# Ethnobotanical knowledge and consumption of non-conventional edible plants (in Portuguese, PANC) at family farming markets in southern Brazil

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## Research

## Abstract

*Background:* Non-conventional Edible Plants (in Portuguese, PANC) are part of regional food biodiversity; however, their presence in family farming markets remains limited. This study analyzed knowledge, consumption, and uses of these plants among family farmers selling at open-air markets in western Santa Catarina, southern Brazil, identifying cultural and structural factors influencing their persistence.

*Methods:* A mixed-method ethnobotanical approach was applied, including semi-structured interviews with 20 vendors across five markets. A set of 13 species was presented to assess recognition, consumption, and forms of use among participants.

*Results:* Results showed a predominance of women and a strong association between culinary practices and continued consumption of PANCs. Although the term UFP (Unconventional Food Plants) is largely unfamiliar, individual species are commonly recognized, indicating a gap between scientific terminology and traditional food knowledge. Knowledge was homogeneous among ethnic groups, with the exception of crem (*Tropaeolum pentaphyllum)*. Some well-known species are rarely consumed or are used for other purposes.

*Conclusions:* The persistence of PANCs in local markets depends not only on knowledge but also on structural factors such as productive transformations, dietary shifts, and time- and labor-related constraints, which contribute to the reduction of active food repertoires.

*Keywords:* PANCs; farmers' markets; ethnobotany; environmental history; food systems.

## Background

Food in Brazil is the result of a historical process marked by intense interethnic interactions that have shaped food repertoires, cultural preferences, and specific preparation methods (Pereira; Magalhães, and Nazareno, 2020). In this context, it is important to distinguish between knowledge and wisdom: while knowledge may assume a more individual and subjective character, wisdom is anchored in historical, cultural, and collective dimensions and is socially produced and transmitted (Sales; Oliveira, 2020). Thus, local ways of life and know-how constitute central elements in the differentiation of social groups, particularly in the use of plants available in the surrounding environment (Jovchelovitch, 2004; Albuquerque *et al.* 2019).

Among the various plant resources associated with these cultural practices, Non-conventional Edible Plants (in Portuguese, PANC) stand out, as they are often linked to traditional food systems and specific territorial contexts. The study of ethnobotanical knowledge related to PANCs enables understanding not only the biological diversity in these territories but also the cultural diversity that sustains different forms of use, management, and knowledge transmission about edible plants (Brack, 2016; Echer *et al.* 2021).

The term Unconventional Food Plants was proposed by Kinupp (2007) to designate edible species or plant parts that are little recognized within the dominant food repertoire, including leaves, flowers, roots, stems, or fruits of plants that are not part of the widely consumed diet (Callegari; Filho, 2017; Sartori *et al.* 2020; Kinupp; Lorenzi, 2021). However, the "non-conventional" nature of these species is relative and varies across cultural and territorial contexts, since certain plants may be widely used by some social groups while remaining virtually unknown to others (Callegari; Filho, 2017; Ranieri *et al*. 2017). Despite Brazil's recognized biodiversity, a paradox exists between the wide availability of food species and the growing dietary monotony observed in recent decades (Paschoal; Gouveia; Souza, 2016; Saito; Barbosa, 2017; Ursi *et al.* 2018; Kinupp; Lorenzi, 2021). Food choices are shaped by complex interactions among cultural, social, and environmental dimensions, reinforcing the multifactorial nature of transitions toward more sustainable food systems (Ramos; Soares; Oliveira, 2025). In this context, many PANCs have become neglected or progressively devalued, resulting in reduced consumption of regional foods and weakening of sociocultural references associated with traditional dietary practices (Madeira *et al.* 2013; Callegari; Filho, 2017; Ranieri *et al.* 2017; Sartori *et al.* 2020).

These transformations are also linked to changes in production and food systems. The consolidation of agricultural models based on monoculture and standardized production tends to reduce the diversity of cultivated and marketed species, limiting the availability of foods traditionally consumed in local contexts (Paschoal, Gouveia; Souza, 2016). In this scenario, local ways of life and know-how are central to the differentiation of social groups, particularly in the use and selection of edible plants available in the surrounding environment.

In Western Santa Catarina, a region marked by processes of European colonization, agrarian reconfigurations, and the expansion of agricultural monocultures, family farming plays a central role in maintaining territorialized production and food practices. In this context, farmers' markets constitute key spaces for the circulation of food, knowledge, and cultural practices, where family farmers act as mediators between rural production and urban consumption (Castro, 2016). In these markets, knowledge associated with Non-conventional Edible Plants may reflect both cultural heritage and food identities, as well as the structural conditions that favor or limit their persistence and commercialization.

Although there is a growing body of scientific literature on Non-conventional Edible Plants in Brazil, most studies focus on the botanical identification of species, their nutritional potential, or specific agroecological experiments. Research that comprehensively analyzes ethnobotanical knowledge, cultural identities, and the structural conditions influencing the persistence of these plants in local food systems, particularly in the context of family farming markets, remains relatively scarce.

In this context, the present study aimed to understand how knowledge associated with PANCs manifests among family farmers at farmers' markets in Western Santa Catarina, analyzing knowledge about these species, their forms of use and consumption, as well as the cultural and structural factors that influence their persistence and circulation in the region's farmers' markets.

## Materials and Methods

The research is characterized as a mixed-methods (qualitative-quantitative) case study with an ethnobotanical design. A case study approach is appropriate for investigating contemporary phenomena embedded in specific territorial contexts, particularly when the boundaries between the phenomenon and its context are not clearly defined (Yin, 2018). The mixed-methods approach enables the integration of interpretive analyses of local knowledge with the quantitative systematization of patterns of species use and commercialization (Creswell; Creswell, 2018). The ethnobotanical design is based on the investigation of interactions between human groups and plant resources, taking into account cultural, historical, and environmental dimensions (Albuquerque *et al.* 2014).

