
Cajá	*Spondias mombin* L. (Anacardiaceae)	Fruit	In natura/juice	0.0447 (0.0676)
Caju	*Anacardium occidentale* L. (Anacardiaceae)	Pseudofruit (“Chestnut”)	In natura/juice/roasted	0.1403 (0.2054)
Caju do mato	*Anacardium sp.* (Anacardiaceae)	Fruit	In natura	0.0199 (0.0091)
Cambucá	*Plinia edulis* (Vell.) Sobral (Myrtaceae)	Fruit	In natura	0.2049 (0.0196)
Cambuí	*Myrcia sp.* (Myrtaceae)	Fruit	In natura	0.3142 (0.0001)
Cana de macaco	*Costus sp.* (Costaceae)	Stalk	In natura	0.0430 (0.0615)
Carambola	*Averrhoa carambola* L. (Oxalidaceae)	Fruit	In natura	0.0268 (0.0197)
Caroá	*Neoglaziovia variegata* (Arruda) Mez (Bromeliaceae)	Fruit	In natura/cooked/roasted	0.1226 (0.3203)
Cebolinha	*Allium schoenoprasum* L. (Amaryllidaceae)	Leaf	Tempero	0.0373 (0.0449)
Cenoura	*Daucus carota* L. (Apiaceae)	Root	Raw/cooked/crumbs	0.0935 (0.4251)
Cheirosa	*Psidium ganevii* Landrum & Funch (Myrtaceae)	Fruit	In natura	0.5683 (0.0000)
Chuchu	*Sechium edule* (Jacq.) Sw. (Cucurbitaceae)	Fruit	Cooked	0.0357 (0.0396)
Coco	*Cocos nucifera* L. (Arecaceae)	Fruit	In natura	0.0060 (0.0013)
Coentro	*Coriandrum sativum* L. (Apiaceae)	Leaf	Spice	0.0855 (0.3515)

*Salience index

Ethnospecies	Scientific name (Família)	Consumed part	Form of consumed	SI* (valor de p)
Condessa	*Annona reticulata* L. (Annonaceae)	Fruit	In natura	0.0479 (0.0844)
Couve	*Brassica sp.* (Brassicaceae)	Leaf	Salad/cooked	0.0844 (0.3417)
Feijão	*Phaseolus vulgaris* L. (Fabaceae)	Fruit	Cooked	0.0663 (0.1941)
Genipapo	*Genipa americana* L. (Rubiaceae)	Fruit	Suco/liquor	0.0046 (0.0009)
Goiaba	*Psidium guajava L.* (Myrtaceae)	Fruit	In natura	0.3206 (0.0000)
Graviola	*Annona muricata* L. (Annonaceae)	Fruit	In natura	0.1435 (0.1818)
Guabiraba	*Campomanesia xanthocarpa* Mart. ex O. Berg (Myrtaceae)	Fruit	In natura	0.2317 (0.0054)
Umbuzeiro	*Spondias tuberosa L.* (Anacardiaceae)	Fruit	In natura	0.1639 (0.0953)
Inhame	*Dioscorea sp.* (Dioscoreaceae)	Root	cooked	0.0312 (0.0275)
Ingá	*Inga sp.* (Fabaceae)	Fruit	In natura	0.2619 (0.0011)
Jabuticaba	*Plinia cauliflora* (DC.) Kausel (Myrtaceae)	Fruit	In natura	0.2401 (0.0023)
Jaca	*Artocarpus heterophyllus* Lam. (Moraceae)	Fruit and seed	In natura/cooked	0.4610 (0.0000)
Jaca pirão	Indeterminate	Fruit	In natura	0.0208 (0.0101)
Jacuti	Indeterminate	Fruit	In natura	0.0134 (0.0043)
Jambolão	*Syzygium cumini* (L.) Skeels (Myrtaceae)	Leaf	Cooked	0.0179 (0.0071)
Jatobá	*Hymenaea sp.* (Fabaceae)	Fruit	In natura	0.0282 (0.0214)

