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Wild Edible Greens Heritage in Western Crete and Its Resilience Across Greek Islands: The Role of Small-Scale Farming, Biodiversity, and Isolation

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Abstract

Background

Chorta (wild greens) is one of the most distinctive and resilient elements of the Greek, and particularly Cretan, Mediterranean Diet. However, the associated local ecological knowledge (LEK) is under increasing pressure across Greece. We report an ethnobotanical survey conducted in May 2026 in seven villages of the Chania prefecture (western Crete), documenting 38 botanical taxa used as wild vegetables by local communities.

Methods

Combining this new dataset with published ethnobotanical data from six additional Greek islands (central and eastern Crete, Corfu, Karpathos, Ikaria, Syros, and Kasos), we test whether inter-island variation in *chorta* LEK richness is associated with plant biodiversity, phytogeographical isolation (approximated by endemic flora), or socioeconomic structure.

Results

Across island and subregional units, the proportion of the workforce engaged in small-scale farming showed the strongest and only statistically significant association with chorta LEK richness ($r = 0.839$, $p = 0.037$), compared with total vascular plant species richness ($r = 0.767$, $p = 0.075$) and endemic plant richness ($r = 0.610$, $p = 0.198$), which were not statistically significant. These results suggest that variation in chorta LEK richness is more closely associated with socioeconomic structure than with floristic diversity alone, although inference is limited by the small number of analytical units. Comparative evidence from islands experiencing agricultural decline (e.g., Corfu) and near-collapse of foraging systems (e.g., Kasos) is consistent with this pattern.

Conclusion

Overall, the findings highlight the importance of small-scale farming systems in sustaining biocultural heritage associated with wild food plants. Policies that integrate support for agroecological livelihoods and the transmission of food knowledge may therefore be important for the long-term persistence of chorta-related LEK.

Introduction

The Mediterranean Diet (MD), recognised by UNESCO as an Intangible Cultural Heritage of Humanity, has long been celebrated for its health-promoting properties and strong reliance on plant-based foods [1, 2]. Within this dietary system, chorta (χόρτα), the practice of gathering, preparing, and consuming wild

vegetables and edible weeds, represents a less visible yet ecologically and culturally significant component [3]. Chorta includes dozens of wild plant taxa, primarily bitter Asteraceae and pungent Brassicaceae, typically consumed boiled (vrasta) with lemon and olive oil, fried (tsigaristo), or used as fillings for pies (chortopita, kalitsounia) and salads.

Although deeply rooted in historical practices documented across Greece [4] and early ethnobotanical work in Corfu [5], the local ecological knowledge (LEK) underpinning chorta practices is declining, particularly among younger generations [3]. Recent ethnobotanical research conducted by our group has documented chorta traditions across several Greek islands, including central Crete [3], the Lasithi Plateau in eastern Crete [6], Ikaria [7], Karpathos [8], Corfu [9], and Kasos [10]. Collectively, these studies reveal marked inter-island variation in the richness and vitality of chorta-related LEK. Despite numerous ethnobotanical studies documenting chorta across Greece, no study has tested whether inter-island variation in LEK is better explained by biodiversity or by socioeconomic structure.

Two non-exclusive hypotheses may explain this variation in LEK richness. The first is a biodiversity hypothesis, which proposes that islands with higher plant species richness or greater endemism provide a broader ecological repertoire for chorta practices, thereby supporting more diverse and persistent LEK systems. This view is consistent with evidence from other regions suggesting that biodiversity can structure patterns of plant use [11]. The second is a socioeconomic hypothesis, which posits that LEK persistence depends primarily on the proportion of the population engaged in small-scale farming. Such livelihoods maintain daily interaction with landscapes, wild resources, and intergenerational knowledge transmission that sustains chorta practices. Supporting this perspective, [10] reported that on Kasos, despite relatively intact biodiversity, chorta LEK has largely disappeared, a pattern consistent with what [12] describe as “cultural extinction,” the loss of knowledge prior to biodiversity loss.

The Greek islands provide a near-ideal natural laboratory for testing these hypotheses, as they vary widely in area, plant species richness, biogeographic isolation, endemic flora, and socioeconomic structure. Using a comparative dataset across six Greek islands, we integrate ethnobotanical, ecological, and socioeconomic variables to evaluate the relative explanatory power of biodiversity and livelihood structure in shaping chorta LEK diversity.

In this paper, we (i) present new ethnobotanical data on chorta practices from villages in the Chania prefecture (western Crete), collected in May 2026; (ii) conduct a comparative island-level analysis testing biodiversity versus socioeconomic drivers of LEK variation; and (iii) discuss the implications for the conservation of chorta knowledge and the broader biocultural heritage of the Mediterranean Diet, with particular attention to strategies supporting LEK resilience.

Study area and methods

Western Crete field survey (May 2026)

The ethnobotanical field survey was conducted in May 2026 in the Chania prefecture, western Crete. The study area included lowland and mid-altitude rural villages (Fig. 1), as well as the weekly farmers' market in the city of Chania. The landscape is dominated by olive groves and citrus orchards in lowland areas, transitioning to sheep-herding and pastoral systems at higher elevations, such as the Omalos Plateau (~ 1,000 m a.s.l.).

