



Food and Agriculture  
Organization of the  
United Nations




## PILLAR 1 PROMOTE SUSTAINABLE MANAGEMENT OF SOIL RESOURCES FOR SOIL PROTECTION, CONSERVATION AND SUSTAINABLE PRODUCTIVITY

Violette Geissen, Suhad Saleh



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### PILLAR 1 BACKGROUND


**Link to the GSP Pillar1**

Increasing degree and extent of soil degradation

Many case studies with SSM present, but not linked and spattered

Urgent action is needed

- **Main objective of the Pillar 1**
  - 1) Increasing sustainable soil management implementation
  - 2) Costs and benefits from sustainable soil management practices
  - 3) Sustainable soil management and soil fertility
  - 4) Challenges and priorities for sustainable soil management implementation
  - 5) Sustainable soil management coordination and monitoring
- **Chair of the Working Group for Pillar 1: Violette Geissen (Wageningen University, NL)**



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## Recommendations for the Pillar 1

Identification and implementation of SSM for all land uses at regional and national levels

Sustainable agricultural production should be supported by **balanced soil fertility, weed control and pest management.**

- 2) Assessment of barriers preventing the implementation/adoption of SSM and propose policy and technical solutions
- 3) Development/implementation of monitoring system to measure the progress of SSM implementation and effects on soil quality
- 4) Facilitation of capacity building by GSP

### Links to the other Pillars

Implementation: strongly linked with Pillars 2 and 5

Generation of technical infos: strongly relies on Pillars 3 and 4



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## PILLAR 1 SPECIFICITY OF THE EUROPEAN CONTEXT

### State of European soils

According to the EU State of soil report (2012) and SWSR (2015), the main problems in Europe are

- soil sealing
- salinization
- contamination.

Additional threats:

- organic carbon changes, nutrient imbalance, soil erosion by wind or water, loss of soil biodiversity, desertification, landslides.

### Policy context

- EU Soil policy, modernization and simplification of the Common Agricultural Policy (CAP)
- Voluntary Guidelines for Sustainable Soil Management (VGSSM)
- Existing networks (at all levels) —in progress.



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## PILLAR 1 OUTPUTS

### Recommendation 1

Appropriate sustainable soil management practices (SSM) and systems should be identified for all land uses at regional and national levels and be implemented at appropriate scales.

#### Action

1. Identification of case studies with successfully implemented SSM
2. Identification of existing networks of stakeholders and existing/past projects related to SSM
  - Possible partners: Project partners from FP7, Horizon 2020, Life and national projects, farmer associations, NGOs and relevant initiatives (e.g. organic farming, agro-ecology, conservation agriculture, permaculture etc.)
  - Timeline: from Sept. 2017
  - Budget and funding: to be discussed

#### Outcome 1

Integrated map on European SSM case studies related to land use, soil threats and pedoclimatic zones

#### Outcome 2

Establishment of a SSM network(s) with stakeholders of the case studies and scientists, policy makers



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## PILLAR 1 CONCEPT

### Recommendation 1

*Inventory of all EC funded projects on SSM (FP7, Horizon2020, Live) by WU (financial support of EC DG ENV/JRC)*

Identification of farmers associations, NGOs and other relevant initiatives by JRC/DG ENV

Inventory of all national projects identified by **national focal points**

→ **Localization of case studies in combined maps of land use, pedoclimatic zone and soil threats**

→ **Localization of stakeholder networks**

→ Activation of interaction between the existing networks



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<https://docs.google.com/spreadsheets/d/1jyShfBYZ2evWjOKol-sXJcj2YtyU7IjMfOIMIoYLGPK/edit#gid=1568793285>

[illegible]

- European projects from 2001 - 2019
- Frameworks: FP7, LIFE, H2020...
- 220 **projects** identified
- **61 projects** selected that work on farming/crop production situations, 249 case studies

