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Consumption of Unconventional Food Plants (UFP) and their contributions to Food and Nutrition Security (FNS), Vale do Ribeira, São Paulo

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ABSTRACT
The consumption of food plants grown in urban residential gardens can contribute to enrich the diet of families, contributing to Nutritional Food Security (SAN). This research investigated the presence of Unconventional Food Plants (UFP) present in the backyards, their respective consumption and potential contribution to the SAN. The study took place in the city of Registro, SP, located in the region of Vale do Ribeira, State of São Paulo, in february and march 2023. Through the "Snowball" methodology, 20 residences were studied. For the choice of residences, we sought to follow the Paulista Index of Social Vulnerability (IPVS) of the city. Two research instruments were applied, a semi-structured script, which directed the recorded interviews and an instrument to measure food insecurity. The results show that the plants present in the gardens studied and consumed in the feeding of the families are: ora-pro-nóbis (OPN), malvarisco, alfavaca-do-mato, turmeric and nabutitana. All of them with nutritional value. However, some UFP that can contribute to the quality of the diet, are not used by families, such as: caruru, major-gomes, almeirão-roxo, aranto and yam. It is concluded that diagnosis of food plants in urban residential gardens are important sources of information for promoting food and nutritional education.

KEYWORDS: Urban Gardens, UFP, Sustainable, SDG, 2030 Agenda.

1 INTRODUCTION

Socioeconomic Vulnerability and the State of Food and Nutrition Insecurity (SOFI) has grown in Brazil in recent years. Part of this scenario, already quite complex in the country, was worsened by the health crisis caused by COVID-19, a pandemic that exposed and worsened the countless social and economic problems faced by Brazilians: among them, access to food, food shortages and, in more serious cases, hunger.

The latest report from the United Nations (UN, 2021): "The State of Food Insecurity and Nutrition in the World (SOFI)", pointed out that countries in Latin America and the Caribbean would be more vulnerable to food insecurity and hunger. The covid-19 pandemic has probably affected the prevalence of malnutrition in numerous ways, especially in developing countries" (FAO, 2021).

In view of the above, it is necessary and urgent to mitigate food and nutritional insecurity and the Government, the Third Sector and Civil Society, in a joint, systematic and continuous effort, are the ones that can do it so that the populations and communities most exposed to socioeconomic vulnerability can have access to food in the quantity and quality necessary for a dignified and safe life.

In the complex path towards food security for vulnerable populations, Unconventional Food Plants (UFP) present a viable and low-cost nutritional alternative. These plant species, previously consumed by our ancestors in their daily diet, grow spontaneously in backyards, vacant lots, squares and forest edges, with great potential for culinary use.

UFP, in recent years, has been studied and validated as a nutritious food with notable nutritional and medicinal properties (SAMBUICHI *et al*., 2020; DE PADUA SOARES *et al*., 2020). More recent studies indicate that these food species, little known and little consumed by the general public, have the potential to mitigate SOFI, improve food quality and provide nutrients different from those found in the few varieties of vegetables produced by conventional agriculture (KINUPP, LORENZI, 2015; RANIERI, 2021). However, it is observed in the studies that there are some gaps that need to be investigated and detailed, especially with regard to socioeconomic vulnerability and SOFI, as indicators of UFP consumption.

Furthermore, there is a growing interest in the consumption of UFP among chefs, in reality cooking shows (JACOB *et al*., 2023) and among those who frequently visit urban green

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gardens in large cities (DIAS *et al*., 2023). This change in behavior provides more knowledge about some of these species, especially edible flowers, at the level of *haute cuisine*. However, using them in gastronomy in a "gourmetized" way will not favor the purchase of these plants, as they will have added value.

To investigate the consumption of these unconventional food plants in different groups of socioeconomic vulnerability and better understand which social groups they are most accessible to, the question that guided this research was: "Do socioeconomic vulnerability and food and nutrition insecurity influence consumption of Unconventional Food Plants (UFP) present in residential backyards?"

2. OBJECTIVE

To investigate the presence of Unconventional Food Plants (UFP) present in urban residential backyards, and their respective consumption as food and contribution to food and nutrition security.