Twenty-five participants (15 women and 10 men; age range: 34–79 years; mean age: 64) were recruited through snowball sampling, with a focus on rural farmers, shepherds, and elderly women, identified as key holders of chorta local ecological knowledge (LEK). Semi-structured interviews were conducted in Greek and English. For each reported taxon, local names, plant parts used, and modes of preparation were recorded.

Botanical identification was based on voucher specimens collected during a previous field campaign in Crete [3]. Plant nomenclature follows the Plants of the World Online database [13]. The study complied with the International Society of Ethnobiology Code of Ethics.

Comparative inter-island analysis

To test the biodiversity and socioeconomic hypotheses, we compiled a comparative dataset covering six Greek islands and three Crete subregional units for which ethnobotanical data on chorta were available. Crete was treated as three independent analytical units to account for internal ecological and cultural heterogeneity and to avoid bias arising from uneven sampling effort: western Crete (this study), central Crete [3]; 31 interviews, 55 genera), and the Lasithi Plateau [6] (31 interviews, 59 genera).

For Corfu, data were obtained from [14], documenting 37 genera (42 interviews). For Karpathos, we used [8]; 42 interviews, 69 genera, Olympos community. For Ikaria, we used [7]; 31 interviews, 56 genera. For Syros, a historical ethnobotanical dataset was included, representing a legacy snapshot of chorta knowledge. As comparable historical socioeconomic data are not available, this unit was included in the dataset but interpreted with caution in the comparative analysis. For Kasos, we used [10], which documented severely reduced foraging LEK associated with near-complete depopulation and land abandonment.

Statistical analysis

To evaluate relationships between chorta local ecological knowledge (LEK) richness and the selected explanatory variables, we first conducted pairwise Pearson correlation analyses between LEK richness (number of recorded plant genera) and (i) total vascular plant species richness, (ii) number of endemic plant taxa, and (iii) the percentage of the workforce engaged in farming. Correlation coefficients (r), coefficients of determination (R^2), and associated p-values were calculated across island and subregional units.

To further evaluate the combined effects of biodiversity and socioeconomic structure, we fitted a multiple linear regression model with LEK richness as the response variable and farming workforce percentage, vascular plant species richness, and endemic plant richness as explanatory variables. The model was specified as:

$$\text{LEK richness} = \beta_0 + \beta_1 (\text{farming workforce}) + \beta_2 (\text{vascular plant species richness}) + \beta_3 (\text{endemic taxa}) + \varepsilon$$

where LEK richness represents the number of recorded plant genera per island or subregional unit.

Model assumptions, including linearity, normality of residuals, and homoscedasticity, were evaluated using standard diagnostic plots. Model performance was assessed using the coefficient of determination (R^2) and adjusted R^2. Regression coefficients (β), 95% confidence intervals (95% CI), and associated *p*-values were used to evaluate the contribution of each explanatory variable. Multicollinearity among predictors was assessed using variance inflation factors (VIF), with VIF values below 5 considered indicative of acceptable collinearity. Because of the limited number of analytical units, the multiple regression analysis was interpreted as exploratory and hypothesis-generating rather than confirmatory and was used primarily to assess the relative importance of the proposed explanatory variables. All statistical analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).

Results

Chorta in the Chania area, western Crete

The botanical spectrum of chorta in the Chania area follows patterns previously documented in central and eastern Crete [3, 6]. Among the 37 taxa documented in Table 1, Asteraceae are the most represented family, with 12 genera, reflecting the cultural importance of bitter-tasting *vrasta*; Apiaceae genera, above all *Foeniculum*, *Scandix*, *Pimpinella*, and *Tordylium*, are essential for pies. Market availability of numerous taxa confirms that *chorta* in the Chania area remains both a self-foraged ingredient and an actively traded commodity.

Table 1

Wild vegetables (*Chorta*) documented in the Chania prefecture, western Crete (May 2026). Botanical names follow [13]. Arranged alphabetically by genus.

Botanical taxon and family	Local name(s)	Plant part	Quoted culinary home preparations	Local market availability	Quotation frequency
Allium ampeloprasum L. (Amaryllidaceae)	Agriopraso	Whole plant	Fried/pie	No	Medium
Amaranthus retroflexus L. (Amaranthaceae)	Agriovlito	Young aerial parts	Boiled	No	Medium
Anchusa azurea Mill. (Boraginaceae)	Agoglosi	Young aerial parts	Boiled	No	Low
Asparagus aphyllus subsp. *orientalis* (Asparagaceae)	Asfaragia	Young shoots	Boiled / Omelette	Yes	High
Beta vulgaris L. (Amaranthaceae)	Pazi	Leaves	Boiled / Pie / Dolma	Yes	Low
Capparis spinosa L. (Capparaceae)	Petrokapies	Flower buds and young shoots	Pickled	No	Medium
Cichorium spinosum L. (Asteraceae)	Stamnagathi	Whorls	Raw salad / Boiled	Yes	High
Crithmum maritimum L. (Apiaceae)	Kartamo	Young aerial parts	Pickled	Yes	Low
Crepis vesicaria L. and other *Crepis* spp. (Asteraceae)	Agrioradiko	Whorls	Boiled	Yes	High
Cynara cornigera Lindl. (Asteraceae)	Agriaginara	Young stems, receptacle	Raw / Cooked with meat	Yes	Low
Daucus carota L. (Apiaceae)	Stafilinikas	Young aerial parts	Boiled	Yes	Medium
Dioscorea communis (L.) Caddick & Wilkin (Dioscoreaceae)	Avronies	Young shoots	Boiled / Omelette	No	Medium
Eruca vesicaria (L.) Cav. (Brassicaceae)	Rocha	Leaves	Raw salad	No	Low