### Google sheet: categories

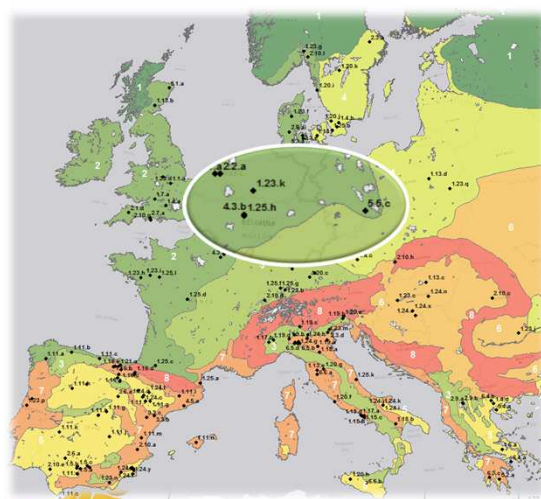
220 projects sorted by category in google sheet

#### Categories:

- Agricultural projects (34)
- Farmer education and outreach (12)
- Sustainable manure management (7)
- Water management (7)
- River conservation (7)
- Wine, olive & pistaccia cultivation (6)
- 
- Modeling, measuring and monitoring (32)
- Soil and water toxic contamination (44)
- Soil microbial projects (8)
- Grassland, wetland and forest conservation (35)
- Urban projects (25)
- Unusual projects (22)
- Existing EU soil networks (9)



249 case studies from 61 agricultural projects on European climate zones  
(zones based on iSQAPER project)



#### Project

#### numeration

Category: #

Project: #


Case study: letter

- 1 Boreal to Sub-Boreal
- 2 Atlantic
- 3 Sub-Oceanic
- 4 Northern sub-continental
- 5 Mediterranean semi-arid
- 6 Southern sub-continental
- 7 Mediterranean (temperate and sub-oceanic)
- 8 Temperate mountainous

Tóth, G., et al. (2016) Hierarchical and multi-scale pedoclimatic zonation

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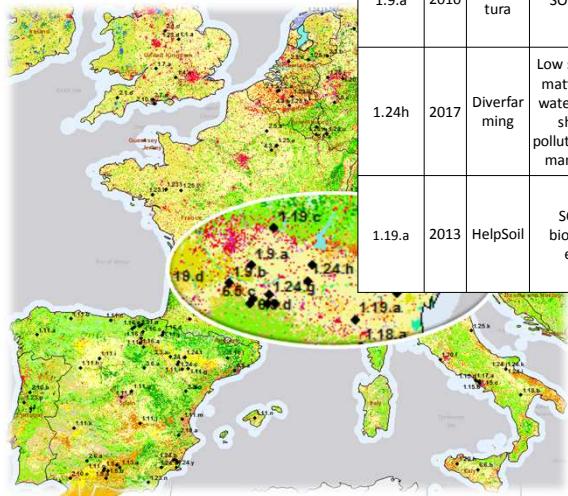
Easy finding: Sort by climate zone in google sheet



	Landuse	Pedoclimatic zone	Climate (after ISQAPER 8 climates)
4	agriculture, organic farming		1
4	Dairy farm		1
4	Dairy farm		1

