PRIMA SOILS4MED: Soil Health Monitoring System for a sustainable management of Mediterranean region

Dimitris Triantakonstantis

Institute of Soil and Water Resources, Hellenic Agricultural Organization – DIMITRA, 1 Sofokli Venizelou, 14123 Lykovrisi, Greece
e-mail: trdimitrios@gmail.com

ESA Symposium on Earth Observation for Soil Protection and Restoration

The PRIMA programme is supported under Horizon 2020, the European Union's Framework Programme for Research and Innovation.

SOIL health monitoring and information systems FOR sustainable soil management in the MEDiterranean region

In line with the principles of the EU Mission A Soil Deal for Europe, SOILS4MED will engage a large platform of scientists, stakeholders and final users in the co-design of scientifically sound, sustainable, and policy-relevant integrated soil health monitoring systems harmonized across the Mediterranean region and will demonstrate the multiple societal benefits deriving from increased investment in soil data and information.

PRIMA SOILS4MED: Soil Health Monitoring System for a sustainable management of Mediterranean region
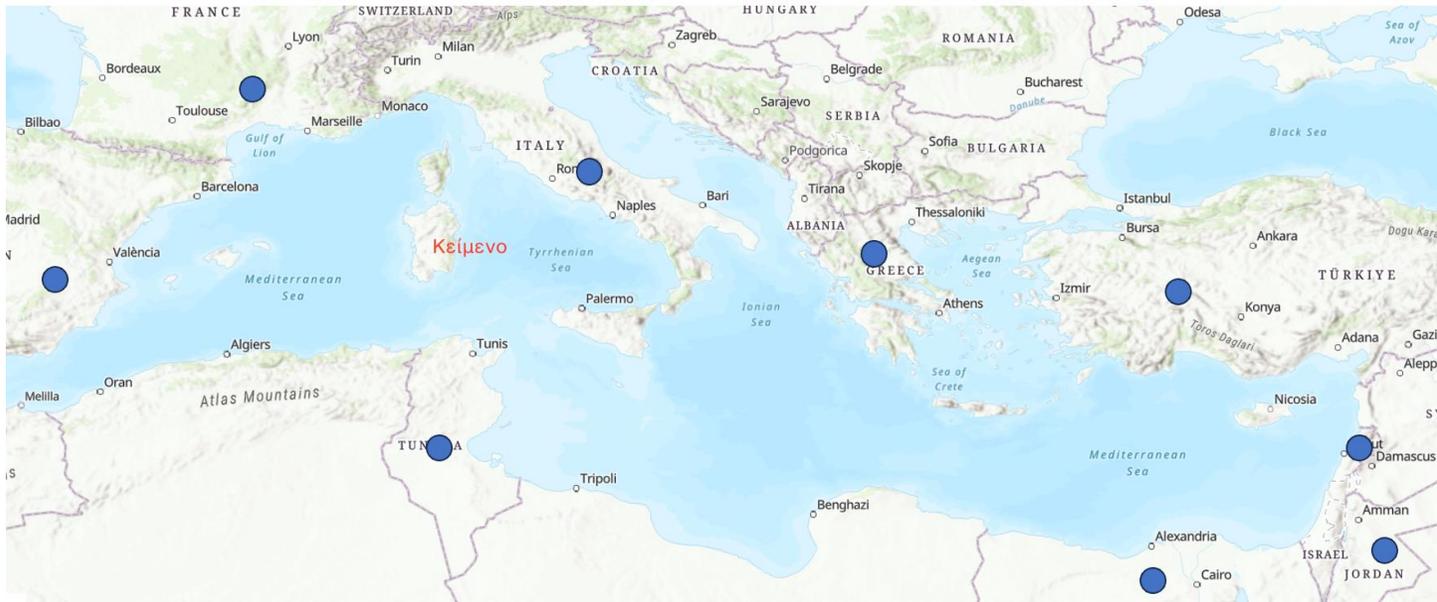
| Organisation	Country
Università di Sassari (UNISS), Nucleo Ricerca Desertificazione	ITA
Mediterranean Agronomic Institute of Bari (CIHEAM-B)	ITA (INT)
Int. Centre for Agricultural Research in the Dry Areas (ICARDA)	LEB (INT)
Universidad de Sevilla (US)	SPA
Université de Poitiers (UNIPOI)	FRA
Direction des Sols (DGACTA)	TUN
Centro Ricerca Sviluppo e Studi Superiori in Sardegna (CRS4)	ITA
Hellenic Agricultural Organization (DIMITRA)	GRE
Università di Palermo (UNIPA)	ITA
University of El Zagazig (UZAG)	EGY
Lebanese Agricultural Research Institute (LARI)	LEB
University of Jordan (UOJ)	JORD
Università di Milano (UNIMI)	ITA
University of Cukurova (UCUK)	TUR
Università Federico II di Napoli (UNINA)	ITA
EC – Joint Research Centre (JRC)	ITA (INT)

Integrated Indicators

Soils Solutions by Context

SOILS4MED has the following **objectives**:

1) engage with stakeholders in line with the **Living Lab** approach and raise awareness on the benefits deriving from increased investment in soil data and information (SDI);

2) develop policy relevant **integrated indicator sets** and monitoring protocols **adapted to the environmental specificities and stakeholder needs of the Mediterranean Region**;

3) validate the protocols in study areas representing major agro-ecological regions and soil types, generating the **first region-wide harmonized soil health dataset**s for the Mediterranean Region;