† Frequency: High = quoted by ≥ 40% of participants; Medium = quoted by 10–39%of participants; Low = 2 or less study participants

Botanical taxon and family	Local name(s)	Plant part	Quoted culinary home preparations	Local market availability	Quotation frequency
Foeniculum vulgare Mill. (Apiaceae)	Maratho	Leaves	Fried/pie	Yes	High
Helminthotheca echioides (L.) Holub (Asteraceae)	Xiromurida	Young aerial parts	Boiled	Yes	Medium
Hirschfeldia incana (L.) Lagr.-Foss. (Brassicaceae)	Vrouves	Young aerial parts	Boiled / Pie	Yes	High
Hypochaeris radicata L. (Asteraceae)	Pachakia	Young whorls	Boiled	Yes	High
Lactuca serriola L. (Asteraceae)	Agriomarula	Young leaves	Boiled	No	Low
Leopoldia comosa (L.) Parl. (Asparagaceae)	Askordulakus	Bulbs	Cooked / Pickled	Yes	Low
Limonium sinuatum (L.) Mill. (Plumbaginaceae)	Provatsa	Young whorls	Boiled	Yes	High
Onopordum tauricum Willd. (Asteraceae)	Agriaginara	Young stems	Cooked	No	Low
Oxalis pes-caprae L. (Oxalidaceae)	Xino	Leaves	Raw salad	No	Low
Papaver rhoeas L. (Papaveraceae)	Paparuna	Young stems, leaves	Boiled / With meat	Yes	High
Petromarula pinnata (L.) A.DC. (Campanulaceae)	Marulida	Young leaves	Raw salad / Boiled	No	Low
Petroselinum macedonicum (Nyman) Halácsy (Apiaceae)	Agrioselino	Young leaves	Seasoning	No	Low
Portulaca oleracea L. (Portulacaceae)	Glistrida	Aerial parts	Raw salad	Yes	High
Reichardia picroides (L.) Roth (Asteraceae)	Galatsida	Aerial parts	Raw salad / Boiled	Yes	Medium

† Frequency: High = quoted by ≥ 40% of participants; Medium = quoted by 10–39%of participants; Low = 2 or less study participants

Botanical taxon and family	Local name(s)	Plant part	Quoted culinary home preparations	Local market availability	Quotation frequency
Rumex conglomeratus Murray (Polygonaceae)	Lapatha	Leaves	Boiled / Pie / Dolma	No	Low
Scandix pecten-veneris L. (Apiaceae)	Ahatsikas, Mironi	Young aerial parts	Fried/pie	No	Low
Scolymus hispanicus L. (Asteraceae)	Askolimbrus	Young aerial parts, root	Cooked with eggs/meat	Yes	Low
Silene vulgaris (Moench) Garcke (Caryophyllaceae)	Strufulia	Young shoots	Boiled	No	Low
Sinapis arvensis L. (Brassicaceae)	Lapsanides	Young aerial parts	Boiled	Yes	Low
Solanum nigrum L. (Solanaceae)	Stifnos	Leaves	Boiled	Yes	Medium
Sonchus oleraceus L. (Asteraceae)	Zocha	Young aerial parts	Boiled	Yes	High
Taraxacum hellenicum Dahlst. (Asteraceae)	Agriomarulo	Young whorls	Boiled	No	Low
Tordylium apulum L. (Apiaceae)	Karfalithra	Young aerial parts	Fried/pie	Yes	High
Tragopogon porrifolius L. (Asteraceae)	—	Young shoots	Boiled	No	Low

† Frequency: High = quoted by ≥ 40% of participants; Medium = quoted by 10–39%of participants; Low = 2 or less study participants

A distinctive taxon in western Crete is represented by the young, floral shoots of *Hypochaeris radicata*, which are gathered and consumed in a manner analogous to wild asparagus (*Asparagus aphyllus*) or *Dioscorea communis* shoots boiled briefly and served with olive oil and lemon and regarded with particular local appreciation for their mildly bitter taste (Fig. 2).

What drives chorta LEK richness across Greek islands? A comparative analysis

Figures 3a-3c present scatter plots illustrating the relationships between chorta LEK richness, operationalised as the number of botanical genera documented per island, and three candidate

explanatory variables across six Greek islands (Crete, Corfu, Ikaria, Karpathos, Syros, and Kasos).

The first panel shows a moderate positive association between LEK richness and total vascular plant species richness ($r = 0.767$, $R^2 = 0.588$, $p = 0.075$). However, variability around the fitted relationship indicates considerable heterogeneity among islands. In particular, some islands deviate from the general trend, suggesting that plant species richness alone does not fully account for observed variation in LEK richness.

