A review of existing soil monitoring systems to pave the way for the EU Soil Observatory

Past and coming steps

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EJP SOIL WP6 main objectives and links with EU Soil Observatory

EJP SOIL WP6

Monitoring

Mapping

Indicators & Benchmark values

Data management

Monitoring
Indicators
Data

EU Soil Observatory

Monitoring

EU Dashboard

Data Center

R&I

Open forum

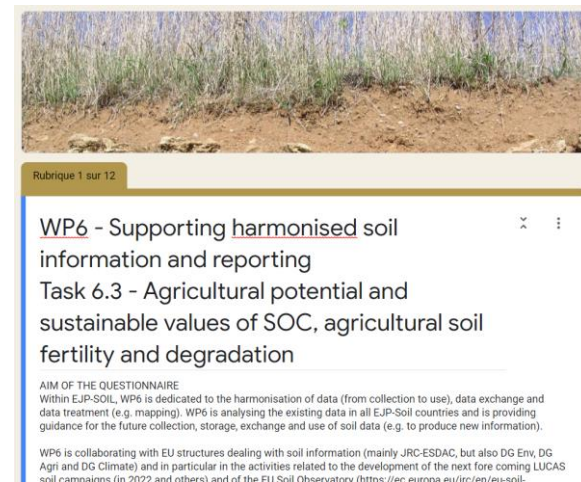# Describe and analyse Soil Monitoring Systems across EJP SOIL partners

- **Stocktake** the description of monitoring networks across EJP SOIL partners through the use of a **questionnaire**
  - Institution identification
  - SMS short description
  - Site information
  - Sampling protocol
  - Sampling for bulk density
  - Soil description
  - Soil sample preparation and conservation
  - Litter sample
  - Analyses and methods
  - *Harmonization options*
  - *Collaborations and/or synergies between Member States and LUCAS*

- 20 answers, 41 contributors

Published on the EJP SOIL web portal:
https://ejpsoil.eu/fileadmin/projects/ejpsoil/WP6/EJP_SOIL_Deliverable_6.3_Dec_2021_final.pdf

WP6 - Supporting harmonised soil information and reporting
Task 6.3 - Agricultural potential and sustainable values of SOC, agricultural soil fertility and degradation

AIM OF THE QUESTIONNAIRE
Within EJP-SOIL, WP6 is dedicated to the harmonisation of data (from collection to use), data exchange and data treatment (e.g. mapping). WP6 is analysing the existing data in all EJP-Soil countries and is providing guidance for the future collection, storage, exchange and use of soil data (e.g. to produce new information).

WP6 is collaborating with EU structures dealing with soil information (mainly JRC-ESDAC, but also DG Env, DG Agri and DG Climate) and in particular in the activities related to the development of the next fore coming LUCAS soil campaigns (in 2022 and others) and of the EU Soil Observatory (https://ec.europa.eu/jrc/en/eu-soil-

