



## Dynamic approach to silvopastoral systems

### KEY MESSAGES

1. Mediterranean silvopastoral systems provide key ecosystem services but face degradation pressures.
2. A dynamic decision support system (DSS) integrates soil, weather, and management data for informed decisions.
3. The DSS supports livestock, forestry, and agro-tourism activities.
4. Enhancing resilience requires balancing environmental, social, and economic goals.
5. The solution adapts to oak woodland, grasslands, and wooded pasture ecosystems.
6. User adoption focuses on decision implementation rather than technical operation.
7. Equitable stakeholder involvement improves sustainability outcomes.
8. Opportunity for green business models (eco-tourism, cork, livestock products).
9. Cost-effective and flexible technology enhances uptake across diverse farms.
10. Strengthens adaptive management under climate variability.

### SUMMARY

Silvopastoral systems in the Mediterranean are multi-functional landscapes that integrate trees, pasture, and livestock to provide food, fodder, timber, and ecological services such as carbon sequestration, biodiversity conservation, and soil protection. These systems are threatened by land degradation, overgrazing, climate variability, and socio-economic pressures. The SALAM-MED Dynamic Approach is a decision support system (DSS) that combines field data from soil

sensors, weather stations, and remote sensing with modeling tools to optimize land management decisions. It enables farmers and land managers to balance productivity, environmental sustainability, and economic viability. The approach supports activities across oak woodlands, grasslands, and wooded pastures, addressing interactions among livestock, vegetation, and trees. By providing real-time feedback and predictive insights, the DSS helps stakeholders anticipate risks such as drought, forage shortage, and soil erosion, promoting adaptive management and multi-functional landscape planning.

### RESEARCH AND RESULTS

The DSS has been implemented in several Mediterranean Living Labs and pilot sites, showing improved land management and ecosystem service outcomes. Data collected from soil moisture sensors, vegetation monitoring, and climate stations feed into predictive models that guide grazing intensity, tree management, and pasture rotation. Initial results indicate enhanced forage production, increased biodiversity, and better soil conservation while maintaining livestock productivity. Stakeholder feedback highlights the system's usability and relevance, demonstrating that non-technical users can integrate the DSS outputs into practical management decisions. The approach also allows experimentation with alternative management





scenarios, helping to identify trade-offs between economic gains and environmental sustainability. Overall, results indicate that dynamic silvopastoral management enhances resilience to climatic variability, reduces degradation, and offers opportunities for diversified income through integrated agroforestry and eco-tourism initiatives.

### RECOMMENDATIONS

- Policy integration: Incorporate DSS recommendations into national and regional rural development plans, climate adaptation strategies, and agri-environmental programs.
- Capacity building: Develop comprehensive training programs for farmers, extension officers, and local managers on interpreting DSS data, integrating predictive models, and applying adaptive management strategies.
- Stakeholder engagement: Encourage participatory governance involving pastoralists, farmers, foresters, and local authorities to ensure equitable benefits and promote sustainable decision-making.
- Financial mechanisms: Introduce incentives, subsidies, and payments for ecosystem services (PES) to reward practices that conserve biodiversity, enhance carbon storage, and improve soil and water resources.
- Scaling and replication: Facilitate knowledge sharing across regions to replicate DSS use in diverse Mediterranean landscapes, including arid and semi-arid areas.
- Monitoring and evaluation: Establish long-term ecological and socio-economic monitoring fra-

meworks to assess the impacts of DSS-guided management and refine decision-making tools.

- Business innovation: Support private sector engagement to develop advisory services, eco-tourism products, and value-added agricultural outputs derived from improved silvopastoral system



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