The research was conducted in the western region of Santa Catarina at five farmers' markets located in the municipalities of Chapecó, Seara, and Paial: Clevelândia Market (Chapecó), Calçadão Market (Chapecó), Centro Market (Seara), Bairro Market (Seara), and Paial Market (Paial). These markets are important spaces for commercializing family farming products and for the circulation of material and symbolic goods in the region. The location of the study area and the farmers' markets investigated is presented in Fig. 1.

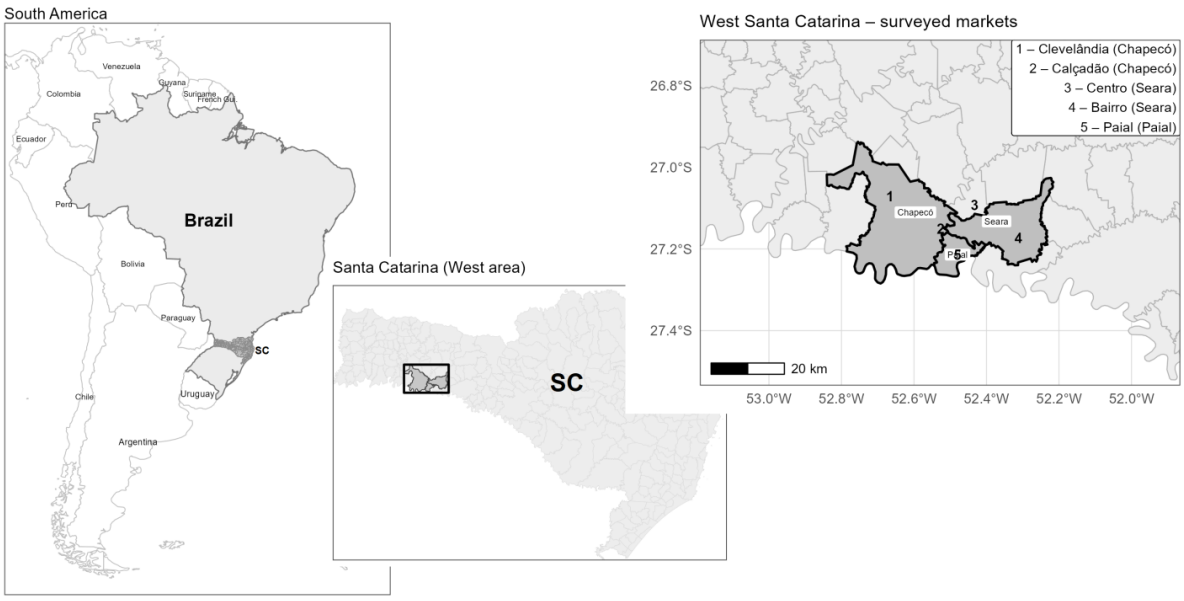


Figure 1. Location of the study area and the farmers' markets investigated in the municipalities of Chapecó, Seara, and Paial, in the western region of the state of Santa Catarina, southern Brazil. Source: The authors (2026).

The markets in the municipalities of Seara and Paial receive institutional support from the Seara Rural Credit Cooperative (CREDISEARA), while the markets in Chapecó are organized by the Association of Market Producers of Chapecó (APROFEC). The sample design involved the initial identification of key informants (experts), defined as individuals with in-depth knowledge of how the markets operate and of their participants. Based on these referrals, a chain sampling technique known as the "snowball" method was employed. This method is widely used in qualitative research to access specific social networks or groups possessing particular knowledge (Noy, 2008). Each participant referred another potential interviewee, progressively expanding the sample.

Twenty family farmers selling at these markets were interviewed, representing approximately 25% of the total number of active fruit and vegetable vendors at the five markets investigated. A free and informed consent protocol was adopted, and personal data were anonymized in accordance with CNS Resolution 510/2016. The research project was approved by the Ethics Committee, nº 6.237.039, CAAE: 70916223.7.0000.5564, dated August 14, 2023.

The inclusion criteria established that participants should: (i) be 18 years of age or older; (ii) qualify as family farmers; (iii) sell fruits and vegetables at the designated market; (iv) have UFP (Unconventional Food Plants) available for sale or report prior experience with their use; and (v) agree to the provisions of the Informed Consent Form (ICF). All participants were informed about the research objectives and voluntarily agreed to participate by signing the ICF, ensuring the anonymity of the information collected.

Primary data were collected through semi-structured interviews conducted between September and October 2023. Semi-structured interviews are considered appropriate for exploring perceptions, practices, and narratives in specific sociocultural contexts, while also allowing flexibility and comparability among responses (Kallio *et al.* 2016). The interview script included questions on participants' socioeconomic profile, dietary repertoire, forms of plant use and consumption, marketing strategies, and knowledge transmission processes associated with PANCs.

The 13 species presented during the interviews were selected based on a preliminary regional survey conducted as part of the dissertation underpinning this study, as well as on their recurrence in specialized literature on PANCs in southern Brazil. Priority was given to species with documented occurrence in the region, potential presence in local markets, and prior recognition in ethnobotanical studies, to ensure territorial relevance and comparability with previous research. Species identification was performed by experts based on reference guides (Kinupp and Lorenzi, 2021).

Qualitative data were analyzed using content analysis, a systematic method of thematic categorization that enables the identification of interpretive patterns and structures of meaning in discourse (Braun & Clarke, 2006). The interviews were coded from E1 to E20 to ensure participant anonymity.