PROPOSAL OF METHODOLOGICAL DEVELOPMENT FOR THE LUCAS PROGRAMME IN ACCORDANCE WITH NATIONAL MONITORING PROGRAMMES
Deliverable 6.3
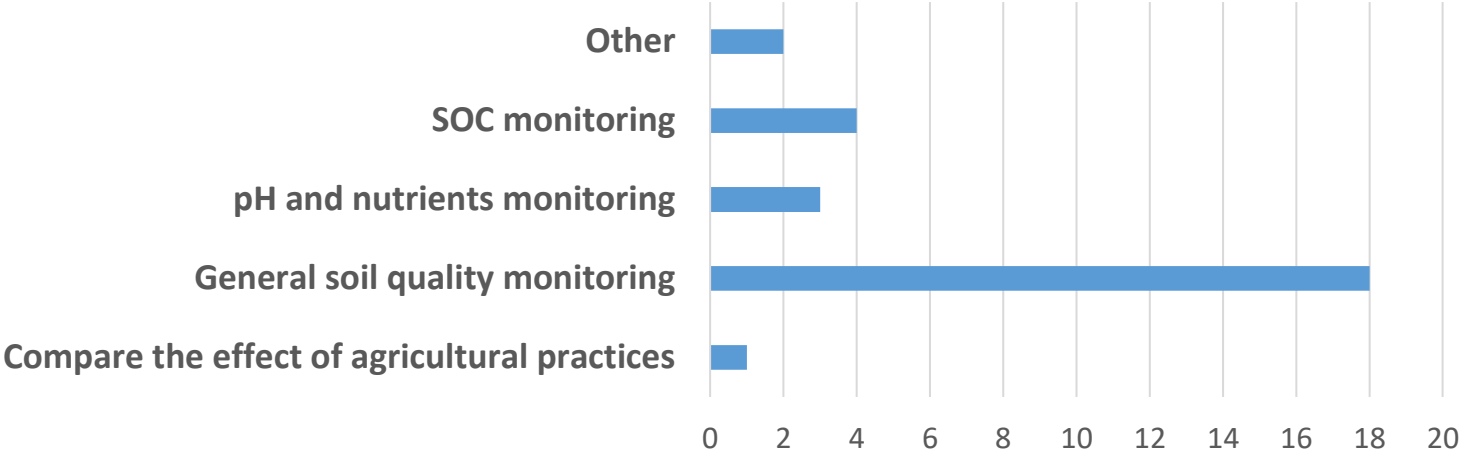
EJP SOIL Delivarable 6.3

SMS in EJP SOIL countries

- 20 countries answered out of 24 (ending with 27 declared SMS)

- Turkey and Portugal do not have SMS

- Five countries have 2 or 3 monitoring systems
  - SMS managed at regional scale
  - SMS with different purposes (e.g. agricultural *vs* forest, monitoring trace element *vs* agricultural parameters, monitoring a network of highly instrumented sites *vs* network agricultural soils)
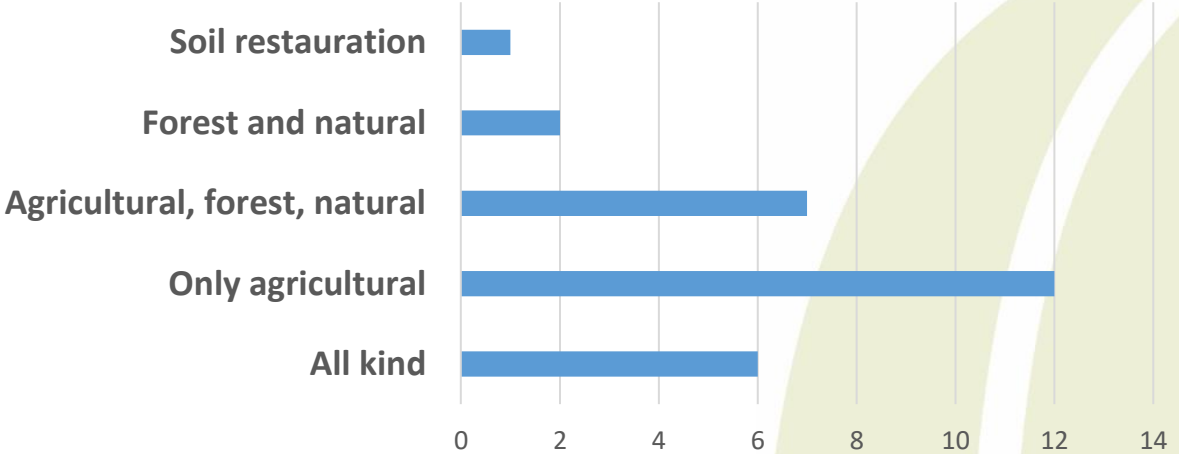
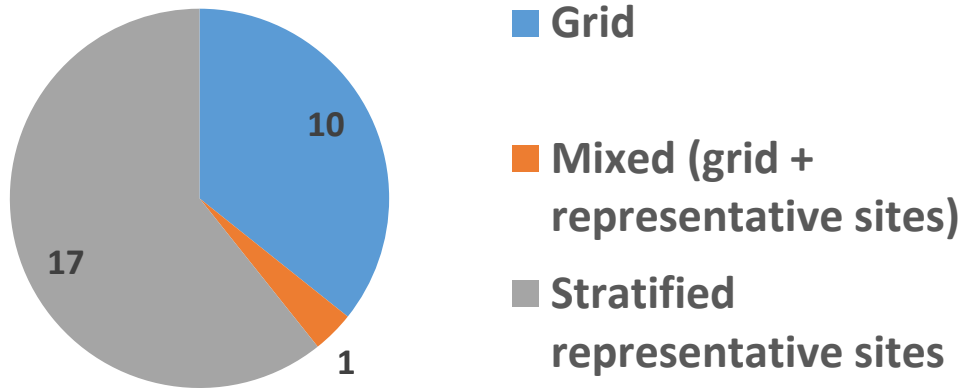- Caution: Not all countries declared their forest SMS

