Measuring readiness for soil innovation and assessing Living Lab maturity

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The NEMESIS project [1] **starts from the identification of experimental sites, chosen within five Living Labs spread across the Mediterranean** – in Italy, France, Spain, and Tunisia/Algeria. Each of these Living Labs has a different focus: soil and crop systems, soil biodiversity, soil and pasture, cross-border soil management. What the sites do not share is a common size, a common farming system, or a common level of technical infrastructure. **What they do share is a posture – an openness to trying, to asking questions, and to working differently on their land.** The project envisions a Mediterranean where soil health is actively regenerated, continuously monitored, and guides decision-making across land use and governance [2,3,4,5] – **supported by Living Labs that function as permanent innovation and learning infrastructures** [6,7], enabling local communities and multiple actors to work collectively for resilient landscapes, sustained ecosystem services, and shared ownership of the soil.

These sites share a local specific experimental vocation that is not formal, nor uniform. It may show itself as a farmer who has spent years observing soil organic matter without anyone asking them to, as a cooperative that already runs open days for schools, or as a land manager who wants to understand why water no longer infiltrates the way it used to. In each case something is already in motion – a curiosity, a practice, a relationship – from which to start building.

NEMESIS intends to measure the readiness of each site toward soil health innovation and experimental vocation. To understand what readiness to soil health innovation really translates into in the practical life of the field, the Italian Living Lab team spent six months on the ground. From November 2025 to May 2026, the team defined and shaped what began as an ice-breaker questionnaire built on the principles of the agroecological approach [8,9], comprising a round of open-answer interviews and exploratory site visits across 12 Italian pilot sites – a deliberately open and divergent phase [10], designed to surface the full variety of the landscape before converging on the right questions to ask. The visits covered a variety of experimental approaches, spanning from agroforestry systems, rice cultivation landscapes, vineyards, horticultural cooperatives, and silvicultural associations.

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The aim was to understand what readiness for soil health actually looks like in practice – whether farmers track how their fields respond to drought or heavy rain, whether they know their organic matter levels or how compaction is changing the way water moves through their soil [11,12], whether they see a connection between the choices they make – what they plant, how they till, what they add or withhold – and the long-term health of the ground beneath them [13], and whether, beyond the field, they share what they observe and have become a point of reference for those around them. **What the visits revealed was a wide spectrum of conditions**: some sites carry decades of soil monitoring data, geospatial information systems, and active research partnerships; others had never run a formal soil analysis and work largely on their own. **Climate pressures such as compaction and water management came up as a shared reality across nearly every site** [14,15]. Digital readiness ranged from sensor networks and precision agriculture interest to fully manual approaches. And in almost every conversation, there was a desire to open the farm to visitors, students, and peers.

This readiness measurement passes through two dimensions: the awareness each site has of its own vocation, and its capacity to transfer what it learns to the wider society and its stakeholders. Readiness moves simultaneously in two directions. The first is inward – whether a site knows its own soil, tracks organic matter, compaction, and how water moves through the ground [11,12], and whether the site manager sees the connection between management choices and what the soil does in return [13]. The second is outward – whether the site shares what it learns with neighbouring farms, researchers, schools, and the wider community of people who could benefit from what is being observed on that land [6,7]. **A site that knows its soil deeply but keeps that knowledge to itself is already doing important work, but it is doing it alone. A site that also opens its doors, contributes its data, and brings others into the conversation becomes part of a living network of knowledge.**

Those findings made it possible to shape the tool for measuring the readiness level of the experimental sites [16]**: the Experimental Sites Maturity Level Assessment Questionnaire (MLAQ)** [17] – a self-assessment of 23 questions – organised into four areas related to specific Key Performance Indicators (Societal, Governance, Scientific, Technological), each reading a different dimension of the experimental vocation.

The first area (Societal) assesses the level and quality of participation [6,7] – whether the site manager engages as a host who provides access or as an active co-designer who proposes ideas and connects the project to its local context. It covers membership in farming networks, cooperatives, or educational institutions; the physical spaces available on the farm for hosting groups; and how the site communicates its activities to neighbours, schools, and the broader public. **The second area (Governance) examines how the site is managed and embedded in its broader institutional context** – whether responsibilities are shared and documented or concentrated informally in one person, whether decisions are recorded, and whether the site maintains ongoing relationships with research bodies, public institutions, or professional networks. It also assesses whether the site is already recognised, formally or informally, as a reference point by others in the region. **The third area (Scientific) goes into the farm itself, covering the overall management approach** – from conventional to certified or pioneering agroecological practice [8,9] – and the centrality of soil innovation to the site's vision for its future. It assesses what soil data already exists, including analyses, organic matter records, and water infiltration measurements [11,12]; the diversity and sustainability of agronomic practices; trends in soil health over the past five years [13]; and the economic resilience of the site in terms of income diversification and subsidy independence. **The fourth area (Technological) looks at the digital monitoring infrastructure already in place** – whether fields are mapped spatially, what sensors are installed and what parameters they measure, how frequently data is collected and whether recording is automated, and the site's willingness to share anonymized data with the consortium and the wider research and agricultural community.

For each of the four areas, the responses are scored by Readiness Level [16] – from Level 1 (Initial) to Level 4 (Advanced). A site may score differently across dimensions: highly advanced in scientific monitoring but just starting out in community connections or deeply embedded in its local network but with little digital infrastructure in place. **Taken together, the cumulative Readiness Level responses compose a KPI Scorecard covering societal, governance, scientific, and technological readiness, which informs a site-specific SWOT analysis, evidencing its strengths, the areas that need development, and its most promising direction within the project.** Over the course of NEMESIS, experimental sites will be supported in building capacity across all four dimensions, progressing toward more conscious, data-informed, and socially embedded soil health practices [13].

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The Readiness Levels of all experimental sites within a Living Lab are averaged to produce the overall aggregate maturity profile of that LL [1] – a single composite score that reflects the collective starting point of the network of sites it brings together. This is the final score that describes the Living Lab and how ready it is to drive soil health innovation in its territory. The next step will be to distribute the MLAQ to each Experimental Site, collect the Readiness Level scores, and produce the maturity profile of each Living Lab.

Each LL profile tells a different story, and NEMESIS will work with each of them accordingly over the course of the project. With this vision, the longer-term ambition is that Living Labs progressing through the project will not only deepen their own capacity but become reference points within their regional and national networks, and, for those **Experimental Sites that go furthest, soil health lighthouses that others can genuinely learn from.**

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