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## CORINE land cover 2018



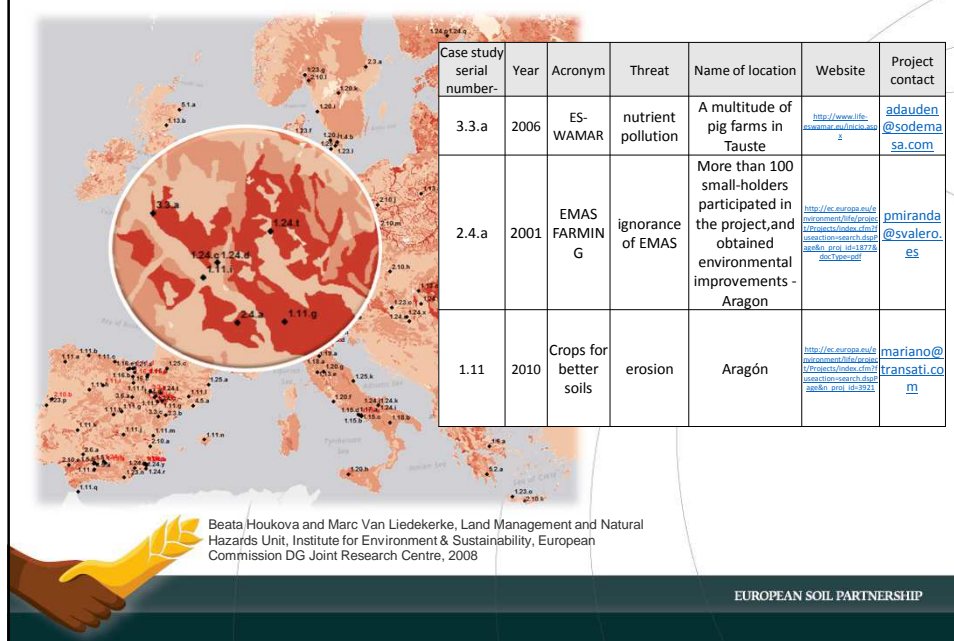
Case study serial number	Year	Acronym	Threat	Name of location	Website	Project contact
1.9.a	2010	AgriCO2tura	SOC decline	Lodi	<a href="http://www.ersaf.lombardia.it">http://www.ersaf.lombardia.it</a>	<a href="mailto:stefano.brenna@ersaf.lombardia.it">stefano.brenna@ersaf.lombardia.it</a>
1.24h	2017	Diverfarming	Low soil organic matter, Risk of water irrigation shortage, pollution, Nitrate management	Padania Valley	<a href="http://www.diverfarming.eu">www.diverfarming.eu</a>	Raul Zornoza ( <a href="mailto:raul.zornoza@uclm.es">raul.zornoza@uclm.es</a> )
1.19.a	2013	HelpSoil	SOC loss, biodiversity, erosion	Several farms in Emilia Romagna	<a href="http://www.lifehelpsoil.eu/">http://www.lifehelpsoil.eu/</a>	<a href="mailto:luca_zucchelli@regione.lombardia.it">luca_zucchelli@regione.lombardia.it</a>

By the European Environment Agency (EEA)

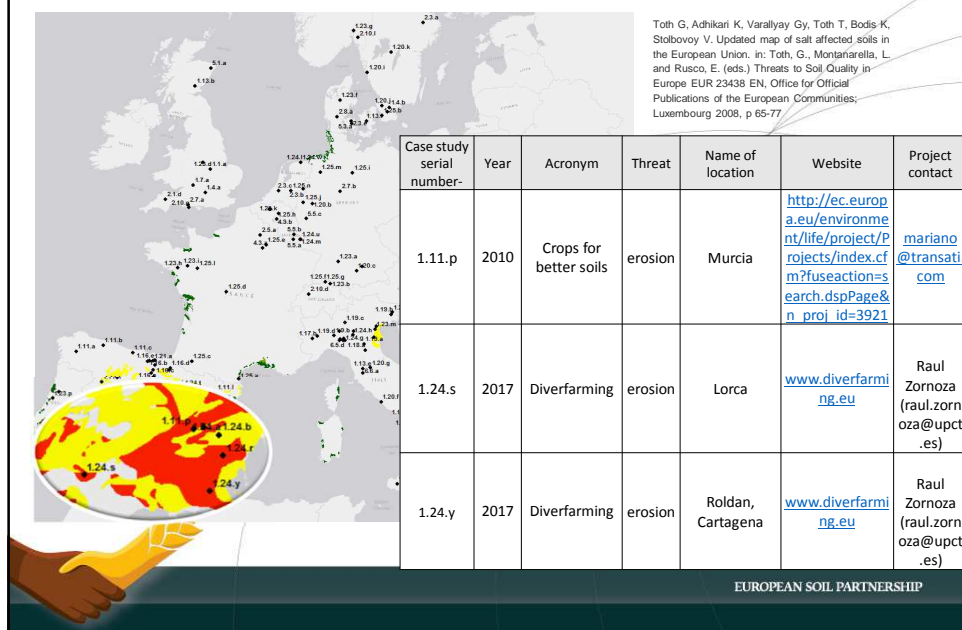
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## Map for Europe of Natural Susceptibility of Soils to Compaction



## Updated map of salt affected soils in the European Union



## Easy finding: Sort case studies by threat in google sheet

Soil threat(s)	Soil Erosion	Carbon Cont	Soil Compact	Soil Salinisation	Soil Sealing	Soil Contamination	Soil Acidification
Erosion, compaction, SOC loss	x	x	x				
Decline in Soil Organic Matter/ Water erosion/ Soil compaction/ Soil contamination	x	x	x			x	
Decline in Soil Organic Matter/ Water erosion/ Soil compaction/ Soil contamination	x	x	x			x	
Decline in Soil Organic Matter/ Water erosion/ Soil compaction/ Soil contamination	x	x	x			x	

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## Feedback

So far 15 project leaders replied that they're interested with together 70 case studies in their projects

For any further information you would need please do not hesitate to contact me  
Best regards  
Massimo Coltorti

Dear Violetta, I am interested in taking part in the European Soil Management Network in Europe. I am professor of Landscape Restoration at the University of Algarve, and I was responsible for the project ESPRACTICE, a bottom up approach for a strategic research agenda in the past I had several projects related to soil, landscape and land management. I am currently coordinating a project about soil.