To assess differences in the time since last consumption among the investigated species, the nonparametric Kruskal-Wallis test was applied, followed by Dunn's multiple comparison test to identify differences between pairs of species. In addition, proportion tests were performed to verify possible differences in knowledge and consumption of the species among self-declared ethnic groups. All statistical analyses were conducted in R, using a significance level of 5% ($p < 0.05$). To complement the descriptive and inferential analyses, the proportions of respondents reporting knowledge and consumption for each of the 13 investigated species were calculated. For each proportion, 95% confidence intervals were estimated to provide a measure of uncertainty associated with the observed frequencies, given the sample size ($n = 20$).

## Results

**Profile of market vendors and awareness of the term UFP (Unconventional Food Plants)**

The profile of the 20 market vendors interviewed indicates a predominance of women (60%) over men (40%). Regarding domestic activities, 70% of respondents reported being responsible for meal preparation in their households, with only one man. Concerning self-reported ethnicity, 65% of the market vendors identified as Brazilian or of mixed heritage (including caboclos), while 35% reported European ancestry, primarily Italian and German.

Supplementary data obtained from the Master Dissertation associated with this study indicate that the average age of the market vendors is approximately 52.8 years. Most reside in rural areas (about 90%), and are predominantly two-person households.

**Knowledge and consumption of the species**

When asked about the meaning of the term Non-conventional Edible Plants (in Portuguese, PANC), 80% of market vendors reported being unfamiliar with the acronym, while 20% were familiar with it. Despite this unfamiliarity, many respondents recognized the species presented when shown photographs and common names of the plants under investigation, reporting current or past use of these species. Knowledge and consumption varied across the 13 investigated species, with generally high recognition and more variable consumption patterns (Table 1).

Table 1: Levels of knowledge and consumption of the 13 investigated species, including confidence intervals for each proportion.

| Species (scientific name) | Family | Common name | Knowledge (%) | 95% CI (knowledge) | Consumption (%) | 95% CI (consumption) |
|---|---|---|---|---|---|---|
| *Taraxacum officinale* FH Wigg. | Asteraceae | Dente-de-leão | 100 | (79.95-100) | 95 | (73.06-99.74) |
| *Amaranthus deflexus* | Amaranthaceae | Caruru | 100 | (79.95-100) | 15 | (3.96-38.86) |
| *Cucurbita pepo* L. | Cucurbitaceae | Flor de abóbora | 100 | (79.95-100) | 55 | (32.05-76.17) |
| *Morus nigra* L. | Moraceae | Amora | 100 | (79.95-100) | 95 | (73.06-99.74) |

| Species (scientific name) | Family | Common name | Knowledge (%) | 95% CI (knowledge) | Consumption (%) | 95% CI (consumption) |
|---|---|---|---|---|---|---|
| *Tropaeolum pentaphyllum* Lam. | Tropaeolaceae | Crem | 100 | (79.95-100) | 65 | (40.95-83.69) |
| *Eriobotrya japonica* (Thunb.) | Rosaceae | Ameixa (nêspera) | 100 | (79.95-100) | 100 | (79.95-100) |
| *Pereskia aculeata* Mill. | Cactaceae | Ora-pro-nóbis | 95 | (73.06-99.74) | 70 | (45.67-87.16) |
| *Stachys byzantina* K. Koch | Lamiaceae | Peixinho | 70 | (45.67-87.16) | 50 | (29.93-70.07) |
| *Tropaeolum majus* L. | Tropaeolaceae | Capuchinha | 60 | (36.41-80.02) | 25 | (9.59-49.41) |
| *Malvaviscus arboreus* Cav. | Malvaceae | Hibisco | 75 | (50.59-90.41) | 30 | (12.84-54.33) |
| *Urera aurantiaca* Wedd. | Urticaceae | Urtigão | 55 | (32.05-76.17) | 30 | (12.84-54.33) |
| *Portulaca oleracea* L. | Portulacaceae | Beldroega | 75 | (50.59-90.41) | 15 | (3.96-38.86) |
| *Begonia semperflorens* Link & Otto. | Begoniaceae | Begoninha | 85 | (61.14-96.04) | 0 | (0-20.05) |

The distribution of species across botanical families reveals distinct patterns, with families such as Rosaceae and Moraceae associated with higher consumption levels, while Amaranthaceae and Portulacaceae, typically represented by spontaneous species, showed lower incorporation into local diets. During the interviews, it was necessary to adapt the initial wording of the question to ensure participants understood the topic, replacing the acronym “UFP” (Unconventional Food Plants) with concrete examples of species. Fig. 2 presents the results on knowledge and consumption of PANCs among the interviewed family farmers who sell at farmers’ markets.

