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Research article

Heritage and carob trees: Where the monumental and landscape intersect

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Abstract: We aimed to explore the significance of monumental trees as elements of heritage and their role in interpreting landscapes. Monumental carob trees, characterized by their impressive size and long lifespan, serve as valuable sources of information for understanding the territories they inhabit and the human societies that have preserved them over time. Over the centuries, these carob trees narrate the tale of Mediterranean landscapes, akin to stone monuments, making them authentic natural and cultural treasures of the Mediterranean region. Our findings, based on fields observations in Sicily (Italy) and GIS analysis, suggested that the landscape is an enabling medium through which traditional culture is preserved, local identities are transferred, and rural heritage is acknowledged. We unfold a conception of landscape based on visual, inherited traditional agricultural practices, valued rural heritage, and territorial identity.

Keywords: heritage trees; GIS; Italy; visual landscape

1. Introduction

Heritage trees are long-lived trees or notable trees with great historical significance, scientific value, or commemorative importance [1]. Typically, heritage trees encompass trees that are at least 100 years old with noteworthy trees like friendship trees presented or planted by international leaders. They are natural resources created through the combined influences of time and geography [2]. Additionally, they

include commemorative and legendary trees featured in historical narratives and anecdotes at scenic films, and trees belonging to rare or endangered species that are officially recognized by the government. Heritage trees are also relevant rural and urban landscapes [1,2]. A good example of a traditional Sicilian landscape is in the Iblei area. Carob trees are considered a rural heritage landscape there. This highlights the potential value of agrobiodiversity and traditional local crops [3].

Carob trees encapsulate a millennia-old history and connect various realms of knowledge. Furthermore, carobs have significant cultural and aesthetic value. They embody folk traditions, myths, and legends, and their food products are integral to both animal and human diet. These trees and their landscapes have inspired literature and art. This influence has sparked discussions on sustainability [4], and the value of reconnecting humans with trees, culture, and nature positively contributing to well-being [5], looking not only at the present but also towards the future of local communities.

We explore how conceptions of heritage trees are actual and relevant for the heritage landscape of local communities and territories. While most researchers focus on landscape, few present insights or understandings of heritage trees linked to the landscape. We apply a GIS analysis to field observations of carob trees in Sicily, in southern Italy. Specifically, ancient trees, including carob trees, are at the core of landscapes and local heritage, making their impact relevant to development. This includes activities such as rural tourism, wellness, and agriculture.

After establishing a theoretical framework on the characteristics of heritage trees, based on the literature review of previous studies, we made a map of the monumental carob trees in Sicily. We identify key contributions of using maps to study carob heritage trees. Monumental carob trees are found on agro-sylvo-pastoral land, not in forests. Changing economic land use has reduced tree numbers and led to the loss of many monumental specimens. Our map shows carob tree concentrations and highlights the need for protection and enhancement efforts to consider agricultural activity. To address our research question, the region of Sicily, was used as case study [6], where the cultivation of carob is a popular example of characteristic and cultural rural landscapes.

1.1. Literature review: Heritage, landscape, and heritage tree

Heritage is not a tangible entity awaiting discovery or identification; instead, it is more appropriately viewed as formed and built, simultaneously shaping and being shaped [7]. Heritage is consistently "the past in the present" or, in simpler terms, "the present past" [8]. Nevertheless, according to [7], contemporary discussions about heritage should establish connections between the current and historical periods, as well as between local and global perspectives. From the perspective of critical heritage studies, heritage has permeated nearly every aspect of our lives, becoming a significant means by which people worldwide attribute value and express care for special objects, places, and practices where the "inevitability of loss, the politics of loss, and the potential in loss have significant implications" [9]. This idea of heritage as a series of contingent and emerging ways of caring for, valuing, and ethically considering the future remains valuable [10]. These discussions function as tools for creating meaning, allowing us to connect with the past and reconsider the present. Originating from local and historical contexts, they remain relevant and comprehensible to both the contemporary local audience and the globalized world. Across the globe, various cultural discussions about heritage encompass diverse subjects, classifications, interpretations, viewpoints, assessments, and more [11]. The concept embraces ideas of belonging, outstanding, significance, culture, value and singularity of place or products, etc [12].

Heritage trees are relevant rural and urban landscapes. It's note, as confirm [13], that our contemporary sense of landscape beauty could owe as much to proximal tree form as to the distal arrangement of landscape features. The past updates the present and vice versa, as well as "whatever we remember, and the manner in which we remember, we get a different past, a different sense of place, and a different landscape every time" [8].

