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Centralization can jeopardize local wild plant-based food security

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ABSTRACT

Centralization is one mechanism of authoritative control, where citizens receive operation guidelines from a single source. This can impact various spheres of life including local gastronomic knowledge, a cornerstone of biocultural diversity. We explored how to evaluate the effects of Soviet centralization on wild food plant local gastronomic knowledge. We considered four case studies of ethnic communities that are divided by political borders. In total, we conducted 581 semi-structured interviews. Our results suggest three main findings. The first regards the high similarity of use of wild food plants among the communities living in Russia and Finland. The second involves the higher proportion of simple preparations made with wild food plants in Soviet contexts, which is not evident in adjacent non-Soviet countries. The third concerns the low(er) number of distinct wild plant-based foods retained by non-Soviet countries and, in post-Soviet contexts, those that refer to past uses. We argue that the erosion of wild food plant-based local gastronomic knowledge guided by homogenization and repression poses a serious risk to local food security.

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1. Introduction

Food security, defined as the condition of having continuous access to sufficient, healthy and nutritious food (Pinstrup-Andersen, 2009) is assured by several ecological (i.e. availability of water, arable lands, etc.), socio-economic (i.e. population size, group membership), and political factors (i.e. food

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accessibility, secure land tenure) (Nkomoki et al., 2019; Premanandh, 2011). Among the political factors, instability poses a serious threat to local food security, for instance, during armed conflicts (Olsen et al., 2021). This is especially evident in the current wheat crisis caused by Russian aggression towards Ukraine. It also emerged in the recent analysis of Köpke (2022) (Köpke, 2022) who found that during the last century most famines were caused not by environmental factors but by political ones, especially authoritarian regimes (e.g. the Holodomor of the 1930s in Soviet Ukraine, the famine among Kazakh pastoralists, the Great Leap Forward famine in the People's Republic of China at the end of the 1950s (Fitzpatrick, 1994; Kindler & Klohr, 2018; Köpke, 2022) and the North Korea famine of the 1990s) (Haggard & Noland, 2007).

Authoritarian rule not only has a profound effect on food availability and accessibility but may also have an impact on local ecological knowledge (LEK). Some research has highlighted the negative impacts of authoritarian regimes on LEK. For instance, in Mongolia, Soma and Schlecht (Soma & Schlecht, 2018) observed a loss of LEK as a result of animal collectivization imposed by the Soviet regime. According to Fedman (Fedman, 2020), during the Japanese occupation, Korean forest managers preserved wild food plants and mushrooms as an alternative food source as indicated in dietary guidelines, yet those uses did not enrich the LEK corpora held by rural inhabitants.

As a part of LEK, local gastronomic knowledge (LGK) encompasses food, its procurement (see also food scouting), preparation, preservation, and consumption, as well as all the societal values associated with them (e.g. those linked to rituals, beliefs, practices). Such knowledge often draws on the local biological and cultural diversity (Petrillo, 2012). The conservation of such food-related biocultural diversity plays an essential role in the maintenance of local food security (Volpato & Ellena, 2022). However, the erosion of LGK was found to be caused by several factors including the loss of biological and cultural diversity through the globalization of agri-food systems, rural depopulation, and the abandonment of traditional landscape management (Braun & Beckie, 2014; Ruelle et al., 2019). Local gastronomic knowledge related to wild food plants is a good proxy to assess food security as it is based on readily available resources even among the most vulnerable populations (Borelli et al., 2020; Cruz-Garcia & Price, 2014; Ulian et al., 2020). Local gastronomic knowledge is shaped by political contexts and even politicized (Anderson, 2020) as is the case for informal post-Soviet markets (Soukand et al., 2020) and the dietary changes of Kyrgyz nomads (Otunchieva et al., 2021). Wild food plants are a common domain of LEK and LGK, as they require both ecological and gastronomic knowledge to be located, harvested, prepared (preserved), and consumed. Moreover, wild food plants are typically found in the LGK corpora of local communities. In order to study the influence of authoritarian regimes on LGK, we selected the area of the former Soviet Union and adjacent territories and an aspect of LGK, namely the use of wild

food plants, which is culturally specific, yet not a dominant element of the foodscape. Thus, we expect LGK related to wild food plants to be able to buffer external disruptions, as food is considered to be one of the most stable components of LEK (Quave & Pieroni, 2015).

The former Soviet republics and adjacent territories were selected as they represent a unique opportunity to explore the effects of political contexts on LEK, considering that the studied communities lived under the same political framework for a long time (and thus we assume them to be culturally homogenous) before being abruptly divided by historical events (e.g. treaties enacted during the Soviet era or the collapse of the Soviet Union). Indeed, the Soviet Union operated a programme where all major decisions were centrally taken, control was generally extremely tight, and goals were transmitted to locally diffused managers/politicians and then as direct orders to the entire population living throughout the territories of the Soviet Union. For instance, the number of commodities centrally planned, allocated by the central government, rose from about 250 in 1937 to 1500 in 1950s (Adeeb, 2007; Perkins, 1963). Therefore, we aim to identify the possible effects of Soviet policies on local wild food plant knowledge by:

- documenting local wild food plant knowledge in post-Soviet (postSov, i.e. the Russian Federation, Estonia, Lithuania, Belarus, Ukraine) and adjacent non-Soviet (nonSov, i.e. Finland, Poland, Romania) contexts in terms of plant taxa, uses, and their combination from a diachronic perspective (from the second half of the 20th century),
- identifying possible commonalities and differences by comparing local wild food plant knowledge in post-Soviet and adjacent non-Soviet contexts,
- identifying possible factors influencing local wild food plant knowledge in post-Soviet contexts through the analysis of collected narratives.

We will discuss the implications of such policies regarding LGK in the light of food security.

2. Methods

2.1. Data collection

Primary data were collected in summers 2018 and 2019 via 581 in-depth semi-structured interviews among 18 ethnic and linguistic groups (11 of which were minority groups) in rural borderland areas of eight countries were wild food plants played a potential role in food habits (Belichenko et al., 2021; Kalle, Sõukand, et al., 2020; Kolosova et al., 2020; Mattalia et al., 2020; Stryamets et al., 2021) (Figure 1 and Table 1). We conveniently selected four case studies, from the Western side of the former Soviet Union, where diverse ethnic and linguistic groups once lived together but are now divided

