



Article

Foraging Practices and Sustainable Management of Wild Food Resources in Europe: A Systematic Review

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Abstract: Wild food gathering activities (i.e., foraging practices) played an important role in securing food in the past. Nowadays, these resources and the knowledge around their use are experiencing a process of erosion. This article aims to identify the factors explaining the abandonment or, on the other hand, the preservation of foraging practices in Europe. The second aim is to analyze how these practices contribute to the economic and social development of local communities and to the sustainability of land management. A systematic review of the literature on European foraging practices was performed to answer these research questions. Following this approach, 111 publications were selected and analyzed. The results highlight that the reasons for the abandonment of foraging practices are related to socio-economic changes as well as changes in the environment such as reduced availability and land-use change. On the other hand, heritagization processes of these resources, such as wild plants sold as traditional local products, in restaurants, or as eco-tourism experiences, are emerging. The sustainability of these practices has not been widely evaluated in the literature. Efficient management strategies of wild food resources could help foster all three dimensions of sustainability at the local level, as well as help preserve traditional knowledge. This systematic review thus contributes to highlighting the framework in which the sustainability of these practices should be assessed.

Keywords: wild plants; wild food; wild herbs; foraging; ethnobotany; food heritage



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1. Introduction

Picking wild foods, i.e., foraging practices, was widespread in the past and played an important role in people's self-sustenance. Nowadays, wild edible plants and the Traditional Ecological Knowledge (TEK) around their use are experiencing a process of erosion. Traditional Ecological Knowledge refers to "knowledge and know-how accumulated across generations, and renewed by each new generation, which guides human societies in their innumerable interaction with the surrounding environment" [1]. Local communities are in this sense custodians of their own territories and, by conserving TEK, they play an important role in the biodiversity conservation of local resources [2]. As reported by Khouri et al. (2014) [3], 94 crop species currently contribute to 90% of the global food supply. This global trend of diet standardization and homogenization is a signal of a high risk of losing both knowledge and biodiversity of wild plant ecosystems. A recent report published by FAO [4] highlighted that most wild edible plants have decreased in abundance. The main local and global drivers behind this change were identified in socio-economic changes brought about by modernization as well as environmental changes such as species overexploitation, habitat alteration, pollution, and land-use change [4,5]. On the other hand, wild edible plants provide important provisioning ecosystem services, but also multiple supporting, regulating, and cultural ecosystem services [4,6]. Raven (2018) [7] introduced

in this regard the idea of ‘Co-dependency’ with the following two-way relationship: “We all need plants, depending on them absolutely for our very existence, but in the Anthropocene, plants also need us for their survival”.

These dynamics show that a global commitment across nations and cultures is needed for the sustainable management and conservation of plant resources, as well as for maintaining the traditional knowledge of local communities. As reported by Sharrock and Jackson (2017) [8], wild plant conservation activities are highly relevant to all the targets under SDG 15, i.e., “Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss”, as well as for achieving food security (SDG 2), promoting sustained, inclusive, and sustainable economic growth (SDG 8), ensuring sustainable consumption and production patterns (SDG 12), and contributing to climate change mitigation and adaptation strategies (SDG 13). Moreover, wild plants can contribute to the European Green Deal [9]. In particular, the policy actions identified to be priorities are related to their conservation and sustainable supply: building competitive, equitable, and territorial value chains; improving the visibility, traceability, data, and information about this market; and improving market and political enabling conditions. The importance of wild plants has also been outlined by UNESCO. With the recognition of the Mediterranean diet among the Intangible Cultural Heritage list, UNESCO has also inserted the skills, knowledge, rituals, symbols, and traditions of wild edible plants in six Mediterranean countries [10]. This recognition is an important step for preserving and enhancing these recourses. Wild plants are a crucial, yet largely unknown, part of the Mediterranean diet. As reported by Biscotti et al. (2015) [11], “The preservation of the food heritage needs to go beyond the usual representations of the Mediterranean diet, which generally underlines only commonly cultivated food plants”. Similarly, Alpine food has been recently nominated for inclusion as Intangible Cultural Heritage within the AlpFoodWay European project [12]. In fact, the European Union has implemented a labelling system, defined as an optional quality term and called “mountain product”, dedicated to European mountain foods and their enhancement [13]. Furthermore, local mountain food is an important element of a stay in mountain areas [14,15] and is an expression of the authenticity and ecosystem services of an area [16,17]. The effect of public policy towards the promotion and selling of wild plant resources needs to be carefully analyzed because it could lead to misleading results [18,19].

These recent publications and recognitions show a need for further research in this field. Some scholars have already focused their research doing reviews on the use of wild edible plants: some studies reviewed wild plants gathered, motivations, and culinary uses in Spain [20,21], Italy [22,23], Poland [24], Sweden [25], Iceland [26], and the whole Mediterranean area [27,28]. Łuczaj et al. (2012) [29] reviewed the changes in the contemporary use of wild food plants in Europe, while Schunko et al. (2022) [30] focused on reviewing globally how the local communities perceive the driver behind the decreased abundance of wild edible plants. Over the years, there has been a steady increase in this field of research, mainly consisting of studies based on specific territories. Scientific contributions that systematically explore the results emerging from these studies are scarce. Therefore, we conducted a systematic review to synthesize the recent trends and changes in the use of wild edible plants in Europe and consider the latest progress in this research field.

Specifically, the first aim of this study was to understand the factors that explain the abandonment or, on the other hand, the prosecution of wild food gathering practices. In particular, the interest lies in whether these practices are now limited to the self-sustenance of a few communities that conserve this TEK, or whether new trends related to the enhancement and conservation of these resources are also emerging. Recently, a lot of attention has been given to food heritagization processes, i.e., the identification of food resources embedded in a given place, and their recognition as part of that territory’s collective heritage in order to attribute new values and purposes to them [31]. Several experiences of a renewed interest in wild plant gathering activities are emerging from the literature [32–34]. The second objective of this study was to analyze how these emerging foraging practices relate to the three dimensions of sustainability. As reported by Pieroni and Giusti (2009) [35], it is important to reconsider wild plants’ management practices in terms of their sustain-

ability. In particular, their contribution to the economic and social development of local communities and the sustainability of land management practices were analyzed.

The definition of wild food used in this study includes all non-domesticated plants that grow spontaneously in their natural habitats, even though they may be subject to management practices. Thus, all culinary preparations, including both food and beverages, are considered in this study. Other uses, such as plants used as medical remedies, are not considered in the results presented in this review.

2. Materials and Methods

2.1. Choosing a Review Methodology

This review was implemented according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology [36] as it has already been recently used by other authors reviewing factors influencing the perceptions of wild edible plants by local communities [30]. This framework is useful for performing a systematic review within a replicable, scientific, and transparent approach. The database search strategy was performed using the SPICE (Setting, Population, Intervention, Comparison, Evaluation) framework [37] as recently applied by other food-related systematic reviews [38,39].

2.2. Research Questions Definition

After an initial exploratory analysis of the literature on the subject, three research questions were formulated:

- Research Question 1 (RQ1): Which drivers of the abandonment of foraging practices in Europe emerge from the literature?
- Research Question 2 (RQ2): What motivations explain the preservation and enhancement of foraging practices in Europe?
- Research Question 3 (RQ3): What are the economic, social, and environmental benefits and risks associated with the management of foraging practices?