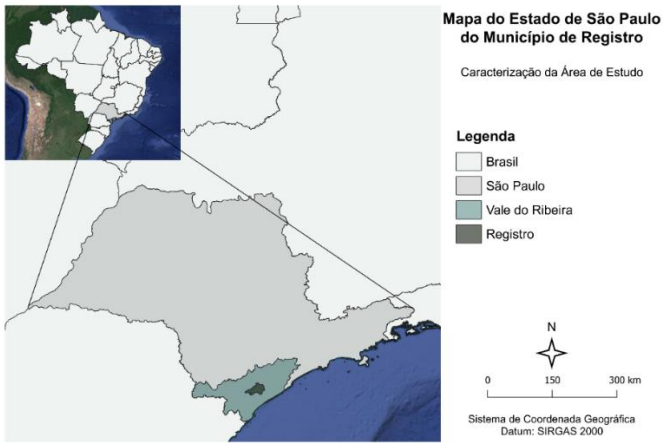
3. METODOLOGY

3.1 Study area

The study area determined for the research was the municipality of Registro, located in Vale do Ribeira, southern region of the state of São Paulo (Figure 1). Vale do Ribeira has the largest concentration of preserved area of remaining Atlantic Forest. Paradoxically, even with all the importance of this ecosystem for the conservation of natural resources, such as soil, water resources and biodiversity, the cities in this region have the lowest human development indices (HDI) in the state of São Paulo (CARDOSO-LEITE; PODADERA; PERES , 2010).

The municipality of Registro has a territory of 722,201km² and 56,463 people occupying a demographic area of 75.11 inhabitants/km² (IBGE, 2021). The schooling rate of children aged 6 to 14 is 97.3% and the municipal human development index is 0.754 (IBGE, 2010). The municipality is one of the largest cities in Vale do Ribeira, and presents different groups of social vulnerability (SEADE, 2010).

Figure 1. Map of Brazil with emphasis on the State of São Paulo, Vale do Ribeira and the Municipality of Registro.



Source: Map created by Eduardo Lopes Doracenzi, 2023.

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The research was conducted using two databases: the IBGE and the São Paulo Social Vulnerability Index (IPVS) (IBGE, 2010; SEADE 2010). The IBGE divides cities by census sectors, formed by continuous areas in rural and urban areas, with a size and number of households that allow census takers to conduct a more assertive survey. By crossing data from IBGE and IPVS, and using the GIS (Geographic Information System) georeferencing tool, the distribution and location of census tracts in the city of Registro were verified within each of the social vulnerability groups identified by IPVS. .

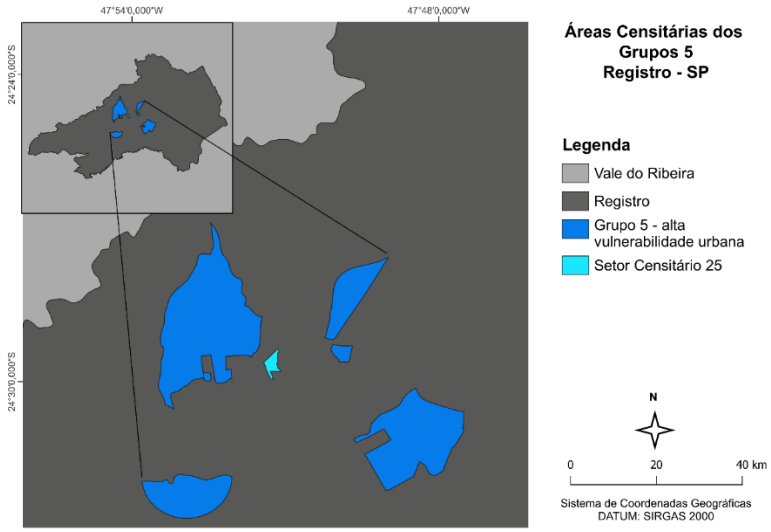
To ensure the assertiveness of research and fieldwork, cartography of the municipality of Registro (IBGE, 2010) linked to georeferencing data provided by IPEA (IPEA, 2023) helped in mapping the neighborhoods within the respective groups and census sectors defined for this study.

After a thorough study, to answer the research objective, it was defined that the target audience for the study would be group 5, that is, high vulnerability in urban areas (SEADE, 2010). The profile of those interviewed were the people responsible for feeding the house or maintaining the yard. The sampling consisted of 20 interviews, with the UFP inventory of the backyards in each house.