*Salience index

Ethnospecies	Scientific name (Família)	Consumed part	Form of consumed	SI* (valor de p)
João gomes	*Talinum paniculatum* (Jacq.) Gaertn. (Talinaceae)	Leaf	Cooked	0.0333 (0.0331)
Juazeiro	*Ziziphus* joazeiro Mart. (Rhamnaceae)	Fruit	In natura	0.0501 (0.0913)
Laranja	*Citrus sp.* (Rutaceae)	Fruit	In natura	0.3557 (0.0000)
Licuri	*Syagrus coronata* (Mart.) Becc. (Arecaceae)	Fruit	In natura	0.1465 (0.1720)
Lima	*Citrus limettioides* Tanaka (Rutaceae)	Fruit	In natura	0.0253 (0.0160)
Limão	*Citrus limonum* Risso (Rutaceae)	Fruit	In natura/juice	0.1079 (0.4540)
Macambira	*Bromelia laciniosa* Mart. ex Schult. f. (Bromeliaceae)	Fruit	In natura	0.0203 (0.0095)
Mamão	*Carica papaya* L. (Caricaceae)	Fruit	In natura	0.1109 (0.4270)
Mamão de veado	*Jacaratia sp.* (Caricaceae)	Fruit	In natura	0.0013 (0.0000)
Mandacaru	*Cereus jamacaru* DC. (Cactaceae)	Fruit	In natura	0.0748 (0.2516)
Mandioca	*Manihot esculenta* Crantz (Euphorbiaceae)	Root	Root/flour	0.1260 (0.3037)
Manga	*Mangifera indica* L. (Anacardiaceae)	Fruit	In natura/juice	0.3438 (0.0000)
Maracujá_de_boi	*Passiflora cincinnata* Mast. (Passifloraceae)	Fruit	Juice	0.1579 (0.1190)
Maracujá_doce	*Passiflora sp.* (Passifloraceae)	Fruit	In natura/Juice	0.1964 (0.0282)
Maracujina	*Passiflora edulis* Sims (Passifloraceae)	Fruit	Juice	0.0403 (0.0517)
Massaranduba	*Manilkara sp.* (Sapotaceae)	Fruit	In natura	0.4326 (0.0000)

*Salience index

Ethnospecies	Scientific name (Família)	Consumed part	Form of consumed	SI* (valor de p)
Maxixe	*Cucumis anguria* L. (Cucurbitaceae)	Fruit	Cooked	0.0313 (0.0280)
Melancia	*Citrullus lanatus* (Thunb.) Mansf. (Cucurbitaceae)	Fruit	In natura	0.0914 (0.3967)
Melão	*Cucumis melo* L. (Cucurbitaceae)	Fruit	In natura/juice	0.0139 (0.0044)
Milho	*Zea mays* L. (Poaceae)	Seed (“grain”)	In natura/cooked	0.0503 (0.0921)
Murici	*Byrsonima sp.* (Malpighiaceae)	Fruit	In natura	0.0780 (0.2781)
Murta	*Myrtus communis* L. (Myrtaceae)	Fruit	In natura	0.0592 (0.1413)
Oiti	*Licania tomentosa* (Benth.) Fritsch (Chrysobalanaceae)	Fruit	In natura	0.2788 (0.0005)
Olho de porco	Indeterminado	Fruit	In natura/Juice	0.1039 (0.5086)
Palma	*Opuntia sp.* (Cactaceae).	Fruit and Cladodium	In natura/cooked	0.0760 (0.2613)
Pepino	*Cucumis sativus* L. (Cucurbitaceae)	Fruit	Raw/cooked	0.0313 (0.0280)
Pimenta	*Capsicum sp.* (Solanaceae)	Fruit	Spice	0.0199 (0.0091)
Pinha	*Annona sp.* (Annonaceae)	Fruit	In natura	0.1348 (0.2413)
Pinha braba	*Annona sp.* (Annonaceae)	Fruit	In natura	0.0208 (0.0101)
Pitanga	*Eugenia uniflora* L. (Myrtaceae)	Fruit	In natura	0.0790 (0.2873)
Pitomba	*Talisia esculenta* (A. St-Hil.) Radlik. (Sapindaceae)	Fruit	In natura	0.0195 (0.0087)
Pitomba de cágado	Indeterminate	Fruit	In natura	0.0156 (0.0054)

