ResAlliance

Type of solution: Management Sector: Agriculture, Agroforestry
Good practice(s): Soil management, Management alternatives, Ecosystems services

Vitiforestry practices for climate resilience in the Mediterranean region

Integrating Agroforestry to Enhance Sustainability and Productivity in Mediterranean Vineyards.

Figure 1. Pine vitiforestry; Restinclières – Occitanie region.
Author: ARTE TV – https://www.youtube.com/watch?v=qkbQ4b_97q4
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Figure 2. Olives in vineyards mixed farming systems used to be the norm across the region – and now they might have a comeback as vitiforestry gains traction!
Author: Unidentified | © Educational use, non-commercial.

/// Context ///

As the Mediterranean region is experiencing significant challenges due to climate change, traditional agricultural systems – particularly vineyards – are under threat. In response to these challenges, the ancient – yet innovative – practice of vitiforestry, is emerging as a promising solution to enhance the climate resilience of Mediterranean viticulture. Vitiforestry involves integrating the strategic planting of trees and shrubs within and around vineyards, leveraging centuries-old agricultural traditions to create more diverse, productive, and sustainable landscapes.

The introduction of trees can create a more favourable microclimate for grapevines, reducing heat stress and conserving soil moisture. Moreover, the presence of trees can improve soil structure and fertility, leading to healthier vines and potentially higher combined yields on the same land area. Lastly, vitiforestry promotes greater biodiversity, which can help control pests naturally and reduce the need for chemical inputs.

Farmers can benefit significantly from implementing vitiforestry practices in their vineyards. Such management strategies can improve water retention in the soil, reducing irrigation costs and enhancing drought resilience. Healthier soil and improved microclimates can lead to better grape quality, reduce yield losses, translating into increased profits. Additionally, incorporating fruit or nut-bearing trees alongside grapevines can provide additional income streams, helping to stabilise farm revenue. Lastly, a more diverse ecosystem can attract beneficial insects that help control pests, reducing the need for chemical pesticides and lowering production costs.

By adopting vitiforestry, farmers can create a more resilient and sustainable agricultural system that not only protects their livelihoods but also contributes to the preservation of the Mediterranean landscape and its rich cultural heritage.

Drawing inspiration from the six indicators of sustainable development listed in the EU Taxonomy Regulation, as illustrated in the 'Brno Agroforestry Declaration', this factsheet highlights how vitiforestry may become a game changer in the region.

Adapting Mediterranean Viticulture to a Changing Climate.

A pine-vine vitiforestry system (Figure 1) contributes to enhancing biodiversity, improving soil health, and providing shade to reduce heat stress on grapes.

Unlike a pine-vine vitiforestry system, the integration of olives in vineyards (Figure 2) provides additional income through the production of olives for oil or table use.

/// Solution for a Resilient Future ///

The benefits of vitiforestry practices are multifaceted. Of notable importance are those in the area of:

Climate change mitigation
By integrating species like olives, pines, or oaks, winegrowers can significantly increase carbon stored in soil and tree biomass. In the long run, this improves soil health through organic matter from decomposed leaves and branches. Integrating trees with livestock grazing creates natural fire breaks around vineyards, reducing fuel loads and mitigating wildfire risks, which are increasingly common due to climate change. The 'Zebra', 'Donut' or 'Teardrop' approaches are some of the most common. Even poultry can play a role; they can eat grass/weeds, reducing pest pressure while fertilising the soil.

Climate change adaptation
Trees act as natural barriers against wind, protecting grapevines from hot, dry gusts that can desiccate grapes and reduce yields. This wind protection helps maintain a stable microclimate, reducing stress on the vines and improving grape quality. In spring, hedges, buffer strips or windbreaks provide essential frost protection by creating a microclimate that safeguards buds against late frosts. Such tree-based landscape features also shield grapes from extreme heat during summer months, mitigating the effects of heat waves and mega-droughts. The shade from trees helps maintain cooler temperatures, preventing early bud break and ensuring balanced sugar and acidity levels in grapes. The relevance of the microclimate is also reflected on the quality of the wines: tree transpiration refreshes the vineyard microclimate, maintaining humidity and lowering temperatures. This process can lead to higher-quality must with lower alcohol content and higher acidity, resulting in more balanced wines.

Sustainable water resources
The root systems of trees enhance soil water retention by improving soil structure and allowing better water infiltration. This is particularly beneficial in Mediterranean regions facing water scarcity, as it reduces the need for irrigation and increases resilience to drought.

Soil, water, and atmospheric pollution
Vitiforestry reduces the need for chemical pesticides by attracting beneficial insects, birds, and bats that control vine pests naturally. This ecological balance promotes a healthier vineyard ecosystem and minimizes environmental impacts. Moreover, integrating trees contributes to a resilient soil microbiome, fostering beneficial microorganisms that help vines combat diseases like rot. A healthy microbiome enhances nutrient cycling and soil fertility, leading to healthier vines and better grape quality.

Domaine Vallot is one of the oldest domaines in the Côtes du Rhône (France). This vitiforestry system produces organic, biodynamic grapes for wine production.
Author: Domaine Vallot | © Educational use, non-commercial.

Protection of biodiversity and ecosystems
Vitiforestry promotes biodiversity by creating diverse habitats for various species. This integration of trees, shrubs, and cover crops supports a wider range of flora and fauna, improving pest control, pollination, and overall ecosystem health.