3.1.1 Vulnerability Mapping

By using the IBGE territorial base, the IPVS maps socioeconomic vulnerability groups throughout the state of São Paulo. In total, there are seven distinct groups of social vulnerability between urban and rural areas (SEADE, 2010). For this research, it was defined that the groups investigated are those who live in the urban area of Registro, who have a yard in their homes and who present, according to the IPVS, "high urban vulnerability", that is, group 5. With the aim to homogeneously investigate group 5, census sector 25 was defined for data collection (Figure 2).

Figure 2: Census sector 25, referring to group 5 (high urban vulnerability), in the municipality of Registro, Vale do Ribeira, SP.



Source: Map created by Eduardo Lopes Doracenzi, 2023.

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3.1.2. Census sector 25 – Group 5 (high vulnerability in urban areas)

Census sector 25 is made up of 240 homes distributed in the neighborhoods of Vila São Francisco, Vila Ipê, Vila Fátima and Jardim Planalto (IBGE, 2010, GOOGLE EARTH, 2023). Part of the population of the urban area in the greatest state of social vulnerability in the municipality of Registro resides in these neighborhoods (SEADE, 2010).

In face-to-face visits carried out in this Sector to characterize the study area, it was noticed that in some neighborhoods, the streets are not paved or the asphalt is uneven. The houses are of heterogeneous construction, some made of masonry, others made of wood and some of them with a combination of these two materials. Another characteristic of census sector 25 is the amount of trash and debris in yards and sidewalks (Figure 3).

Figure 3: Census sector 25 - A: Rua Belmiro do Vale; B: Rua Ipê; C: Rua Alagoas; D: Rua Rondônia.

Source: Authors, 2023.

3.2. Data collect

Initially, the methodology chosen for data collection in houses and backyards was based on random criteria (LAKATOS; MARKONI, 2003). The streets and houses to be investigated in census sector 25 were drawn. The streets and residences were drawn using Excel, using the "randombetween" function. All street names indicated in the IBGE and Google Earth databases, which correspond to sector 25, were on the draw list.

In the drawn streets and houses, field research began, knocking on doors of the residences defined by the draw. However, after numerous attempts to apply the random methodology, it was found that people did not want to participate in the interview, or simply did not show up at the windows and doors to at least find out what it was about. Faced with numerous unsuccessful attempts, it was decided to change the research methodology to a non-probabilistic sampling commonly used in Ethnobotany research, the Snowball methodology (VINUTO, 2014).

The Snowball can be useful when interviews have a more delicate and reserved content or to research groups that are difficult to access. An advantage of applying this methodology is that an individual indicates another from the same group (neighbors, family, friends) to participate, which facilitates access to people and even certain groups that are difficult to communicate with (VINUTO, 2014). However, one of the limitations of this methodology is that there is not exactly precision regarding the number of people interviewed, therefore, it is configured as qualitative research (LAKATOS; MARKONI, 2003; VINUTO, 2014).

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3.2.1 Script

To conduct data collection, a summary table of the instrument that guided the objective of this work was created (Table 1). The script used was semi-structured, divided into parts: identification of UFP present in backyards and consumed by families, presence of UFP present in backyards and not consumed, and the food insecurity assessment instrument.

The first interview took place on 02/23/2023, on Ipê street, in the Vila Ypê neighborhood. From the first interview onwards, nominations happened naturally, normally a neighbor nominating two to three people from their own street or from adjacent streets. In total, there were 9 days of interviews, totaling 34 collections.

Chart 1. Data collection planning to meet the specific objectives of this work.

Sections	Objectives	Interview script
Presence of UFP	Identify food plants present in backyards consumed by families;	1. Visit to backyards; 2. Semi-structured interview with the person responsible for the family's food (Tese Nascimento, 2008); 3. Identification of the plants consumed: botanical family, genus and species; 4. Carrying out a photographic record of the species.
	Identify unconventional food plants present in backyards and not consumed by families;	5. Visit to backyards; 6. Semi-structured interview with the person responsible for the family's food (Tese Nascimento, 2008); 7. Identification of the plants consumed: botanical family, genus and species; 8. Carrying out a photographic record of the species.
Food Insecurity	Check family food insecurity	9. Application of a questionnaire that measures Food Insecurity.
		10. Application of the economic income classification questionnaire.

4. RESULTS AND DISCUSSION

4.1 Adequação metodológica

As mentioned above, there was a need for a change in the methodology to obtain the interviews, moving from a random sampling of houses to the indication by the interviewee of other residents (Snowball), allowing successful responses from residents and enabling development of the study.

