

Pasture with scattered trees

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ABSTRACT

The "pasture with scattered trees or wooded grasslands" system are traditional land management method that preserves valuable trees, such as fruit-bearing species, on agricultural lands. These trees thrive due to direct sunlight and space, leading to broad, symmetrical crowns. Animals benefit from the trees' shade, while their presence helps fertilize the soil. The trees also contribute to biodiversity, enhancing the agricultural landscape's ecological balance. This system has historical significance in regions like Transylvania, where village laws in the 17th and 18th centuries protected fruit trees. Despite its benefits, traditional landscapes like these are increasingly threatened by modern agricultural practices that favor land homogenization and intensive farming, neglecting the environmental and cultural values provided by scattered trees. Efforts to conserve these landscapes involve engaging local communities, promoting sustainable grazing practices, and recognizing the cultural significance of ancient trees. Pastures with scattered trees offer natural, economic, and aesthetic benefits, providing a sustainable model of land management that balances agriculture and environmental protection. However, challenges include changes in land use and policies that discourage tree preservation, threatening the resilience of these landscapes and their socio-ecological systems.

Keywords: biodiversity, ecological balance, land management, pasture, scattered trees.

INTRODUCTION

The "pasture with scattered trees" is a traditional land management system where valuable trees, such as fruit-bearing species (wild apple, wild pear, rowan, cornelian cherry, sweet chestnut, hazel etc.), are preserved on arable lands or pastures, even after deforestation. These trees are maintained for the benefits they provide to both agricultural productivity and biodiversity. Scattered trees have direct access to sunlight, unobstructed by other trees, which promotes the development of broad, symmetrical crowns. The soil around these trees is naturally fertilized by animals seeking shelter in their shade, while the rubbing of trunks by animals helps eliminate harmful insects. Unlike trees in forests, these trees benefit from ample space both vertically and horizontally, allowing for harmonious growth and the creation of a unique rural landscape characterized by

imposing, well-formed trees. Beyond their aesthetic value, pastures with scattered trees support considerable biodiversity, thereby contributing to the protection of local ecosystems and the conservation of biological diversity. Scattered woody vegetation in open landscapes leads to a great increase in overall biodiversity and a diversification of ecosystem services (Erdos *et al.*, 2018).

This model of agro-ecological management achieves a balance between agricultural use and environmental protection, enhancing soil fertility, reducing erosion risks, and ensuring a balanced microclimate. Scattered tree pastures are an example of sustainable practice, providing benefits to both agriculture and the environment. In Transylvania, such trees are commonly found, even in village gardens, intentionally preserved for their economic and ecological value. The tradition, dating back to the 17th and 18th centuries, when Szekler village laws forbade the cutting of fruit trees, protected these essential resources. In the Harghita Mountains, specific customs allow the claiming of fruit-bearing trees by marking them with branches, straw, or piles of stones.

However, according to local traditions, this marking does not prevent others from accessing the tree's fruit. Foreign travellers, migratory shepherds, mineral water vendors, and potters have the right to harvest a portion of the fruit from marked trees without violating customary rules. These informal regulations reflect a longstanding tradition of communal cooperation and sustainable management of natural resources, respected for centuries in this region (www.arcanum.com).

Scattered trees and the marking of property on wild fruit-bearing trees can be considered early forms of organized fruit cultivation, paving the way for artificial selection. The protection of these trees and the transmission of the marking tradition represented a crucial step in the development of agricultural practices, which later evolved into intensive and controlled fruit tree cultivation. The traditional rural landscapes of Eastern Europe, including Romania, serve as reservoirs of diverse native vegetation, traditional ecological knowledge, and local skills. This agricultural heterogeneity, with small plots, diverse crops, and scattered trees on meadows and pastures, provides not only natural and cultural value but also multiple benefits for local communities, such as enhancing biodiversity and ecosystem potential (Fischer and Tibor, 2012; Molnár, 2014).

Despite their multiple values, traditional agricultural landscapes are increasingly threatened by changes in land use. The homogenization of these landscapes, driven by monofunctional management, leads to the loss of local skills and knowledge, as well as the values associated with the multifunctional management of landscapes. This process represents a critical vulnerability factor for the resilience of local socio-ecological systems (Baumgartner, 2007).

Trees in agricultural landscapes are classic examples of vegetative structures that synergistically enhance the multiple values of traditional farmlands, including aesthetic and cultural benefits, provisioning services, and biodiversity. Traditionally, scattered trees have played a crucial role in agricultural landscapes, being utilized for their fruit, leaves (as fodder), or wood, while also providing shade for animals and contributing to the improvement of soil fertility (Plieninger, 2012).