Nb of SMNs
- 3
- 2
- 1
- No SMN
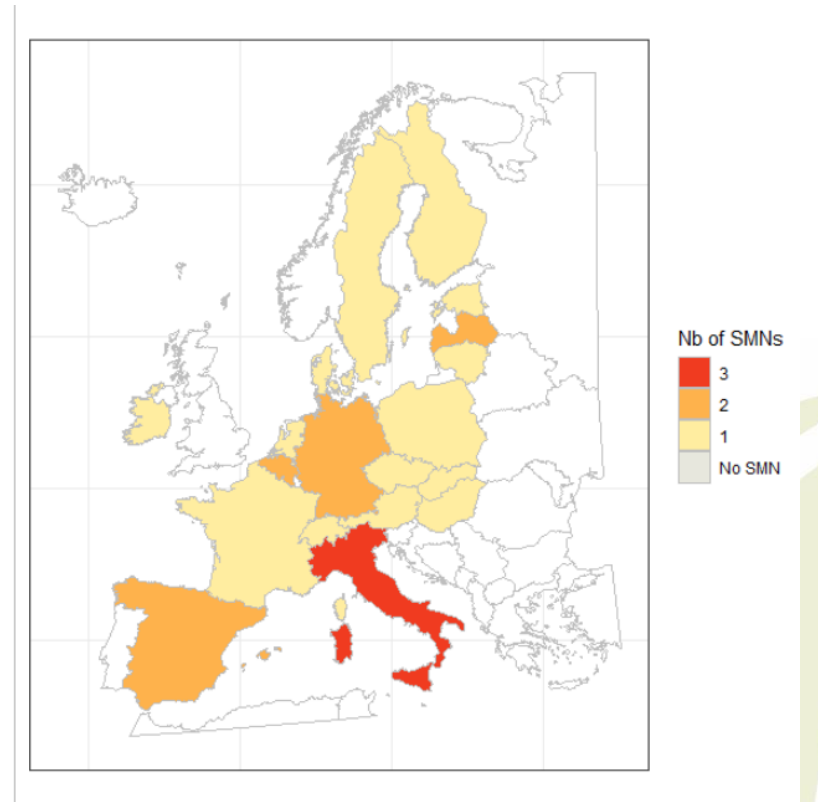
Results at a glance

Main objective of the SMS

Investigated land uses

Results at a glance

Sampling design

- Grid
- Mixed (grid + representative sites)
- Stratified representative sites

10

17

1

Sampling area

Composite sampling (from <10 to 30 sub-samples)