In nine days of field work, 34 interviews were validated successfully and without major setbacks. An important fact to mention is that when interviewees were asked about the reasons why people did not respond when not indicated, the answers were similar: increasing number of robberies and people posing as public agency employees to steal from homes.

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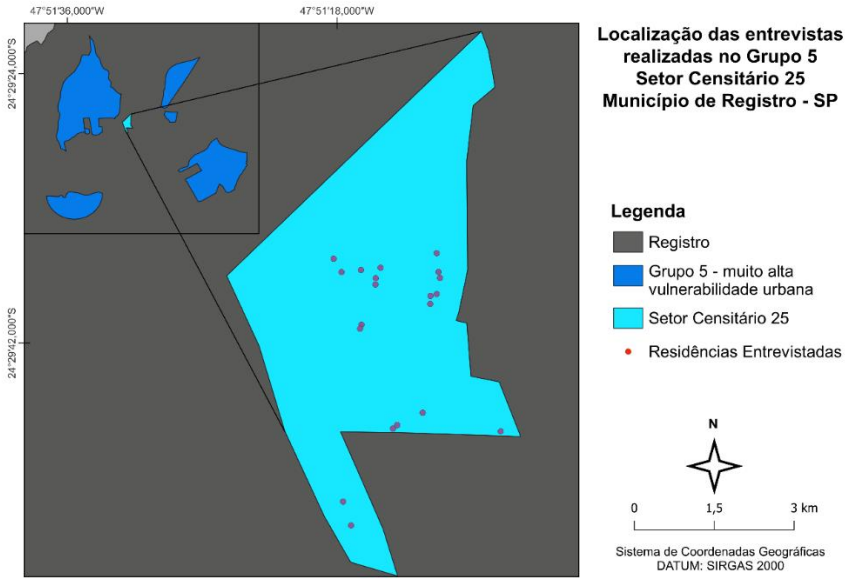
During the interviews and visits to the backyards, when one person recommended another, the reception at the next residence was warm and calm, as upon arriving at the door of the residence, the person indicated was called by name, bringing confidence and security to the interviewee and the researcher. .

A major difficulty in the Snowball methodology was obtaining indications from interviewees for other neighborhoods within census sector 25, without going beyond the geographical limits stipulated in the research. And even taking great care not to cross the limits of the census sector, due to the very nature of the methodology applied, collections were carried out in other vulnerability groups corresponding to vulnerability groups 2, 3 and 4.

Of the 34 collections carried out, 20 are part of census sector 25 (group 5, urban vulnerability) (Figure 4); seven collections are in group 2 (very low vulnerability), four collections in group 3 (low vulnerability) and two collections in group 4 (medium vulnerability). For the present study, only the interviews referring to census sector 25, that is, 20 collections were analyzed.

Figure 4: Data collection carried out in census sector 25, group 5 (high vulnerability in urban areas). Neighborhoods: Jardim Ipê, Vila Fátima, Vila São Francisco and Jardim Planalto, municipality of Registro, Vale do Ribeira, SP.



Source: Map created by Eduardo Lopes Doracenzi, 2023.

4.2 Profile of Interviewees

In the 20 homes visited in sector 25, almost 100% of the people responsible for feeding the house or maintaining the yard were women, only one man (5%) with a predominance of the age group of 40 to 59 years old, totaling 60% of those interviewed (Figure 5).