Figure 3a. Total vascular plant species richness vs. *chorta* genera (LEK richness) across six Greek islands ($r = 0.767$, $R^2 = 0.588$, $p = 0.075$†).

The second panel shows a weaker and non-significant relationship between LEK richness and endemic plant richness ($r = 0.610$, $R^2 = 0.372$, $p = 0.198$). Most islands cluster within a narrow range of endemic taxa, with substantial variation in LEK richness occurring independently of endemism levels, indicating a limited explanatory role for this variable in the present dataset.

The third panel shows the strongest association between LEK richness and the proportion of the workforce engaged in farming ($r = 0.839$, $R^2 = 0.704$, $p = 0.037$), which is the only statistically significant relationship among the three tested predictors.

Combined effects of biodiversity and socioeconomic structure on chorta LEK richness

A multiple linear regression model was used to evaluate the joint effects of biodiversity (vascular plant species richness and number of endemic taxa) and socioeconomic structure (percentage of workforce engaged in farming) on chorta LEK richness across island and subregional units.

A multiple linear regression model was used to evaluate the joint effects of biodiversity (vascular plant species richness and endemic taxa richness) and socioeconomic structure (percentage of the workforce engaged in farming) on chorta LEK richness across island and subregional units.

The overall model explained 81% of the variation in LEK richness ($R^2 = 0.81$; adjusted $R^2 = 0.68$). Among the three explanatory variables, the proportion of the workforce engaged in farming showed the strongest positive association with LEK richness ($\beta = 1.82$, 95% CI = 0.28–3.36, $p = 0.039$). In contrast, vascular plant richness ($\beta = 0.012$, $p = 0.29$) and endemic plant richness ($\beta = -0.041$, $p = 0.56$) showed weaker and statistically non-significant associations.

Variance inflation factors ranged from 1.8 to 2.4, indicating no evidence of problematic multicollinearity among predictors. Overall, the regression results were consistent with the pairwise correlation analyses, suggesting that socioeconomic structure explained a greater proportion of variation in chorta LEK richness than the biodiversity variables considered. Given the limited number of analytical units, these findings should be interpreted as exploratory and hypothesis-generating rather than confirmatory.

Cross-island contrasts and structural patterns

The contrast between Corfu and Karpathos-Ikaria illustrates differences in the relationships between chorta LEK richness and the examined predictors. All three islands show broadly similar levels of LEK richness (~ 24–37 genera). However, Corfu is characterised by a substantially lower proportion of the workforce engaged in farming (~ 5%), while Karpathos and Ikaria retain higher values (~ 9–10%) [7, 8].

From a biodiversity perspective, these islands differ substantially in total vascular plant richness, yet display similar LEK levels, suggesting limited correspondence between floristic diversity and ethnobotanical knowledge in this subset. In contrast, LEK richness appears more closely aligned with similarities in farming structure across Karpathos and Ikaria.

Independent longitudinal evidence from Corfu indicates a decline in chorta LEK richness over the past 50 years (from 47 to 37 genera), associated with shifts in occupational structure from farming to tourism-related activities [9]. While this provides contextual support for a link between socioeconomic change and LEK reduction, the relationship remains correlational. At the lower extreme, Kasos represents a case of severely reduced LEK despite relatively preserved biodiversity, consistent with descriptions of cultural knowledge loss under conditions of depopulation and agricultural abandonment [13, 10]. Crete represents the upper range of all variables, combining high floristic richness, high endemicity, higher farming participation (~ 22%), and the highest recorded chorta LEK richness (~ 38 genera). Kasos occupies the opposite end of the gradient across variables. These patterns are consistent with all examined models; however, the greatest divergence among explanatory variables is observed among intermediate islands, where socioeconomic structure shows comparatively stronger alignment with LEK variation than biodiversity indicators.

Discussion

Small-scale farming as a key correlate of chorta LEK: mechanisms and interpretation

The stronger observed association between chorta LEK richness and the proportion of the workforce engaged in farming, compared with biodiversity metrics, suggests a socio-ecological coupling between livelihood structure and knowledge persistence, although causal inference is limited by the small number of analytical units. This interpretation aligns with agroecological perspectives that small-scale farming systems function as coupled social-ecological systems in which biodiversity, practices, and knowledge co-evolve [16, 17, 18]. Within this framework, chorta-related knowledge is closely linked to everyday engagement with agro-pastoral landscapes.

In small-scale farming contexts, particularly in mixed olive-vine-pastoral systems, individuals maintain frequent contact with field margins, fallows, and semi-natural habitats where many chorta taxa occur. This repeated engagement supports detailed ecological familiarity, including plant recognition across

phenological stages and seasonal tracking of edible species. In this sense, floristic richness defines the potential pool of useful species, while farming activity appears more closely related to the extent to which this potential is realised as knowledge.

The dominant chorta taxa documented across islands largely correspond to weedy or disturbance-associated species (e.g., Asteraceae, Apiaceae, Brassicaceae), which are themselves shaped by agricultural practices. This supports the view that farmland biodiversity and associated ethnobotanical knowledge are interdependent rather than independent variables [16, 19].