Landscape studies encompass a broad spectrum, including theoretical and methodological aspects, as well as ecological, social, cultural, applied themes, and conflicts [14–16]. The concepts of landscape, involving human perception, and landscape characterization, focusing on natural and ecological aspects, are both valid. They can complement each other when integrated at different stages of addressing landscape-related issues [17]. Essentially, a landscape represents the connection between individuals and places. It is shaped by the interaction and perception of various elements. These elements include the natural environment, such as climate and flora, and the cultural environment, like the historical aspects of land use and housing. The people who inhabit and utilize these elements play a crucial role in shaping the landscape [18]. Regarding rural landscapes, they serve multiple functions. Communities assign cultural significance to all rural areas, viewing them as landscapes. These rural landscapes are vibrant, evolving systems that include locations shaped and maintained through traditional methods, techniques, accumulated knowledge, and cultural practices. When regarded as heritage, the rural landscape has the potential to propel local development forward. It also refers to historical geography that acknowledges the presence of diverse cultures within landscapes, reflecting the cultural impacts of rural life and an aspiration for an idealized cultural landscape, often depicted as a mythical pastoral concept [19]. This is achievable if its cultural significance can create a broad understanding of local identity and uniqueness, emphasizing the importance of sustainable resource utilization [20,21].

Certainly, the trees are an integral part of the natural environment; they can be altered by humans through various activities, such as reshaping their trunks or branches, peeling their bark, carving arborglyphs on their surfaces, and girdling. Resources from trees might be extracted for spiritual purposes, such as creating scrolls. Additionally, some trees, whether naturally or incidentally formed, are regarded as having personhood and hold cultural significance as trail markers, resource indicators, or sites of social memory. The trees symbolize continuity or breaks with historical events [22]. However, epistemological barriers can hinder communication and understanding of natural heritage resources [23]. Stories of human–tree relations in worlds can provide a different perspective on urban trees, contemporary urban greening, and people-plant relationships, helping us to better grasp the emergent sensations, gratitude to nature and connections from people's everyday interactions with trees [24,25]. Furthermore, they originate from the capacities of imagination, curiosity, awe, and a profound sense of connection, both with the vibrant ecosystem surrounding us and with our own capacity to engage meaningfully with that environment. All this recalls the cultural landscape that exist in the "cultural imagination" [26] where a cultural landscape is also healthy, dynamic "but rather in a state of equilibrium", in other words, a place with a healthy ecology, an "interface between nature and culture" [27]. In addition, studying how trees may matter for health and how it may facilitate researchers' understandings of local knowledge as well as the social and physical context, the go-along method is a means of obtaining contextually based information about how people experience their local worlds and the effects these experiences have on health and well-being [28].

Trees might be included in an expanded concept of heritage. Various types of trees can express distinct metaphorical modes of identity, enhancing the significance for individual, role, or group

identities [29]. They are culturally constructed in a complex milieu, which depends both on their physical location and context and on their symbolic and imaginative locations within local and wider cultures [30]. Heritage is an arena where assemblages (e.g., trees and material objects) prompt multiple stories and generate an affective force, impacting the sensory experiences and desires of those who encounter them. With heritage assemblages, these affects can evoke time, as 'certain planes of the past, or temporal occasions embedded in matter, voluntarily or involuntarily, acquire sensorial intensity and affective weight' [31]. Heritage tree grounded in its historical and geographical context has a significant role in fostering community development, offering the possibility of economic, social, and cultural benefits. Through the convergence of local culture and community engagement, heritage trees enhance a shared sense of belonging, influencing the formation of landscape. The understanding of heritage arises from creating local narratives of memories, which help construct identity references. Through this process, social groups define their traditions where heritage is seen as an asset because it helps communicate a group's unique characteristics and values. It acts as a tool for expressing and preserving the group's identity [32]. Furthermore, for the enhancement of such a landscape, it is now established that a development policy focusing on sustainable tourism and the exploration of perceptions and sensations related to forms of ecotourism, slow tourism [33], and even community-based tourism is necessary. Other concept link to heritage tree is monumental trees: it refers to exceptionally large, old, or historically significant trees that are often preserved and considered as natural monuments [34]. These trees are valued for their cultural, historical, religious or ecological importance, also the value associated with age, size, shape, conformation, botanical rarity, vegetative architecture, and landscape significance [35]. In addition, the knowledge of the beliefs, rituals and aesthetics are relevant in the preservation and the development of the heritage in the form of trees that can be applied and created to fit with the territorial context [36].