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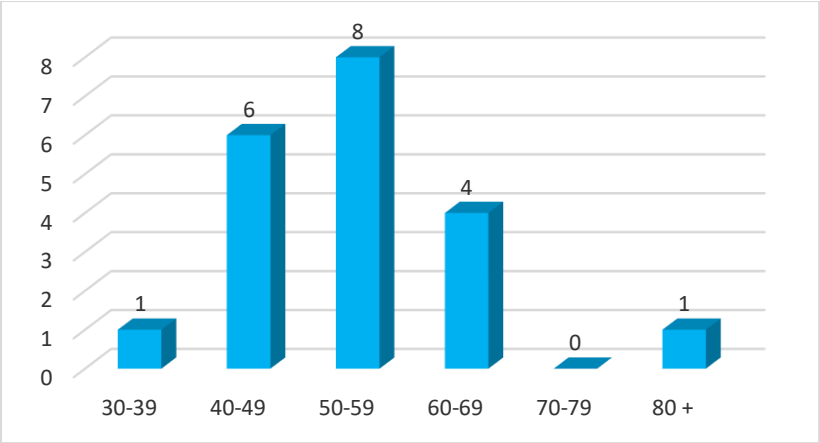
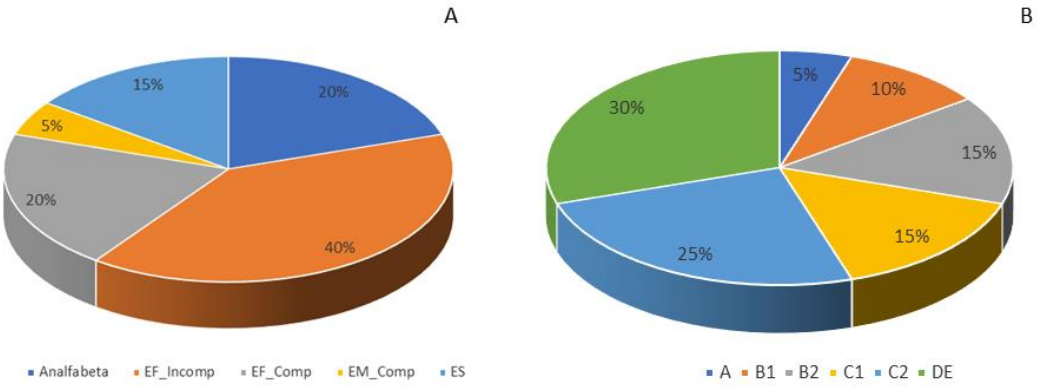
Figure 5: Age distribution of respondents from Census Sector 25.



Source: Authors, 2023.

In relation to education, although the group has a low level of education, it is heterogeneous, consisting of 20% Illiterate, 40% with Incomplete Elementary School (In_ES), 20% with Complete Elementary School and Junior High (Co_ES), 5% with Complete High Shool (Co_HS) and 15 % with Complete College Education (Co_CE) (Figure 6A). Regarding the distribution of respondents by Economic Class, Census Sector 25 can be characterized by more economically vulnerable classes comprising 55% distributed between Classes C2 and DE (Figure 6B). But, like Education, the group is also heterogeneous, with 15% belonging to Classes A and B1.

Figure 6: Level of education in A and economic class in B, data from respondents from Census Sector 25.



Source: Authors, 2023.

It is worth noting that data from interviewees belonging to Economic Class C2 and DE are usually related to the lowest levels of education, according to the Brazilian Economic Classification Criteria (CBCE). However, although those who have Complete High School are in Classes B1 and B2, those interviewed with Complete Elementary School are distributed across Classes A, B1, C1 and C2.

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4.3 UFP present in backyards most consumed by families

Among the most frequent and most consumed plants described by interviewees are ora-pro-nóbis (OPN), malvarisco, alfavaca-do-mato, turmeric and nabutitan (Table 1). The ora-pro-nóbis plant is the most cited and most used as food by families, it is an easy-to-grow UFP, spontaneous, native and with high nutritional value.

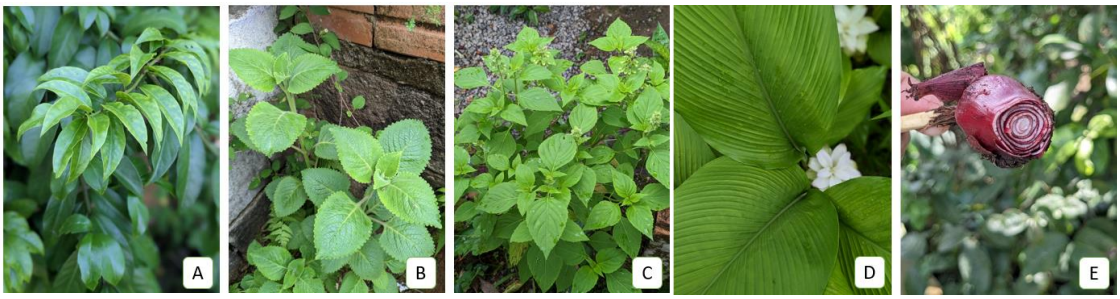
Table 1. Most common and most consumed Unconventional Food Plants (UFP).