2.3. Papers' Selection Procedure

The following steps were initially followed to find the most relevant peer-reviewed papers for the purpose of the review: database selection; selection of the keywords for queries; and eligibility criteria to be applied.

Two databases were selected for researching the scientific literature: Scopus by Elsevier and Web of Science (WoS) by Thomson Reuters, as they are recognized today as the largest databases of abstracts and citations of peer-reviewed literature [38,40] and ensure the best coverage on the subject. As for the keywords used for the queries, the authors chose to use the combination of words reported in Table 1. After an initial exploratory analysis, it was decided not to include the term 'wild plants' in the search string because it was deemed excessively broad. Results returned mainly research about botanical and ecological aspects of these resources, and were thus not food related. Instead, the term "wild edible plants" was used combined with "wild food" to narrow the search results to wild plants used for food consumption, while the terms "foraging" and "ethnobotan*" were used to limit the research to practices and knowledge around the use of these resources.

Table 1. SPICE framework used for the database search strategy.

SPICE Element	Search Terms Assigned	Reason
<i>Setting</i> —where?	No term assigned	The geographical context was retrieved during abstract reading
<i>Population</i> —for whom?	No term assigned	No term assigned
<i>Intervention</i> —what?	"Wild edible plants"	To limit the information on wild plants used for human consumption
<i>Comparison</i> —compared with what?	"Wild food"	No term assigned
	No term assigned	No term assigned
<i>Evaluation</i> —with what result?	"Foraging"	The outcomes of interest are the foraging activity and ethnobotanical studies
	"Ethnobotan*"	

The keywords specified in the table were then combined on Scopus and WoS using the “OR” operator between terms and “AND” between different SPICE elements. The exact search string used in Scopus was the following: (TITLE-ABS-KEY (“wild food”) OR TITLE-ABS-KEY (“wild edible plants”) AND TITLE-ABS-KEY (foraging) OR TITLE-ABS-KEY (ethnobotan*)). This activity was carried out on 13 June 2023.

At the “Identification” stage, 881 potentially selectable publications were detected, of which 519 were on Scopus and 362 on WoS (Figure 1). Subsequently, only scientific peer-reviewed articles written in the English language and published in journals were retrieved, while 108 publications, which included all non-English publications and contributions other than articles such as reviews, book chapters, and conference proceedings were removed. The inclusion and exclusion criteria used during the article selection procedure are listed in Table 2. It was decided to not use eligibility criteria based on a time range in order to include all relevant publications. After the application of the first two eligibility criteria, 316 duplicates present in both databases were withdrawn.

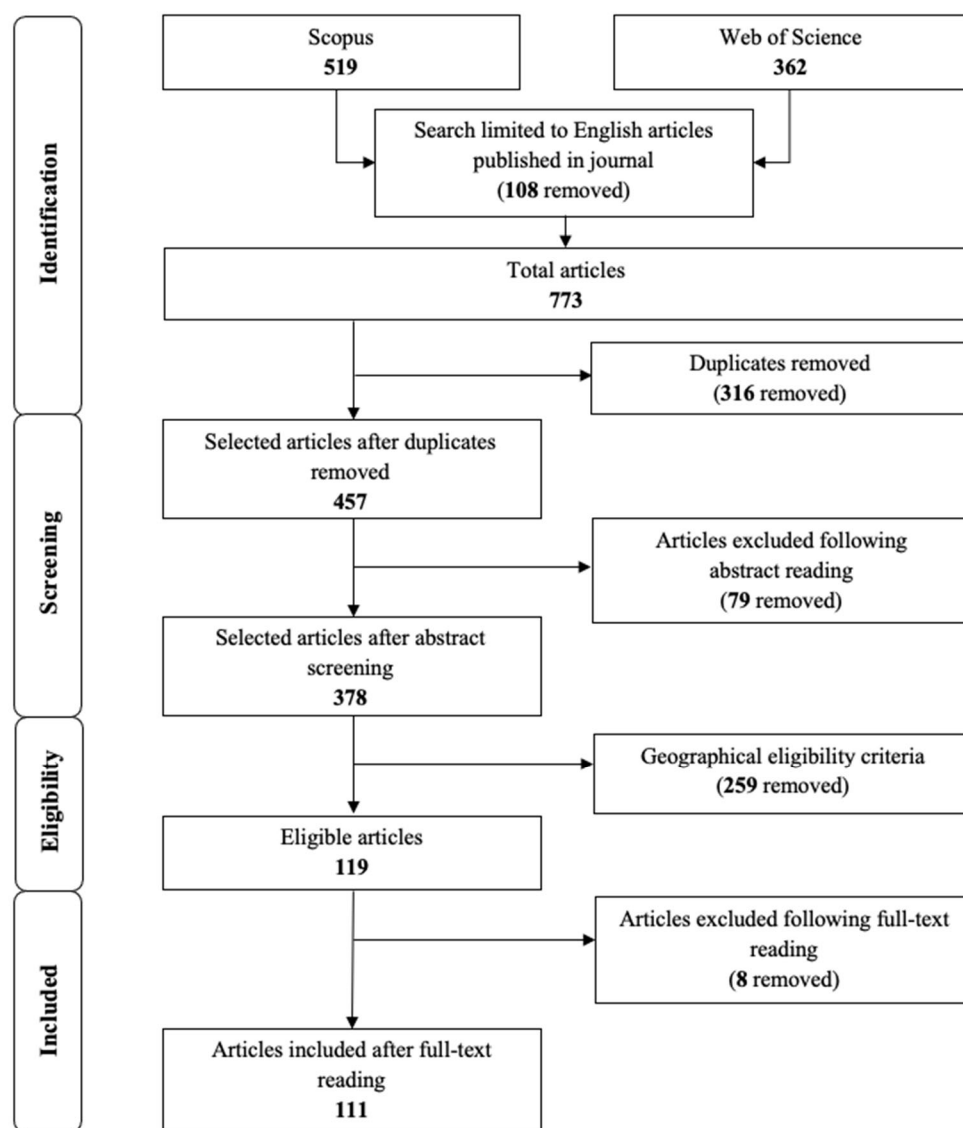


Figure 1. PRISMA flow diagram for the article selection process.

Table 2. Eligibility criteria.

Inclusion Criteria	Exclusion Criteria
<p><i>Before abstract screening:</i></p> <ul style="list-style-type: none"> -English language -Peer-reviewed journal articles 	<p><i>Before abstract screening:</i></p> <ul style="list-style-type: none"> -Other languages -Reviews, book chapters, proceeding articles
<p><i>During abstract screening:</i></p> <ul style="list-style-type: none"> -Focus on local knowledge and foraging practices of wild edible plants -European context 	<p><i>During abstract screening:</i></p> <ul style="list-style-type: none"> -Focus on other aspects of wild edible plants -Different geographical context

At the “Screening” stage, with the application of the “during abstract screening” eligibility criteria, the papers focusing on local knowledge and foraging practices of wild edible plants used as food were selected (378 publications), while 79 focused on other aspects related to the wild edible plants were removed. In particular, 36 articles were related to the chemical and nutritional composition of wild plants, 25 to animals’ behavior towards wild plants, and 18 to archaeological studies of wild plants used by ancient populations.