*1.2. The distribution and the characteristic of carob cultivation (*Ceratonia siliqua L.*)*

The carob tree is a small evergreen fruit tree that has gained increased interest in the recent years in the use of products made from its seed in the agribusiness industry, because of its high protein and sugar-rich fruit production. Moreover, it is attracting growing attention for its characteristics of resistance and adaptability to difficult soil and climatic conditions [37,38] also in the context of combating desertification, preserving biodiversity and promoting sustainable agricultural practices from a bioeconomy perspective [39].

The carob tree has been cultivated since antiquity in many countries of the Mediterranean Basin, usually in places with a mild, dry climate and low fertile soils. Its importance was recognized by the ancient Greeks, who introduced it from its place of origin in the Middle East to Greece and Italy, while the Arabs spread it along the North African coast, northern Spain and Portugal. In more recent times, Spanish colonizers spread it to other Mediterranean climate regions, such as California, Mexico, Chile, and Argentina, or even in semi-arid climate regions like Arizona. Mediterranean emigrants spread it to parts of Australia, while the British brought it to South Africa and India [40].

Italy has quite a presence of carob trees (Figure 1), which, together with other crops, exercise a symbolic and iconic role in the Mediterranean flora and have played a significant role in the country's agricultural history [41]. It should be noted, however, that as early as between 1955 and 1995, national production was halved [42], with a trend that has not completely stopped despite the fact that in recent

years, the commercial value of carob has increased due to its use as a raw material in the food industry, but also in the pharmaceutical, cosmetics, and biofuel industries [39,43].

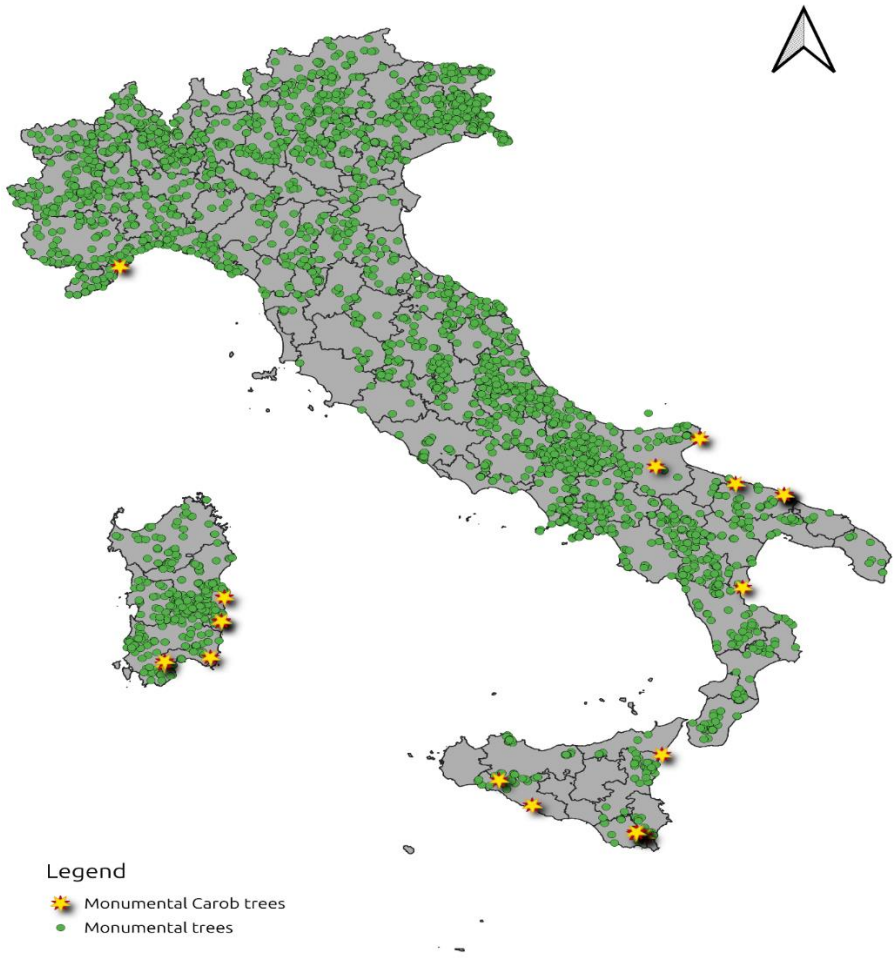

Figure 1. Distribution of monumental trees and monumental carob trees in Italy.