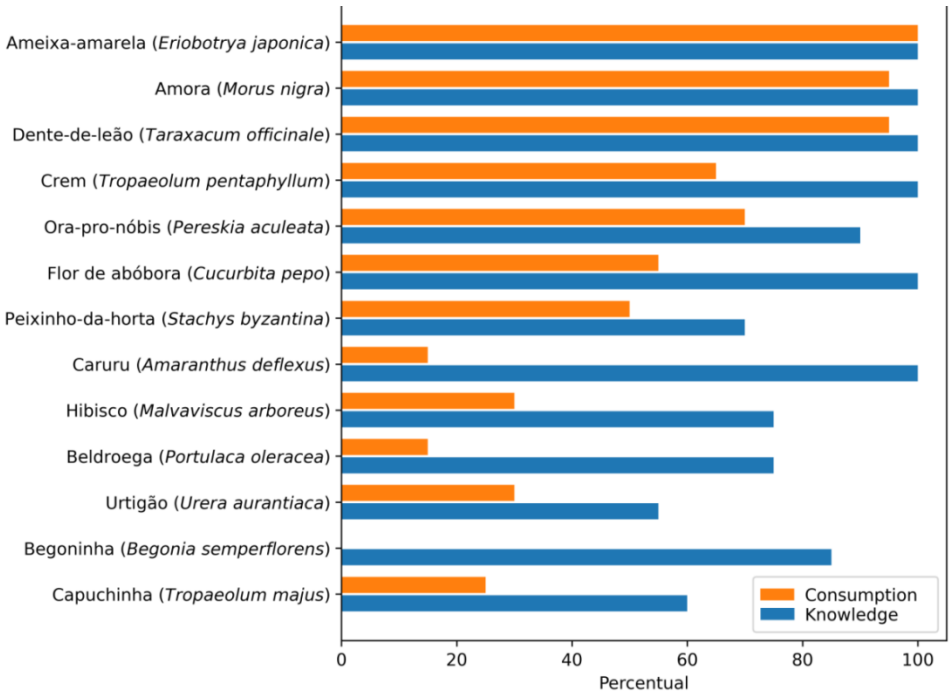


Figure 2. Knowledge and consumption of PANCs among the interviewed family farmers selling at farmers’ markets. Source: survey data (2023).

**Parts used, preparation methods, and knowledge transmission**

Analysis of knowledge and consumption of the 13 investigated species indicates that, although most market vendors do not recognize the term UFP, a large proportion of the species presented were identified by the participants. Overall, recognition exceeded 55%, indicating prior familiarity with these plants.

When knowledge and consumption are compared, an important distinction emerges. Of the 13 species presented, seven were consumed by more than 50% of the respondents, while six were consumed by less than half or were not consumed at all. Fig. 3 highlights this difference between recognition and actual dietary incorporation.

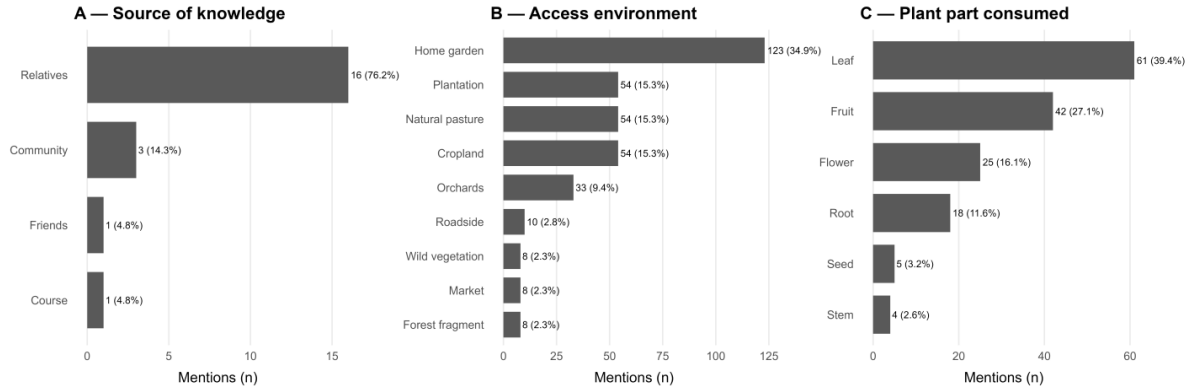


Figure 3. Knowledge, consumption, and parts used of the investigated species. Source: survey data (2023).

Supplementary data from the same research project indicate that market vendors reported consuming 34 varieties of PANCs over the course of their lives, although only some of these species remain in current use, and an even smaller proportion is sold at farmers' markets (Fasolo *et al.* 2024).

Among the species most frequently recognized and consumed are *E. japonica*, *M. nigra*, and *T. officinale*. Other species, such as *P. aculeata*, *C. pepo*, *T. pentaphyllum*, and *S. byzantina*, were also reported as consumed, albeit to a lesser extent. In contrast, *Amaranthus deflexus*, *Portulaca oleracea*, *Malvaviscus arboreus*, *Begonia sempervirens*, and *Urera aurantiaca* were recognized by the interviewees but had low consumption levels. Regarding the parts of the plants used, leaves (68 mentions), fruits (42), and flowers (25) predominated, followed by roots (18), seeds (5), and stems (4).

Regarding preparation methods, consumption of the plants in their natural state was most frequently reported (54 mentions), followed by salads (27), teas (26), preserves (18), and stir-fries (14), along with fried preparations, juices, and occasional medicinal uses. It was also observed that consumption of the most frequently mentioned species was predominantly reported by women.

Regarding knowledge transmission, 80% of respondents reported learning about these plants from family members, especially parents and grandparents, while smaller proportions mentioned the community, courses, or friends.

**Knowledge, consumption, and differences according to self-reported ethnicity**

Analysis of knowledge and consumption of PANCs according to self-reported ethnicity revealed a high degree of homogeneity between the Brazilian/mixed-heritage (n = 13) and European (n = 7) groups. Both groups reported familiarity with all 13 species presented, and, in most cases, no statistically significant differences were observed in the proportions of knowledge or consumption between the groups ($p > 0.05$).

Despite this general convergence, a specific difference emerged for T. pentaphyllum: consumption was higher among market vendors who self-identified as European than among those who self-identified as Brazilian/mixed-heritage, although knowledge of the plant was shared between the groups.

One collected illustrates this relationship between consumption and family memory. One interviewee (E19) mentioned that her grandmother used to make bread with *T. pentaphyllum*, a culinary practice that has fallen out of use.