Popular name	Scientific name	Family	Citations	% Relative to the occurrences mentioned	% Relative to total occurrences	FL (%)
Ora-pro-nóbis	*Pereskia aculeata* Mill.	Cactaceae	8	10,5	7,1	88,9
Malvarisco	*Coleus amboinicus* Lour.	Lamiaceae	4	5,3	3,5	100,0
Wild alfalfa	*Ocimum campechianum* Mill.	Lamiaceae	4	5,3	3,5	100,0
Turmeric	*Curcuma longa* L.	Zingiberaceae	3	3,9	2,7	100,0
Nabutitana	*Eleutherine bulbosa* (Mill.) Urb.	Iridaceae	3	3,9	2,7	100,0

Source: Authors, 2023.

According to Soares et al. (2022), in the review of 26 international scientific articles, the authors concluded that OPN leaves have high levels of proteins, which is popularly known as "poor man's meat" in many Brazilian communities, as in many homes it is the main source of proteins (Figure 7A).

Figure 7. The most frequent UFP in backyards and most consumed by families in census sector 25 (high social vulnerability group): A: *Pereskia aculeata*; B: *Coleus amboinicus*; C: *Ocimum campechianum*; D: *Curcuma longa*; E: *Eleutherine bulbosa.*



Source: Authors, 2023.

Another plant considered a nutraceutical, a food that helps improve health and prevent diseases, is turmeric (Figure 7D). This is a plant originating from Asia and cultivated in several regions of Brazil, which is a source of seasoning, used as a coloring, flavoring and ingredient for *curry* powder (AJANAKU *et al.*, 2022). Also known as *açafrão da terra*, this plant is a food supplement and is sold today in both powder and capsule form. Furthermore, it adds flavor and seasoning to foods and plays a role in their digestion (SHAH *et al.*, 2022).

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4.4 UFP present in backyards and not consumed by families

Among the unconventional food plants common in residential backyards and not consumed are caruru, major gomes, almeirão-roxo, aranto and yam, as shown in Table 2 and their respective images in Figure 8.

Table 2. Frequent and unconsumed Non-Conventional Food Plants (UFP).

Popular Name	Scientific name	Family	Citations	% Relative to the occurences mentioned	% Relative to the total ocorrences
Caruru	*Amaranthus spp*.	Amaranthaceae	4	10,8	3,5
Major-gomes	*Talinum paniculatum* (Jacq.) Gaertn	Talinaceae	4	10,8	3,5
Almeirão-roxo	*Lactuca indica* L.	Asteraceae	3	8,1	2,7
Aranto	*Kalanchoe daigremontiana* Raym.-Hamet &	Crassulaceae	3	8,1	2,7
Yam	*Colocasia esculenta* (L.) Schott	Araceae	3	8,1	2,7

Source: Authors, 2023.

Both Caruru (pigweed) and Major-Gomes are plants that have a lot of calcium. According to Sarker *et al.* (2022) pigweed is a vegetable abundant in nature, whose leaves and stems are edible and have a high amount of ascorbic acid and proteins with amino acids such as lysine and methionine essential for human nutrition. Also according to the authors, this plant is acclimatized to the environmental stress of drought and salinity. Therefore, pigweed is a plant with bioactive components that has the potential to provide nutritional support for families in a state of food insecurity.

Figure 8. The most frequent UFP in backyards and not consumed by families in census sector 25 (high social vulnerability group): A: *Amaranthus* spp; B: *Talinum paniculatum*; C: *Lactuca indica*; D: *Kalanchoe daigremontiana*; E: *Colocasia esculenta.*

Source: Authors, 2023.

4.5 Food Insecurity

Table 3 shows the results of the questionnaire applied to the interviewed families. The instrument used, the Brazilian Food Insecurity Scale (EBIA, 2014), which had 14 closed questions, allowed measuring the degree of food insecurity of families. This is divided into four categories: Food Security (FS), Mild Food Insecurity (MildFI), Moderate Food Insecurity (ModFI) and Severe Food Insecurity (SFI).