The Mediterranean climate prevailing in many regions provides an ideal environment for a wide variety of plant species to thrive, and within this context the cultivation of the carob tree has held a special place in Italian agriculture for centuries. Historically, carobs were valued for their versatile uses: as a source of food, fodder for livestock and geese diets [44,45] and as a component in traditional medicine. Actually, the name Komiški Rogač PGI was registered in the European Official Journal (OJ L 91 of 29/03/2023), which, in the food sector, is number 22 of the Croatian PGIs and number 39 of the Geographical Indications of Croatia. The product Komiški rogač is marketed in two types: Komiški rogač (fruit) and Komiški rogač (ground).

The tree's long life and ability to withstand harsh conditions make it a resilient and sustainable choice for cultivation. In fact, carob cultivation involves paying special attention to soil conditions, temperature, sunlight and water availability, because although the plant originates in wild form, adapting to wooded soils and in open areas, in both warm places in the sea and cold places in the mountains, as altitude rises, production decreases until it is reduced to zero [40]. In fact, for this reason,

it is common practice not to plant carob trees at an altitude above 500/600 meters above sea level or in areas subject to high frost risk [46]. Adaptation to low temperatures requires a period of days or weeks for the plants to develop maximum resistance to cold stress.

These resistant trees thrive in well-drained soils, often found in hilly and coastal areas. The Mediterranean climate, characterized by hot, dry summers and mild, wet winters, provides an ideal environment for carob trees to flourish and whose growing process involves little periodic pruning to improve yields and maintain tree health.

Not only has carob production contributed to the preservation of Italy's natural landscape, but it is also of economic importance stemming from, among other things, the practically zero cost of planting and being able to spread to land less coveted for other uses and crops [47]. Carob pods, which resemble large, dark beans, contain a more or less sweet pulp, depending on the variety (*Carrua sarvaggia* or asinedda, *Carrua cipriana*, and *Carrua fimminedda*) or cultivar (*Gibiliana*, *Racemosa*, *Saccarata*, *Ibla*, and *Amele of Bari*), which is processed into powder as carob flour [48,40]. This powder serves as a versatile ingredient in various food products, such as confectionery, baked goods, and beverages. In addition, carob is recognized for its nutritional benefits, being rich in fiber and free of caffeine [49], and carob-fruit-extract has demonstrated antidiabetic properties and antioxidant potential [50].

Italian carob production has created economic opportunities for farmers and local businesses, as its cultivation boosts sustainable agricultural practices, fostering a connection between rural communities and the land they cultivate [51]. This has led to carob products (flour, powder, and syrup) being considered traditional Mediterranean foods, recently recognized by UNESCO and included, for example, in the National catalogue of the Intangible Cultural Heritage of Greece and Cyprus [39]. Regarding the area allocated to the cultivation of carobs, the leading producer is Portugal (13,240 ha in 2017), followed by Morocco (10,234 ha) and Italy (5,576 ha). The economic impact extends beyond the agricultural sector, as the carob industry contributes to local economies through processing plants, distribution networks and the creation of job opportunities.

The cultural relevance of the carob tree has considerable significance in Italy, entwined in the roster of traditional practices and folklore. In some regions, carob trees are associated with feasts and festivals, symbolizing abundance and prosperity. The use of carob in traditional recipes, handed down from generation to generation, reflects the deep-rooted connection between the land and the people. In addition, carob cultivation aligns with the principles of sustainable and environmentally friendly practices, promoting environmental awareness and conservation [39]. The historical significance, cultivation practices, economic impact, and cultural relevance of carob production in Italy highlight its multifaceted role in the country's agricultural fabric.

Interest in carob cultivation is mainly found among growers in Spain, Portugal, Greece, and Italy. Many other Mediterranean countries preserve the carob tree as a native tree, valued for its environmental contribution and its role in the landscape formation. Carob cultivation has been part of the European Union's aid program and has been integrated into the context of nut and carob production organizations, according to European Regulation Number 2159/89. In addition, carob is included in EU forestry interventions, as specified in European Regulation number 2080/92 [40].

The spread of the crop, linked to its own pedo-climatic needs, has mostly interested the regions of southern Italy and especially, among them, Sicily, from which about 90 percent of the national production comes, more precisely from the *Iblei* area, between the former provinces of *Ragusa* and *Siracusa* [46].