In addition to differences in self-reported ethnicity, the temporal frequency of consumption of the food items investigated was analyzed. To assess temporal differences in consumption, records were analyzed to determine the last time each respondent reported consuming each UFP. In total, 130 consumption records (respondent × item) were considered. These data were analyzed using the Kruskal-Wallis test, followed by Dunn's multiple comparison test.

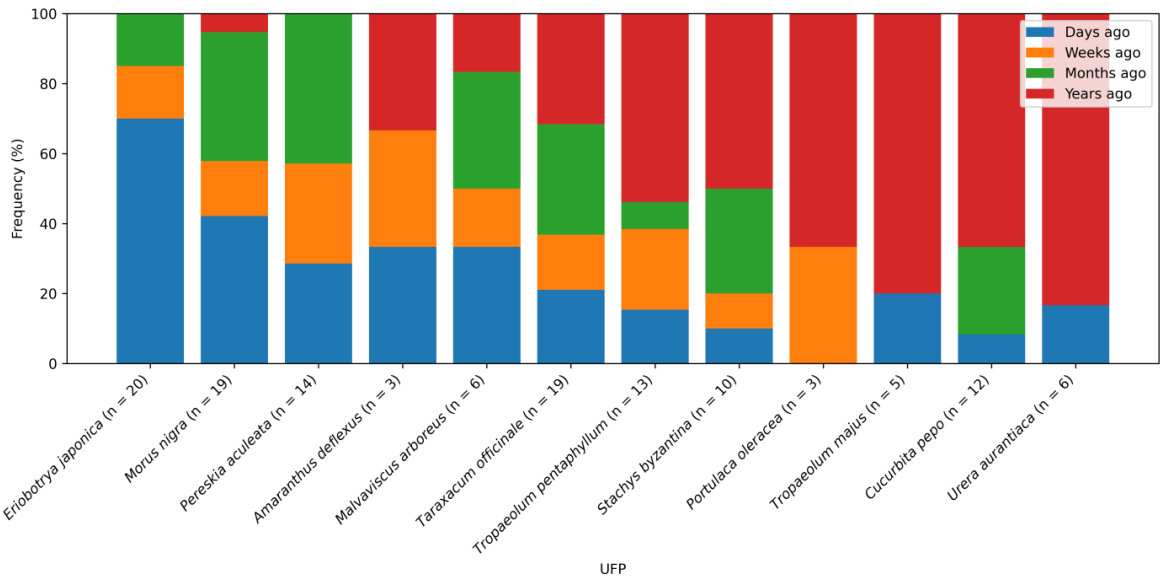


Figure 4: Association between UFP species and time since last consumption reported by respondents (n = 130 consumption records). Source: survey data (2023).

## Discussion

**Profile of market vendors and knowledge of the term UFP (Unconventional Food Plants)**

The predominance of women among market vendors is consistent with studies highlighting their strong presence in farmers' markets and their contributions to diversifying product offerings and mediating relationships with consumers (Pereira *et al.* 2020). In addition to their commercial activities, research also emphasizes women's leading role in income generation and in organizing family production units (Anacleto *et al.* 2016; Gomez *et al.* 2016).

High female participation is also evident in domestic activities. The predominance of women responsible for meal preparation reinforces the historical association between culinary practices and gender roles, indicating that the family dietary repertoire, including the use of PANCs, tends to be mediated primarily by women. This pattern aligns with studies that associate food identity, culinary practices, and social recognition in rural communities (Carniel *et al.* 2019).

The ethnic composition observed among market vendors reflects the historical formation of Western Santa Catarina, marked by traditional populations and European migratory flows that began in the late nineteenth century (Pinto & Silva, 2020; Corona *et al.* 2018). Although these groups have distinct origins, the results indicate a high degree of homogeneity in knowledge of the species investigated, suggesting that regional environments and sociocultural interactions contributed to the development of shared food repertoires.

Another relevant element concerns the demographic conditions of household units. The relatively high average age and the predominance of households with few residents suggest a scenario characterized by an aging agricultural workforce and reduced availability of family labor. These conditions may limit the maintenance of diversified production systems and food practices that require more time and labor.

This context resonates with broader discussions regarding the aging of the rural population and the weakening of succession processes in family farming phenomena, frequently associated with reduced production diversification and the prioritization of crops with more predictable economic returns. Under these conditions, species considered unconventional may become secondary in the face of pressures for production efficiency and financial stability.

Thus, participation in farmers' markets serves not only as a marketing channel but also as a space for the social reproduction of family farming. However, the combination of an aging rural population, a reduction in the number of residents per household, and intensified production demands may restrict the cultivation and supply of unconventional species, particularly those requiring specific management or more elaborate preparation. In this sense, the characterization of market vendors constitutes an important element for understanding the structural conditions that favor or limit the persistence of PANCs in the territory.

**Knowledge and consumption of the species**

The term Unconventional Food Plants (UFP) was proposed by Kinupp (2007) and later consolidated in specialized literature by Kinupp & Lorenzi (2021). Internationally, similar terminology is also used, such as Unconventional Food Plants (Durigon & Seifert, 2022). However, the results indicate that this terminology is not part of the everyday vocabulary of the market vendors interviewed, revealing a gap between scientific terminology and the practical knowledge systems used in family farming.

The high percentage of interviewees unfamiliar with the acronym "UFP" is consistent with findings reported by Nunes *et al.* (2021), who also observed widespread unfamiliarity with the term in another regional context. These findings suggest that the dissemination of academic nomenclature remains limited among rural producers whose relationship with plants is predominantly mediated by practical experience, family memory, and culinary traditions.