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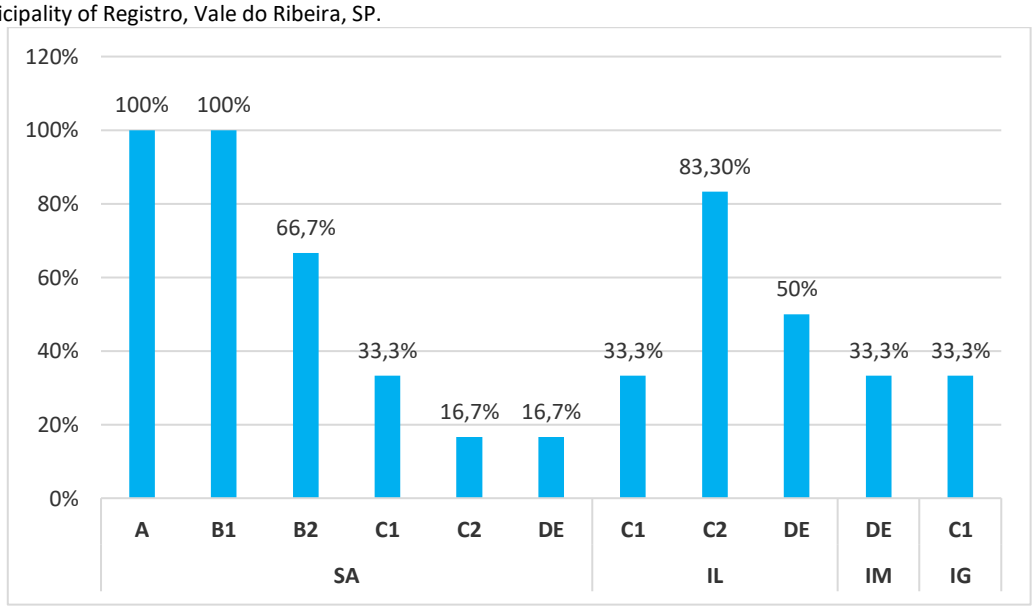
Table 3: Food Insecurity Categories for Census Sector 25 (high urban social vulnerability).

Categoria	N	%
FS =	8	40%
MildFI =	9	45%
ModFI =	2	10%
SFI =	1	5%
Total =	20,0	100%

Source: Authors, 2023.

It is important to highlight that although census sector 25 is classified as having high urban vulnerability, it is still a heterogeneous sector in its composition of economic classes (Figure 9), as well as in the categories of Food (In)Security. Within this context, it is observed that Food Security (FS) occurs in all economic categories. However, the proportion of families in FS decreases as the economic class decreases. On the other hand, the family that was categorized as Severe Food Insecurity (SFI) is present at a medium level (C1), while families in Mild Food Insecurity (MildFI) occur mainly in the C2 class, affecting 83.3% of these families. In class DE, food insecurity is present in 83.3% of families.

Figure 9. Relationship between Food Insecurity and Economic Classification of families interviewed in the municipality of Registro, Vale do Ribeira, SP.



Source: Authors, 2023.

The heterogeneity of the census sector 25 is present in the different types of analyzes and characterizations, such as in relation to the Level of Education and the level of Food Insecurity (Figure 10). Among those interviewed with Incomplete Elementary Education (In_ES), 50% demonstrated Mild Food Insecurity (MildFI) and 37.5% were in Food Security (FS) and 12.5% were in Severe Food Insecurity (SFI). Those who completed Elementary School and Junior High (Co_ES) 50%, presented Food Security (FS). Those interviewed who have Completed High School

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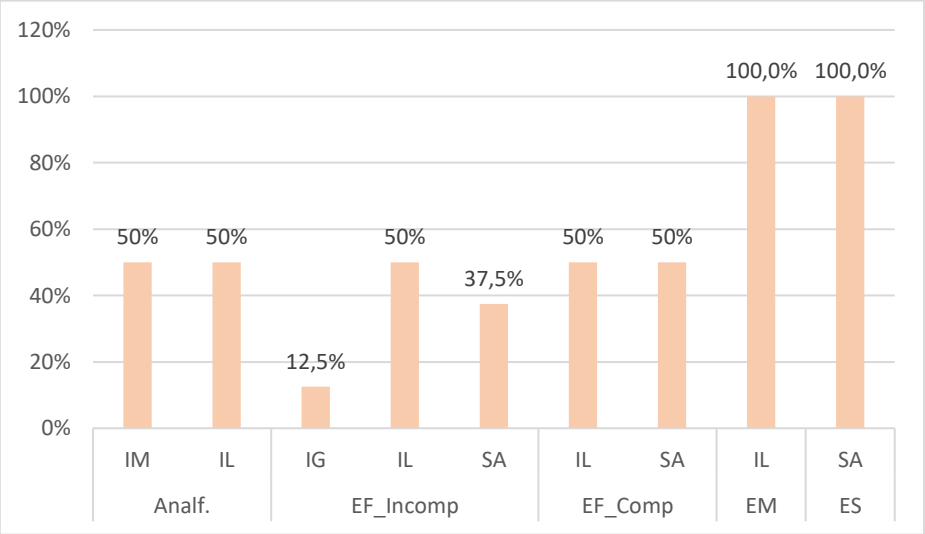
(Co_HS) have Mild Food Insecurity (MildFI). Therefore, there is no clear pattern in relation to the level of education and Food (In)Security, but there is a tendency that the level of education can interfere with the level of Food Security of families, increasing with the higher level of education.