Scattered trees, of various species and ages, are essential elements of the agricultural landscape's identity. However, in modern agriculture, dispersed woody vegetation is often "eliminated" because the values these trees provide—whether aesthetic, ecological, or economic—are not perceived as sufficiently important. Additionally, official agricultural policies discourage the maintenance and regeneration of trees on farmland, as they are not considered vegetative components with high and consistent production yields (Beaufoy, 2015).

Human societies have undergone major changes over the past centuries, weakening the traditional ties between communities and their landscapes, including pastures with

scattered trees. Population growth, industrial development, urbanization, and globalization have led to landscape modifications to meet new social and economic demands. These transformations have also significantly impacted rural communities in Eastern Europe, which, although more isolated, have nonetheless felt the effects of these changes.

Grazing in European forests has been practiced for centuries, influenced by specific socio-economic and ecological conditions. In the past two centuries, these conditions have changed drastically, profoundly affecting traditional grazing practices in forests and pastures with scattered trees throughout most of Europe. Today's pastures with ancient trees in Europe likely represent only a small fraction of the "functional" pastures that existed centuries ago. For instance, in Hungary, wooded pastures were once widespread, but today they have been reduced to just over 5,000 hectares, managed exclusively for nature conservation (Varga and Bölöni, 2009). In Germany, only approximately 5,500 hectares of wooded pastures have been confirmed, although optimistic estimates suggest that the area could reach up to 100,000 hectares (Luick, 2009). In the Netherlands, nearly all forests were cleared in the 17th century, and today there are approximately 31,000 hectares of landscapes with ancient trees, including orchards, most of which are plantations from the 19th and 20th centuries (Oosterbann, 2009). In the Czech Republic, wooded pastures are almost non-existent (Horák, 2012), while in central Romania, ancient wooded pastures still persist.

MATERIALS AND METHODS

The natural forests of the region, primarily composed of *Quercus* - *Carpinus* and *Fagus* - *Carpinus* associations, are still present, although significantly altered from their original state. In the past, these forests covered slopes and valleys at higher altitudes, dominated by *Carpinus betulus*, a species heavily exploited by local communities. Oak (*Quercus* spp.), Sycamore (*Acer pseudoplatanus*), and Linden (*Tilia cordata*) completed this forest community, typical of Central Europe. In steeper areas, *Fagus* was dominant, adapted to harsher conditions. These forests reflect a balance between ecological influences and human interventions, resulting in mixed forest landscapes, with some relatively intact areas and others modified by traditional management.

Vegetation is an essential component of the natural environment (Iliescu, 2003). This vegetational composition reflects the adaptation of species to well-drained soils capable of retaining moisture, while the diversity of herbaceous species highlights the close ecological connections between these forest habitats and the Dacian landscapes. The *Fagus sylvatica* and *Carpinus betulus* forests on the slopes of the Carpathians form a robust ecosystem, essential for maintaining biodiversity and the ecological balance of the region. *Crataegus*, *Prunus spinosa*, and Black Locust (*Robinia pseudacacia*) invade pastures, particularly where cattle graze instead of sheep, and could form extensive thickets if grazing levels decline. Farmers control the invasion of *P. spinosa* through regular burning. An analysis of these thickets reveals associations from the Prunetalia order, such as *Pruno spinosae* - *Crataegetum* and *Ligustro* - *Prunetum*. These spiny thickets are common in the Pannonian Basin and adjacent regions, such as the Banat Hills, the Transylvanian Plateau, and the Southern Carpathians (Sanda and Popescu, 1980; Mountford and Akeroyd, 2005). The wetland vegetation in this landscape indicates ecological diversity adapted to local hydrological conditions. In areas where calcium-rich water has produced springs, a specialized flora has developed. Along the banks of watercourses, *Salix* shrubs dominated, and the floodplain was covered by *Carex* and *Phragmites*. The less flood-prone edges of the floodplain were influenced by mowing and grazing, promoting the development of tall

riparian meadows. The pastures with scattered trees exhibited high floristic diversity, including species adapted to nutrient-rich soils.

RESULTS AND DISCUSSIONS

The analyzed scattered tree pasture is located in the (ro: Becheciul de Jos/hu: Bekecsalja) area, between the villages of Drojdii and Bereni, near the right bank of the Nirajul Mic stream in Mureş County. This region covers an area of approximately 1.5 square kilometres, situated on the northern slopes of the hills, in a transitional zone between pasture and forest ecosystems. To the north and west, the pasture is bordered by mixed deciduous forests, characterized by a diversity of species typical of this climatic zone. To the south, the area is bordered by a forest strip following the course of the Nirajul Mic stream, providing an ecological transition between the streambed and the pasture. On the eastern side, the pasture is framed by a continuous association of trees and shrubs.

The pasture consists of several terraced areas, due to the relief that varies as one move from the stream to the north. These terraces are characterized by alternating steep slopes and relatively flat surfaces, creating a diverse topographical landscape. On the first terrace, located at the base of the area, there is a sheepfold (the seasonal shelter of shepherds) and the night pen for sheep. This location is strategically chosen due to its accessibility, being easily reachable from County Road 135, an important element for pastoral activities.