*Salience index

Ethnospecies	Scientific name (Família)	Consumed part	Form of consumed	SI* (valor de p)
Pursá	Indeterminate	Fruit	In natura/juice	0.2640 (0.0011)
Quiabo	*Abelmoschus esculentus* (L.) Moench (Malvaceae)	Fruit	Cooked	0.0052 (0.0010)
Repolho	*Brassica sp.* (Brassicaceae)	Leaf	Salad/cooked	0.0170 (0.0063)
Salsa	*Petroselinum crispum* (Mill.) Mansf. (Apiaceae)	Leaf	Spice	0.0402 (0.0512)
Seriguela	*Spondias purpúrea* L. (Anacardiaceae)	Fruit	In natura/juice/jam	0.1878 (0.0397)
Sapucaia	*Lecythis pisonis* Cambess. (Lecythidaceae)	Fruit	In natura	0.0781 (0.2792)
Serralha	*Sonchus oleraceus* L. (Asteraceae)	Leaf	Cooked	0.0304 (0.0260)
Taioba	*Xanthosoma sagittifolium* K. Koch (Araceae)	Leaf	Spice/flour	0.0617 (0.1574)
Tamarindo	*Tamarindus indica* L. (Fabaceae)	Fruit	In natura/juice	0.0565 (0.1247)
Tamoia	*Annona cherimola* Mill. (Annonaceae)	Fruit	In natura	0.0038 (0.0009)
Tangerina	*Citrus reticulata* Blanco (Rutaceae)	Fruit	In natura	0.2766 (0.0005)
Tomate	*Solanum lycopersicum* Lam. (Solanaceae)	Fruit	In natura	0.0104 (0.0029)
Tomate cereja	*Solanum lycopersicum var. cerasiforme* (Alef.) Voss (Solanaceae)	Fruit	In natura	0.0273 (0.0197)
Umbuzeiro	*Spondias tuberosa* L. (Anacardiaceae)	Fruit	In natura	0.1639 (0.0953)
Urucum	*Bixa orellana* L. (Bixaceae)	Seed	Colouring	0.0089 (0.0025)

*Salience index

Ethnospecies	Scientific name (Família)	Consumed part	Form of consumed	SI* (valor de p)
Xique xique	*Pilocereus gounellei* F.A.C. Weber (Cactaceae)	Fruit	In natura	0.0104 (0.0029)
Xixó	Indeterminate	Fruit	In natura/juice	0.0069 (0.0017)
*Salience index				

Regarding the lowest indexes, all these plants had only 3% of citations, which also differ significantly from the null model, we observed “mamão de veado” (*Jacaratia sp.*) (SI= 0.0013); burra leiteira (*Sapium sp.*) (SI= 0.0015); “anomá” (*Annona sp.*) (SI= 0.0035); “tamóia” (*Annona clerimola*) (SI= 0.0038); “genipapo” (*Genipa americana*) (SI= 0.0046); “araucária” (*Araucaria angustifolia* (Bert.) O. Kuntze) (SI= 0.0052); “quiabo” (*Abelmoschus esculentus*) (SI = 0.0052); “coco” (*Cocos nucifera*) (SI = 0.0058) (Table 2).

Influence of socioeconomic variables

Among the socioeconomic variables evaluated (Table 3), only family income and preference for the place of collection significantly influenced knowledge of food plants. From this analysis, it was possible to verify that people with higher family income and who collect plants in more disturbed areas, such as homegardens, are the ones who cited a greater number of plants with high salience value (Table 3). When socioeconomic variables were analyzed considering the forms of use of food plants, the explanatory model suffered a small variation, in which only the preference for the collection site significantly influenced the use (Table 3). Based on the two approaches, it can be concluded that the people in the community who are most familiar with food plants collect these plants, preferably, in anthropized areas, especially in homegardens and areas close to their homes.