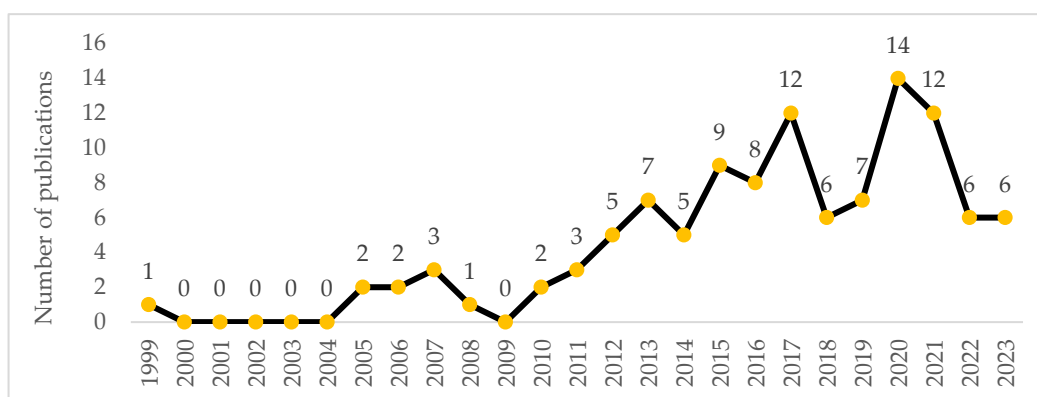
At the “Eligibility” stage, on the base of the information extracted during the abstract screening, the authors grouped the remaining papers according to their geographical area. Subsequently, the authors decided to focus exclusively on Europe, thus excluding 259 papers related to other countries. To precisely define the European boundaries, the M49 geographic subdivision of the United Nations was used [41]. This choice was made to conduct an analysis in a comparable socio-economic context. At the end of this phase, 119 papers became eligible for full-text reading.

This last phase led to the further withdrawal of 8 articles as they focused only on which wild plants were used by the local population, thus not giving any useful insights for answering the research questions posed in this systematic review. Eventually, a total of 111 articles were included in the analysis presented in the next section.

3. Results

3.1. Descriptive Statistics on Selected Papers

First, some basic descriptive information (e.g., year of publication, region where the research was carried out) is useful for a contextualization of the 111 papers retrieved. The distribution of articles per year of publications (Figure 2) shows a growing interest in the international scientific community on this topic in the last ten years.

**Figure 2.** Distributions of articles per year of publication.

Regarding the sources, a total of 45 journals were counted. The journals that accounted for the largest number of publications were *Journal of Ethnobiology and Ethnomedicine* (20 publications), followed by *Economic Botany* (9 publications), *Genetic Resources and Crop*

Evolution (8 publications), and *Acta Societatis Botanicorum Poloniae* (7 publications). The ten most productive journals are reported in Table 3 together with the ten most productive authors. Among the latter are Pieroni A. (37 publications), Sõukand R. (26 publications), Łuczaj L. (16 publications), Kalle R. (11 publications), and Mattalia G. (11 publications).

Table 3. Ten most productive journals and authors for published papers.

Journals	N	Authors	N
<i>Journal of Ethnobiology and Ethnomedicine</i>	20	Pieroni A.	37
<i>Economic Botany</i>	9	Sõukand R.	26
<i>Genetic Resources and Crop Evolution</i>	8	Łuczaj L.	16
<i>Acta Societatis Botanicorum Poloniae</i>	7	Kalle R.	11
<i>Sustainability</i>	6	Mattalia G.	11
<i>Appetite</i>	5	Pardo-De-santayana M.	8
<i>Journal of Ethnopharmacology</i>	4	Tardío J.	8
<i>Foods</i>	4	Quave C.L.	8
<i>Biology</i>	3	Aceituno-Mata L.	7
<i>Plants</i>	3	Schunke C.	7

As for the geographic distribution of case studies, reported in Figure 3, the vast majority took place in Italy (26 publications) and Spain (16 publications), followed by Croatia (7 publications), Austria (6 publications), Estonia (5 publications), and Albania and Kosovo (with 4 publications each). In total, 31 countries were involved in the analysis. Among the selected articles, 103 were single-country studies, while 8 papers considered more than one European country. Finally, looking at the geographical subdivision in the Europe continent, four clusters emerged: 15 (14%) studies were carried out in Northern Europe, 9 (8%) in Western, 42 (38%) in Central and Eastern, and 45 (40%) in Southern Europe. Interestingly, almost half of the selected publications concerned the six European countries included in the Mediterranean Diet Intangible Cultural Heritage of UNESCO.

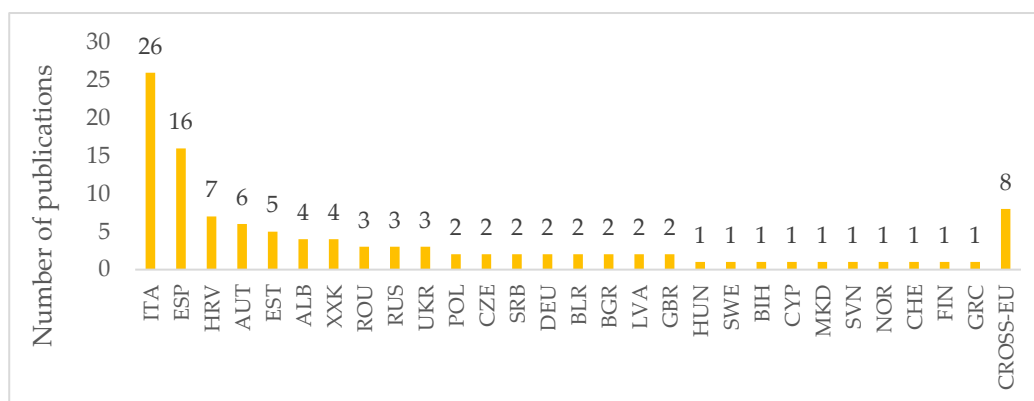


Figure 3. Geographical distributions of selected publications.

Most of the selected publications were based on the interview of experts from the local communities, who were usually elderly people who retain the traditional knowledge around foraging practices. However, other actors were sometimes interviewed: local producers [42,43], consumers [44], tourists [45], local sellers [46,47], commercial and recreational foragers [48,49], and experts [50–52]. Thus, different points of view were considered. Furthermore, two articles analyze plant availability instead of interviewing people [53–55], while some others analyze historical sources and literature to assess wild plant use [51,55–61]. As for the characteristics of the studied territory, most of the selected articles focused on a well-defined rural area, again with some exceptions: some focused on urban areas [53,62–64] or food markets [44,46,47], while others analyzed more generally different areas of a country [43,44,47,49,50,52,58,59,61,65–68].

The articles selected for the systematic review, together with the aforementioned features and the specific area of study, are listed in Appendix A.

3.2. Erosion of TEK and Abandonment of Foraging Practices

To answer the first research question (RQ1) the reasons for TEK erosion and the abandonment of foraging practices individuated in the literature were grouped into four interrelated macro-categories: socio-economic, cultural, personal, and environmental reasons. Figure 4 shows all the aspects individuated together with the number of references for each reason. This framework helps to increase the readability of the results.