However, unfamiliarity with the terminology does not imply a lack of knowledge about the species. Recognizing plants through photographs or common names indicates that the local food repertoire is structured by its own systems of classification and identification. This disconnect between the acronym "UFP" and the actual use of the plants suggests that technical-scientific categories do not always correspond to the ways in which botanical knowledge is organized in everyday rural life. As Borstmann *et al.* (2023) point out, the invisibility of these species in dominant discourse may result from both a lack of institutional recognition and limited appreciation of their food potential.

The literature also indicates that information about PANCs typically circulates through specific intermediaries, such as school activities, agroecology groups, health outreach programs, technical assistance services, and the media (Echer *et al.* 2021). The need to adapt the wording of the question during the interviews reinforces the idea that local knowledge of edible plants is organized primarily through common names, culinary experiences, and family memory, rather than through formal categories.

Furthermore, the absence of consistent public policies to promote these species in daily diets may contribute to limited dissemination of the term, restricting its circulation to certain institutional or academic circles (Narcisa-Oliveira *et al.* 2018; Nunes *et al.* 2021). In this sense, what is observed is not so much a lack of interest in these plants, but rather a gap between technical-institutional discourse and the nowadays practices in the daily life of family farming.

These results suggest that knowledge of the species precedes the adoption of the term. The category "UFP" can be understood as a relatively recent construct, associated mainly with academic, extension, and agroecology circles, whereas the use of these plants in the region predates and is independent of this nomenclature. Recognizing this distinction is essential to avoid conflating terminological unfamiliarity with a lack of traditional knowledge and to contribute to the development of communication strategies and public policies that are more sensitive to local categories of plant identification and use.

**Parts used, methods of preparation, and knowledge transmission**

Recognition of the species, even among interviewees unfamiliar with the term UFP, confirms the findings of Nunes *et al.* (2021), who demonstrated that unfamiliarity with the acronym does not prevent recognition when plants are presented with common names or images.

PANCs encompass both rare species and parts of conventional plants that are not usually consumed (Callegari & Filho, 2017; Sartori *et al.* 2020). In this context, the predominance of leaves and fruits observed in this study indicates that edible potential of these species is often only partially exploited.

The observed discrepancy between knowledge and consumption suggests a gap between the cognitive repertoire and dietary practice, in which known species fail to become part of the daily diet. The contrast between the 34 species reported

over a lifetime and the small number of species actually consumed or marketed today (Fasolo *et al.* 2024) indicates a gradual reduction in the dietary repertoire of these plants.

Some widely recognized and consumed species, such as *E. japônica*, *M. nigra*, and *T. officinale*, are naturalized or widely cultivated in southern Brazil (Kinupp & Lorenzi, 2021; Dhiman *et al.* 2022). In contrast, species such as *A. deflexus*, *B. semperflorens*, *P. oleracea*, *M. arboreus*, and *U. aurantiaca*, although recognized, showed low levels of consumption and are frequently associated with ornamental uses or animal feed (Terra & Ferreira, 2020).

This shift in function highlights that sociocultural contexts and different domains of use influence the selection of food plants (Albuquerque *et al.* 2019). The low dietary incorporation of species available in the surrounding environment can also be interpreted in light of the concepts of botanical blindness and botanical illiteracy, which describe the difficulty of perceiving and valuing the potential of plants in everyday environments (Ursi *et al.* 2018; Santos *et al.* 2021). Many of these species are locally classified as "weeds" or unwanted plants, which contributes to their invisibility as a food resource (Liberato *et al.* 2019; Kinupp & Lorenzi, 2021).

The pattern observed in plant parts used differs somewhat from that reported in other studies. Although some studies indicate a higher frequency of fruit consumption (Echer *et al.* 2021; Carriço *et al.*, 2023). Preference for these parts may be associated with both ease of preparation and reduced impact on plant development (Pilla & Amorozo, 2009).

The different preparation methods reported indicate culinary versatility but also reveal certain limitations. Some species require specific preparation methods to reduce potentially toxic compounds or improve digestibility (Ranieri *et al.* 2017), which may influence their incorporation into daily diets. In this sense, the availability of recipes and culinary adaptation has been identified as a relevant factor for increasing the consumption of these plants (Durigon; Seifert, 2022; Cardoso *et al.* 2015).

The higher consumption reported by women aligns with studies highlighting the central role of women in maintaining culinary practices and dietary repertoires in rural communities (Borstmann *et al.* 2023; Carniel *et al.* 2019). Food preparation creates space for culinary experimentation that may support the retention of these species in the family's dietary repertoire. Knowledge about these plants is transmitted predominantly through intergenerational channels, especially among family members (Echer *et al.* 2021). However, although this transmission channel remains active, the results indicate that the frequency of use and the diversity of species consumed tend to decrease over time. This process may compromise dietary diversification and reduce the role of wild edible plants in local food systems, despite their recognized importance for food security in rural communities where traditional ecological knowledge remains active (Singh *et al.* 2021).

Despite the high nutritional potential often attributed to PANCs (Sartori *et al.* 2020), the results indicate that this potential does not automatically translate into increased consumption. The persistence of these species in daily diets depends on interactions among local knowledge, environmental availability, culinary practices, the organization of domestic work, and productive viability.

**Ethnicity, environmental history, and the differentiated persistence of UFP**

The high degree of homogeneity in knowledge of these species among ethnic groups can be interpreted through the environmental history of Western Santa Catarina. Until the late nineteenth century, the region was predominantly occupied by Indigenous and Caboclo populations, whose subsistence practices were closely linked to forest environments, polyculture, and the use of native species (Silva *et al.* 2020; Tempass, 2019). Subsequent European colonization, particularly by Italians and Germans, promoted major productive and territorial transformations, including agricultural expansion, logging, and increased livestock production (Pinto &Silva, 2020).