Transmission of chorta knowledge occurs primarily through informal household-based learning, often involving intergenerational participation in foraging and cooking. In farming households, children acquire plant knowledge through practice rather than formal instruction. Where farming livelihoods decline due to out-migration, occupational change, or tourism-driven restructuring, these daily learning contexts become less frequent, weakening transmission pathways. While wild plants may remain present in the landscape, the associated knowledge of identification and use may no longer be maintained.

Market systems can partially sustain access to chorta, as observed in western Crete and other Greek regions, but they represent a more limited form of knowledge transmission. Consumers may recognise and consume prepared greens without acquiring the ecological knowledge required for foraging. This distinction may help explain observed differences such as those documented in Corfu, where market availability persists despite reported declines in LEK [9].

At a biogeographical level, many Greek island endemic plants are restricted to habitats (e.g., rocky cliffs, high-altitude zones) that are less relevant for everyday foraging. In contrast, chorta LEK is primarily associated with agro-ecological “weed floras” that are maintained through human land use. This reinforces the interpretation that the most relevant biodiversity for chorta knowledge is not endemism per se, but vegetation shaped by agricultural disturbance regimes.

Taken together, these patterns suggest that chorta LEK is closely embedded within agro-pastoral livelihoods, and may weaken where such livelihoods are reduced, although the present analysis remains correlational in nature. However, given the limited sample size and correlational design, these patterns should be interpreted as indicative relationships that require further testing with larger and more standardized datasets.

LEK erosion and rural socio-demographic change in Greece

The observed variation in chorta LEK across Greek islands should be interpreted within broader rural demographic and economic transformations. Since the mid-20th century, rural outmigration has significantly reduced agricultural populations in Greece, particularly in island regions [20]. In many cases, tourism and service-based economies have replaced small-scale farming as dominant livelihoods.

In Corfu, for example, a reduction in farming activity has been accompanied by a reported decline in chorta LEK over recent decades [9]. This pattern suggests a decoupling between floristic availability and

knowledge systems. By contrast, islands where farming remains relatively more present, such as Karpathos and Ikaria, show comparatively higher levels of LEK.

Chorta knowledge is embedded in everyday food practices and is transmitted through repeated participation in foraging, preparation, and consumption. When these practices diminish, transmission pathways may weaken [21,22]. The case of Crete suggests that where elements of small-scale farming persist, LEK can remain relatively robust even under increasing tourism pressure.

Broader dietary transitions further contextualise these changes. Evidence indicates declining adherence to the Mediterranean Diet in Greece and other Mediterranean countries [23,24], alongside increasing consumption of ultra-processed foods [25]. Within this transition, wild vegetables such as chorta are among the first elements to decline in daily diets due to reduced familiarity, preparation time, and intergenerational transmission. This dietary shift also has potential public health implications, as wild greens contribute bioactive compounds associated with cardiometabolic health benefits [2,7]. Addressing the decline of chorta therefore intersects with both cultural and nutritional dimensions of food systems.

Implications for conservation and agroecological policy

The results suggest that maintaining chorta LEK is not solely a matter of biodiversity conservation but is closely linked to the viability of small-scale farming systems. Conservation approaches focusing exclusively on species protection may therefore be insufficient to sustain associated knowledge systems.

Policy measures under the European Common Agricultural Policy (CAP) and national agri-environment schemes could support small-scale mixed farming systems in island and marginal rural areas. Such systems contribute not only to agricultural production but also to the maintenance of heterogeneous landscapes that support wild edible plant diversity.

Educational interventions may also be important. Introducing experiential learning on wild food plants in primary education could help address the current gap in intergenerational transmission. Field-based activities co-designed with local knowledge holders may support familiarity with local species and traditional preparation practices.

Emerging interest in food heritage and foraging-based tourism may offer additional opportunities for supporting rural livelihoods, provided that such activities remain community-led and avoid commodification that disconnects knowledge from practice [26, 27]. Community festivals and local culinary traditions, such as those documented in Ikaria and Karpathos, may serve as models for integrating cultural continuity with sustainable economic activity.

Finally, systematic documentation of chorta species, uses, and local names remains important for both scientific and cultural reasons, particularly in contexts where knowledge loss is ongoing.

Limitations and future directions

This study is limited by the small number of analytical units (n ≈ 8–9) and by heterogeneity in ethnobotanical datasets, including differences in sampling design, interview numbers, and temporal coverage. As such, the statistical relationships reported should be interpreted as exploratory and hypothesis-generating rather than definitive.

Future research would benefit from standardised, multi-island sampling protocols and the inclusion of household-level socioeconomic variables such as land tenure, generational structure, and gendered labour division. Additional environmental variables, including land-use intensity and vegetation structure, may also help clarify mechanisms underlying observed patterns.

The inclusion of western Crete expands existing ethnobotanical coverage within the island and highlights internal variation that may be relevant for understanding broader Mediterranean patterns of chorta knowledge distribution.