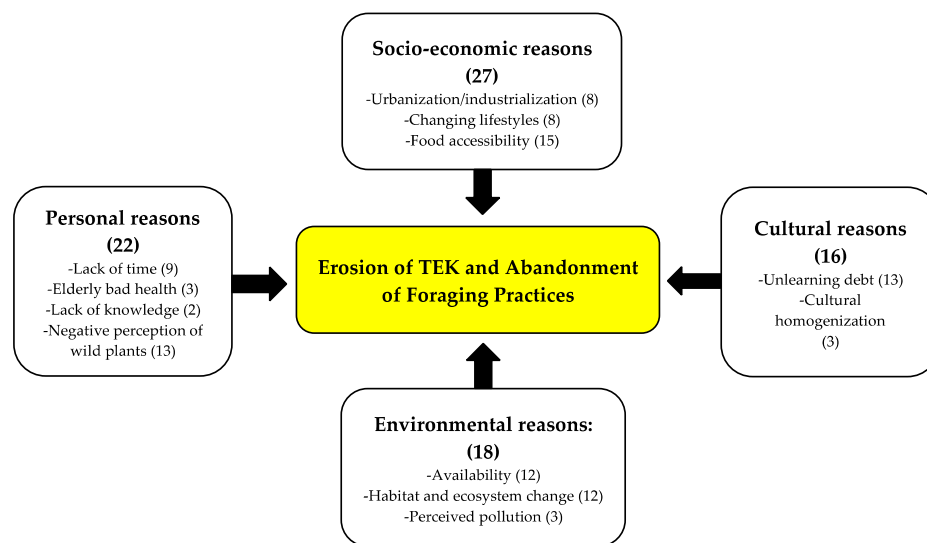


Figure 4. Conceptual framework of factors influencing the erosion and abandonment of TEK and foraging practices. Numbers in brackets refer to the number of publications highlighting that reason.

3.2.1. Socio-Economic Reasons

Several authors underline the relation between the socio-economic changes brought about by the modernization of agropastoral systems and the reduction in the frequency of foraging practices, and therefore an erosion of TEK. Urbanization and industrialization led to profound changes in society, among which were the abandonment of traditional agricultural and pastoral practices [69–76]. The disappearance of the traditional agrarian culture has entailed abandoning many activities in the fields and forests linked to gathering and consuming wild edible plants [77]. Wild plants were collected when people went into the fields for other primary activities (such as farming or livestock grazing) [78–80]. Compared to the past, less time is spent close to nature and in the countryside [74,81,82]. This, therefore, led to having fewer and fewer opportunities to practice foraging. Moreover, increased wealth and purchasing power resulted in increased food accessibility and affordability than in the past [74,75,83,84]. Industrial production reduced the need for gathering and processing wild plants at home [85], while proximity and easiest access to nearby cities and markets increased food supply alternatives [76,83,86–88]. People nowadays prefer instead to cultivate or buy their food [89]. Furthermore, as famine is no longer common in Europe, wild plants stopped playing a role in helping people with self-sustenance [90]. Nowadays, foraging activities are not driven by necessity anymore [91]. Similarly, while the collection of wild plants was an important part of income in the past, people no longer have this need [92]. The relationship between economic changes and TEK erosion is perfectly summarized by the study of Mattalia et al. (2021) [69] which reported an elderly lady saying, “We became rich and lost everything”, referring to the fact that she now uses industrial chamomile while she used to pick and dry the plants herself.

3.2.2. Cultural Reasons

Moving to the cultural sphere, the literature shows that TEK around wild plants was mainly transmitted orally and vertically between generations [92,93]. Young people increasingly detached from agropastoral activities and therefore were no longer interested in foraging [72,74,84,94–97] or migrated because of the greater opportunities offered by the city [98–101], which resulted in knowledge erosion. Moreover, as knowledge about foraging is mainly in the hands of older people, transfer to new generations became an issue [56]. In this regard, Kalle and Sõukand (2016) [102] starting from the concept of “extinction debt” [103], proposed the term “unlearning debt” to indicate the process where local knowledge around foraging practices was lost because it was not practiced nor transferred to younger generations anymore, while still alive in the memory of older generations. Finally, some authors pointed out the role played in abandoning foraging practices by cultural homogenization and standardization driven by the dominant culture [86,104]. Similarly, the study of Cucinotta and Pieroni (2018) [105] underlined that TEK is under threat because of the changes brought about by seasonal mass tourism.

3.2.3. Personal Reasons

Moving on to the personal sphere, which is influenced by the socio-economic and cultural changes just mentioned, the first reason reported in the literature is that foraging is much too time-consuming [66,72,80,81,85,86]. Wild plant gathering is time intensive, and nowadays there is less time to spend on it [88]. The study of Sõukand (2016) [90] reported that young people are not interested in foraging because their parents had not the time to take them to do this type of activity when they were younger. Other personal reasons are related to reduced mobility, bad health, or the need for a reduced workload by the elderly [88,90,102]. Old people still retain the knowledge but no longer have the physical strength to practice foraging. Furthermore, a lack of knowledge about wild food gathering emerges from the literature [66,79]. Insufficient knowledge about the parts of plants that can be used for what purposes, or fear of intoxication are all reasons for not gathering wild plants. Finally, wild plants are rejected because they are a reminder of the harder experiences associated with agricultural life, such as famine, child labor, or harsh life conditions [52,59,61,66,67,72,80,81,85,106–109].

3.2.4. Environmental Reasons

The main environmental reason behind the abandonment of foraging is plant availability. A decreased abundance of wild plants was observed by several authors [69,102,110,111], frequently attributed to changing climate [79,88,90] or the disappearance of the place of growth following ecosystem changes [56,93,96,112,113]. Some elderly informants reported that landscape changes such as forest expansion and decreased coppices or agricultural intensification are among the anthropogenic land-use changes responsible for this reduction [58,107,109,114], and others blame the practice of intensive mowing [90,113] as well as the increased use of chemical products as responsible [57,83]. Similarly, some informants noted that the disappearance of sheep herding resulted in a decreased abundance of wild plants [69]. Finally, some others perceived environmental pollution among the reasons to not consume wild plants anymore. According to them, the habitats where they were used to pick wild plants are not clean anymore: “Nowadays people are afraid to collect anything because there are too much car fumes on the roadside and too many pesticides and fertilizers are used in the fields” [90].

3.3. Preservation of TEK and Enhancement of Foraging Practices

Moving to the second research question (RQ2) related to the current preservation of TEK and the enhancement of foraging practices, several motivations can be found in the literature, which we grouped into six macro-categories: cultural motivations, personal motivations, product-related motivations, economic motivations, reasons related to emerging

markets, and finally the role of policy, education, the scientific community, and media in influencing these practices. Figure 5 shows the conceptual framework behind this process.