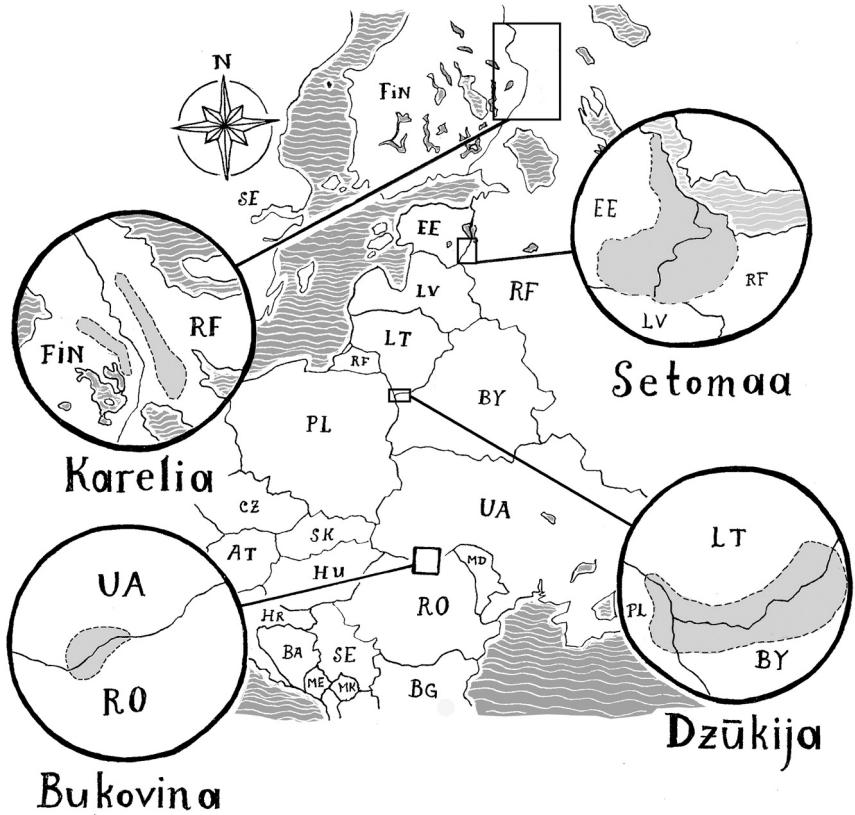


Figure 1. Map of the study areas in adjacent post-Soviet countries. Illustration by Johanna Lohrengel.

as a result of annexation to the Soviet Union in the 1940s or its fall in the 1990s. This resulted in the selection of three adjacent countries for comparison that had diverse political backgrounds: Poland, Romania, and Finland. Specifically, Poland was centralized during the Polish People's Republic (1945–1989) as a Soviet satellite state (Paczkowski, 2002) (Soviet control of satellite countries was exercised through the penetration of the armed forces, security organs, communist party organizations, and state administration at all levels by Soviet representatives or agents, as well as the integration of the satellite economies with that of the Soviet Union. In contrast, after 1953, Romania decided to pave the way towards de-satellization through limited but significant actions. This trend was evident in economic policies in which Romania sought detachment from an exclusive dependency on Moscow (Pop, 1994). Moreover, the Romanian study site, considering its marginal geographical and economic position, was less severely affected by Ceausescu's regime (1967–1989) (Mattalia et al., 2021). Lastly, Finland has

Table 1. Summary of field sites.

Post-Soviet/ non-Soviet	Region	Country	Group	Number of interviewees	Interview language	Data published in:
Post-Soviet	LT/BY/PL Borderland	Belarus	Lithuanian	33	Lithuanian, Belarusian, Russian	Prakofjewa et al. forthcoming;
			Poles	40	Polish, Belarusian, Russian	Prakofjewa et al. forthcoming
		Lithuania	Lithuanian	30	Lithuanian, Belarusian, Russian	Prakofjewa et al. forthcoming
			Poles	37	Polish, Lithuanian, Russian, Belarusian	Prakofjewa et al. forthcoming
	Setomaa	Estonia	Estonian	35	Estonian	Kalle et al (Kalle, Sõukand, et al., 2020).
			Setos	37	Estonian	
		Russian Federation (Setomaa)	Setos	25	Russian	Belichenko et al (Belichenko et al., 2021).
			Russian	38	Russian	
	Karelia	Russian Federation (Karelia)	Karelian	29	Russian	Kolosova et al (Kolosova et al., 2020).
			Russian	21	Russian	
	Bukovina	Ukraine	Hutsuls	31	Ukrainian	Mattalia et al (Mattalia et al., 2020).
			Romanians	34	Romanian, Russian, Ukrainian	Stryamets et al (Stryamets et al., 2021).
Adjacent Non-Soviet	LT/BY/PL Borderland	Poland	Lithuanians	32	Lithuanian, Polish	Prakofjewa et al. forthcoming
			Poles	32	Polish	Prakofjewa et al. forthcoming
	Karelia	Finland	Finns	34	Finnish	Mattalia et al. forthcoming
			Karelians	33	Finnish, Karelian	
	Bukovina	Romania	Hutsuls	30	Romanian	Mattalia et al (Mattalia et al., 2020).
			Romanians	30	Romanian	Stryamets et al (Stryamets et al., 2021).

not experienced a socialist regime, as it has remained a democracy since its independence in 1918 (Pesonen & Olavi, 2002).

We conducted 390 interviews in post-Soviet field sites and 191 interviews in non-Soviet ones, which included 169 males and 412 females. Twenty-five participants did not report any wild plant food uses. We verified age and gender variables, but occupation was not always univocally interpretable (e.g. in some study areas we recorded only "retired"). We found that there is not enough evidence to conclude that age (year of birth classified in three classes) is different between countries that belonged to the Soviet Union and those that did not (p-value of the chi-squared test on the corresponding contingency table was 0.1177). On the contrary, we found that gender is different across the analysed countries (p-value of the chi-squared test on the corresponding contingency table was 0.0007). The difference in gender is not surprising as some contexts (e.g. Belarus, Russian Karelia, and Ukraine) are affected by phenomena like male alcoholism (Grigoriev & Bobrova, 2020) which greatly reduces the life expectancy of the male population (see https://apps.who.int/gho/data/view.main.SDG2016LEXv?lang=en for official statistics). For these reasons, we can assume that age does not have a significant impact on the sample we documented in our results, yet we cannot exclude the influence of gender.

Interviewees were conveniently (pseudo randomly) selected by walking around villages and approaching local inhabitants in the street, local cafés, and gardens, except for in Finland where interviews were previously arranged via phone or email, after getting in contact through social media or previous contacts (snowball technique). Interviews were conducted in the most comfortable language(s) for the interviewee. Interviews lasted between 0.5 and 3 hours and were recorded upon the consent of the interviewee. Prior informed written consent was obtained, and ISE ethical guidelines (International Society of Ethnobiology ISE, 2008) were strictly followed. The study received approval of the Ethical Committee of the Ca' Foscari University of Venice. Interviewees were asked to free list the wild food plants they use or have used in the past. Subsequently, they were asked to mention wild food plants they use for different food categories (e.g. jam, soups, salads, etc.). Plants were considered wild according to local perception (i.e. those which grow spontaneously, without human intervention, such as fertilizing, pruning, or watering). Interviews were transcribed and the data organized in an Excel file according to detailed use reports (DURs), which included, among others, interview code, the plant's scientific name and family, part(s) of the plant used, use, emic food preparation, period of use, and person(s) who used it. Fresh or dried voucher specimens were collected and are now stored in the

herbarium of Ca' Foscari University of Venice (UVV) or in each of the non-EU countries and the herbarium numbers are reported in respective publications.

All raw data has been published, or will soon be published, in respective papers (see Table 1).