Best regards  
Theresa Panagoulas  
University of Algarve  
Lisboa, Portugal  
800-101 000, Portugal

Many thanks for this initiative!  
Kind regards,  
Nerea Mandakovic and Lur Epelde

Attached you will find filled Case study document, with the latest information you are proposing as part of the Project.

Upon request we would be happy to share additional details if you need them.

Best regards,  
Tamara Todorovska  
Project Development and Evaluation Officer | EPI CENTAR International

We are interested in taking part in the ESP network and here there is the list of our Soil4Wine successful case studies. We give you also a Annex file to localize case studies on GIS. We will happy to provide you more detailed information about those case studies. Feel free to contact me (Irene Diti) or prof. Puri ex contact person.

Best regards  
Irene Diti  
Dipartimento di Scienze delle Produzioni Vegetali Sostenibili  
UNIVERSITA' DI TRIESTE  
VIA GIUSEPPE GIARDINO, 1  
34129 TRIESTE, ITALIA



## Who replied?

Name	Project	Soil Threat	SSM
Dr. Raul Zornoza	Diverfarming – 24 case studies with 16 different case study leaders	diverse: SOC loss, compaction, erosion, loss of biodiversity	focusing of appropriate crop choices and rotations
Prof. Chris Stoate	Allerton project – 1 case	Erosion, compaction, loss of SOM	Reduced tillage, direct drilling, cover crops, sub-soiling, grass leys ...
Tamara Todorovska	UNDP – National policy action Macedonia – (3)	Salinization/ Water erosion/nutrient pollution, loss of biodiversity	The overall objective of the assignment is the introduction of a set of comprehensive measures to significantly improve the Lake's ecological health, strengthen its resilience, and ensure, in the long-run, control of the eutrophication processes through a technical assistance in the introduction of sustainable agriculture farming practices among the apple producers in the Prespa region.
Dr. Grazia Masciandaro	BIOREM (3)	Soil Degradation in Mediterranean areas	Provision of support to EU farmers and land managers, to enable them to effectively tackle land contamination and depletion; Prevention of further soil degradation; and Furthering of the ability of policy-makers and land managers in all sectors to devise and implement new and effective soil use and management plans.
Dr. Grazia Masciandaro	ZEOWINE (2)	desertification, SOC loss, water loss, compaction, loss of biodiversity	The LIFE ZEOWINE project targets an improvement in soil quality in vineyards by combining organic waste from wine production with microporous minerals known as zeolites. The innovative product, known as ZEOWINE, could loosen the structure of soils, improve their ability to retain water, add organic matter to them and foster subsurface microbial life. The project will roll out protocols for producing ZEOWINE and apply it in organic and biodynamic vineyards.
Irene Diti and Prof. Stefano Poni	Soil 4 Wine (4)	erosion/SOC loss/compaction/Decline in Soil biodiversity/Water logging/Drought	Permanent grass (Grasses), cover crops

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## Who replied?