Interactions among these groups and the shared use of the same landscapes fostered hybrid dietary repertoires. As noted by Albuquerque *et al.* (2019), convergent plant use may result from cultural exchanges and similar environmental conditions. The regional mosaic of agricultural areas, forest fragments, and anthropized environments likely facilitated the circulation and incorporation of various species into local diets.

Despite shared knowledge, the case of *T. pentaphyllum* suggests the persistence of distinct cultural traditions. This species remains associated with the culinary practices of Italian and German descendants, where it is commonly grated and

preserved in vinegar as an accompaniment to meats and soups (Kinupp & Lorenzi, 2021; Carriço *et al.* 2023). In this context, certain plants function as markers of culinary identity and cultural memory.

Structural transformations in regional production systems also help explain shifts in plant use. The expansion of monoculture and agricultural modernization replaced diverse polycultural systems with more specialized models, contributing to productive and dietary homogenization and reduced species diversity (Benetti; Silva; Moretto, 2021). From this perspective, species persistence or abandonment reflects broader processes of cultural and productive standardization (Mignolo, 2017).

Although knowledge of species converges across ethnic groups, the differentiated persistence of some plants highlights the continued influence of cultural identity, culinary memory, and regional history. At the same time, colonization and agricultural modernization have reduced the diversity incorporated into daily diets. Thus, the "non-conventional" character of PANCs is relational and context-dependent, as certain species remain traditional in domestic settings while marginal in formal markets (Callegari & Filho, 2017; Ranieri *et al.* 2017).

**Persistence and structural constraints: temporality, market, and discontinuity of practices**

Analyzing consumption frequency deepens understanding of UFP persistence in daily diets. Dunn's multiple comparison test indicated that Begoinha, *T. pentaphyllum*, *T. officinale*, *C. pepo*, and *U. aurantiaca* have been consumed for longer periods, whereas *E. japonica* has been consumed more recently and frequently. The remaining differences were not statistically significant. These results suggest that some species remain more strongly associated with food memory than with current practices.

*E. japonica*, for example, was reported as recently consumed by most respondents, possibly due to seasonality and its consolidation as a cultivated species incorporated into the regional dietary repertoire (Silva *et al.* 2010). In contrast, species such as *T. pentaphyllum* and Begoinha were associated with older consumption patterns, suggesting discontinuity in regular use.

The reasons cited for reducing or abandoning consumption reinforce this pattern. Respondents mentioned difficulty in accessing species, loss of interest, lack of time, preparation complexity, and substitution with more accessible foods. These factors indicate that UFP persistence depends not only on knowledge but also on structural conditions involving environmental availability, work organization, and production dynamics.

Changes in land use and agricultural modernization help explain this process. Colonization, logging, and the expansion of monoculture altered landscapes and reduced heterogeneous environments where many species formerly grew spontaneously (Pinto & Silva, 2020; Benetti *et al.* 2021). These historical transformations continue to influence contemporary interactions with plant resources, as discussed by Albuquerque *et al.* (2019).

Sociocultural and organizational factors also contribute to this dynamic. The profile of market vendors indicates an aging workforce and a reduced availability of family labor, which limits production diversification and the preparation of species requiring specific handling. Consequently, foods that are quicker to prepare, such as conventional vegetables, tend to be prioritized, reinforcing the displacement of PANCs from daily consumption. This process may weaken not only dietary diversity, but also broader socioecological relationships, since traditional food plants perform multifunctional roles within rural systems, contributing to cultural continuity, livelihood strategies, and local resilience (Rahayu *et al.* 2025). Market dynamics further constrain persistence. Although 34 species were reported as consumed throughout life, only about 38% were sold at markets, indicating that much of the repertoire remains restricted to domestic consumption or food memory (Fasolo *et al.* 2024). Sales often occur only with surplus production or specific demand, placing PANCs in a peripheral position within local market dynamics. Additionally, demand for species not available for sale reveals a mismatch between consumer interest and production capacity (Fasolo *et al.* 2024).

This scenario indicates selective persistence shaped by structural, cultural, and environmental factors. Some species remain integrated into daily life due to established production and lower management requirements, while others persist mainly as cultural identity markers but face difficulties in productive continuity. In this context, intergenerational knowledge remains present, but its translation into everyday practices is increasingly constrained by market demands, time limitations, environmental transformation, and the reorganization of agricultural labor (Albuquerque *et al.* 2019). Moreover, the continued use of traditionally consumed species also depends on the environmental quality of collection areas, since plants harvested in contaminated environments may pose potential toxicological risks to local populations (Blanco *et al.* 2025).

Local food systems are shaped by adaptive processes in which cultural memory, environmental conditions, labor organization, and market relations interact dynamically to determine resilience or vulnerability (Ladio *et al. 2023*).

Figure 5 synthesizes the relationships between the regional historical context, the transmission of ethnobotanical knowledge, and the structural, cultural, and environmental factors that determine actual consumption and persistence of these plants in local food systems. The model highlights that UFP persistence depends less on cultural memory alone and more on structural viability. Although recognition of species remains widespread, their continuity is conditioned by historical, productive, and environmental factors that shape which species persist, become sporadic, or are abandoned.