Secondary data regarding the impacts of the Soviet Union on local gastronomic knowledge were collected from digital databases and from local libraries and archives in Russia, Estonia, Belarus, and Ukraine. This included both scientific resources and grey literature published in Russian and English.

2.2. Data analysis

Data from the different local datasets were homogenized and combined with the use of software programmes such as Access and Excel. Each local dataset followed *The Plant List* website (http://www.theplantlist.org/) for genus and species names and the *Angiosperm Phylogeny Website*, Version 14 (http://www.mobot.org/MOBOT/research/APweb/), for botanical families (last access according to the publication date of each dataset). Species from local datasets were simplified when underdifferentiation occurred in some of the study areas. For instance, in Romania, interviewees distinguished between *cimbru* and *cimbrisor*, *Thymus vulgaris* L. and *Thymus serpyllum* L., respectively. In Ukraine, people mentioned *cebrets*, which is a common term for various species of *Thymus*; in this case, we considered the genus (*Thymus*).

Emic food preparations were organized into etic categories to facilitate transnational comparisons. For instance, the Finnish data included several types of porridges, yet for the purpose of the comparative analysis, we simplified this into "porridge".

The Jaccard Similarity Index was calculated following Gonzalez-Tejero et al. (González-Tejero et al., 2008) according to the formula $C/(A + B - C) \times 100$, where A is the number of species of sample A, B is the number of species of sample B, and C is the number of species common to A and B.

Distinct foods were selected by considering Use Instances (UIs, refer to a plant used for a specific food category; e.g. "soup of *Atriplex*") mentioned by at least 20% of either a group within a country (e.g. Setos of Estonia), both groups in a country (e.g. Setos and Estonians of Estonia), or each transborder ethnic group (e.g. Setos of Estonia and Russia), but by less than 10% (minimum 3 interviewees) in any other group.

The separation into simple and more elaborated foods was intuitive, based on the perceived amount of work (hours needed for preparation of the dish), ingredients (their wide availability and abundance), and additional support systems (like a juicer, smoking oven, etc.). Some categories (e.g. drink) were considered not assessable because of the very different ways of preparing them.

Fisher's exact test was utilized to compare the proportion of postSov and nonSov interviewees that share wild food plant taxa, uses, and their specific combinations (UIs). It is important to note that this test is nonparametric, and its p-value can be calculated exactly rather than relying on an asymptotic approximation (like the chi-squared test) (Bonnini et al., 2014). Small p-values indicate that the two proportions are different. We considered the following thresholds:

· mild evidence (*) when 0.05 < p-value<0.1
· moderate evidence (**) when 0.01 < p-value<0.05
· strong evidence (***) when p-value<0.01

P-values reported in respective figures in the Results were computed using the R – free software environment for statistical computing (R Core Team, 2020).

3. Results

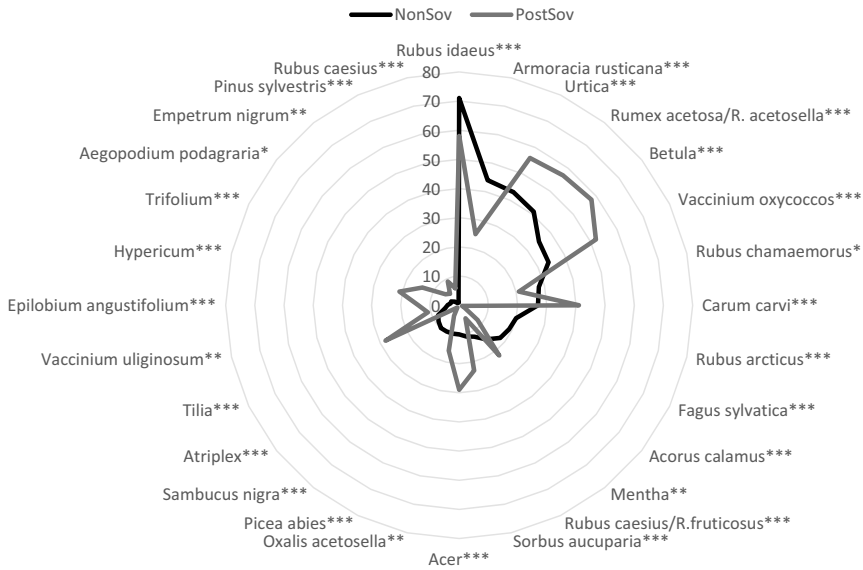
3.1. Local wild food plant knowledge in post-Soviet and adjacent non-Soviet contexts

We recorded the use of 131 wild food plant taxa belonging to 44 families. Of those, 117 taxa were mentioned in postSov by 390 interviewees and 84 taxa in adjacent nonSov countries by 191 interviewees. In total, 70 taxa were shared across the two contexts (and 41 taxa were mentioned by only one or two people: 37 and 31 in postSov and nonSov countries, respectively). The most often mentioned species were common to both types of territories and included *Vaccinium myrtillus* L. (685 postSov, 444 nonSov Detailed Use Reports-DURs) and *Vaccinium vitis-idaea* L. (562 postSov, 334 nonSov DURs). The third most frequent taxon was *Vaccinium oxycoccos* L. (512 DURs) in former Soviet areas and *Rubus idaeus* L. (292 DURs) in adjacent nonSov countries.

3.2. Trajectories of local wild food plant knowledge in post-Soviet and adjacent non-Soviet contexts

The results of Fisher's exact test revealed that twenty-two taxa were statistically significantly different in the number of DURs per taxon between nonSov and postSov territories (see Figure 2).

Wild food plants were consumed using 46 methods of preparation in the former Soviet Union and 48 methods in communities of adjacent nonSov countries. Of those, 36 were common to both postSov and nonSov contexts. Jams and snacks were the most often mentioned methods of preparation in both areas, with the third most frequent type being recreational teas in postSov countries and seasoning in adjacent nonSov territories. The Fisher's

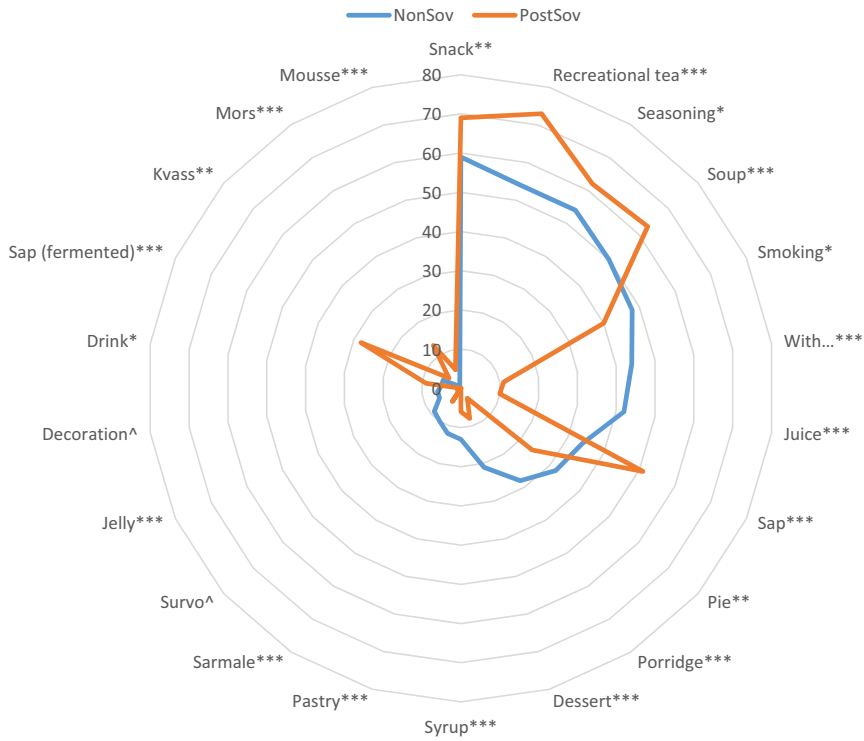


***<0.01; **0.01<p<0.05; *0.05<p<0.1

Figure 2. Significant plant taxa in PostSov and NonSov case studies.