Name	Project	Soil Threat	SSM
Dr. Felicity Crotty (forwarded by Rudi Hessel, mentioning Dr. Nicola Cannon)	Long-term impact of agricultural establishment methods (1)	Soil erosion; soil compaction; loss of organic matter in mineral soil; loss of soil biodiversity	Quarry Field Experiment, set up in 2010, investigating the impact of ploughing compared to minimal tillage and direct drill in a replicated (n=6) field trial in plots 30m x 100m. Focus is on the impact of these three different management systems within same location and fully replicated
Dr. Nerea Mandaluniz and Dr. Lur Epelde	Soil Montana (1)	Compaction, nutrient imbalance, loss of biodiversity, organic carbon change	Phosphorus application, clearance of bushes, control of ferns, manure fertilization, liming, exclusions for livestock
Dr. Nerea Mandaluniz and Dr. Lur Epelde	REGEN farming (2)	Compaction, nutrient imbalance, loss of biodiversity, organic carbon change	Regenerative grazing management, direct sowing with perennial species to keep permanent pasture and fertilisation with manure or compost made in the farm
Bartke Stephan	<b>No own case studies but is interested and forwarded to colleagues</b>		
Prof. Thomas Panagopoulos	INSPIRATION (outreach, no field studies)	Public and farmer ignorance	a bottom up approach for a strategic research agenda on soil, land-use and land management in Europe
Prof. Massimo Coltorti	ZEOLife (1)	Intensive agriculture: Nitrogen excess from chemical fertilizers and zootechnical effluents	By using zeolites as soil amendment we reached the following main goals: reduction of nitrate leaching; reduction of the amount of fertilizers required for crop growth while maintaining or even increasing crop yield; reduction of the amount of water used for irrigation; improvement of soil chemical and physical properties

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## Who replied?

Dr Maria Doula (mdoula@otenet.gr)	ZeoLIFE	see above	see above
	PROSODOL (1)	soil pollution	Development of legislative proposals for soil protection from Olive mill waste disposal, development of decision support tools for selecting the appropriate areas for waste disposal and monitoring soil properties through GIS web tools
	AgroStrat (2)	Intensively cultivated mediterranean areas under desertification risk, pollution	Development of an Integrated management scenario for cultivation under desertification risk to ensure soil protection, yield and food safety. Guidelines for regional plans design and implementation for sustainable development of rural agricultural areas. Development of GIS-based web tools for monitoring cultivated areas to be used by regional authorities and farmers associations.
	ClimaMED (19)	soil degradation, decline of soil organic carbon	The project aims mainly at developing and delivering innovative, reliable, rapid and cost effective technologies of Tier 3 level for the measurement of CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O emissions and Soil Organic Matter (SOC) stock changes from agricultural fields at real time
	BIOIONIAN (6)	unsustainable soil use, degradation due to non appropriate cultivation practices and organic materials/waste reuse or discharge. Threats under climate change, eg. Erosion, landslides	The Integrated Management Scenario of the above LIFE AgroStrat project will be implemented at the Region of Ionian Islands as regard the development of GIS-based web tools for the visualization of soil data, web platform for managing cultivated areas, assess soil appropriateness for waste disposal or reuse of organic materials, assess soil parameters and fertility level for cultivation type selection, recording soil erosion risk, etc.

Additionally, four Diverfarming **case study managers**: Dr. Esperanza Huerta-Lwanga, Dr. Karl Manuel Seeger, Jorge Álvaro-Fuentes and Roberta Farina

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## Threats that the projects work on

Soil threat	Project where we have feedback
Compaction	7
SOC loss	8
biodiversity loss	7
Erosion	6
Salinisation	1
Nutrient pollution	4
degradation	3
water loss	2
desertification	2
pollution	2

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### People willing to collaborate in setting up a database about national projects dealing with sustainable soil management

Name	email	Country
Dr. Taru Sandén	<a href="mailto:taru.sanden@ages.at">taru.sanden@ages.at</a>	Austria
Ass. prof. Dr. Jaroslava Sobocká	<a href="mailto:j.sobocka@vupop.sk">j.sobocka@vupop.sk</a>	Slovakia
Peter Hajek	<a href="mailto:peter.hajek@tirol.gv.at">peter.hajek@tirol.gv.at</a>	Austria
Francesco Pascale	<a href="mailto:f.pascale@terrafelix.eu">f.pascale@terrafelix.eu</a>	Italy
Yuriy Dmytruk	<a href="mailto:y.dmytruk@chnu.edu.ua">y.dmytruk@chnu.edu.ua</a>	Ukraine
Dietmar Müller-Grabherr	<a href="mailto:dietmar.mueller-grabherr@umweltbundesamt.at">dietmar.mueller-grabherr@umweltbundesamt.at</a>	Austria
Mykola Miroshnychenko	<a href="mailto:ecosoil@meta.ua">ecosoil@meta.ua</a>	Ukraine
Dusko Mukaetov	<a href="mailto:d.mukaetov@zeminst.edu.mk">d.mukaetov@zeminst.edu.mk</a>	Macedonia
Edward Someus	<a href="mailto:edward.someus@gmail.com">edward.someus@gmail.com</a>	Hungary
Maria Doula	<a href="mailto:mdoula@otenet.gr">mdoula@otenet.gr</a>	Greece
Costas Costa	<a href="mailto:costas.costa@cut.ac.cy">costas.costa@cut.ac.cy</a>	Cyprus
Isabel Lopes	<a href="mailto:ilopes@ua.pt">ilopes@ua.pt</a>	Portugal
Eduardo Costantini	<a href="mailto:edoardo.costantini@crea.gov.it">edoardo.costantini@crea.gov.it</a>	Italy
Marc van Liedekerke	<a href="mailto:Marc.van-Liedekerke@ec.europa.eu">Marc.van-Liedekerke@ec.europa.eu</a>	EU
Svetlana Chovancova	<a href="mailto:Svetlana.Chovancova@ec.europa.eu">Svetlana.Chovancova@ec.europa.eu</a>	EU
Diti Irene	<a href="mailto:irene.diti@unicatt.it">irene.diti@unicatt.it</a>	Italy