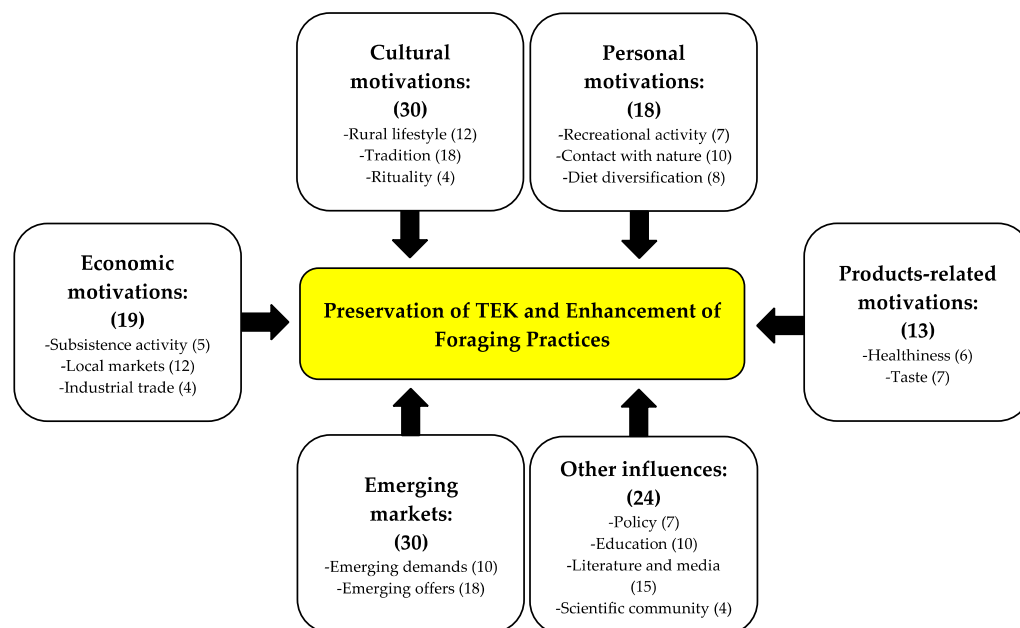


Figure 5. Conceptual framework of factors influencing the enhancement and preservation of TEK and foraging practices. Numbers in brackets refer to the number of publications highlighting that reason.

3.3.1. Cultural Motivations

Although emphasized previously that the general consequence of modernity is the abandonment of traditional agropastoral culture, the literature reports that when these practices are still alive in the local community, foraging practices are also still in use [52,56,71–73,91,108,115]. Traditional knowledge is therefore preserved where it is retained by a strong cultural identity within a well-defined boundary [82,116,117]. Furthermore, some wild plants are still used today because they are associated with traditional cultural identity [87,106,107,109,118,119], and because of their role in traditional cuisine [72,73,96,120–122]. People still consume plants because of their past role in the community and because they are linked to their ethnic identity [55,61,101]. Even when traditional plants do not grow anymore in the wild, people have started to buy them [111], thus showing their cultural importance. The persistence of these practices binds the present society with the positive aspects of their origin [107]. Similarly, some wild plants are usually eaten on specific traditional occasions, in a ritual way [92,111,123,124]. Traditional foraging looks like a residual practice. However, as it will be further discussed, strategies to preserve them are also reported in the literature.

3.3.2. Personal Motivations

Foraging was then often reported as a recreational activity [49,79,89,102,125,126]. Some people, especially in more developed contexts, practice foraging because they enjoy gathering wild plants and because of the well-being generated during the time spent doing this activity. Thus, nowadays foraging practices are becoming popular in the framework of healthier and more sustainable diets, and responsible engagement with nature [59]. Moreover, according to several authors, foraging generates pleasure associated with the contact with nature [59,100,112,116,118], which has important stress-reducing health benefits [92]. In this regard, Schunko et al. (2015) [33] reported that wild-gathered plants are considered to be better and have a higher hedonistic value compared to those bought. Furthermore, as reported by Łuczaj et al. (2021) [48], recreational foragers' associations could play a role in the

preservation of the knowledge around these practices. Finally, diet diversification is another reported motivation for the consumption of wild-gathered plants [59,102,105,106,110].

3.3.3. Product-Related Motivations

Wild plants are collected and consumed because they are considered a healthy product [79,90]. They are perceived as being healthiest because they grow naturally without human intervention and, consequently, they are seen as non-processed, pesticide-free natural food sources [61,101,118]. Furthermore, as reported by Sansanelli and Tassoni (2014) [100], wild plants are perceived to have better quality than the food produced on a large scale whose exact production process is unknown. Some people practice foraging because they like the taste of wild plants [59,61,65,79,107,127]. In this regard, some papers report specific traditional products still in use today that are obtained from wild plants [112,128,129]. These products are usually local products with a strong territorial identity, such as liquor distilled from local herbs and cheese obtained by cows and sheep fed wild plants.

3.3.4. Economic Motivations

Wild plants are still actively gathered for self-subsistence in some remote areas with poor economic conditions [92,125]. Although not very common anymore, wild food plants still help people survive because they are free to collect [118]. However, foraging is practiced not only for the savings from using plants as a source of food instead of buying them [127], but also as an additional source of income when selling plants to local markets [43,46,49,61,69,75,85,88,96,108,130,131]. Therefore, local sellers play an important role in preserving Traditional Ecological Knowledge [47,132]. Apart from these direct marketing experiences, some different value chains such as large-scale harvesting for industrial reasons also emerge [43,88,92,124].

3.3.5. Emerging Markets

The demand for local traditional products is increasingly growing in Europe [34] and wild food plants are also affected by this trend. Several authors underlined that knowledge and practices around wild plants must be considered an important source of local food heritage [65,70,98,104,105,133], and therefore, need to be preserved. This trend emerges in the literature in two different ways. On the one hand, young people are a new category of consumers interested in organic and environmentally conscious food choices [44,47,59,120]. These consumers are therefore interested in local products from wild plants, but also in foraging itself [48,49]. On the other, some producers, especially organic farmers, have started collecting and selling wild plants and derived products [34,42,134]. As reported by Schunko and Vogl (2018) [43], some farmers have introduced foraging as a complement to their primary activity, while others are starting to specialize in plant processing and marketing. Although not very common, some farmers are also selling wild plants to processors or retailers. Some papers report a renewed interest in foraging proven by wild plant usage in local restaurants [60,69,85,94,112,121,127,130], agritourism [83], high cuisine [100], and marketing as traditional high-quality products in local shops [135,136]. Furthermore, eco-tourism experiences, such as foraging courses and wild plant cookery classes [106], could enhance the local gastronomy and wild food heritage [45,98,99,104,105,121,137–139]. The study of Quave and Saitta (2016) [140] reported that the advent of tourism in the territory has increased the market for these products. In this regard, some publications highlight the role that associations such as “Slow Food” can play in preserving and enhancing this traditional knowledge [42,141]. Finally, urban foraging is emerging as a new trend [43,62–64,142] when foraging expands from rural areas to urban environments because of the need for interaction with nature.