exact test revealed that fourteen ways of preparing wild food plants were significantly different, of which eight dominated in nonSov contexts (especially juices and food additives) and six in postSov contexts (especially recreational teas, soups, snacks) (see Figure 3). In postSov countries, 86% of the DURs referred to simple food preparations (e.g. those which do not require much time nor many ingredients), whereas in adjacent nonSov contexts this figure was 76%. Finland stands out in these proportions with 31% of DURs referring to complex food preparations, while among Estonian interviewees 9% of all reported DURs were complex.

The gastronomic preparations that were significant in the postSov case studies included jam (boiled or mashed for freezing) made from *Vaccinium vitis-idaea*, jam and kissel made from *V. oxycoccos*, fresh *Acer* L. sap, fresh or fermented *Betula* L. sap, and *Urtica* L. and *Rumex* L. soups (Figure 4). Important preparations in adjacent nonSov countries included juices and porridges with the addition of two *Vaccinium* species, pies filled with *V. myrtillus and Rubus idaeus, Fagus sylvatica* L. used for smoking (meat, cheese, and less frequently fish), as well as two *Rubus* species, two *Vaccinium* species, and *Armoracia rusticana* G. Gaertn., B. Mey. & Scherb that were all eaten with other simple ingredients (e.g. milk, yoghurt, sugar, or beetroot in the case of *Armoracia rusticana*). Among the common UIs, there



^=>5% from the respective group; ***<0.01; **0.01<p<0.05; *0.05<p<0.1

Figure 3. Significant wild plant based foods in PostSov and NonSov case studies.

were several recreational teas, seasonings, and snacks for which *Vaccinium* and *Rubus* species dominated .

In general, outside the former territories of the Soviet Union wild food plants were used in a higher proportion of more elaborate recipes (e.g. pastries, desserts, and pies represent 8.4% of the DURs in adjacent territories and only 4.6% of the DURs in post-Soviet countries).

The analysis of Jaccard Similarity Indexes (Table 2) revealed that the most similar groups in terms of their use of plant taxa were Setos and Estonians living in Estonia (JI = 0.85), followed by Poles living in Poland and Lithuania as well as Poles living in Belarus and Lithuania (JI = 0.826 for both), and Russians and Setos living in Russian Setomaa (JI = 0.82).

The analysis of the Jaccard Similarity Index referring to the combination of a wild food plant with a specific recipe reveals that the greatest similarity is found among Russians and Setos living in Russian Setomaa and Finnish and Karelians living in Finland (JI = 0.70), followed by Karelians and Russian living in Russian Karelia (JI = 0.64) (see Table 3). In general, Poles and Lithuanians in

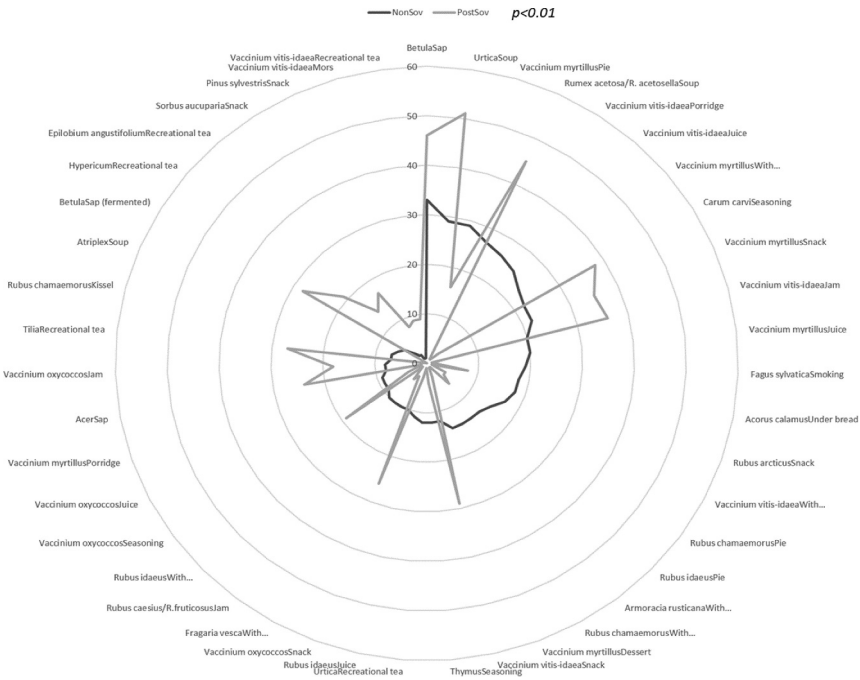


Figure 4. Significant combinations of wild plant based food preparations in PostSov and NonSov case studies. Combinations (>60) of food category and plant taxon. ***p < 0.01.

the Belarusian-Lithuanian-Polish borderland show considerable similarity in the use of wild food plant taxa and their preparation. In contrast, Romanians living in Romania show little similarity with the other groups.

Out of a total of 561 UIs, 17 were found to be unique to a specific group (e.g. Karelians in Finland) or country (e.g. Romanians and Hutsuls in Romania). These distinct foods (DF) are listed in Table 4.

Eighty-two percent of the wild plant-based DF ($N = 14$) were found to be preserved by minority groups, while 9 DF were shared with the majority group of the country. No DF were shared among the studied cross-border communities. In total, 11 DF were found in nonSov countries and six within postSov space; of the latter, three were recorded among Estonian Setos, one among Russian Karelians, and one among Lithuanians living in Lithuania.

The Fisher's exact test comparing the proportions of the distinct species in PostSov and NonSov countries is not statistically significant as it fails to reject the null hypothesis that the corresponding probabilities are different (p-value = 0.1286). The reason for this surprising result, considering that one proportion is more than two times the other, is likely a lack of test power due to insufficient sample sizes. Moreover, the test is conservative, due to the

Table 2. Jaccard Indexes (lower part of cells) and number of overlapping (upper part of cells) wild food plant taxa. The upper/right half of the table represents taxa mentioned by 3 or more interviewees in each group, while the lower/left half represents all taxa. F/Fin = Finns in Finland; K/Fin = Karelians in Karelia; K/RuK = Karelians in Russian Karelia; Ru/RuK = Russians in Russian Karelia; Ru/RuS = Russians in Russian Setoma; S/RuS = Seto in Russian Setomaa; S/Est = Seto in Estonia; E/Est = Estonians in Estonia; L/Bel = Lithuanians in Belarus; P/Bel = Poles in Belarus; L/Lit = Lithuanains in Lithuania; P/Lit = Poles in Lithuania; L/Pol = Lithuanians in Lithuania; P/Pol = Poles in Poland; H/Ukr = Hutsuls in Ukraine; R/Ukr = Romanians in Ukraine; R/Rom = Romanians in Romania; H/Rom = Hutsuls in Romania.

