



## NATURE-BASED SOLUTIONS IN ACTION

### WHAT WE DO

SALAM-MED identifies, tests and validates nature-based practical solutions to enhance the resilience of endangered MED dryland socio-ecological systems or to restore degraded ecosystems in arid and hyper-arid lands. Through six Living Labs across the Mediterranean, the project co-develops eco-technological and socio-economic strategies to combat land degradation and water scarcity. By integrating scientific research with community engagement, SALAM-MED fosters sustainable land and water management practices, aiming to improve ecosystem services and support local livelihoods.

- **SWRT + Water harvesting + MAR**
  - Subsurface water retention technology (SWRT) (Morocco)
  - Leveled terraces for water harvesting (Egypt)
  - Management of aquifer recharge systems (Tunisia)
- **Adaptive forest management + agronomic options**
  - Soil and irrigation management in olive Orchard (Greece)
  - Microbial-based solutions (Italy)
  - Adaptive vegetation management - CAFE DSS (Spain)
- **Modelling, remote sensing, apps**
  - DSS for forage crop improvement (Italy)
  - Dynamic approach to Silvopastoral Systems (Italy)
  - GPS collars for AMP grazing (Italy)
  - Landagritech (Tunisia)



### Subsurface water retention technology

#### What technology?

This technology uses a U-shaped polyethylene membrane placed under the root zone to retain water and reduce percolation. It conserves nutrients, limits leaching, and improves plant growth with lower fertilizer input. It also reduces soil erosion and costs.



#### Who can use it and why?

Used mainly by agencies and private companies involved in Argan reforestation. It enhances seedling growth under drought, improving plantation success in water-scarce areas.

#### Successful cases and limitations

Tested with tomatoes and prickly pears in Morocco to improve drought resistance. Recommended by Moroccan forestry agencies. Limitation: cost of biodegradable plastic (if not available locally).

#### Ease of use and costs

Not yet commercialized in Morocco. Cost: ~10€/seedling. Biodegradable membrane lasts 36 months. No training or maintenance

#### Equipment/requirements

No special tools, skills, or ownership issues.

#### Business opportunities

Improves early productivity of argan plantations. Replicable in Tunisia and Palestine, especially for olives. Targets: public and private reforestation actors.



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### Leveled terraces for water harvesting

**What technology?**

Goes beyond traditional terracing: uses modelling to design the optimum number, size and location of terraces in wadis.



Maximizes stored and infiltrated water, improves soil use, and prevents downstream conflicts.

**Who can use it and why?**

Governments, NGOs, farmers. Helps determine where and how to build terraces for optimal water retention and crop planning.

**Successful cases and limitations**

Tested in Agarma wadi (Egypt) and other basins. Depends on terrain and climate: requires mild slopes, permeable sediments, and impermeable layers. High initial costs and sensor availability.

**Ease of use and costs**

Sensors are expensive and scarce locally. Needs expert support for planning and monitoring. Training available for governmental staff.

**Equipment/requirements**

Requires geotechnical sensors, mapping tools, trained staff, and stakeholder coordination. Maintenance: basic skills.

**Business opportunities**

Creates demand for earthmoving services, roads, irrigation inputs, and monitoring. Boosts agriculture and livestock.



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### Management of aquifer recharge systems

**What technology?**

Captures flash floods and infiltrates water into aquifers. Uses recharge wells, trenches, and passive filtration systems. Monitored with piezometers. Aims to boost groundwater in arid zones.



**Who can use it and why?**

Used by public bodies to enhance water availability in drylands. Reduces evaporation and complements water harvesting.

**Successful cases and limitations**

10 recharge wells built under SALAM-MED in Tunisia. Effective in southern regions with Triassic aquifers. Limits: high implementation costs and need for suitable recharge sites.

**Ease of use and costs**

High readiness but costly (~50,000€ per system). Built during dry seasons. Requires training in hydrology and periodic maintenance every 5+ years.

**Equipment/requirements**

Needs drilling machinery, geophysical tools, trained technicians. Requires long-term monitoring and management.

**Business opportunities**

Involves civil works, sensor installation and local contractors. Increases water availability for farming. Replicable in Egypt, Palestine, and Morocco.