> 1000 m²	
500 to 1000 m²	
100 to 500 m²	
< 100 m²	

0   2   4   6   8   10   12

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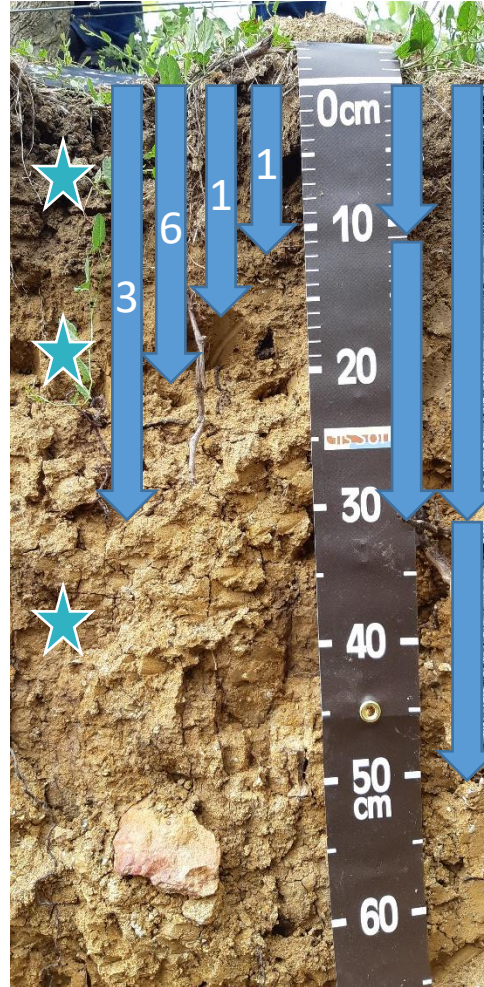
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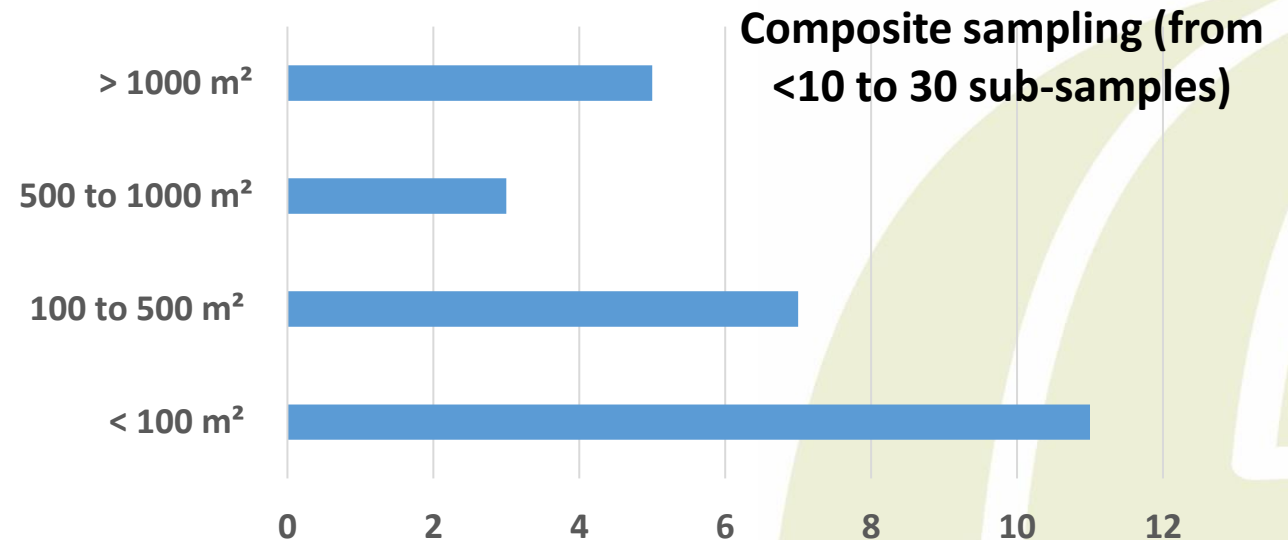
Results at a glance - Sampling depths

4 according to horizons

11 one fixed depth

14 different fixed depths

to 1 m

16 MS sample for bulk density

13 MS are sampling deeper than 30 cm

Analytical methods (still to be completed)