Table 3
Standardized Model Coefficients for the predictors of knowledge and forms of consumed.

Knowledge (Salience index)	
(intercept)	8.172263e-18
Gender	NA
Age	NA
Time of residence	1.071755e-02*
Family income	2.494921e-01+
Preferred place of collection	-1.497609e-01+
Retired	NA
Forms of consumed	
(intercept)	1.497787e-17
Gender	NA
Age	NA
Time of residence	NA
Family income	4.218177e-01+
Preferred place of collection	-1.041884e-01*
Retired	NA
NA=Variable not selected for inclusion in the final model	
+Statistically significant at alfa=0.05	
* Variable selected, but not significant at alfa=0.05	

Discussion

Knowledge, use and preference of food plants

The predominance of species belonging to the Myrtaceae family reflects a trend in studies of food plants development in Brazil [21]. This family groups together a number of relevant food species, in which the most consumed part is the fruit, with attractive organoleptic characteristics, such as smell, flavor and shape. Also, the fact that the fruits were the most commercialized part of the plant may be related to two issues that are worth mentioning: 1) part of the plant that, in most forms of consumption, requires little

preparation time and; 2) the community plays an important role for the nearby municipality, with regard to the supply of fruit for sale.

The maintenance of homegardens in the Serra dos Morgados community may have influenced informants to quickly remember the plants present in the area. Many studies on food plants, linked to the maintenance of homegardens, concluded that people prioritize keeping plants close to their homes that can be used daily [22]. The fact that food plants are commercialized also deserves attention, as these plants have an important economic value, which can influence the frequency of citation of certain species and their cultural importance, even if most of these plants are exotic. The predominant presence of exotic plants needs to be considered, as it raises some important issues such as, for example, the use of memory to store information considered useful; greater cultural acceptance of exotic plants by people in the municipality of Jaguariri, since several families in the community sell these species in the urban center and, finally, the ease of maintenance of these species close to their homes.

From the above, it called our attention to the fact that we have a native species which presented the highest value of cultural importance, it is *P. gannevii*, popularly known as “cheirosa”. This is an endemic species for the northeast region, commonly found in areas from 800 to 1200m of altitude, especially in the Bahia portion of the “cadeia do espinhaço” (mountain chain extending through the states of Minas Gerais and Bahia) [23, 24]. This plant has a restricted occurrence, which draws attention to the importance of describing the relationship between people in the Serra dos Morgados community and this species. It is noteworthy that before this study there was no record of occurrence of this species in the region, reinforcing the importance of this study for ethnoprospecting food plants. Finally, it is interesting to say that the “cheirosa” plant was considered the species with the most widespread knowledge in the community, being found everywhere, especially in homegardens. Thus, it is important to emphasize that, among so many exotic plants, there is a native species with considerable local prominence, which leads us to suggest that plants of spontaneous occurrence, but which have a high nutritional and cultural value, linked to practices can be maintained over time in intercropping with exotic species of equal nutritional and economic importance to these populations. Campos et al. [25], highlight a similar behavior of communities that maintain homegardens with the presence of spontaneously occurring plants and exotic plants. In the same study, Campos et al. [25] of the three communities studied by them, the one that maintained a closer relationship with the homegardens showed less knowledge and use of spontaneously occurring plants, leading to the conclusion that homegardens interfered with the knowledge and use about native species. On the other hand, recently Albuquerque et al. [26] proposed the theory of resource maximization, in which they postulate that the structuring and organization of socio-ecological systems are guided by the human behavior of maximizing benefits and reducing costs. In this sense, considering that for the people of Serra dos Morgados, the main areas for obtaining food resources are anthropized environments, highly managed, which makes this environment very productive for the population of the region, not only for domestic consumption, but for commercial use.