2. Material and methods

2.1. Overview of the study area: The carob tree in Sicily

The carob trees in Sicily are grown scattered and without a planting pattern. This is partly because they are often wild-born plants, and partly because rocky soils limit the spread of other crops. Additionally, carob trees are frequently grown in intercropping systems. However, the practice of intercropping is considered a "relict" landscape. In fact, the cultural innovation of orchard specialization, which began in the late 1950s, aimed to phase out the practice of intercropping. In southern Italy, this intercropping typically involved combining almond, olive, and carob crops, or integrating them with herbaceous crops such as wheat and legumes [52].

The original affiliation of carob populations in Sicily is debated [53–55]. Historical sources do not refer to carob-dominated forest communities, but many attest to large-scale cultivation of this species from the 17th century onward, following considerable deforestation, as in the case of the territory of Vittoria, formerly part of the County of Modica. In this area of the Ragusa municipality there are the so-called *chiuse* (locks), which constitute a particular cultural landscape marked by a complex interweaving of drystone walls made of limestone, which delimit regular polygons in which pastures or thermo-Mediterranean garrigue are found, with the presence of carob trees [56] (Figure 2). The landscape of carob tree pastures in the Iblei Mountains spans approximately 2,277 hectares. The area maintains the scenic features of tree pastures and enclosures. These are characterized by well-preserved terraces near deep valleys.

In recent decades, many "chiuse" in the vicinity of the coast have undergone transformation into greenhouses for growing vegetables, and have been irretrievably lost, "because with tomatoes, eggplants and peppers you get rich, with carobs you don't" [57]. Currently, the main threats to these anthropogenic ecosystems arise from the abandonment of traditional agricultural lands and practices. This is especially true in the southeast of Sicily, in the so-called "transformed belt". This area consists of territories where agricultural activities under protected cultivation have replaced the original crops for several decades. Among these original crops, the carob tree is particularly notable. This agrarian transformation led to several changes in the local environment, which resulted in the loss of biodiversity and the partial destruction of dune ecosystems. There was also a strong polarization and marginalization of migrant communities. Additionally, it caused conflicts between different land uses and varying land rent trends [58].

The painter Piero Guccione, a privileged observer of the period and the author of a series of pictorial works in which carob trees are the protagonists (Figure 3), also gives evidence of these changes, recalling how, since the late 1950s and for at least two decades, thousands of them were razed to the ground [57].

Figure 2. Carob trees landscape.

Figure 3. Piero Guccione, The Happy Carob Tree, 1969, oil on canvas, dimensions 47 × 45 cm.

2.2. Methods applied

In this study, we applied a qualitative research method following the interpretivist paradigm. Desk research, a methodology that relies on the selection and reprocessing of existing information, was used. We collected data through a document analysis (using policy documents, reports, websites). In order to conduct our observation, we first reconstructed the events that affected carob cultivation in Sicily.

Afterwards, we explored main webpages and their subpages on google imagines using the keywords "photos, carob tree, landscape, Sicily". To study the visual content, we collected around 900 photos between January and February 2024. Videos were excluded from data collection. This approach allowed us to investigate the organization of the visual elements in the study area. We discarded images that showed only derived products (e.g. honey, spirits, etc.) as they did not provide visual interaction with the landscape. This method has the advantages of being relatively inexpensive in terms of the use of financial resources and time.

In addition, field based research studies are especially employed in the study area to verify the landscape and the beauty of heritage trees. The geographers have shown the role of walking in highlighting how relationships between human actors and the surrounding environment can emerge intensely [59]. In fact, walking tends to be longer and more spatially focused, and generates more place-specific data. Walking, or moving at a walking pace with the ability to change direction freely (i.e., not inside a vehicle), is the best way to explore and experience spaces of various scales, including settlements, streets, and parks. This mode of movement allows us to discover and appreciate the stories these places hold. The leisurely pace of walking gives us the time to savor the details of our surroundings. Unlike the rushed nature of modern life, walking engages all our senses. Displacements, i.e., mobilities, reflect the transitions in the lives of individuals and the intersections between their engagement in a variety of different forms of mobility, where rhythm is multidimensional, both temporally and spatially, and recalls the issues of time, duration, and intensity as well as timing, including sustainability [60]. The benefits of walking method helped us with the interpretation of the perception of tangible and intangible, and rural landscape in the analysis of the case study of carob trees.

In addition, the method develops a Geographic Information Systems (GIS) map, dedicated to the monumental carob trees in the Sicilian land providing a better understanding of the value that they provide to the surrounding region. GIS, is a robust and flexible technology that integrates geographical data with analytical instruments to visually represent, analyze, and comprehend spatial patterns and connections within the natural environment.