4) demonstrate the capacity of the SDI produced by the protocols, integrated by legacy soil data, to **feed state-of-the-art tools** to support sustainable soil and water management, land degradation neutrality, and to **enhance regional soil health mapping** including carbon stock mapping; and

5) design and implement **standardized country-based soil information systems (SIS)** for the effective management and use of SDI.
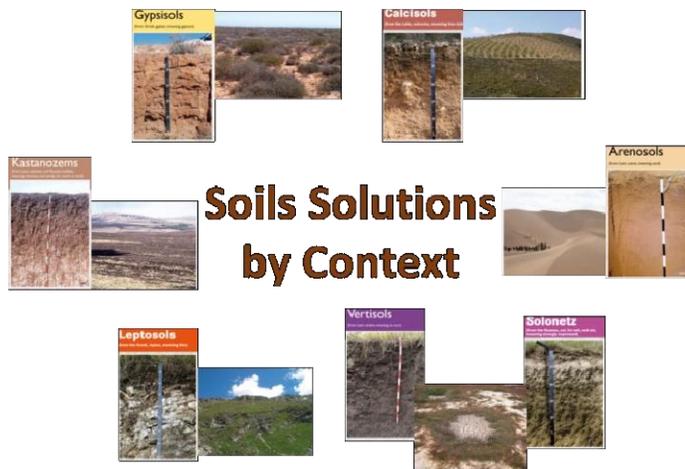
WP3: Policy-relevant indicators of soil ecosystem health for PRIMA countries
Task 3.3: Potential indicators, alternative or proxies

Task goal: Review potential/innovative datasets and methods that could generate alternative cost-effective indicators or proxies

Soil challenges in the wider Mediterranean region

- Erosion
- Soil organic matter loss
- Desertification
- Salinization
- Biodiversity loss

How can remote / proximal sensing indicators contribute to tackling soil challenges in the Mediterranean region?

Remote / proximal sensing applications

SOC estimation: with remote sensing (spaceborne, airborne, unmanned aerial vehicles) and laboratory or handheld visible and near infrared (VNIR)- short wave infrared (SWIR) spectroscopy (Angelopoulou et al., 2019, 2020; Triantakonstantis et al., 2021)

Soil salinity: Soil Adjusted Vegetation Index as a predictor of soil salinity (Nouri et al., 2018)

Drought Impact: Normalized Difference Vegetation Index (NDVI) and Standardized Precipitation Evapotranspiration Index (SPEI) (Gouveia et al., 2017)

Erosion: proximal sensing with unmanned aerial vehicles (Takáts et al., 2022)

Plant biodiversity: spectral diversity correlates with plant species richness (H. Gholizadeh et al., 2018)

Soil contamination: vegetation stress as a proxy for soil contamination, different sensors and spectral ranges per pollutant (Gholizadeh & Kopačková, 2019)

References

- Angelopoulou, T., Balafoutis, A., Zalidis, G., & Bochtis, D. (2020). From Laboratory to Proximal Sensing Spectroscopy for Soil Organic Carbon Estimation—A Review. *Sustainability*, *12*(2), Article 2. https://doi.org/10.3390/su12020443
- Angelopoulou, T., Tziolas, N., Balafoutis, A., Zalidis, G., & Bochtis, D. (2019). Remote Sensing Techniques for Soil Organic Carbon Estimation: A Review. *Remote Sensing*, *11*(6), Article 6. https://doi.org/10.3390/rs11060676
- Gholizadeh, A., & Kopačková, V. (2019). Detecting vegetation stress as a soil contamination proxy: A review of optical proximal and remote sensing techniques. *International Journal of Environmental Science and Technology*, *16*(5), 2511–2524. https://doi.org/10.1007/s13762-019-02310-w
- Gholizadeh, H., Gamon, J. A., Zygielbaum, A. I., Wang, R., Schweiger, A. K., & Cavender-Bares, J. (2018). Remote sensing of biodiversity: Soil correction and data dimension reduction methods improve assessment of α-diversity (species richness) in prairie ecosystems. *Remote Sensing of Environment*, *206*, 240–253. https://doi.org/10.1016/j.rse.2017.12.014
- Gouveia, C. M., Trigo, R. M., Beguería, S., & Vicente-Serrano, S. M. (2017). Drought impacts on vegetation activity in the Mediterranean region: An assessment using remote sensing data and multi-scale drought indicators. Global and Planetary Change, 151, 15–27. https://doi.org/10.1016/j.gloplacha.2016.06.011
- Nouri, H., Chavoshi Borujeni, S., Alaghmand, S., Anderson, S. J., Sutton, P. C., Parvazian, S., & Beecham, S. (2018). Soil Salinity Mapping of Urban Greenery Using Remote Sensing and Proximal Sensing Techniques; The Case of Veale Gardens within the Adelaide Parklands. Sustainability, 10(8), Article 8. https://doi.org/10.3390/su10082826
- Takáts, T., Mészáros, J., & Albert, G. (2022). Spatial Modelling of Vineyard Erosion in the Neszmély Wine Region, Hungary Using Proximal Sensing. Remote Sensing, 14(14), Article 14. https://doi.org/10.3390/rs14143463
- Triantakonstantis, D., Papadopoulou, Z., Katsenios, N., Sparangis, P., & Efthimiadou, A. (2021). Chapter 17—Use of GPS, remote sensing imagery, and GIS in soil organic carbon mapping. In G. p. Petropoulos & P. K. Srivastava (Eds.), GPS and GNSS Technology in Geosciences (pp. 351–369). Elsevier. https://doi.org/10.1016/B978-0-12-818617-6.00022-6