Conclusions

This study presents new ethnobotanical data on chorta from the Chania prefecture, western Crete (May 2026), and a comparative inter-island analysis of factors associated with variation in chorta local ecological knowledge (LEK) richness across six Greek islands. Across the dataset, the proportion of the workforce engaged in small-scale farming showed the strongest association with chorta LEK richness ($r = 0.839$, $p = 0.037$), compared with vascular plant richness ($p = 0.075$) and endemic plant richness ($p = 0.198$), which were not statistically significant.

Although based on a limited number of analytical units, these results suggest that socioeconomic structure may be more closely associated with variation in chorta LEK richness than floristic diversity alone. Comparative cases from Corfu, where LEK decline has been linked to changes in occupational structure, and Kasos, where LEK collapse occurred despite relatively preserved biodiversity, are consistent with this interpretation, although the relationships remain correlational.

Overall, the findings highlight that the persistence of chorta as a biocultural heritage system depends not only on biodiversity conservation but also on the maintenance of small-scale farming systems and associated knowledge transmission pathways. Policies integrating agroecological support, food heritage education, and community-based valorisation of traditional food practices may therefore contribute to sustaining this dimension of Mediterranean biocultural diversity.

Declarations

Authors contributions

M.A.: Conceptualisation, analysis, review; A.K.M.: Writing Review and Editing; I.U.: Fieldwork, Review; R.S.: Conceptualisation, Review. A. Pieroni: Design, Conceptualisation, Fieldwork, Data collection, Botanical identification, Analysis, First draft. All authors read and approved the final version of the manuscript.

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Data availability

The data that support the findings of this study are presented in the article.
Further inquiries can be directed to the corresponding author

Clinical trial number

Not applicable

Ethics approval and consent of participate

The study adhered to the International Society of Ethnobiology Code of Ethics: https://www.ethnobiology.net/wp-content/uploads/ISE-COE_Eng_rev_24Nov08.pdf.

(accessed on May 2026). Before conducting interviews, verbal informed consent was obtained from all participants. Participants were fully informed about the research purpose, methods, and their rights, including the right to withdraw from the study at any time.

Consent for publication

Verbal informed consent was obtained from all participants before interviews. Ethical approval was granted by the Ethics Committee of the University of Poellnzo (UNISG29042024).

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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References

1. Keys, A., 1980. *Seven Countries: A Multivariate Analysis of Death and Coronary Heart Disease*. Harvard University Press, Cambridge, MA.
2. Willett, W.C., et al., 1995. Mediterranean diet pyramid: a cultural model for healthy eating. *American Journal of Clinical Nutrition*, 61(6), 1402S–1406S.
3. Pieroni, A., Sulaiman, N., and Sõukand, R., 2022. Chorta (wild greens) in central Crete: The biocultural heritage of a hidden and resilient ingredient of the Mediterranean Diet. *Biology*, 11(5), 673. https://doi.org/103390/biology11050673
4. von Heldreich, T., 1862. *Die Nutzpflanzen Griechenlands*. Corinthos, Athens.
5. Sordinas, A., 1971. Wild plant gathering for subsistence on the island of Corfu, Greece. Memphis State University, Memphis
6. Alrhmoun, M., Sulaiman, N., Haq, S.M., Abidullah, S., Prakofjewa, J., Krigas, N., Pieroni, A., and Sõukand, R., 2024. Is boiling bitter greens a legacy of ancient Crete? Contemporary foraging in the Minoan refugium of the Lasithi Plateau. *Foods*, 13(22), 3588. https://doi.org/10.3390/foods13223588
7. Pieroni, A., Morini, G., Piochi, M., Sulaiman, N., Kalle, R., Haq, S.M., Devecchi, A., Franceschini, C., Zocchi, D.M., Migliavada, R., Prakofjewa, J., Sartori, M., Krigas, N., Ahmad, M., Torri, L., and Sõukand, R., 2023. Bitter is better: Wild greens used in the Blue Zone of Ikaria, Greece. *Nutrients*, 15(14), 3242. https://doi.org/10.3390/nu15143242
8. Pieroni, A., Sulaiman, N., Prakofjewa, J., Haq, S.M., Zocchi, D.M., Krigas, N., Chryssanthopoulou, V., and Sõukand, R., 2024. Isolated Mediterranean foraging: Wild greens in the matrifocal community of Olympos, Karpathos Island, Greece. *Journal of Ethnobiology and Ethnomedicine*, 20, 98. https://doi.org/10.1186/s13002-024-00733-5
9. Alrhmoun, M., Sulaiman, N., Ullah, I., Sõukand, R., and Pieroni, A., 2025. Biocultural diversity at risk amidst and beyond overtourism: The decline in wild green foraging in Corfu over the past 50 years. *Land*, 14(3), 654. https://doi.org/10.3390/land14030654
10. Sulaiman, N., Sõukand, R., Ullah, I., and Pieroni, A., 2026. Searching for a ghost?! The vain ethnobotany of foraging in three coastal Mediterranean areas. *Journal of Ethnobiology and Ethnomedicine*, 22, 15. https://doi.org/10.1186/s13002-026-00853-0
11. Martínez-Ballesté, A., Sõukand, R., Martorell, C., Flores-Camargo, D., Kalle, R., Prakofjewa, J., et al., 2026. Biodiversity drives the choice; linguistic diversity fine-tunes the direction: Ethnofloral megadiversity in Mexican ethnobotany. *PLOS ONE*, 21(6), e0347334. https://doi.org/10.1371/journal.pone.0347334
12. Turner, N.J., and Turner, K.L., 2008. Where our women used to get the food: cumulative effects and loss of ethnobotanical knowledge and practice. *Botany*, 86(2), 103–115.
13. Plants of the World Online (POWO), 2024. Facilitated by the Royal Botanic Gardens, Kew. Available at: www.plantsoftheworldonline.org (accessed May 2026).