	F/Fin	K/Fin	K/RuK	Ru/RuK	Ru/RuS	S/RuS	S/Est	E/Est	L/Bel	P/Bel	L/Lit	P/Lit	L/Pol	P/Pol	H/Ukr	R/Ukr	R/Rom	H/Rom
F/Fin		23	24	27	27	25	25	26	20	16	21	15	20	17	16	12	8	12
		0.5349	0.4364	0.4426	0.3750	0.4098	0.4098	0.4063	0.3279	0.3019	0.3182	0.2885	0.3279	0.2833	0.2581	0.1905	0.1509	0.1967
K/Fin	17		22	24	21	21	22	23	16	14	18	14	18	16	13	12	7	10
	0.8095		0.4681	0.4444	0.3088	0.3818	0.4074	0.4035	0.2909	0.3111	0.3051	0.3256	0.3396	0.3137	0.2364	0.2264	0.1591	0.1887
K/RuK	13	16		33	32	26	27	28	23	17	23	19	22	19	20	18	10	15
	0.4815	0.6154		0.5690	0.4571	0.4127	0.4355	0.4308	0.3770	0.3091	0.3433	0.3725	0.3548	0.3115	0.3279	0.3000	0.1852	0.2459
Ru/RuK	16	19	21		37	32	33	33	26	19	24	19	26	22	23	21	12	17
	0.5000	0.6129	0.6774		0.5000	0.4848	0.5077	0.4783	0.3881	0.3065	0.3200	0.3167	0.3881	0.3284	0.3433	0.3182	0.1967	0.2500
Ru/RuS	16	18	19	24		43	40	43	30	26	31	23	35	28	30	22	13	22
	0.4211	0.4737	0.4872	0.5714		0.6515	0.5797	0.6143	0.4054	0.3939	0.3924	0.3433	0.5072	0.3889	0.4225	0.2895	0.1831	0.2973
S/RuS	15	17	19	24	32		37	38	29	26	32	25	32	27	29	21	14	23
	0.3947	0.4474	0.5000	0.5854	0.8205		0.6271	0.6129	0.4677	0.4906	0.4923	0.4808	0.5424	0.4500	0.4915	0.3281	0.2456	0.3833
S/Est	16	18	19	24	27	27		42	28	23	30	23	26	24	22	19	11	19
	0.4211	0.4737	0.4872	0.5714	0.6000	0.6136		0.7241	0.4444	0.4107	0.4478	0.4259	0.4000	0.3810	0.3333	0.2879	0.1833	0.2969
E/Est	17	19	19	25	28	27	35		26	23	26	22	28	25	23	18	10	20
	0.4146	0.4634	0.4419	0.5556	0.5833	0.5625	0.8537		0.3768	0.3833	0.3467	0.3729	0.4179	0.3788	0.3333	0.2535	0.1538	0.2985
L/Bel	11	11	11	15	19	19	16	17		27	33	25	28	29	22	23	13	19
	0.3438	0.3235	0.3056	0.3750	0.4524	0.4634	0.3556	0.3542		0.5745	0.5593	0.5319	0.4828	0.5472	0.3607	0.4035	0.2453	0.3220
P/Bel	12	11	10	14	19	18	16	15	17		28	22	28	24	20	17	12	19
	0.4286	0.3548	0.2941	0.3684	0.4872	0.4615	0.3810	0.3191	0.5667		0.5385	0.5789	0.6087	0.5217	0.3922	0.3333	0.2857	0.4043

(*Continued*)

Table 2. (Continued).

L/Lit	13	14	14	19	23	25	21	20	20	20		27	30	27	25	21	14	22
	0.3514	0.3684	0.3500	0.4419	0.5111	0.5952	0.4468	0.3846	0.5405	0.5882		0.5294	0.4839	0.4426	0.3906	0.3231	0.2414	0.3548
P/Lit	11	10	9	13	17	18	16	15	18	19	20		24	23	20	18	12	19
	0.4074	0.3333	0.2727	0.3514	0.4359	0.4865	0.4000	0.3333	0.6667	0.8261	0.6250		0.5000	0.5111	0.4082	0.3750	0.3000	0.4222
L/Pol	13	12	11	16	21	20	17	17	17	21	22	19		28	30	23	14	22
	0.4194	0.3529	0.2973	0.4000	0.5122	0.4878	0.3778	0.3469	0.5000	0.7778	0.6111	0.7037		0.5185	0.5660	0.4035	0.2692	0.3929
P/Pol	13	12	10	15	19	19	16	18	19	19	20	19	20		23	21	14	19
	0.4815	0.4000	0.2941	0.4054	0.4872	0.5000	0.3810	0.4091	0.6786	0.7600	0.5882	0.8261	0.7143		0.4107	0.3818	0.2917	0.3455
H/Ukr	9	9	10	15	18	19	15	15	15	15	19	14	16	15		25	16	27
	0.3000	0.2813	0.3030	0.4167	0.4615	0.5135	0.3571	0.3261	0.4839	0.5357	0.5588	0.5185	0.5161	0.5357		0.4808	0.3404	0.5625
R/Ukr	8	8	8	11	13	12	10	11	13	12	14	11	14	13	12		18	23
	0.2500	0.2353	0.2222	0.2683	0.2889	0.2667	0.2083	0.2157	0.3824	0.3750	0.3500	0.3548	0.4118	0.4194	0.3871		0.4286	0.4694
R/Rom	4	4	4	5	6	6	6	5	5	7	6	6	7	5	6	10		21
	0.1379	0.1290	0.1212	0.1250	0.1333	0.1364	0.1333	0.1000	0.1429	0.2333	0.1463	0.2069	0.2059	0.1563	0.2000	0.3704		0.5676
H/Rom	7 0.1892	6 0.1500	7 0.1707	11 0.2444	14 0.2917	15 0.3261	14 0.2917	13 0.2453	13 0.3421	13 0.3714	17 0.4146	13 0.3939	15 0.4054	12 0.3333	13 0.3824	15 0.4545	12 0.4138	

Table 3. Jaccard Similarity Indexes (lower part of cells) and number of overlapping (upper part of cells) combinations of wild food plant taxa and methods of preparation. The upper/right half of the table represents wild food plant/preparation combinations mentioned by 3 or more interviewees in each group, while the lower/left half represents all wild food plant/preparation combinations. F/Fin = Finns in Finland; K/Fin = Karelians in Karelia; K/RuK = Karelians in Russian Karelia; Ru/RuK = Russians in Russian Karelia; Ru/RuS = Russians in Russian Setoma; S/RuS = Seto in Russian Setomaa; S/Est = Seto in Estonia; E/Est = Estonians in Estonia; L/Bel = Lithuanians in Belarus; P/Bel = Poles in Belarus; L/Lit = Lithuanains in Lithuania; P/Lit = Poles in Lithuania; L/Pol= Lithuanians in Lithuania; P/Pol = Poles in Poland; H/Ukr=Hutsuls in Ukraine; R/Ukr = Romanians in Ukraine; R/Rom = Romanians in Romania; H/Rom = Hutsuls in Romania.