3.3.6. Other Influences

Other aspects that have a positive influence on foraging practices include public procurement and policy, education, the literature and media, and finally the role of the

scientific community. Policies and national support for businesses can influence the extent of foraging practices [85]. Some authors reported that state-induced procurement has historically played a role in keeping foraging practices alive [51,68,132]. As it will be further discussed in the next session, centralized procurement could lead to misleading results. Changes in the agenda of many national food and local policymakers are therefore advisable [66,95,143]. Moreover, some authors highlight the role of influencers within the community, such as schoolteachers and local shop owners, in keeping foraging practices alive [74,85,136]. Therefore, it is suggested to develop learning material for schools [42,66] and experiences in schools and universities [53,67,95,96,144]. Finally, several sources have been reported regarding the origin of knowledge around foraging practices. Apart from oral transmission, which appears to be the most common, knowledge sources include books and magazines [42,59,68,74,83,100,126,145,146], calendars with recipes printed on them [132], internet and television [51,74,136,145], and foraging workshops [48,126]. Some authors highlight that workshops, books, and national tv programs have increased the popularity of wild plants [59,136,140]. However, these knowledge sources could also be inaccurate [147]. Even when successfully increasing the use of wild edible plants, this could result in transferring erroneous information about wild plants' cultural origins and use contributing to the invention of tradition [148]. Finally, if the knowledge of wild plants is mainly orally transmitted by local people, some authors highlight that scientific papers and experts could play an important role to keep written track of this local know-how [42,50,149,150].

4. Discussion

The analysis of the selected publications clearly outlines a widespread erosion and abandonment of foraging practices in Europe. The most cited reasons that emerged from the literature are related to the socio-economic changes that happened during the last decades and resulted in changing lifestyles and increased food accessibility. After that, personal reasons have been mentioned in the literature (mostly a negative perception of poorness associated with wild plants), followed by environmental reasons such as reduced plant availability and land-use change, and finally some cultural reasons (the most reported one was the difficulty of maintaining this cultural knowledge among the younger generation). These results are in line with that of other publications about the drivers for erosion and the current state of wild food resources at the global level [4,30], as well as for the European context [29]. Nevertheless, the results of our study showed that when traditional agropastoral practices are still in place, traditional knowledge about wild plants is also preserved. However, these cases are restricted to specific rural areas where the drivers of abandonment individuated in the literature were less marked. Other less cited reasons are related to wild plants sold for economic reasons, foraging activities carried out for recreational reasons and for contact with nature, and wild plants consumed for their healthiness and taste. Other influences (such as media, literature, policy, and education) emerge as well.

Interestingly, new experiences that can contribute to the preservation and enhancement of these local resources are emerging. Innovative practices, such as selling wild plants as typical local products to be included in restaurant preparations or at the center of ecotourism experiences, certainly are important occasions for keeping TEK alive. Furthermore, they are important opportunities to foster the economic and social development of local communities [31] and contribute to sustainable land management and biodiversity conservation [34]. Therefore, foraging practices could contribute to the enhancement of all three dimensions of sustainability. However, when not properly managed, an unsustainable management of local resources might occur. How the economic, social, and environmental management of foraging activities are emerging from the literature, and how to identify a sustainable pathway enhancing wild plant heritage (RQ3) will therefore be discussed in this section. Table 4 summarizes the potential benefits and risks related to different management practices of wild edible plants.

Table 4. Benefits and risks of different foraging management practices.

Potential Benefits of Foraging Practices	Potential Risks of Foraging Practices
<i>Environmental:</i> Sustainable land management and conservation of biodiversity	<i>Environmental:</i> Unsustainable land management practices and overexploitation or underexploitation of local resources
<i>Social:</i> Social cohesion and cultural enhancement of local communities	<i>Social:</i> Commodification of local knowledge and wild plants
<i>Economic:</i> Widespread economic development of local communities	<i>Economic:</i> Economic development not distributed to the local communities

Concerning environmental risks, anthropogenic landscape changes may result in a reduced availability of wild plants. In particular, the abandonment of traditional agropastoral practices and the relocation of many people to the cities led to the reforestation of many areas, thus reducing the ecosystems where edible wild plants usually grow [5,93,107,112,118]. The abandonment of traditional livestock grazing itself is to blame for this reduced abundance [69]. Furthermore, intensive agriculture is also responsible because of largely applied techniques such as deep plowing, fertilization, and use of herbicides and pesticides [34,90,113]. This indeed shows that anthropogenic land-use change is the main driver behind wild plants' reduced availability and emphasizes the need for sustainable land management practices. On the other hand, wild food plants are common resources that the local community can gather for free [124]. Consequently, as reported by Dee et al. (2017) [151], "society increasingly focuses on managing nature for the services it provides people rather than for the existence of particular species". This means that local communities are usually more interested in plants as an economic opportunity rather than in their preservation. The relationship between resource use and resource availability is not static and can lead to decreased abundance of certain species, and thus a reduction in biodiversity [134,152]. These are the main reasons why the heritagization of wild plants could imply the risk of their overexploitation, i.e., foraging mainly driven by economic reasons might result in less sustainable gathering practices [33,35,57,88,144]. This risk is even higher when wild plants are harvested for trade. When resources are not used by the local people, an escape from the local system can facilitate overexploitation [124]. Therefore, sustainable land management is in the foragers' interest only when their income depends on the continuous availability of wild plants [34]. In this regard, some papers highlight that foragers do not perceive themselves to have a negative influence on local wild plant availability [32,48,49,55].

Furthermore, while the rediscovery of wild plants as a valid local food source would help local communities strengthen social cohesion and foster economic development, focusing only on their economic return can lead to misleading results. With this kind of approach, even if rewarding in the short term, long-term sustainable development is at risk, mainly because the local community becomes economically dependent on the outside, as pointed out by Comaroff and Comaroff (2009) [153]. When local communities promote and inflate traditional knowledge to suit the needs of the market, local food resources could be objectified and commodified, i.e., when resources are valued only in economic terms, to adapt to market demand [153]. Moreover, in these cases, only a few actors are usually involved in the decision-making process and the distribution of revenues [5,31,137].

Some possible solutions to solve these issues are the implementation of public policies, such as regulation on wild food gathering, fees, and the institution of protected areas [35,69,89,154], and educational programs for locals about the limitations of resources [124]. Some authors highlighted some problems related to these policies. For example, some endangered plants are not included among the protected ones [35], while some fees do not include wild food plants' social and economic importance [134]. As highlighted by Palomo et al. (2014) [155],

while the protected area approach is common in ecosystem and biodiversity conservation strategies, this approach shows many limitations in the long term. Furthermore, as showed by Mattalia et al. (2023) [18], centralized promotion of wild plants, as in the historical case of Soviet Russia, could result in a decreased use of wild plant species and instead favor homogenizations of foraging practices over large territories. Finally, as reported by Sõukand et al. (2020) [19], public regulations could lead to misleading results such as the exclusion of informal sellers which in some contexts play an important role in maintaining traditional knowledge about wild plants. Public policies need, therefore, to consider these peculiarities and the importance of the economic, social, and cultural functions that traditional wild plant products play in rural contexts.