However, such evidence found here supports the need to understand why, in view of a great biodiversity and regional food potential, consumption is still restricted to a small number of food plants. In this sense,

studies on this understanding should be expanded, also enabling the prospecting of food plants, an aspect that will greatly contribute to food security [8]. Another explanation that deserves to be mentioned regarding the lesser use of native resources that can be used for food, especially in times of scarcity, is the fact that residents receive financial aid from the federal government. Thus, it is suggested that the improvement in these conditions and, consequently, the expansion of the purchasing power of other foods, resulted in a reduction in the collection of native plant resources, a factor also observed in other studies, with the same theme, carried out in Brazil [5, 25, 27, 28].

Influence of socioeconomic variables

In the Serra dos Morgados, neither the gender nor the time of residence influenced the quantity of known plants and forms of local consumption. In this sense, Ojelel and Kakudidi 29] studying the Obalanga Community, found that knowledge about food plants is directly related to the functions performed by an individual in the community, in Uganda, Africa. In this sense, it is important to highlight that, in Serra dos Morgados, both men and women manage the homegardens. In addition, there is no single person responsible for managing these plants, which may explain the fact that they are equally aware of this resource. In most studies that find differences in knowledge between genders, the authors explain such differences by relating them to their social function within communities [4, 30]. Thus, suggest that the distribution of knowledge between men and women is dynamic and needs to be considered based on particular socio-ecological structures and/or specific practices, such as type of cooking and duration of the process, for example.

The family's income had a positive relationship with the number of plants and forms of consumption. Considering homegardens as productive areas and the fact that the majority of respondents were retired, the income factor varied positively with the dependent variables analyzed. The most common scenario of studies that analyzed the influence of income on knowledge was the opposite of that observed in Serra dos Morgados. As Medeiros et al. [31] points out, low income families would tend to relate more closely to natural resources, considering them for their subsistence. In this sense, the greater the knowledge about natural resources, the lower the people's income would be, indicating that in the first moment the income would be influencing in the opposite direction in the quantity of resource used [31]. However, this interference of the income factor in the uses of resources, warns Medeiros et al. [31], may be representing not what is earned, but savings on domestic expenses.

Something that was not contemplated in the present study, but that needs to be detailed to better understand the processes related to the use of food resources. This is because the difference is not in the richness of the known plants, but in the way these plants are processed. Jacob et al. (2020) advises on the need to investigate in more detail the relationship of people with food plants, emphasizing the form of consumption of this resource in the sense of detailing the recipes produced. Future studies, considering this approach to plants of greater cultural importance, are necessary for a greater understanding of the region's food systems.

Conclusion

The homegardens of Serra dos Morgados are spaces of great manipulation of food plants, especially fruit trees. This finding is justified, mainly because these environments are managed to meet local demands for domestic and commercial use. This continuous stimulus may also be responsible for the immediate memory of these plants [32], evidenced in the high salience rates of fruit trees, found mainly in these environments (homegardens). It is noteworthy that the entire spatial context of homegardens is fundamental in the development of autonomic memory associated with the use of food plants [32–34]. However, much remains to be investigated in this regard, as well as on the ethnoculinary and nutritional aspects of food plants, as suggested by Jacob et al. [8], and on the structure and dynamics of these homegardens. In any case, this study contributes to the understanding of the dynamics of knowledge and use of fruit food plants in regions that have a high dependence on the managed environments, which may have important implications for strategies for managing environments and local knowledge.

Declarations

Please contact author for data requests

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Authors’ contributions

LVSS, Wrote the manuscript and conducted research in the field. JM, oversaw field research and assisted in proofreading the manuscript. LZOC, strongly contributed to the improvement of the writing of the manuscript and carefully revised the manuscript. EMFLN, senior research supervisor, responsible for the construction of the proposal, supervision of the field research, supervision of the principal author in the Posgraduate Program, data analysis and careful revised of the manuscript.