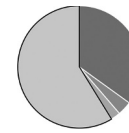
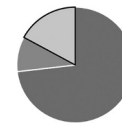
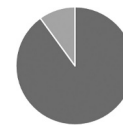
	F/Fin	K/Fin	K/RuK	Ru/RuK	Ru/RuS	S/RuS	S/Est	E/Est	L/Bel	P/Bel	L/Lit	P/Lit	L/Pol	P/Pol	H/Ukr	R/Ukr	R/Rom	H/Rom
F/Fin		89	54	62	50	44	57	57	33	28	36	26	38	30	30	23	11	25
		0.4890	0.2523	0.2661	0.2101	0.1991	0.2794	0.2615	0.1667	0.1556	0.1622	0.1477	0.1836	0.1538	0.1554	0.1173	0.0601	0.1256
K/Fin	47		53	59	42	44	52	52	27	24	33	24	38	29	25	21	10	23
	0.7015		0.2624	0.2646	0.1803	0.2115	0.2653	0.2476	0.1414	0.1404	0.1557	0.1455	0.1959	0.1585	0.1351	0.1135	0.0585	0.1223
K/RuK	29	30		81	68	66	54	54	41	32	43	33	40	34	29	26	12	25
	0.3718	0.3529		0.4091	0.3333	0.3607	0.2827	0.2634	0.2356	0.2000	0.2161	0.2157	0.2116	0.1943	0.1629	0.1469	0.0723	0.1366
Ru/RuK	28	29	42		75	73	66	66	44	37	47	35	46	40	36	32	13	27
	0.3590	0.3412	0.6462		0.3348	0.3596	0.3204	0.3000	0.2222	0.2033	0.2117	0.1966	0.2190	0.2041	0.1818	0.1616	0.0677	0.1298
Ru/RuS	23	24	33	31		86	69	73	50	47	57	40	60	48	41	36	17	28
	0.2556	0.2474	0.4074	0.3780		0.4699	0.3520	0.3544	0.2703	0.2848	0.2780	0.2410	0.3175	0.2652	0.2204	0.1925	0.0939	0.1400
S/RuS	23	22	31	29	47		69	70	45	41	57	45	49	44	39	30	15	27
	0.2738	0.2366	0.4026	0.3718	0.7015		0.3988	0.3763	0.2695	0.2770	0.3132	0.3261	0.2768	0.2716	0.2364	0.1765	0.0938	0.1517
S/Est	27	26	33	33	37	35		90	45	39	50	39	48	41	38	31	12	30
	0.2872	0.2524	0.3708	0.3750	0.4066	0.4023		0.5556	0.2761	0.2671	0.2703	0.2786	0.2759	0.2547	0.2346	0.1879	0.0755	0.1754
E/Est	24	23	31	31	34	31	50		49	42	48	39	52	43	38	31	13	29
	0.2526	0.2212	0.3483	0.3523	0.3696	0.3483	0.5952		0.2832	0.2675	0.2388	0.2532	0.2826	0.2486	0.2159	0.1732	0.0756	0.1559
L/Bel	13	12	18	20	25	21	21	24		46	56	39	51	41	38	30	16	32
	0.1667	0.1379	0.2432	0.2817	0.3425	0.2958	0.2471	0.3000		0.4220	0.3758	0.3545	0.3617	0.3130	0.2879	0.2206	0.1280	0.2302

(*Continued*)

Table 3. (Continued).

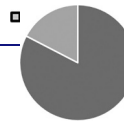
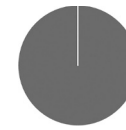
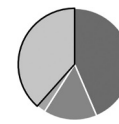
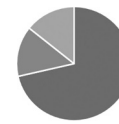
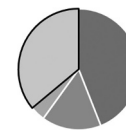
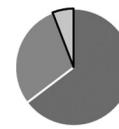
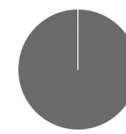
P/Bel	12	10	14	16	21	19	18	19	24		51	39	48	38	36	31	16	30
	0.1714	0.1250	0.2029	0.2424	0.3088	0.2969	0.2278	0.2500	0.5581		0.3893	0.4483	0.3967	0.3423	0.3243	0.2768	0.1569	0.2542
L/Lit	16	15	20	22	27	27	27	25	25	23		47	59	44	46	32	18	35
	0.2025	0.1705	0.2632	0.3014	0.3600	0.3913	0.3253	0.3012	0.4545	0.4792		0.3643	0.3688	0.2839	0.3046	0.1988	0.1200	0.2147
P/Lit	16	14	17	20	23	22	22	23	24	23	27		41	40	30	25	14	28
	0.2353	0.1795	0.2500	0.3125	0.3382	0.3492	0.2857	0.3108	0.5333	0.6216	0.5870		0.3361	0.3883	0.2703	0.2232	0.1429	0.2456
L/Pol	17	16	18	20	26	24	27	24	24	26	28	25		47	45	36	18	35
	0.2179	0.1839	0.2308	0.2667	0.3421	0.3333	0.3253	0.2857	0.4286	0.5778	0.5000	0.5208		0.3381	0.3237	0.2500	0.1314	0.2333
P/Pol	16	16	15	17	23	22	23	23	23	19	23	23	26		33	30	13	25
	0.2254	0.2025	0.2055	0.2429	0.3239	0.3333	0.2911	0.2987	0.4694	0.4318	0.4340	0.5476	0.5200		0.2519	0.2308	0.1066	0.1786
H/Ukr	11	9	14	15	21	20	19	16	17	16	21	14	20	14		37	21	41
	0.1507	0.1084	0.1972	0.2174	0.3000	0.3077	0.2375	0.1975	0.3269	0.3636	0.4038	0.2917	0.3774	0.2745		0.3058	0.1875	0.3361
R/Ukr	8	8	9	9	12	11	11	9	13	12	14	9	16	11	15		23	37
	0.1096	0.0988	0.1233	0.1250	0.1579	0.1549	0.1294	0.1059	0.2453	0.2667	0.2500	0.1800	0.2963	0.2157	0.3409		0.2170	0.3033
R/Rom	6	6	5	4	6	5	5	6	8	7	5	5	8	4	10	10		38
	0.0822	0.0741	0.0667	0.0533	0.0750	0.0667	0.0562	0.0698	0.1429	0.1458	0.0794	0.0962	0.1333	0.0714	0.2128	0.2273		0.3958
H/Rom	12	11	12	12	16	14	17	16	18	15	18	14	19	14	18	18	18	
	0.1395	0.1158	0.1379	0.1395	0.1798	0.1647	0.1771	0.1684	0.2769	0.2542	0.2609	0.2258	0.2794	0.2154	0.3103	0.3273	0.3396	

Table 4. List of distinct foods. Definitions: mors is a cold drink made from fruit pulp and water; "under bread" refers to leaves used as a base for baking bread; sarmale is a broad-leaf wrap filled with meat (and rice); "with … " signifies the addition of a simple ingredient (e.g. sugar, milk, yoghurt) to the wild food plant; taar is a fermented drink, similar to kvass, historically common in Estonia, for which now mainly only the name remains; socata is a cold beverage made from Sambucus nigra flowers.