Near this sheep pen, numerous wells and water troughs can be observed, installed to provide a constant water source for animals. Around these water sources, due to the increased humidity, hygrophilous vegetation associations have appeared, meaning plants that prefer wet habitats. The presence of these plants is a valuable ecological indicator, historically used by shepherds to locate water sources. During grazing, shepherds would follow these vegetative signs to guide sheep to the best spots for feeding and hydration. Even at this level, there are old trees, some reaching 60, 80, or even 100 years. Surprisingly, these trees are in remarkable health with relatively intact crowns. Their utility and importance for scattered tree pastures are best highlighted by aerial captures made with a drone at the right time (Figure 1-2). During the heat of the day, sheep briefly shelter in the shade of the trees while continuing to graze, underscoring the vital role these trees play in maintaining a suitable environment for grazing.



Figure 1. Aerial captures made with a drone.

Regarding the exact age of the trees, we can only rely on available sources (Figure 2). The fact that similar pastures are shown on maps made by the Hungarian Military Plan in 1941 (Figure 3 4) supports the hypothesis that some existing trees are approaching 100 years or more. Furthermore, cartridges from the Austro-Hungarian troops during World War I were discovered under some trees. Since these cartridges were found only near the trees and not in the open areas of the pasture, it is plausible that soldiers took shelter and fired from the shade of these trees.



Figure 2. The present situation of the scattered trees (<https://earth.google.com/>).



Figure 3. The Hungarian Military Plan from 1941 (maps.arcanum.com).

Similar discoveries were made with other mature and older trees, highlighting their historical significance in the local landscape (Figure 4).



Figure 4. Shooting Master Plan (<http://igrek.amzp.pl>).

The map indicates a well with a drawbar, and a similar well still exists in the same area today, emphasizing the continuity of the traditional function of the site. Although it cannot be confirmed that it is the same structure from 80 years ago, similar drawbar wells are increasingly rare in the Nirajul Mic Valley. These structures maintain a practical and cultural link to the past.

The well is situated on a natural rise, offering impressive views of the landscape. From this point, the medieval church tower in Băra and Becheci Peak (ro: Vârful Becheci/hu: Bekecs tető), a significant geographical landmark for the region, can be seen.

The long-term challenge for local communities will be recognizing the importance of these pastures and implementing concrete measures for their conservation. Protecting these pastoral landscapes is essential not only for biodiversity but also for preserving the agricultural traditions passed down through centuries. Sustainable resource management and raising public awareness will be crucial for maintaining these valuable ecosystems. Our suggestions are in accordance with the results obtained by Tolgyesi *et al.*, 2023 which states that existing the free-standing trees should be preserved, with their centuries-old, massive carbon stock and the many microhabitats and additional ecosystem services they provide.

This can be achieved through strategies to delineate grazing areas where grazing is prohibited or temporarily reduced, and/or by manually planting spiny shrubs to protect seedlings, allowing grazing around them. The effectiveness of these methods can be tested and compared with control sites. However, the success of these initiatives depends on local social support and adaptation to community needs. Testing the effect of different types of farm animals on vegetation structure and biodiversity is another approach. In this case, traditionally cattle-grazed wooded pastures can be compared with those grazed by sheep and abandoned wooded pastures (Figure5).

Assessing the openness of local communities to value and protect old trees (including dead ones) in wooded pastures.

Identifying ways to promote the social value of wooded pastures for local communities (Hartel, 2014).



Figure 5. Traditional grazed wooded pastures.

CONCLUSIONS

The present research underscores the essential role of "pastures with scattered trees" as a traditional land management system that promotes both agricultural productivity and biodiversity. By preserving valuable tree species, particularly those bearing fruit, these pastures play a significant role in enhancing ecosystem health, improving soil fertility, and fostering a balanced microclimate. However, despite their ecological and economic advantages, these landscapes are increasingly threatened by modern agricultural practices and land-use changes that favor monoculture over biodiversity.

The study reveals that traditional customs, which historically played a crucial role in the protection of these trees, are deteriorating in the face of population growth and industrialization. The existence of ancient wooded pastures in regions such as central Romania highlights the necessity of incorporating sustainable practices into contemporary agricultural methods to safeguard these vital ecosystems. The findings indicate a pressing need for community engagement and awareness-raising initiatives to facilitate the conservation of these unique landscapes, accentuating the importance of effective management strategies that harmonize agricultural requirements with ecological preservation.

Future initiatives should aim to elevate the social value of scattered tree pastures and acknowledge their contributions to local culture, biodiversity, and agricultural sustainability. By implementing strategies designed to protect these ecosystems, it is possible to preserve biodiversity while simultaneously supporting the agricultural traditions that have endured for centuries.

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