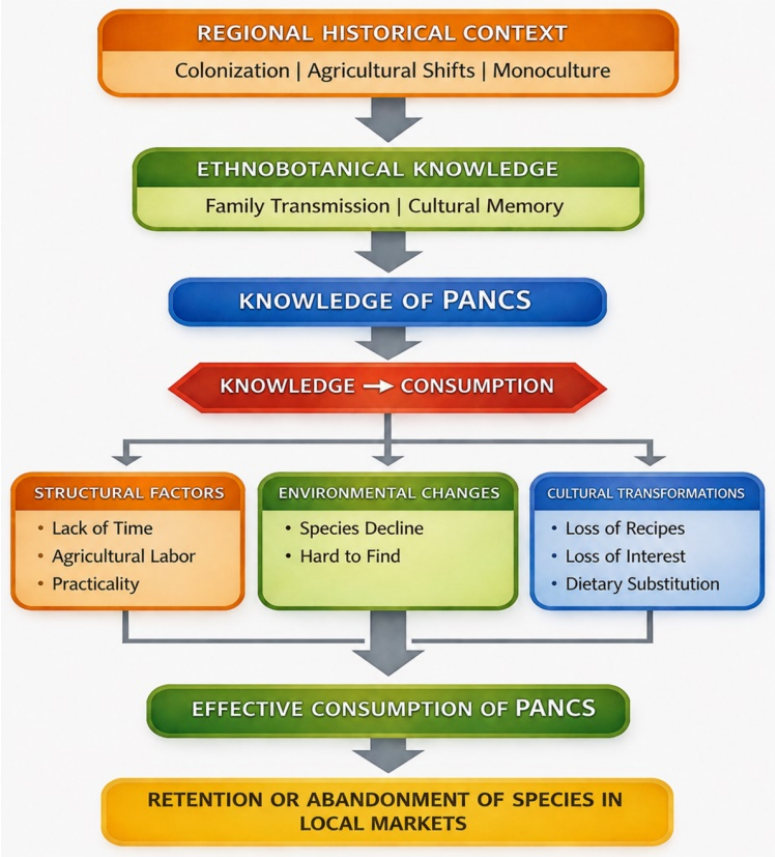


Figure 5. Conceptual model of the factors influencing the continued presence of PANCs at family farming markets in western Santa Catarina.

The conceptual model also reinforces that the persistence of PANCs within contemporary rural food systems is not determined exclusively by the survival of ethnobotanical knowledge, but by the interaction between cultural transmission and the structural conditions that enable or constrain their practical incorporation into everyday life. The persistence of local food systems depends not only on maintaining traditional knowledge, but also on the collective social arrangements that sustain production, exchange, and commercialization processes (Ladio *et al.* 2023).

## Conclusion

The results indicate that the persistence of Non-conventional Edible Plants in family farming markets in Western Santa Catarina depends not only on knowledge of these species but also on structural conditions shaping work organization, time availability, and the social reproduction of family farming units. The predominance of women among market vendors and their central role in meal preparation highlight culinary know-how as a key factor in maintaining consumption. Although the term UFP is largely unfamiliar, species are recognized when presented individually, revealing a gap between technical-scientific nomenclature and traditional food repertoires.

Some well-known species are rarely consumed or used for other purposes, such as animal feed or ornamental uses, indicating that knowledge does not necessarily translate into dietary practice. Although intergenerational knowledge persists, culinary

practices associated with PANCs appear to be gradually replaced by foods that are quicker to prepare and more consistently available.
High homogeneity in knowledge among ethnic groups suggests that shared environments and historical interactions contributed to convergent food repertoires, except for *T. pentaphyllum*, which showed greater consumption among descendants of Europeans and reflects the persistence of migratory influences in regional food culture.

Several species are no longer regularly consumed due to reduced access, environmental and productive transformations, changing dietary habits, and the reorganization of agricultural labor. In market terms, PANCs occupy a peripheral position, often associated with surplus production or occasional availability. Thus, their persistence depends not only on cultural appreciation but also on overcoming structural constraints such as an aging workforce, reduced family labor, and market dynamics.

From a practical perspective, policies promoting PANCs should extend beyond cultural valorization and include technical assistance, incentives for diversification, and market access strategies aligned with family farming realities. Consolidating these species therefore depends on creating material conditions that enable their production, preparation, and circulation in local food systems.

The persistence of PANCs in contemporary rural food systems therefore depends not only on safeguarding ethnobotanical knowledge, but also on strengthening the social, productive, and environmental conditions that allow these species to remain part of everyday food practices.

This study has limitations related to the small sample size (n = 20), concentration in three municipalities, and reliance partly on retrospective information and a predefined set of species. Nevertheless, the findings contribute to understanding ethnobotanical knowledge and the structural factors influencing the persistence of PANCs in regional food systems.

## Declarations

**List of abbreviations:** (PANC, in Portuguese) - Non-conventional Edible Plants; UFPs - Unconventional Food Plants; CREDISEARA - Seara Rural Credit Cooperative; APROFEC - Association of Market Producers of Chapecó; SC - Santa Catarina State**.**
**Ethics approval and consent to participate:** A free and informed consent protocol was adopted, and personal data were anonymized in accordance with CNS Resolution 510/2016. The research project was approved by the UFFS Ethics Committee - Federal University of Fronteira Sul under Opinion CEP/UFFS: 6.237.039, CAAE: 70916223.7.0000.5564, dated August 14, 2023.
**Consent for publication:** All participants provided informed consent for the publication of anonymized data included in this study.
**Availability of data and materials:** The data used to support the conclusions of this study are available upon reasonable request to the corresponding author.
**Competing interests:** The authors declare no conflict of interest.
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**Author contributions:** CF and AH - Conceptualization; investigation; methodology; data curation; writing - original draft. CF and AH - Organization and creation of figures; writing - revision and editing. VJZ and TCD - Supervision; writing - revision and editing. CF - Conceptualization; methodology; writing - revision and editing. VJZ, TCD - Methodology; data curation, writing - revision, and editing. GCC revision and editing.
**Declaration of AI use:** The authors used ChatGPT-5.2 (OpenAI) to improve language clarity and generate the concept map (Figure 5). The content was reviewed and edited by the authors to ensure accuracy and appropriateness.

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