Distinct Foods (DF)	Group	Country	PostSov/NonSov	Proportion of interviewees who mentioned this food per group	Proportion of DURs mentioned per temporal frame Continuous Recently adopted Recently abandoned Past
Porridge with the addition of *Vaccinium vitis-idaea*	*Finns and Karelians*	Finland	NonSov	>70%	
Mors made from *Vaccinium vitis-idaea*	*Karelians and Russians*	Russian Karelia	PostSov	>60%	
Snack of *Pinus sylvestris*	Setos	Estonia	PostSov	>55%	
With … *Armoracia rusticana*	*Hutsuls and Romanians*	Romania	NonSov	>40%	
Under bread of *Acer* leaves	Poles and Lithuanians	Lithuania	PostSov	>35%	
Snack of *Rubus arcticus*	*Finns and Karelians*	Finland	NonSov	>30%	

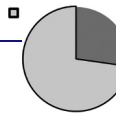
(*Continued*)

Table 4. (Continued).

Distinct Foods (DF)	Group	Country	PostSov/NonSov	Proportion of interviewees who mentioned this food per group	Proportion of DURs mentioned per temporal frame Continuous Recently adopted Recently abandoned
Jam made from *Rosa rugosa/ R.* × *centifolia*	*Hutsuls and Romanians*	Romania	NonSov	>30%	
Sarmale made from *Atriplex*	Romanians	Romania	NonSov	>30%	
With . . . *Rubus chamaemorus*	*Finns and Karelians*	Finland	NonSov	>25%	
Snack of *Rubus nessensis*	Setos	Estonia	PostSov	>25%	
With . . . *Rubus idaeus*	*Finns and Karelians*	Finland	NonSov	>25%	
Porridge with the addition of *Vaccinium myrtillus*	*Finns and Karelians*	Finland	NonSov	>20%	
Soup made from *Atriplex*	*Hutsuls and Romanians*	Romania	NonSov	>20%	

(*Continued*)

Table 4. (Continued).

Distinct Foods (DF)	Group	Country	PostSov/NonSov	Proportion of interviewees who mentioned this food per group	Proportion of DURs mentioned per temporal frame Continuous Recently adopted Recently abandoned
Soup made from *Heracleum sphondylium*	Lithuanians	Lithuania	PostSov	>20%	
Taar made from *Juniperus communis*	Setos	Estonia	PostSov	>20%	
Socata made from *Sambucus nigra*	Romanians	Romania	NonSov	>20%	
Alcoholic drink made from *Vaccinium myrtillus*	Hutsuls	Romania	NonSov	>20%	

discreteness of the test statistic, and this too contributes to the lack of test power.

In addition to those DF found in a single group or country, we detected five wild food plant UIs that were reported only within territories of the former Soviet Union (by at least three interviewees): recreational tea made from *Origanum vulgare* L. (in Russian Setomaa and Ukraine), snacks of *Prunus cornuta* (Wall. ex Royle) Steud and *Trifolium* spp. (both found in Estonia, Russian Karelia, and Russian Setomaa), and mors and pies made with *Vaccinium oxycoccos* (both found in Russian Karelia and Russian Setomaa).

3.3. Possible factors contributing to shaping local gastronomic knowledge related to wild food plants

We identified four direct and five indirect factors that have possibly contributed to the shaping of LGK related to wild food plants among the

communities that once lived in the Soviet context. Among the direct factors, education figures prominently. First, there was a wide distribution of books, newspapers, magazines, and radio and TV programmes about the use of wild food plants, which were published and broadcast mainly in the Russian language and at the political and economic heart of the Soviet Union, that is, Moscow and Leningrad (Koscheev, 1981; Rybitskiy & Gavrilov, 1969; Verzilin, 1953). Prout mentioned the term "Russification" as it applied to the gastronomic domain (Jacobs, 2015). Waite Papashvily and Papashvily (Waite Papashvily & Papashvily, 1975) also expressed their concern about the process of "Russianization" that was fostered by Soviet education and mass media, which reduced regional gastronomic differences. Actually, during Soviet times, a large number of books were also published about national cuisines, but they rarely contained recipes based on wild food plants. Second, some interviewees recalled that All-Union agricultural exhibitions were quite common, and they played an important role in constructing "agricultural profiles" of various regions (Elina, 2020). Another possible direct factor (the third) involves the past widespread use of cafeterias, which usually contained standardized meals. Those dishes were taught in Soviet cooking schools and served in the communal dining halls of schools, universities, collective farms, and factories (the so-called "workers canteens" [*рабочая столовая*]), where workers – from miners to engineers to the facility higher management – all across the Soviet Union ate. The fourth, and last, possible factor concerns the procurement system where the Soviet State used to buy specific wild foods and raw medicinal materials, which also may have affected local practices (Belichenko et al., 2021). In Estonia, for example, children had to collect specific kinds of medicinal plants for pharmacies; in addition, many wild berries were procured and therefore perceived as cash crops, especially *Vaccinium oxycoccos* (Kalletal., 2020).

The five indirect factors that possibly affected LGK related to wild food plants are mainly behaviour related. The first involves the inability to establish a deep connection with the surrounding environment (and thus accessing wild resources) due to precautionary behaviour in Soviet territories (see also Prakofjewa et al. in preparation), and the second concerns the lack of time (most time was devoted to collective farm jobs and growing food for personal use; see also Pieroni and Sõukand (Pieroni & Sõukand, 2017). These two factors may have prevented the cooking of dishes based on wild plants and may have posed limitations on recipe complexity. Third, relocations disconnected people from their local food identity and possibly led to the homogenization of gastronomic knowledge by their adapting to new ingredients and customs. These relocations were as dramatic as mass deportations at the beginning of the Soviet regime (Sõukand, 2016) and, later, as mundane as the obligation of all university students to spend at least three years in a designated

workplace, which was often located in another territory far from their homeland (Kolosova et al., 2020). The fourth indirect factor is the stigmatization of the use of some wild food plants (*"Słuchaj, nu chto ž pirahi z travoj jeści? Smiešna čuć": "Listen, well, who eats pies with grass? Funny to hear"*) [Lithuanian woman, Belarus, 82 years old]. The fifth factor involves the "sudden" availability of specific foods (like industrially produced canned preserves, sweets, and cheap and abundant bread) which were promoted as modern Soviet cuisine and previously not present in the area. While a similar process of LEK erosion was caused by industrialization in capitalist economies, there were some peculiarities. Soviet propaganda also worked to show that "old-style food" was not proper and not Soviet (by disconnecting people from traditional cuisine they also lose their identity). For example, the traditional Hutsul corn dish made with wild mushrooms called Banosh was not considered proper for Soviet workers (Braichenko, 2017).