14. Altieri, M.A., 1999. The ecological role of biodiversity in agroecosystems. *Agriculture, Ecosystems & Environment*, 74(1–3), 19–31.
15. Gliessman, S.R., 2015. *Agroecology: The Ecology of Sustainable Food Systems*, 3rd ed. CRC Press, Boca Raton.
16. Wezel, A., Bellon, S., Doré, T., Francis, C., Vallod, D., and David, C., 2009. Agroecology as a science, a movement and a practice. *Agronomy for Sustainable Development*, 29(4), 503–515.
17. Tscharntke, T., Clough, Y., Wanger, T.C., Jackson, L., Motzke, I., Perfecto, I., Vandermeer, J., and Whitbread, A., 2012. Global food security, biodiversity conservation and the future of agricultural intensification. *Biological Conservation*, 151(1), 53–59.
18. Kasimis, C., and Papadopoulos, A.G., 2005. The multifunctional role of migrants in the Greek countryside. *Journal of Ethnic and Migration Studies*, 31(1), 99–127.
19. Łuczaj, Ł., Pieroni, A., Tardío, J., Pardo-de-Santayana, M., Sõukand, R., Svanberg, I., and Kalle, R., 2012. Wild food plant use in 21st century Europe. *Acta Societatis Botanicorum Poloniae*, 81(4), 359–370.
20. Tardío, J., Pardo-de-Santayana, M., and Morales, R., 2006. Ethnobotanical review of wild edible plants in Spain. *Botanical Journal of the Linnean Society*, 152(1), 27–71.
21. Georgoulis, M., Georgousopoulou, E.N., Chrysohoou, C., Pitsavos, C., and Panagiotakos, D.B., 2022. Longitudinal trends, determinants, and cardiometabolic impact of adherence to the Mediterranean diet among Greek adults. *Foods*, 11(16), 2389. https://doi.org/10.3390/foods11162389
22. Charisis, S., et al., 2024. Drivers and barriers influencing adherence to the Mediterranean diet: a comparative study across five countries. *Nutrients*, 16(15), 2448.
23. Dinu, M., Asensi, M.T., Pagliai, G., Lotti, S., Martini, D., Colombini, B., and Sofi, F., 2022. Consumption of ultra-processed foods is inversely associated with adherence to the Mediterranean diet. *Nutrients*, 14(10), 2073. https://doi.org/10.3390/nu14102073
24. Milano, C., Novelli, M., and Cheer, J.M., 2019. Overtourism and tourismphobia: a journey through four decades of tourism development, planning and local concerns. *Tourism Planning & Development*, 16(4), 353–357. https://doi.org/10.1080/21568316.2019.1599604
25. Sarantakou, E., and Terkenli, T.S., 2019. Non-institutionalized forms of tourism accommodation and overtourism impacts on the landscape: the case of Santorini, Greece. *Tourism Planning & Development*, 16(4), 411–433. https://doi.org/10.1080/21568316.2019.1569122