3. Results

3.1. A map of monumental carob trees

Over time, the various dynamics of erosion of the cultivation heritage have almost completely erased the presence of the carob tree. Studies of the history and culture of trees are crucial for understanding heritage and cultural identities. They involve mapping, inventories, and recording practices and knowledge, which help in the creation of traditions, memories, and identity references. Viewing trees as a cultural element, artifact-heritage, and ritual object that shapes identities and collective imaginations highlights the social construction of cultural processes, the invention of traditions, and the choices of a community or social group, including its symbolic system, language, and landscape. However, some important specimens have survived, particularly in the former provinces of southeastern Sicily (Ragusa and Siracusa). These are eight trees identified and included in the list of monumental trees compiled by Italian Ministry of Agriculture [35]. Through the database of the Ministry of Agriculture, Food Sovereignty and Forestry, it was possible to confirm what emerged from the consultation of all the sources found, namely that the crop was originally widespread over a wide area with the highest concentration included between the municipal territories of Modica and

Vittoria (Figure 4). In this area there are numerous carob trees of great significance, particularly in the regions of *Favarottella*, *Miglifulo*, and *Cammaratini* (Figure 5).

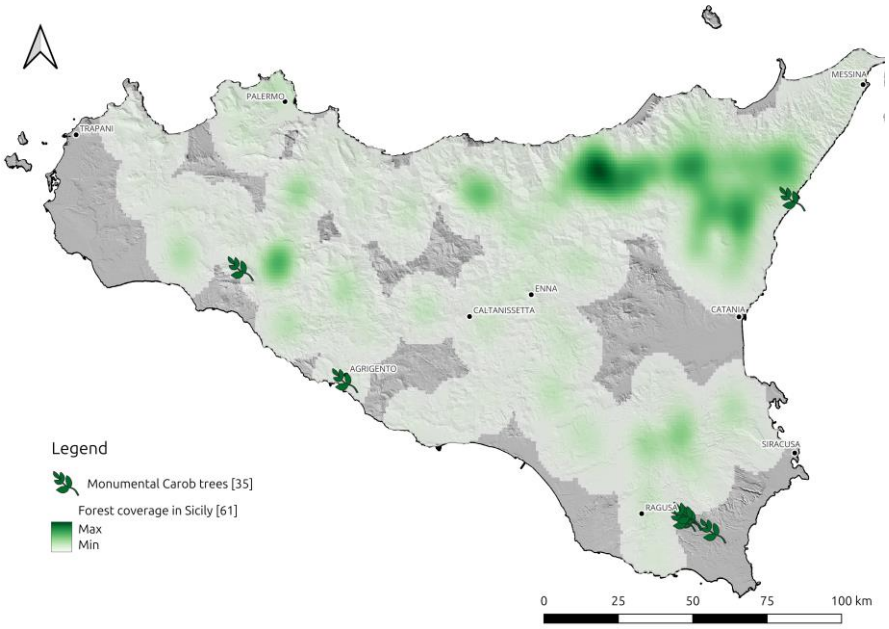

Figure 4. Distribution of monumental carob trees in Sicily, Italy; data source [35,61].

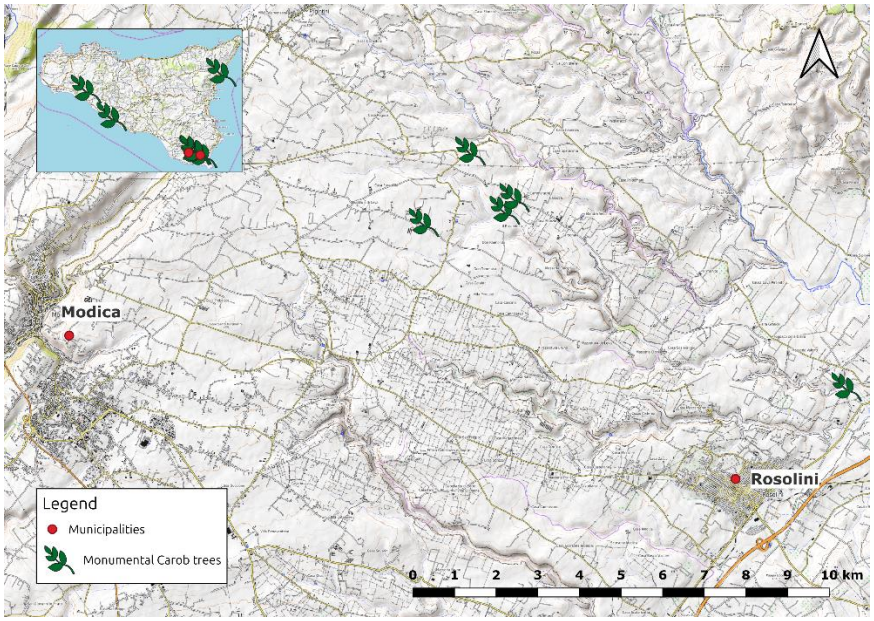

Figure 5. Focus of monumental carob trees in *Rosolini*, *Eloro* District (Sicily, Italy).