4. Discussion

Our results suggest three main findings.

1. The Jaccard Similarity Index reveals that the greatest similarity of use of wild food plants is among the groups living in Russian Karelia and Russian Setomaa, and in Finland.
2. The analysis of wild food plant-based dishes reveals a higher proportion of simple preparations based on wild food plants in post-Soviet territories than in adjacent countries.
3. The analysis of distinct wild plant-based foods (DF) reveals a low number of wild plant-based DF that are mainly retained by non-Soviet countries or those that refer to past uses (of culturally and linguistically distinct communities) in post-Soviet contexts.

Before discussing those results, we want to mention two caveats. First, because of the complex cultural, linguistic, and historical context of the study area, for the purpose of comparison, we applied etic and general categorizations to foods and their level of simplicity/complexity. Despite our efforts to keep the categorization as impartial as possible, this might have impacted the results. Second, the distribution of our interviews was uneven between the two compared groups, which may also have affected the results. However, to avoid biased results we considered them as proportional in our analysis. Finally, we want to highlight, as a limitation, the fact that pre-Soviet ethnobotanical literature is not available for our study areas, and thus an accurate and definitive diachronic analysis could not be performed.

4.1. Wild food plant preparation homogenization in the Russian Federation and Finland

The combinations of wild food plant taxa and their uses (recipe) were found to be most similar among the inhabitants of present-day Russia. We argue that, lying in the heart of the Soviet Union, homogenization in the use of wild food plants may have been more pronounced in this territory. Nevertheless, the results also showed a high similarity between Finns and Karelians living in Finland. As we argue in a forthcoming paper (Mattalia et al.), Finland has experienced major internal migrations that resulted in a homogenization of food-related practices.

4.2. Soviet simplicity of preparation of wild food plants

Wild food plants mentioned in post-Soviet contexts are often driven by the simplicity of preparation for which little time and technology, as well as few widely available ingredients, are needed. Indeed, we recorded mainly staple foods (soups) and basic recipes (e.g. jams that can be easily transformed into a drink when mixed with hot water, which produces "mors").

On the plant taxa level, *Vaccinium oxycoccos*, *Vaccinium vitis-idaea*, and *Sorbus aucuparia* L. were frequently mentioned by our interviewees. However, on closer examination, they were not only widely available species and potentially economically interesting, but also specifically promoted in books and often associated with a specific "collective" practice during the Soviet era (Bexultanova et al., 2022).

On the preparation level, our findings show that three simple consumption modes of wild food plants – snacks, jams, and recreational teas – dominated the post-Soviet foodscape. Snacks, as fleeting on-the-spot foods, represented important micronutrient sources especially in times of food scarcity. Jams are a simple way of preserving fruits for wintertime as they require only sugar, which was generally available during the Soviet period, and they had an important role after the collapse of the Soviet Union. Recreational teas were promoted as substitutes for tea (*Camellia sinensis* (L.) Kuntze) especially in times of shortages and later as a healthier drink (Kalle et al., 2020). Another notable substitution drink is (fermented or fresh) tree sap, which is a peculiar case as the use of *Betula* and *Acer* L. saps is traditional for the Baltic States and the whole of northern Europe (Svanberg et al., 2012). However, in the Baltic countries, for example, the industrial production of sap (which was harvested by state forestry enterprises and sold in retail shops) was perceived as an alternative to "Western" beverages, which were scarcely available.

The analysis of gastronomic preparations also found that found wild food plant use outside the former territories of the Soviet Union contained a higher proportion of more elaborate recipes. This could be due to the fact that, in

contrast, more complex recipes of several postSov contexts seem to favour cultivated plants (e.g. pies with cabbage, apples, etc.) (Nikol'skaia, 1986).

4.3. Distinct foods mainly retained by non-Soviet countries and possible factors affecting LEK

Post-Soviet countries have retained a lower number of DF (mainly related to the past), which might suggest that there are not many regional specialities related to wild food plants. Also, we identified *Prunus cornuta* and *Vaccinium oxycoccos* as common in three postSov case studies (Estonia and both Russian sites). This similarity may be due to the effect of homogenization and standardization promoted during the time of the Soviet Union in the gastronomic sector as well (Geist, 2012). For instance, in the post-war period, the already existing traditional use of *Prunus cornuta* was frequently promoted as a snack, and also as an additive to pies, kissel, and strong alcoholic drinks, in Soviet wild food plant books (Rybitskiy & Gavrilov, 1969; Verzilin, 1953; Zuyev, 1988). The wide variety of traditional uses of *Vaccinium oxycoccos* was promoted in written sources on wild food plants during the Soviet era as well (Koscheev, 1981; Rybitskiy & Gavrilov, 1969; Zuyev, 1988). In addition, *V. oxycoccos* was one of the best "cash crops" procured by the Soviet cooperative system (Kalleet al., 2020). Indeed, political centralization through the central and planned management of the territories occupied by the Soviet Union, and the lives of millions of people living there, may have had a strong effect on LGK. *Chenopodium album* L. was used during the Holodomor famine and was perceived as a "famine food'' afterwards. Even though there were old recipes that used *Chenopodium album*, it was viewed as poor people's food or a symptom of food scarcity.

The authoritarian policies implemented by the Soviet Union also likely impacted several other aspects of LGK and, more generally, LEK. First, the ecology of wild food plants was changed through amelioration, collectivization, and other policy-guided processes impacting rural landscapes (e.g. planned deforestation/reforestation affects the presence and amount of forest berries) (Sayadyan & Moreno-Sanchez, 2006). Second, languages and cultures of the USSR were intentionally homogenized by transforming the local cultures (Hirsch, 2014). Third, the authoritarian regime of the Soviet Union likely impacted the social-economic context by imposing activities and time management, for example, rationalized work and leisure activities (Hanson, 1997) which limited freedom to access to the wild resources and experiment with recipes (yet some exceptions applied) (Pirogovskaya, 2017). All these factors may have resulted in the lower diversity of LGK preserved in the collective memory of minority groups in postSov countries.

The erosion of wild food plant-based LGK through homogenization endangers local food security. This should especially be considered at the present time, when we are witnessing territorial and cultural aggressions that cause a disconnectedness between people and their environment (e.g. through internal and international migrations, landscape devastation, and the potential risk associated with foraging and agricultural activities as a result of landmines and aerial attacks) (Stryamets et al., 2022) resulting in not only (short-term) food insecurity (at both the local and global level) (Behnassi & El Haiba, 2022) but also possibly irreversible erosion of LEK and LGK which may have long-term effects on local food availability (Stryamets et al., 2021).

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Data availability statement

Full datasets are available upon reasonable request and will be soon published as required by the grant agreement.

Code availability

The "fisher.test" function, available in the base distribution of R, was used to compute the p-values of the Fisher tests in the Data Analysis Section.

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