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Ethics approval and consent to participate

This study was submitted to and approved by the ethics committee for research with human beings at the Federal University of Vale do São Francisco (CAAE: 80902217.2.0000.5196). All informants gave

verbal and write (signed the Termo de Consenso Livre e Esclarecido - TCLE) consent for the information they provided to be shared for academic purposes.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Figures

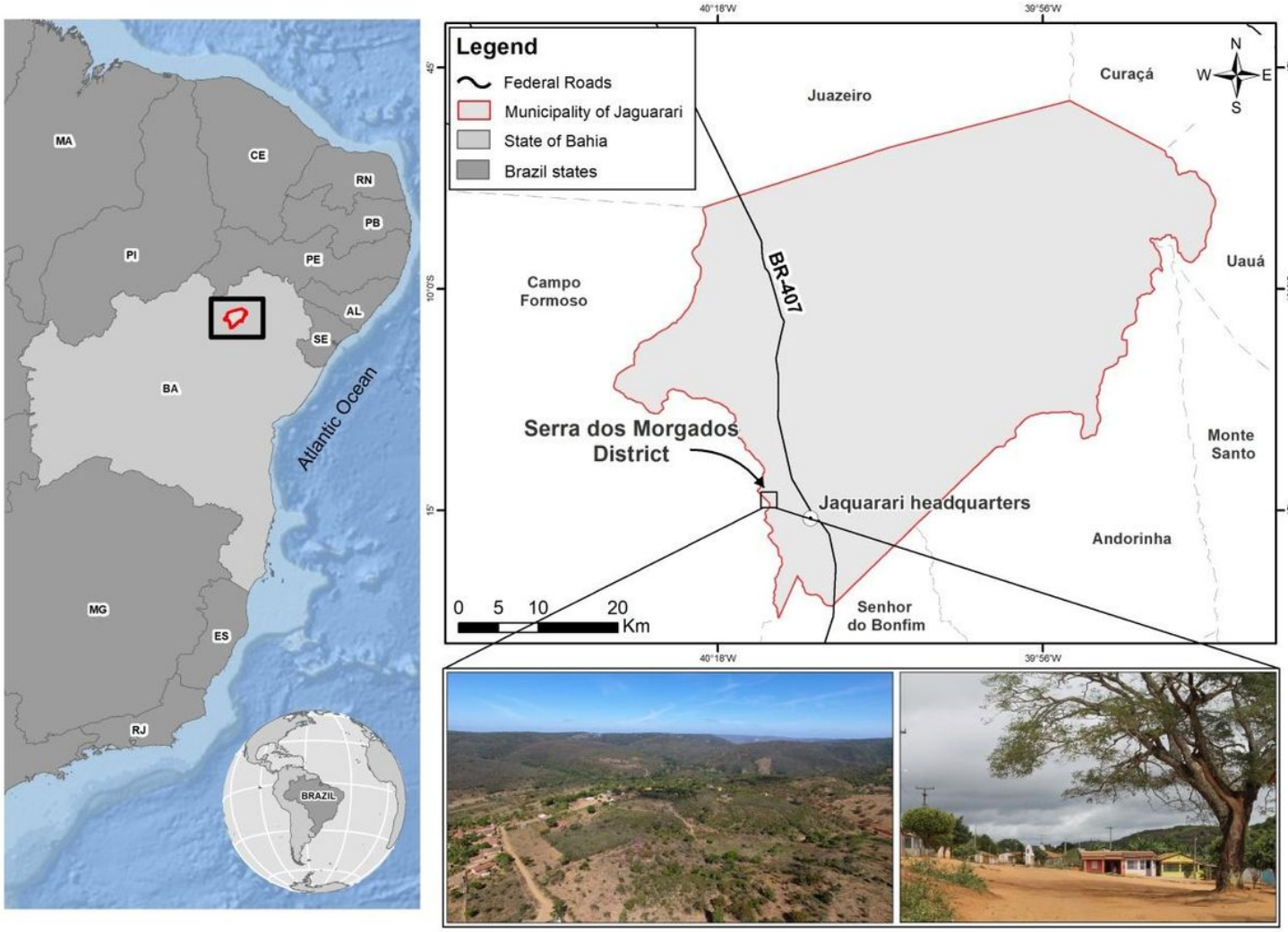

Figure 1

Map of community Serra dos Morgados, Jaguarari-Bahia 2020. Authors.