New multifunctional approaches that are more integrated into the surrounding landscape and that actively involve the local communities are advisable [5,89,137,144]. For instance, livestock grazing could be combined with eco-tourism experiences [6]. Producing more economically attractive products than the traditional ones helps the economic development of the local communities and discourages land abandonment [129], while contributing to landscape and biodiversity conservation [34]. Therefore, development and conservation strategies that integrate social, economic, and environmental sustainability at the local level while helping preserve Traditional Ecological Knowledge are possible. As shown by De Groot et al. (2010) [156], “investments in conservation, restoration, and sustainable ecosystem use generate substantial ecological, social and economic benefits”. However, to obtain these positive benefits there is a need to efficiently develop governance, policy, and educational frameworks [56,144]. Furthermore, the ecological context of each territory needs to be carefully analyzed. As suggested by Molina et al. (2014) [54], different plants need different management strategies. Species with high yields are more prone to be turned into commercial activities that promote rural development, while species low in availability and therefore at risk of overexploitation require conservation strategies. The concept of Traditional Ecological Knowledge seems to be the bridge between exploiting these resources for economic reasons and sustainably managing the land to avoid their overexploitation. TEK is in fact at the base of providing effective biodiversity conservation strategies as well as sustainable management of local resources [2]. Since the knowledge around the use of wild plants is mainly in the hand of local communities, eco-tourism and local food markets can only be put in place upon the permanence of this local knowledge [115]. Furthermore, external recognition of the importance of these resources could increase the awareness of the importance of TEK among local communities, thus incentivizing its preservation.

5. Conclusions

The review of the scientific literature on European foraging practices has been useful for identifying the current trends behind the abandonment and preservation of these practices. The former results from the socio-economic changes brought about by modernity and the reduction of traditional agropastoral practices and environmental changes such as reduced plant availability and land-use change. Furthermore, the abandonment of foraging practices is supported by other personal and cultural motivations (lack of time, elderly bad health, lack of knowledge, negative perception associated with wild plants, cultural reasons, homogenization and standardization, and lack of interest among young people). The motivations behind preserving Traditional Ecological Knowledge and enhancing foraging practices emerge as more context-dependent. In some isolated areas, wild plants are still an important part of the life of rural communities, as well as important resources for their self-sustenance or an essential additional source of income. Elsewhere, some new markets emerge. Wild plants are often sold as typical local products, included in restaurant preparations, or at the center of eco-tourism experiences. These new practices are related to the heritagization of wild food and are mainly driven by a renewed interest in traditional local products and people’s need for contact with nature and recreational activities.

Given the rising demand for traditional food products and for rural touristic experiences, wild plants are important local resources that could be properly enhanced for the development of rural territories as well as for helping to maintain Traditional Ecological Knowledge around their use. However, these processes need to be properly managed to include all three dimensions of sustainability: environmental, by contributing to the conservation of biodiversity; social, by enhancing cohesion; and economic, by accelerating local development. Furthermore, as shown in the discussion, TEK could play an important role in fulfilling these objectives. These results suggest the need for further research on how TEK is influenced by emerging wild plant markets, as well as how TEK helps in their management.

The research in this field of study is mainly focused on plant species, their cooking use, and documenting the actual Traditional Ecological Knowledge around wild plants. However, other approaches are also needed. In this regard, while new experiences in managing and enhancing wild food plants, such as eco-tourism, are often suggested in the concluding part of the selected publications, established and truly multifunctional development strategies seem difficult to find in the literature. Similarly, none of the three dimensions of sustainability are often investigated. This paper might help identify the aspects that should be considered when analyzing the sustainability of wild food heritage and foraging practices of a given territory. Further research on these aspects and more market-oriented analysis are suggested. Furthermore, more research on other actors, such as consumers, producers, and local sellers is needed.

Finally, the results of this systematic review confirm that studying changes in Traditional Ecological Knowledge and land-use practices can contribute to mapping dynamics such as the abandonment or intensification in the rural areas of a given territory, and therefore in understanding the movement of the anthropogenic frontier.

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Appendix A

Table A1 lists the articles selected for the systematic review together with some features.

Table A1. Selected articles.

Reference	Country	Area of Study	Territory	Sample
Abbet et al. (2014) [93]	CHE	Valais Valley	Rural	Local residents
Aceituno-Mata (2021) [107]	ESP	Sierra Norte de Madrid	Rural	Local residents
Acosta-Naranjo et al. (2021) [78]	ESP	Madrid/Extremadura/Andalusia	Rural	Local residents
Aziz et al. (2022) [144]	EST/UKR	Estonia/SW Ukraine	Rural	Local residents
Babai et al. (2020) [114]	SVN	Goričko region	Rural	Local residents
Bardone (2013) [59]	EST	Whole country	Rural/urban	Literature
Belichenko et al. (2021) [132]	RUS	Pechorsky District (Pskov Oblast)	Rural	Local residents

Table A1. Cont.

Reference	Country	Area of Study	Territory	Sample
Bellia and Pieroni (2015) [117]	ITA	Piedmont region	Rural	Local residents
Benítez et al. (2017) [109]	ESP	Granada Province	Rural	Local residents
Bexultanova et al. (2022) [68]	RUS	Whole country	Rural	Literature
Biscotti et al. (2015) [11]	ITA	Gargano National Park (Apulia)	Rural/Food Markets	Local residents
Biscotti et al. (2018) [96]	ITA	Apulia region	Rural/urban	Local residents
Brandner and Schunko (2022) [62]	AUT	Vienna	Urban	Urban population
Cucinotta and Pieroni (2018) [105]	ITA	Aeolian Islands (Sicily)	Rural	Local residents
Della et al. (2006) [72]	CYP	Paphos/Larnaca	Rural	Local residents
Dénes (2017) [35]	HUN	Pecs	Food Markets	Local salesmen
Di Tizio et al. (2012) [97]	ITA	Montemitrio (Molise)	Rural	Local residents
Dolina and Łuczaj (2014) [84]	HRV	Dubrovnik coast	Rural	Local residents
Federman (2011) [83]	ITA	Salento (Apulia)	Rural	Local residents
Fischer et al. (2019) [53]	DEU	Berlin	Urban	Field study
Fontefrancesco and Pieroni (2020) [137]	ITA	Sangone Valley (Piedmont)	Rural	Local residents
Ghirardini et al. (2007) [65]	ITA	Whole country	Rural	Local residents
González et al. (2011) [89]	ESP	Arribes del Duero National Park	Rural	Local residents
Gras (2021) [127]	ESP	Catalan area	Rural	Local residents
Hadjichambis et al. (2008) [66]	CYP/GRC/ITA/ ESP/ALB	Mediterranean area	Rural	Local residents
Ivanova (2023) [67]	BGR	Whole country	Rural	Local residents
Jug-Dujakovic and Łuczaj (2016) [51]	HRV	Adriatic islands	Rural	Literature/Expert interview
Kalle and Sõukand (2013) [52]	EST	Whole country	Rural	Local experts
Kalle and Sõukand (2016) [102]	EST	Saaremaa	Rural	Local residents
Kalle et al. (2020a) [85]	EST	Võrumaa/Setomaa	Rural	General
Kalle et al. (2020b) [147]	FIN/RUS/EST/LTU LVA/BLR/UKR	Karelia/Pskov/Voromaa/Dagda/ Salcininkai/hrodna/cherenivsti	Rural	Local residents
Kolosova et al. (2020) [88]	RUS	Karelia	Rural	Local residents
Landor-Yamagata et al. (2018) [63]	DEU	Berlin	Urban	Urban population
Lee and Garikipati (2011) [143]	GBR	Whole country	Rural	Literature
Lentini and Venza (2007) [149]	ITA	Sicily region	Rural	Local residents
Łuczaj (2010) [58]	POL	Whole country	Rural	Literature
Łuczaj and Dolina (2015) [123]	BIH	Herzegovina-Neretva Canton	Rural	Local residents
Łuczaj and Kujawaska (2012) [50]	POL	Whole country	Rural/urban	Botanist
Łuczaj et al. (2013a) [47]	HRV	Dalmatia	Food Markets	Local salesmen
Łuczaj et al. (2013b) [91]	HRV	Lake Vrana Nature Park	Rural	Local residents
Łuczaj et al. (2013c) [61]	BLR	Whole country	Rural	Literature/local residents
Łuczaj et al. (2015) [122]	ROU	Maramureş region	Rural	Local residents
Łuczaj et al. (2019) [136]	HRV	Adriatic islands	Rural	Local residents
Łuczaj et al. (2021) [48]	GBR	Whole country	Rural	Foragers
Lukovic et al. (2021) [121]	SRB	Golija-Studenica Biosphere Reserv	Rural	Local residents/sellers
Luković et al. (2023) [45]	SRB	Whole country	Rural	Tourist
Maruca et al. (2019) [94]	ITA	Reventino Massif (Calabria)	Rural	Local residents
Mattalia et al. (2013) [128]	ITA	Western Alps (Piedmont)	Rural	Local residents
Mattalia et al. (2020a) [104]	ITA	Cosenza Province (Calabria)	Rural	Local residents
Mattalia et al. (2020b) [112]	ITA	Natisone Valley (Friuli-Venezia-Giulia)	Rural	Local residents
Mattalia et al. (2020c) [145]	UKR/ROU	Bukovina	Rural	Local residents
Mattalia et al. (2020d) [125]	ITA	Calabria region	Rural	Local residents
Mattalia et al. (2020e) [129]	ITA	Barbagia (Sardinia)	Rural	Local residents
Mattalia et al. (2021) [69]	ITA	Abruzzo and Molise region	Rural	Local residents
Mattalia et al. (2023) [74]	FIN	Karelia	Rural	Local residents
Menendez-Baceta et al. (2012) [80]	ESP	Basque Country	Rural	Local residents
Menendez-Baceta et al. (2017) [77]	ESP	Arratia Valley (Basque country)	Rural	Local residents
Molina et al. (2012) [55]	ESP	Madrid Province	Rural	Field study
Molina et al. (2014) [54]	ESP	Madrid Province	Rural	Field study
Motti et al. (2020) [106]	ITA	Campania region	Rural	Local residents
Mullalija et al. (2021) [70]	XXK	Anadrini region	Rural/Urban	Local residents
Mustafa et al. (2012) [75]	XXK	Gollak region	Rural	Local residents
Mustafa et al. (2015) [138]	XXK	Sharr Mountains	Rural	Local residents
Nebel et al. (2006) [95]	ITA	Graecanic area (Calabria)	Rural	Local residents