Figures

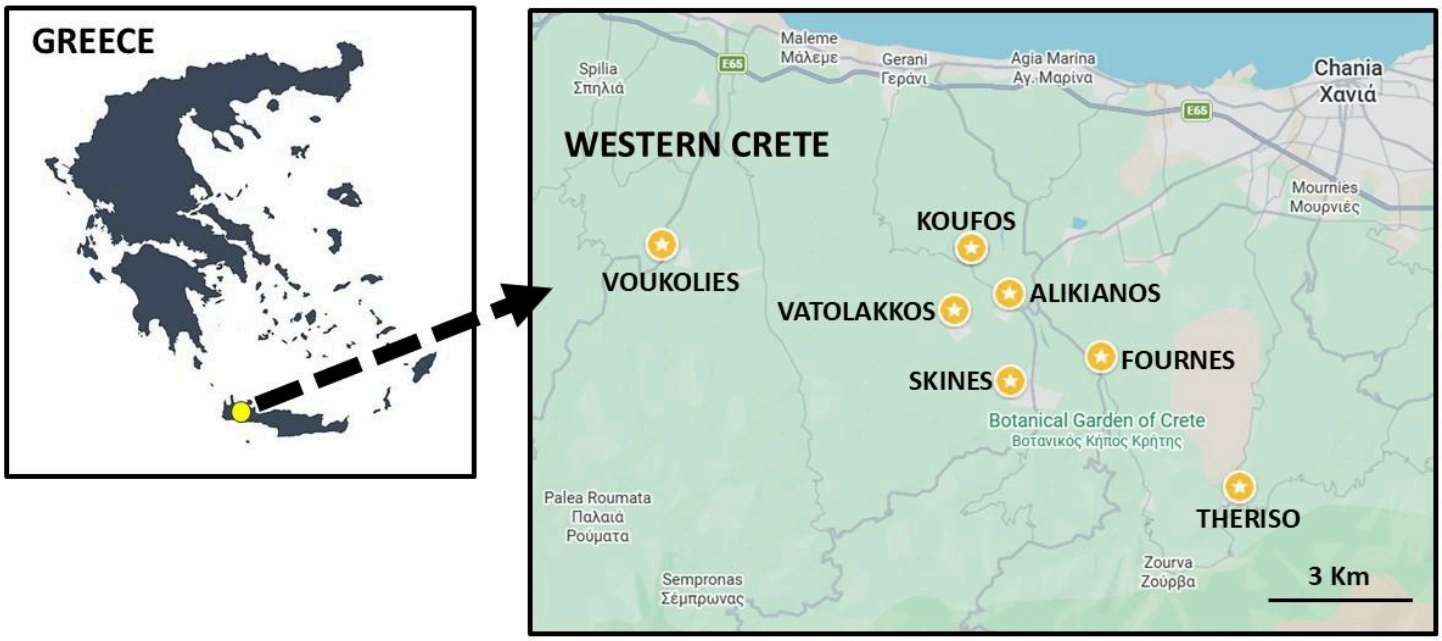


Figure 1

The field study area and the visited settlements in the Chania prefecture, western Crete (May 2026).



Figure 2

Hypochoeris radicata floral shoots sold in the weekly farmers’ market of Chania.

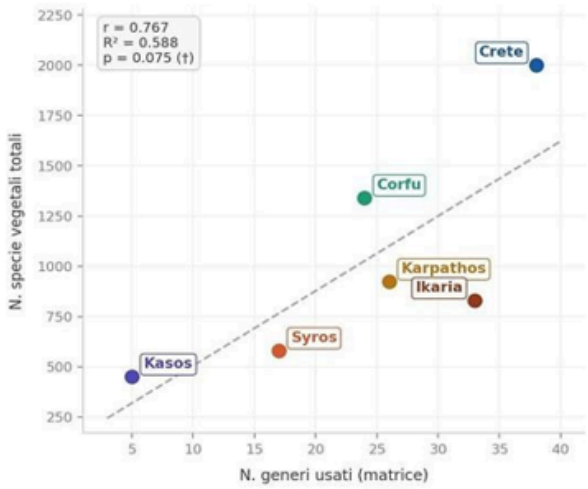


Fig. 3a.

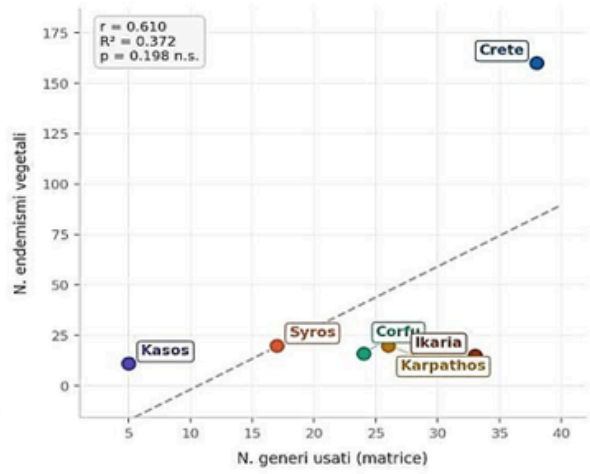


Fig. 3b.

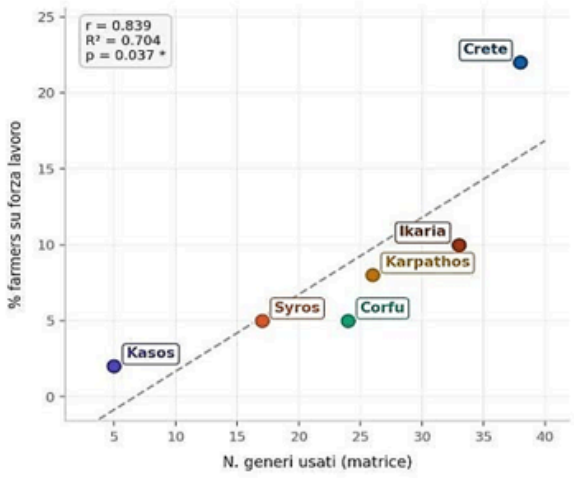


Fig. 3c.

Figure 3

Fig. 3a. Total vascular plant species richness vs. *chorta* genera (LEK richness) across six Greek islands (r = 0.767, R^2 = 0.588, p = 0.075†).

Fig. 3b. Number of endemic plant taxa vs. *chorta* genera (LEK richness) across six Greek islands (r = 0.610, R^2 = 0.372, p = 0.198).

Fig. 3c. Percentage of the workforce engaged in farming vs. *chorta* genera (LEK richness) across six Greek islands (r = 0.839, R^2 = 0.704, p = 0.037*).