In the latter locality, one of the most impressive examples of monumental carob can be found on a private land along the road (Figure 6). The foliage, less extensive than others, has a rounded shape and is very dense and vigorous, enveloping the trunk at a height of 1.5 meters above the ground. The trunk has numerous grooves and lesions, evidence of its venerable age, estimated at around 600 years [35].

Creating a map with carob trees can be highly useful for several reasons, particularly in agricultural planning, environmental conservation, and resource management. Here are some key benefits: A map can help identify the best locations for planting carob trees based on soil type, climate, and water availability; farmers can use the map to estimate potential yields by analyzing tree density and health across different areas; and identifying and mapping carob trees can help in protecting and managing biodiversity, ensuring the conservation of species that rely on these trees. Finally, maps can be used to create educational trails for visitors, promoting agro-tourism and raising awareness about carob trees. The map highlights monumental carob trees found in farmland, not forested areas, serving as relict trees used for livestock feed. Their survival depends on local community choices as they lack forest protection. Over time, the community has adapted their land use, decreasing the number of trees and sacrificing many monumental specimens to accommodate other crops.

Figure 6. Monumental carob tree in *Rosolini*, Eloro District, Sicily.

3.2. Evidence and proposals for the revitalization of Mediterranean carob cultivation

Most ecosystems have been influenced by agricultural activity, and when such a trend has not occurred, it is due to natural limitations that make the investment uneconomical. Compensating for these dynamics are human activities and sustainable agricultural practices capable of offsetting the resulting imbalances. The agroecological practices that stem from this foundation their success on endemic crops that are less burdensome in a broad sense and more capable of resisting climate change. In this context, the carob tree seems to play an important role, as a typical species of the Mediterranean, gaining ground both literally and in the debate on climate change, reclaiming its place in agriculture and production throughout the Mediterranean basin, always playing a significant ecological role. The cultivation of the carob tree, as we have highlighted, exhibits high resistance to systemic drought conditions, can contribute to combating hydrogeological instability, and has shown to play a decisive role in mitigating the climate crisis. It is also evident that for carob cultivation to regain a role in the

agricultural landscape of the future, it must undoubtedly begin from the well-established landscape of monumental trees but must also be reintegrated into its function as an agricultural crop, including new uses of its derived products. As we have seen, in the past, carob was used for livestock feed and, to a lesser extent, for human consumption, while relatively recently, the production of "carob seed flour" (LBG) has become important, used for its thickening and emulsifying properties in numerous food and non-food applications [62,63]. Currently, carob pulp is used according to its size: the finer one (diameter <6 mm), with a low percentage of sugars (25–30%), undergoes refining processes for the production of quality feed and in various food preparations [64–66]. Forms of consumption are expanding, such as a cocoa substitute in chocolate production (Figure 7), and it also shows some potential as a functional food for celiac, diabetic, and caffeine-intolerant individuals [51]. The medium-large seed (6–18 mm in diameter), with a sugar content of 35–45%, is destined for animal feed for the production of flakes or pellets [67]. This latter function, along with carob pulp, seems particularly relevant to us because it involves the creation of annual biomass without harming the plant, thus potentially carving out a leading role in a phase where environmental concerns are pushing towards the adoption of energy transition models with renewable energy production.

Figure 7. An example of carob-based products.

4. Discussion and conclusions

It is relevant talks about the landscape characterized from these monumental trees. The link between carob trees and the Mediterranean landscape is deeply intertwined and has shaped the region's environment and culture for centuries. They contribute to the region's iconic scenery, with their evergreen foliage and distinctive pod-like fruits. Their presence in the landscape not only adds aesthetic value but also serves important ecological functions and well-being. Additionally, the focus is on carob trees and their derivatives as resources for new productive economic activities, such as recreation and

tourism, including visual appreciation. Their history can be seen as an expression of the landscape in the perception of nature. The biodiversity of these trees is crucial in providing ecosystem services, particularly cultural services.