### Next

- Activating further case study leaders.....who helps?
- Adding national projects: Contact national focal points (JRC provides contacts)
- Sending maps and link to google sheet to all interested parties
- Completing google sheet where possible
- Workshops??? JRC/EC

## Next tasks WUR until end of April

The collected material should then be analysed and the following output should be produced:

1. list of contacted persons/organizations, and report on the response ✓
2. overview of the replies, highlighting the relevance to SSM ↻
3. elaborate maps that show the spatial distribution of known SSM activities ✓
4. highlight various activities and exchanges of good practices that support the sustainable soil management in Europe
5. based on a few examples (minimum 5) provide a guidance document that advocates SSM practices and report costs and benefits of SSM practices (compared to conventional farming)

The output will be:

- a report (in MS Word) that covers point 1 to 4,
- a report (in MS Word) that covers point-5,
- maps with the location of the SSMs and related case studies ✓
- a two/four page guidance document in English for dissemination on ESP website (for eventual further translation to other MS languages).



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### Links to google sheets:

International projects

<https://docs.google.com/spreadsheets/d/1jvShfBYZ2evWjOKol-sXJc2YtyU7IjMfOIMJ0vLGPK/edit?usp=sharing>

National projects

[https://docs.google.com/spreadsheets/d/1M0z3etunRlsPYksp\\_QXlldH9p20XTZUCRU4fcxSTzUU/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1M0z3etunRlsPYksp_QXlldH9p20XTZUCRU4fcxSTzUU/edit?usp=sharing)



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## Outlook 2019

- Finalizing of the data collection of the international projects
- Data collection of the national projects with the input of national focal points/ participants
- Compiling these data and listing stakeholder networks
- Data analysis and short report
- Finding budget to start activities 2 and 3



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## PILLAR 1 OUTPUTS

### Recommendation 2

Sustainable agricultural production should be supported by balanced soil fertility, weed control and pest management.

### Action

1. Organisation of a conference bringing the existing stakeholders together
2. Organize farm visits with the SSM network
  - Possible partners: WU, JRC, EC, existing networks, farmers associations, NGOs ....and national focal points
  - Timeline: autumn 2018
  - Budget and funding: to be discussed

### Outcome



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## PILLAR 1 CONCEPT

### Recommendation 3

Interviews with representatives of the stakeholder networks identified from the different regions organized by national institutions:

- Perception of stakeholders on SSM's
- Feed-back on the VGSSM of the GSP
- Reasons for implementation and extension of SSM's to other regions
- Reasons for stopping of implementation and not extension of SSM.....
  
- Conclusions for requirements for voluntary guidelines to ensure the implementation of successful SSM in all regions with all land use types and soil threats.



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## PILLAR 1 OUTPUTS

### Recommendation 4

A monitoring system should be developed to measure the impact and the progress of implementation of sustainable soil management practices and systems.

#### Action

1. **State of the art and requirements for soil monitoring in European agriculture and forestry**  
LUCAS –defined, SQAPP working from April 2019 on
2. **Monitor the effects of soil management change on soil biota (started in Diverfarming)**
3. **Knowledge of existing established systems and gaps to be filled**
  - Possible partners: ESP INSII and EIONET-NRC Soil, WU (ISQAPER), EC (LUCAS database and ESTAT farm surveys), national soil inventories...
  - Timeline: 2019+
  - Budget and funding: to be discussed

#### Outcomes

Report on State of the art and requirements for soil monitoring in European agriculture and forestry



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## PILLAR 1 CONCEPT

### Recommendation 5

Testing the long term effects of the SSMs in the case studies by the soil app developed in the iSQAPER project.