Table A1. Cont.

Reference	Country	Area of Study	Territory	Sample
Nedelcheva (2013) [60]	BGR	Whole country	Rural	Literature
Nedelcheva et al. (2017) [116]	MKD	Plačkovica Mountain	Rural	Local residents
Pardo-De-Santayana et al. (2005) [135]	ESP	Campoo (Cantabria)	Rural	Local residents
Pardo-De-Santayana et al. (2007) [141]	ESP	Northwest of the Iberian Peninsula	Rural	Local residents
Pascual and Herrero (2017) [154]	ESP	Nord Palencia	Rural	Local residents
Pasta et al. (2020) [56]	ITA	Sicily region	Rural	Literature
Paura et al. (2021) [150]	ITA	Whole country	Rural	Literature
Pawera et al. (2019) [119]	CZE	White Carpathians	Rural	Local residents
Pieroni (1999) [73]	ITA	Garfagnana (Tuscany)	Rural	Local residents
Pieroni (2017) [99]	ALB	South-Eastern Albania	Rural	Local residents
Pieroni and Sökand (2017a) [86]	UKR	Transcarpathia	Rural	Local residents
Pieroni and Sökand (2017b) [115]	ALB	North-East Albania	Rural	Local residents
Pieroni and Sökand (2018) [108]	UKR	Polesia	Rural	Local residents
Pieroni et al. (2014) [124]	ALB	Peshkopia	Rural	Local residents
Pieroni et al. (2015a) [98]	ALB	Rrajcë and Mokra	Rural	Local residents
Pieroni et al. (2015b) [139]	ROU	Dobruja	Rural	Local residents
Pieroni et al. (2017) [82]	XXK	Kosovar Gora	Rural	Local residents
Pieroni et al. (2022) [130]	GRC	Central Crete	Urban/Rural	Local residents
Prakofjewa (2023) [111]	POL/BLR/LTU	Podlajsa/Vilnius/Hrodna	Rural	Local residents
Prüse et al. (2021a) [110]	LVA	Dagda	Rural	Local residents
Prüse et al. (2021b) [152]	LVA	Latgale	Rural	Local residents
Quave and Saitta (2016) [140]	ITA	Pantelleria Island	Rural	Local residents
Reyes-García et al. (2015) [87]	ESP	Whole country	Rural	Local residents
Rigat et al. (2016) [133]	ESP	Ripollès district	Rural	Local residents
Sansanelli et al. (2017) [101]	ITA	Middle Agry Valley (Basilicata)	Rural	Local residents
Sansanelli and Tassoni (2014) [100]	ITA	Emilia-Romagna region	Rural	Local residents
Savo et al. (2019) [120]	ITA	Monti Picentini Regional Park	Rural	Local residents
Schunke and Brandner (2022) [64]	AUT	Vienna	Urban	Urban population
Schunke and Vogl (2010) [42]	AUT	Styria	Rural	Local farmers
Schunke and Vogl (2018) [43]	AUT	Whole country	Rural	Local farmers
Schunke and Vogl (2020) [44]	AUT	Whole country	Food Markets	Organic consumers
Schunke et al. (2019) [34]	ITA	South Tyrol	Rural	Local farmers
Schunke et al. (2021) [142]	AUT	Vienna	Rural	Stakeholders
Serrasolses et al. (2016) [79]	ESP	Catalan Pyrenees/Balearic Islands	Rural	Local residents
Sisak et al. (2016) [134]	CZE	Whole country	Whole country	General
Sökand (2016) [90]	EST	Saaremaa	Rural	Local residents
Sökand and Pieroni (2016) [146]	UKR/ROU	Bukovina	Rural	Local residents
Sökand et al. (2017) [81]	BLR	Liubań	Rural	Local residents
Stryamets et al. (2015) [92]	UKR/RUS/SWE	Rozrochya/Kortkeros/Småland	Rural	Local residents
Sulaiman et al. (2023) [131]	UKR	Western Oblasts	Rural	Local residents
Svanberg and Berggren (2018) [57]	DNK/FIN/EST SWE/ISL/NOR	Whole country	Rural	Literature
Svanberg and Lindh (2019) [126]	SWE	Uppsala	Rural/urban	General
Tardío et al. (2005) [71]	ESP	Madrid Province	Rural	Local residents
Teixidor-Tineu et al. (2023) [49]	NOR	Whole country	Whole country	Foragers
Varga et al. (2019) [76]	HRV	Dalmatia	Rural	Local residents
Vári et al. (2020) [118]	ROU	Transylvania	Rural	Local residents
Vitasović-Kosić et al. (2022) [71]	HRV	Central Lika	Rural	Local residents

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