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Comparing soil properties between LUCAS Soil and National Soil Information Monitoring System (N-SIMS): major differences and implications for future policies to evaluate soil quality

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Soil is crucial for life as it provides us food and fibre, regulates water and climate, and hosts thousands of organisms. A recent assessment states that 60-70% of soils in Europe can be considered as unhealthy due to different soil degradation processes. To protect this non-renewable resource at human scale, we first need to acquire knowledge about it and implement soil monitoring to determine the current soil properties, assess the soil status and detect soil changes over time.

In Europe, two types of monitoring networks currently exist in parallel. Many EU Member states (MS) developed their own soil information monitoring system (N-SIMS), some of them in place for decades. Since 2009, a European topsoil monitoring programs has been established by the European Commission based on the Land Use/Land Cover Area Frame Survey (LUCAS) led by EUROSTAT. This survey was repeated several times since 2009 and offers a consistent spatial database. Nevertheless, N-SIMS and LUCAS Soil were established for different purposes with diverging monitoring strategies. To evaluate soil quality and support European policies, there is a clear need to establish reference values to assess soil health, based on reliable soil data. Consequently, a question remains whether

the soil properties obtained by both monitoring programs (N-SIMS and LUCAS Soil) are comparable, and what could be the limitations of using either one dataset or the other.

In the context of workpackage 6 of EJP Soil, a comparison of statistical distribution of three soil properties (organic carbon, pH and clay content) has been conducted among 12 different EU countries including BE, DE, DK, EE, ES, FR, DE, HU, IT, NL, PL, SE and SK. In addition, a comparison of the results of two indicators including soil loss indicator OC/Clay and pH classes using N-SIMS and LUCAS Soil datasets has been conducted. The results underlined substantial differences in soil properties statistical distributions between N-SIMS and LUCAS Soil in many countries, particularly for woodland and grassland soils, affecting the evaluation of soil quality using indicators. Such differences that might be explained by both the monitoring strategy (spatial distribution of sites) and sampling protocols exposes the significance of selecting reliable data to support European and national policies. Those results advocate for a further effort of dialogue between national institutions conducting soil monitoring and LUCAS Soil to strengthen future soil monitoring and provide reliable data to reach the objectives of healthy soils.