The circular economy
Vitiforestry offers opportunities for economic diversification through the sale of fruits, nuts, and timber from trees. Farmers can generate additional income streams, reducing reliance on grape production alone and enhancing financial resilience.

Rural socioeconomics
Implementing vitiforestry fosters community engagement and education on biodiversity and sustainable practices. Local workshops and educational programs can raise awareness, encouraging more farmers to adopt these practices.
The integration of trees also enhances the landscape's aesthetic value, attracting tourism and promoting regions as destinations for recreational activities – as well as nature conservation, further supporting local economies.

Innovative Vitiforestry Practices for Climate Resilience in Mediterranean Vineyards.

Healthier soil and improved microclimates can lead to better grape quality, reduce yield losses, translating into increased profits.

> **"The vineyard is a whole ecosystem, a landscape: we're not here just to harvest grapes." Anaïs Vallot, Domaine Vallot.**

In Italy, 'Di Filippo' winery relies on geese for pest control.
Author: Vini Di Filippo | © Educational use, non-commercial.

Skills, policies, and generation renewal
Training specialists in area of vitiforestry is of particular relevance in the context of the high workload needed to manage such farming systems, and the shortage of skilled workers in agriculture. Digital tools and models are being developed to help winegrowers design optimal vitiforestry systems tailored to their local climate, soil conditions, and production goals. These decision support systems enable more informed planning and implementation of climate-smart agroforestry practices. An example of an accessible vitiforestry electronic library has been created by the 'Sustainable Wine Roundtable' and be used freely by anyone in the industry.

/// Always Moving Forward ///

To drive wider adoption of vitiforestry, researchers, policymakers, and industry stakeholders should intensify their efforts to address key barriers, such as knowledge gaps, financial constraints, and regulatory hurdles. The potential is huge: more than 2/3rds of EU's vineyards are in the Mediterranean basin, covering an area larger than Slovenia! If half of the vineyards area from the region will transition to vitiforestry, more than 30 million trees could be planted across the region, having the potential to store the carbon emitted from 11 million passenger vehicles in tree biomass alone!

Several EU-funded initiatives are demonstrating the potential of vitiforestry and promoting its replication across the region. Moreover, hundreds if not thousands of vineyards – some of which are flagged in the above-mentioned e-library – already boast vitiforestry systems in the EU and beyond, as well as around the world (around 1.5% of U.S. farms reported using agroforestry).

Some priority areas for targeted efforts are:

- Addressing regulatory barriers, by incentivising vitiforestry through Common Agricultural Policy subsidies or tree-planting schemes. Involving regional administrations, farmers and landowners organisations is key to accelerating progress when establishing new vitiforestry systems in existing or abandoned vineyards.
- Developing decision support tools and guidelines, relying on EU-funded initiatives such as the VINEAS platform co-designed in the MEDCLIV project. Demonstrating the potential of vitiforestry and promoting its replication across the region through peer-to-peer knowledge is key – and such initiatives are crucial for providing winegrowers with the necessary tools and guidelines to effectively implement vitiforestry practices in their vineyards (e.g. which tree species should be planted, how they should be managed).
- Establishing certification and traceability and empower consumers to have access to clearer, accessible information about the efforts done by vinegrowers practicing vitiforestry. While labels are seen as tools that may enhance consumer confidence and support the market demand for sustainably produced wines, initiatives such as the 'Bee friendly wine' in the US or the 'HVE' certification in France are created to promote an environmentally friendly approach to wine production. What about having a 'vitiforestry' label?

> **Scaling up vitiforestry across the Mediterranean and beyond.**

> **Vitiforestry is emerging as a sustainable solution to the limitations of monoculture vineyards, blending tree cultivation with vine growing to foster biodiversity and environmental health (Vinerra).**

To bolster landscape resilience amid escalating wildfire threats, a farmers association (Raïm +500) in Spain uses vitiforestry-inspired practices.
Author: Angela Llop | © Educational use, non-commercial.

- Exploring innovative business models and marketing strategies to capitalise on the benefits of vitiforestry. By promoting the unique qualities of wines produced in vitiforestry systems – as well as the environmental benefits of such production systems, wineries can attract environmentally conscious consumers.
- Promoting research and innovation focused on key research gaps, such as the role of various tree species in pest control – or the water use efficiency at landscape level. Safeguarding the future of such iconic agricultural landscapes requires continued investment in research and innovation, in view of ensuring that vitiforestry may be scaled rapidly.
- Fostering knowledge-sharing and capacity-building is critical to ensure that best practices are disseminated and adopted widely across the Mediterranean wine sector. The role of forestry experts and technicians is crucial – as they can contribute to training the agricultural workforce working in the wine sector and help them managing their trees on agricultural land.

> **"We're not inventing anything; it's more a matter of recreating landscapes as they existed some 50 years ago." Pierre Hermans, head of the vitiforestry program for Reforest'Action's.**

Illustration from 'Tacuina sanitatis' – 14th century; trees were used as support for vines, which were believe to be less susceptible to disease.
Author: 'Tacuina sanitatis'
©Educational use, non-commercial.

Further information

- European Agroforestry Federation. 2024. Brno Agroforestry Declaration – 31.5.2024. https://doi.org/10.5281/zenodo.12654867
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Kristina Vachadze and 'Domaine Kox'. More: https://repositorio-aberto.up.pt/bitstream/10216/157078/2/659369.pdf

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