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### Soil management in olive orchard

**What technology?**

Cover crops improve soil fertility and structure, enhance microbial life, retain moisture, and prevent erosion. They also reduce herbicide use and help capture carbon, contributing to climate mitigation.



**Who can use it and why?**

Ideal for farmers with tree crops (e.g. olive, vineyard). Increases sustainability, reduces input costs, boosts ecosystem resilience.

**Successful cases and limitations**

Adopted in Greece (Messenia, Crete) and Spain. Recommended in sloped and drought-prone areas. Limits: seed costs, labor, and timing, especially during autumn harvests.

**Ease of use and costs**

Well-established and accessible. Seed cost: ~50€/ha; total cost (incl. labor): ~300€/ha. Requires seasonal planning and basic knowledge.

**Equipment/requirements**

Basic sowing and mowing tools. Knowledge of species selection and timing. Farmers manage the system, often with agronomist support.

**Business opportunities**

Seed production and consulting services offer opportunities for agronomists and local advisors. Suited for sustainable farming initiatives.



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### Irrigation management in olive orchard

**What technology?**

Aligns irrigation with crop growth stages. Enhances water use efficiency, prevents stress, and improves yields while reducing environmental impact.



**Who can use it and why?**

Useful for all farmers growing irrigated crops. Helps combat water scarcity, salinization, and crop stress - especially under climate change.

**Successful cases and limitations**

Successful in Israel and other dry countries. High potential in Mediterranean zones. Limitation: requires equipment like sensors and some technical capacity.

**Ease of use and costs**

Widely used but requires investment. Cost: several hundred to thousand €/ha. Offset by long-term water savings. Needs training in phenology and irrigation tools.

**Equipment/requirements**

Soil moisture sensors, agrometeorological data, irrigation scheduling tools. Users need basic data interpretation skills. Maintained by farmers with expert support.

**Business opportunities**

Advisory services, software tools, equipment supply, and training for precision irrigation. Especially relevant for regions with groundwater dependence.

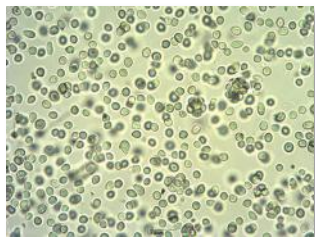


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### Microbial-based solutions - *Trichoderma*

#### What technology?

Biofertilizers and microbial consortia (e.g. mycorrhizae) applied to improve soil fertility and plant resilience in degraded or dryland ecosystems.



#### Who can use it and why?

For farmers, NGOs, and institutions in dry or degraded areas. Helps transition from traditional practices to more sustainable agriculture.

#### Successful cases and limitations

Tested on olive and wheat in Egypt. Effective under drought stress. Limitations: not widely known; behavioral change and training still needed.

#### Ease of use and costs

Ready and easy to apply, but not yet common among smallholders. Requires awareness and training. Costs vary based on input type and scale.

#### Equipment/requirements

Minimal: inoculants and basic mixing tools. Training is key. Suitable for community-based introduction and extension services.

#### Business opportunities

Local supply chains for microbial inputs. Service delivery models for biofertilizers. Opportunities for youth and women in distribution and training.



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### Microbial-based solutions - *Rhizobia* soil bacteria

#### What technology?

Consists in inoculating legume seeds with rhizobia—soil bacteria that fix nitrogen inside root nodules. This boosts plant growth, reduces fertilizer needs, and improves soil health.



#### Who can use it and why?

Farmers growing legumes, especially in poor or acidic soils. Solves low yields due to absence or inefficiency of native rhizobia.

#### Successful cases and limitations

Adopted widely in Australia (legume crops and pastures). In the Mediterranean, successful in Sardinia with *Sulla coronaria*. Limitations: not needed if soils already host efficient rhizobia; sensitive to some seed treatments.

#### Ease of use and costs

Mature and easy to use. Cost: ~25€/ha. Requires sowing seeds within 6 hours of inoculation. No special equipment or maintenance needed.

#### Equipment/requirements

Just a bucket for mixing inoculant with seeds. Basic instructions available online. Anyone can apply it. No ownership issues.

#### Business opportunities

Inoculant production, seed inoculation services, and training. Opportunities for young people and women in rural areas.