Explore the feasibility of monitoring SSMs e.g. by extending existing monitoring system (e.g. LUCAS) to the identified case study sites (JRC) or through other approach

Activity of the iSQAPER, SoilCare. Diverfarming ongoing  
JRC and national extension services/ stakeholder networks in cooperation with pillar 4.

### Outcome

App available in April 2018 for testing, final version April 2019



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## PILLAR 1 OUTPUTS

### Recommendation 6

The GSP should facilitate the development of a capacity building strategy.

### Action

1. Reactivate summer school
2. Setup voluntary certification on SSM
3. Launch training program on SSM
4. Implement pilot projects
  - Possible partners: JRC and partners
  - Timeline: to be discussed
  - Budget and funding: to be discussed

### Outcomes

To be discussed....



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## PILLAR 1 OUTPUTS

### Recommendation 7

Develop mechanisms to support indicators and targets for the soil-related SDG implementation in Europe.

### Action

**Coordinated approach on indicators and targets for the follow-up and review for the implementation of soil-related SDGs in Europe**

- Possible partners: EC (JRC, DG ENV) and EEA, IASS, WU and others
- Timeline: 2017+
- Budget and funding: to be discussed

### Outcomes

To be discussed....



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## PILLAR 1 OUTPUTS

### Recommendation 8

Activities addressing soil contamination.

### Action

1. **Inventory of EU contaminated sites including sites of diffuse pollution of organic pollutants**
2. **Revision of the indicator "Progress in the Management of Contaminated Sites in Europe"**
3. **Dissemination of the Good Practices and progress including threshold values for organic soil contaminants**

- Possible partners: JRC, EEA and EIONET (NRC Soil and ad-hoc WG on soil contamination), WU, SMEs
- Timeline: 2017+
- Budget and funding: to be discussed



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## PILLAR 1 CONCEPT

### Outcomes

- Extend the LUCAS monitoring for analysis of diffuse soil pollution in Europe (EC)?
- Map on Soil pollution by Glyphosate in Europe published (Silva et al. 2018, WU)
- Map on Soil pollution by multiple pesticides in preparation (Silva et al. 2019, WU)
- Literature review on existing data on pesticide residues in European soils (Geissen et al. in prep., WU)



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Contents lists available at ScienceDirect

**Science of the Total Environment**

journal homepage: [www.elsevier.com](http://www.elsevier.com)

**SEVIER**

Science of the Total Environment

**Distribution of glyphosate and aminomethylphosphonic acid (AMPA) in agricultural soils of the European Union**

Luca Montanarella<sup>a,\*</sup>, Arwyn Jones<sup>b</sup>, Oihane Fernández-Ugalde<sup>b</sup>, Hans G.J. Mol<sup>c</sup>, Coen J. Ritsema<sup>a</sup>, Lette Geissen<sup>a</sup>

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**ABSTRACT**

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**Keywords:**  
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Approval for glyphosate-based herbicides in the European Union (EU) is under intense debate due to concern about their effects on the environment and human health. The occurrence of glyphosate residues in European water bodies is rather well documented whereas only few, fragmented and outdated information is available for European soils. We provide the first large-scale assessment of distribution (occurrence and concentrations) of glyphosate and its main metabolite aminomethylphosphonic acid (AMPA) in EU agricultural topsoils, and estimate their potential spreading by wind and water erosion. Glyphosate and/or AMPA were present in 45% of the topsoils collected, originating from eleven countries and six crop systems, with a maximum concentration of 2 mg kg<sup>-1</sup>. Several glyphosate and AMPA hotspots were identified across the EU. Soil loss rate (obtained from recently derived European maps) were used to estimate the potential export of glyphosate and AMPA by wind and water erosion. The estimated exports, result of a conceptually simple model, clearly indicate that particulate transport can contribute to human and environmental exposure to herbicide residues. Residue threshold values in soils are urgently needed to define potential risks for soil health and off site effects related to export by wind and water erosion.

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