Overall, the presence of carob trees in the Mediterranean landscape is emblematic of the region's rich biodiversity, agricultural heritage, and ecological resilience. They serve as a symbol of sustainability and adaptation to the unique environmental conditions [68]. The carob trees stand tall and proud, basking in the warm glow of dusk, a testament to the enduring beauty of the natural world. An example of eco-tourism experiences based on the beauty and therapeutic aspects of heritage trees involves hiking excursions. Participants can enjoy breathtaking landscapes, experiencing firsthand the leisurely pace of mobility while eagerly anticipating the discovery of the natural beauty of the countryside and landscapes. They can also interact and actively participate in understanding the flora, learning about elements of its present and historical life. Additionally, during these excursions, participants can stop in small villages, where they can savor culinary delights and interact with local communities.

Many are the territories in Italy, including the insular ones, consisting of complex realities and intrinsic heritage of immeasurable value, built on natural beauties such as trees, as well as landscapes of rugged territories where sustainable and gastronomic tourism is promoted. This involves expanding to products linked to the typical tradition of the area, biodiversity, and the communities living there.

The preservation of the numerous monumental carob trees, particularly in marginal and inland areas such as those in Sicily, constitutes a significant moment for rediscovering the region's identity. The combination of nature and human activity is crucial for conserving natural assets that become cultural heritage of the territories. As [39] asserts, since the Mediterranean region is the birthplace of the carob tree, its cultivation contributes to the sustainability of agroecosystems and will enhance the socioeconomic status of the local population. Given the rising demand for carob products and the Mediterranean's comparative advantage in quality and quantity, small companies and family farms can vertically integrate production processes without significant investments. This leads to additional income opportunities from carob cultivation in unconventional and disadvantaged areas, offering a viable alternative for crop restructuring.

Looking to other scholars, [69–72] assert that natural and cultural heritages intertwine not just in forms of coexistence, merging, and blending, but also in ways that effectively transform nature into cultural or cultural landscape heritage. Additionally, the notion of cultural landscape heritage ought to be broader to acknowledge the cultural significance of individual trees (and other forms of natural presence).

The benefits linked to landscape of the monumental trees can serve as a model for economic, social, and touristic development in all over the world. Trees, much like cultural landscapes exit not only in the physical world but also within the cultural psyche. They gain physical form through collective experiences and a shared cultural consciousness. These landscapes have both tangible and intangible qualities, which are preserved through continuous reinterpretation and cultural engagement [26]. A vibrant cultural landscape is dynamic, maintaining balance similar to a thriving ecosystem.

Politics should complement protection with enhancement, especially regarding tourism and natural resources. This involves the geographical areas and landscapes concerned. Promoting the design and implementation of naturalistic and cultural itineraries would be advisable. These should be accessible to both the local community and visitors, leading to a greater understanding of the territory and a rediscovery of the community' roots and cultural identity. Heritage tourism is increasingly recognized as a unique subset within special interest tourism. It holds the potential to not only benefit

communities in political, economic, social, and psychological aspects but also foster a shared identity and consciousness of destination significance. This phenomenon transforms what was once considered local and commonplace into something of broader value and appreciation.

Our findings call for future research to provide actionable recommendations to implement also a fair and healthy food transition. It is important to understand and study the uses of the raw material in food for the purpose of market development of derived products. Future studies should also analyze the role of the beauty and rarity of carob trees with the territories in which they occur. Securly, the trees have acted as relatively autonomous material presences that have spanned across and between eras of place identity and place configuration [30]. Are monumental carob trees a symbol of tourism or a cultural product? This question opens a new research area. An exploratory study is needed to demonstrate the relationship between this practice and the place, emphasizing its importance in both domains. This highlights the significance of tourist activities in shaping places within tourism and landscape heritage. Future research on heritage trees should also explore how tree conditions (e.g., abundance and diversity) may influence local community perceptions.

Author contributions

Gianni Petino: Writing-original draft, Conceptualization, Methodology, Data Analysis, Results. Gaetano Chinnici: Writing – original draft, Conceptualization, Supervision, Discussion and conclusion, Resources; Donatella Privitera: Writing – original draft, Conceptualization, Literature review, Supervision, Writing – review & editing, Discussion and conclusion, Resources.

Use of AI tools declaration

We did not used Artificial Intelligence (AI) tools in the creation of this article.

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Conflict of Interest

The authors declare no conflicts of interest.

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