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### Adaptive vegetation management tool (CAFE)

#### What technology?

A digital Decision Support System (CAFE) to plan forest management for fire resistance, water conservation, carbon capture, and ecosystem resilience. It simulates and optimizes multiple outcomes over time.



#### Who can use it and why?

Designed for forest managers and planners tackling climate change, wildfire risks, and resource allocation. Integrates environmental data for sound decisions.

#### Successful cases and limitations

Applied in Spain by government bodies. Useful wherever ecosystem services need quantification (e.g., carbon credits). Limit: requires modelling skills and field data.

#### Ease of use and costs

Developed in 2021, now available online. Free software (open source). Needs training in ecohydrology, simulation tools, and data interpretation.

#### Equipment/requirements

Computer, internet, Docker. Skills in forest modelling. No commercial license needed—developed under EU LIFE program.

#### Business opportunities

Supports ecosystem service valuation (e.g. carbon markets). Enables planning for sustainable forestry with economic return. Useful for policy and certification.



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### DSS for forage crop improvement

#### What technology?

A mobile DSS that provides site-specific recommendations to improve forage crop choice and pasture productivity in Mediterranean silvo-pastoral systems.



#### Who can use it and why?

Farmers, advisors and land managers who need optimized species selection and management options to enhance forage yield and sustainability.

#### Successful cases and limitations

Tested in a Sardinian Living Lab on perennial legumes. Limitations include the need for updated regional databases, continuous validation and proper user training.

#### Ease of use and costs

User-friendly, requiring minimal training. Costs depend on database development and software maintenance.

#### Equipment/requirements

Reliable soil, climate and land-use data; a compatible mobile device; technical capacity for app updates.

#### Business opportunities

Consulting, app development, and improved farm profitability through better forage planning..



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## Dynamic approach to Silvopastoral Systems

### What technology?

A dynamic decision-support system (DSS) for silvopastoral systems, integrating soil, vegetation, and livestock management.

### Who can use it and why?

Farmers, advisors, and land managers in Mediterranean



areas—especially those managing oak woodlands and pastures—for productivity and sustainability.

### Successful cases and limitations

Applied in Italy and other Mediterranean contexts. Limitation: requires inclusive stakeholder involvement to avoid unbalanced outcomes.

### Ease of use and costs

User-friendly with minimal training. Costs vary based on customization and scale.

### Equipment/requirements

Soil/weather sensors, GPS tools, modeling software.

### Business opportunities

Consulting services, sustainable farming/tourism, tech-based decision support.



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## GPS collars for AMP grazing

### What technology?

Virtual fencing for adaptive multipaddock grazing using GPS-enabled collars and mobile apps to manage livestock movement without physical fences.

### Who can use it and why?

Pastoral farmers aiming to enhance pasture use, reduce labor, and optimize rotational grazing in Mediterranean silvopastoral systems.

### Successful cases and limitations

Being tested in Sardinia; potential animal welfare concerns and device reliability still under evaluation.

### Ease of use and costs

Easy to learn; high initial investment but lower long-term costs than traditional fencing.

### Equipment/requirements

GPS collars, solar power, smartphone app, skilled setup.

### Business opportunities

Livestock tech services, precision grazing consulting



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## Landagritech

### What technology?

A digital platform connecting farmers and land-owners with agricultural service providers (soil work, irrigation, harvesting) in real-time, including GPS and video tracking of activities.

### Who can use it and why?

Producers, service providers, and land managers to access/tender for services, monitor activity, reduce land abandonment, and empower women and youth in agriculture.

### Successful cases and limitations

In Tunisia (Médénine region) over 200 users utilise the platform. Constraints: poor internet connectivity, limited tech access in rural areas, need for training, cultural/social barriers.

### Ease of use and costs

Affordable investment, ease of training, and demonstrable environmental impact are critical to adoption

### Equipment/requirements

A smartphone or device with internet access, GPS/video tracking capability, platform backend, reliable connectivity.

### Business opportunities

Creation of on-demand agricultural service marketplaces, job creation in rural tech-enabled agriculture.



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**SALAM-MED**  
sustainable  
approaches  
to land and water  
management  
in mediterranean  
drylands



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