Countries	Sweden	France	EU-JRC	Czech Republic	Latvia		Lithuania	Belgium - Wallonia	Belgium - Flanders	Netherlands	Slovakia	Denmark	Germany	TOTAL
Name of the Soil Monitoring System	Soil & Crop Inventory	RMQS	LUCAS[a]	Basal soil monitoring	SPPS	SPPS N	Dirv_DR10LT	CARBIOSOL	Koolst of monitoring netwerk	Netherlands Soil Sampling Program (NSSP)	CMS-P	DSMDB	Boden-Dauerbeobachtung[b]	
total profile depth		x												6
plant exploitable (effective) soil depth		x												4
organic carbon	x	x	x											13
pH in water	x	x	x											10
sand	x	x	x											10
silt	x	x	x											10
clay	x	x	x											10
gravel		x	x											6
ECEC	x	x	x											9
bulk density of the fine earth (< 2 mm) fraction (excludes gravel)		x												5
bulk density of the whole soil in situ (includes gravel)		x	x											7
available water capacity														2
Electrical Conductivity		x												6
calcium-carbonate content	x	x	x											10
Field capacity (mm)														2
Plant available amounts of macro and micro nutrients	x	x	x											12
Total amounts of macro and micro nutrients/trace elements	x	x	x											8
quality of clay minerals (e.g. type or ratio of illite, smectite, montmorillonite in clay fraction...etc)			x											2
distribution of soil organisms		x	x							x		x	x	5
properties for NIR and MIR (near and mid infrared)	x	x	x					x	x					5

Row group labels: "Main soil properties, according to Global Soil Map specifications, 2015" and "Other soil properties"

Main « common » parameters:

- Organic carbon
- pH (in water)
- Soil texture
- Calcium/carbonate content
- Macro/micronutrients

… but different methods are applied… (see also Deliverable D6.1 from EJP SOIL)

Harmonization options

Can you modify:
- the sampling design of your SMS => NO but we may add new points (#12)
- the sampling area => NO (#20)
- the sampling depths => NO (#18) but we may sample deeper (#4)
- the soil sample preparation, before analysis => NO (#21)
- the analytical methods => NO (#16)

Any change would make impossible the comparison with previous data…

- Can you consider collecting new information on the monitoring sites?
  - YES: (#24)
- Can you improve soil description on the monitoring sites?
  - YES: (#16)
- Can you add extra analytical parameters?
  - YES: (#21)

But this will require more funds …

Main recommendations

- Compare national and LUCAS sampling strategies/schemes

- Compare national and LUCAS data, country/country

On going/well advanced activity (see presentation from Claire Forger)

- Develop transfer functions (from sampling to analytical methods), taking the opportunity of LUCAS 2022

EJP SOIL partners investment in the development of transfer functions (in link with LUCAS SOIL 2022)

Analytical procedures

- Double samples obtained from LUCAS 2022 samplers
- Between 100 and 200 sites will be analyzed depending on the countries
- 17 countries involved
- Comparison of EU and national results

Sampling and analytical procedures

- Sampling (on national SMS and/or on LUCAS 2022 points) according to national and LUCAS sampling protocols
- 6 countries involved
- Compare the overall process

On going activity…

An update needs to be made with all partners to identify:
- **any difficulties**
- **the time needed to deliver the analysis (either by JRC and countries)**
- **the work to be done on transfer functions …**

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Main recommendations

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On going activity (see presentation from Claire Forger)

- Develop transfer functions (from sampling to analytical methods), taking the opportunity of LUCAS 2022

To be organized

- Identify / test methods to merge national and LUCAS datasets and/or existing maps

Still to be started

- Develop / test benchmark values or scoring approaches

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Conclusions and next steps

- Overview of SMS in EJP SOIL countries …
- Full harmonization seems impossible
- Ways forwards/proposals

To be published

- Next steps:
  - New and if possible common sites may be implemented across countries
  - Identify ways to take advantage of national/EU data
    - Merging datasets / maps knowing and understanding the differences
    - Transfer functions to be developed using the LUCAS 2022 sampling campaign
    - Threshold values to be tested
    - Scoring functions to transform the data obtained through different ways

- Results can be later used to (i) improve LUCAS campaigns and (ii) implement and populate the EU Soil Observatory

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Thank you for your attention

EJP SOIL meeting
Palermo – June 2022

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