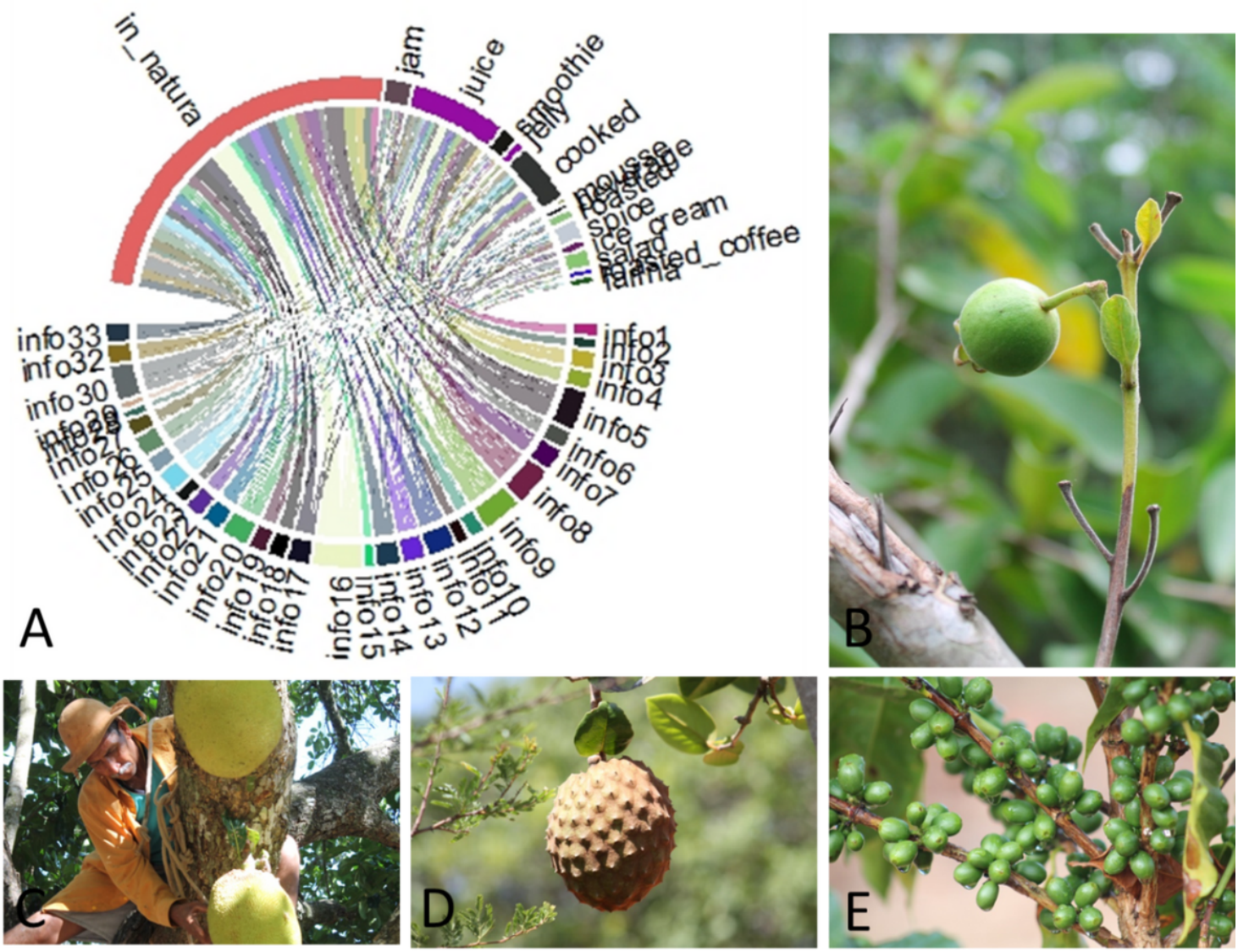

Figure 2

Chord diagram (A) represented the distribution of use form of the edibles plants per informant in Serra dos Morgados. Examples of some of the plants mentioned: Cheirosa – Psidium ganevii. (B), Jaca - Artocarpus heterophyllus Lam. (C), Bruto da Grota – Annona sp. (D) e Café - Coffea arabica L. (E), 2020. Authors.