Figure 10: Relationship between Education Level and Food Insecurity of families interviewed in the municipality of Registro, Vale do Ribeira, SP.



Source: Authors, 2023.

When observing the relationship between SOFI and education levels, the analysis showed heterogeneity in the census sector 25 (Figure 11). From the study carried out, it was possible to verify that in the Food Security (FS) group, which corresponds to 40% of those interviewed, there is the following distribution: 15% have Complete College Education (Co_CE), 15% have Incomplete Elementary School (In_ES) and 10% have Complete Elementary School and Junior High (Co_ES). The group of families in a state of Mild Food Insecurity (MildFI) represents 45% of the households surveyed. It was found that 20% of respondents in this group only have Incomplete Elementary School (In_ES), followed by 10% of illiterate people and 10% with Complete Elementary School and Junior High (Co_ES).

It is also worth noting that illiterate interviewees were equally distributed in the categories of Mild Food Insecurity (MildFI) and Moderate Food Security (ModFI).

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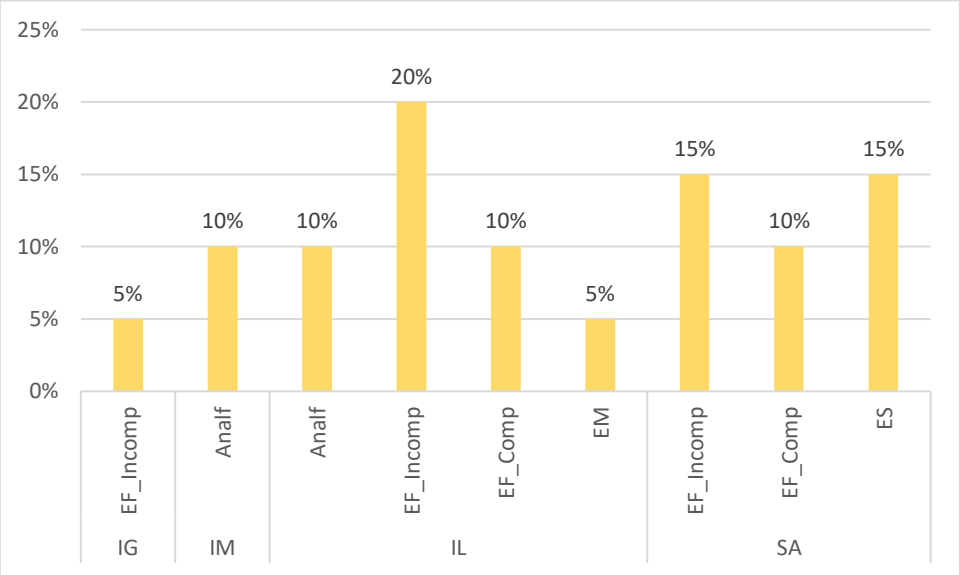
Figure 11: Relationship between Education Level and Economic Classification of families interviewed in the municipality of Registro, Vale do Ribeira, SP.



Source: Authors, 2023.

5. CONCLUSION

Urban residential backyards in the city of Registro, located in Vale do Ribeira, state of São Paulo, have Non-Conventional Food Plants (UFP) that can contribute to promoting Food Security for socially vulnerable families. Of the UFP found in the backyards, it was possible to describe five plants present in the backyards that are most consumed as food and five potential plants that are not consumed due to lack of family knowledge.

The plants present in the backyards studied and consumed in the families' diet are: ora-pro-nóbis (OPN), malvarisco, alfavaca-do-mato, turmeric and nabutitana. All of them with added nutritional value. The UFP that can contribute to the quality of the diet, but are not yet used by families, are: caruru, major gomes, almeirão-roxo, aranto and yam.

The present study showed that social vulnerability and food insecurity influence the consumption of UFP. However, it is worth mentioning that these data are still preliminary and the authors are deepening the study for further contributions. Even so, more studies are suggested on conventional or non-conventional food plants present in backyards and their use to complement family diets. Based on this diagnosis, food and nutritional education for families that have food plants in their backyards may be possible.

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