

Opportunities for soil sustainability in Europe

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Specialists from 18 European countries, meeting on 21-23 November 2016
at KNAW, Amsterdam with introductions from EASAC ENV Director and invited speakers

The process

- First provide a background document (2 rounds)
- Use that to develop the report in its current shape
- Review by EASAC Environment Steering Panel
- Review by 13 reviewers appointed by the various Academies
- Final approval by Academies

Outline of the study

2 The role and importance of soils from recent science

3 Soil biodiversity and above-ground biodiversity

4 Soils and modern farming

4.1 Current challenges to soils in farming

4.2 Opportunities in the future Common Agricultural Policy

5 Soils, plant health and human health

5.1 Concept of soil 'health'

5.2 Plant health and food quality

5.3 Soils and human health

6 Soils and climate change

6.1 General considerations

6.2 Specific issues on peatlands

6.3 The '4 per mille' initiative

Everything that we eat, drink, breath, clothes that we wear, and materials that we use pass through soil over and over again



2015
International
Year of Soils

healthy soils for a healthy life



THE MAJOR SOIL TYPES OF EUROPE

Supporting the European Union's Thematic Strategy for Soil Protection



What is soil?

Soil is composed of inorganic particles, organic matter, water and living organisms. It is an extremely complex, variable and living material. Soils are the result of six main factors: parent material, climate, organisms, topography, time and human activity. These factors interact in a complex way to create the soil. The soil is a natural resource that is essential for the production of food and the maintenance of the environment. It is a complex system that is constantly changing and evolving.

Soil functions

Soil is defined as the uppermost layer of the Earth's crust and is the interface between the ground and soil mass. Soil performs many vital functions: food and other biomass production, storage, protection and transformation of many substances including water, carbon, nitrogen, and phosphorus. Soil has a role in the global water cycle as a reservoir for water. It also plays a role in the carbon cycle as a sink for carbon. Soil is also a habitat for many organisms and is a source of nutrients for plants and animals.

The Soil Map of Europe

The Soil Map of Europe shows the diversity of the soil in the continent. It is a map of the soil types of Europe, showing the distribution of the major soil groups. The map is based on the results of a large-scale soil survey of Europe, which was carried out by the European Commission. The map shows the distribution of the major soil groups, which are defined by their physical and chemical properties. The map is a valuable tool for understanding the diversity of the soil in Europe and for planning soil protection measures.

WRB Reference Soil Groups

The World Reference Base for Soil Taxonomy (WRB) is a global soil classification system. It is based on the results of a large-scale soil survey of the world, which was carried out by the International Geosphere and Biosphere Programme. The WRB is a valuable tool for understanding the diversity of the soil in the world and for planning soil protection measures. The WRB is based on the results of a large-scale soil survey of the world, which was carried out by the International Geosphere and Biosphere Programme.

The JRC Research Centre

The JRC Research Centre is a leading research institution in the European Union. It is dedicated to the study of the environment and the development of sustainable technologies. The JRC is a valuable resource for the European Union and the world. It is a leading research institution in the European Union, dedicated to the study of the environment and the development of sustainable technologies.

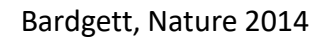


Soils in Europe are physically and chemically highly diverse

Source:
 Soil Atlas of Europe
 Jones et al. 2005
 JRC ISPRA, Italy

Biology is even more diverse:

- 5000 species on a tea spoon of soil
- Soil life influences aboveground diversity



“A nation that destroys its soils destroys itself.”

Franklin D. Roosevelt



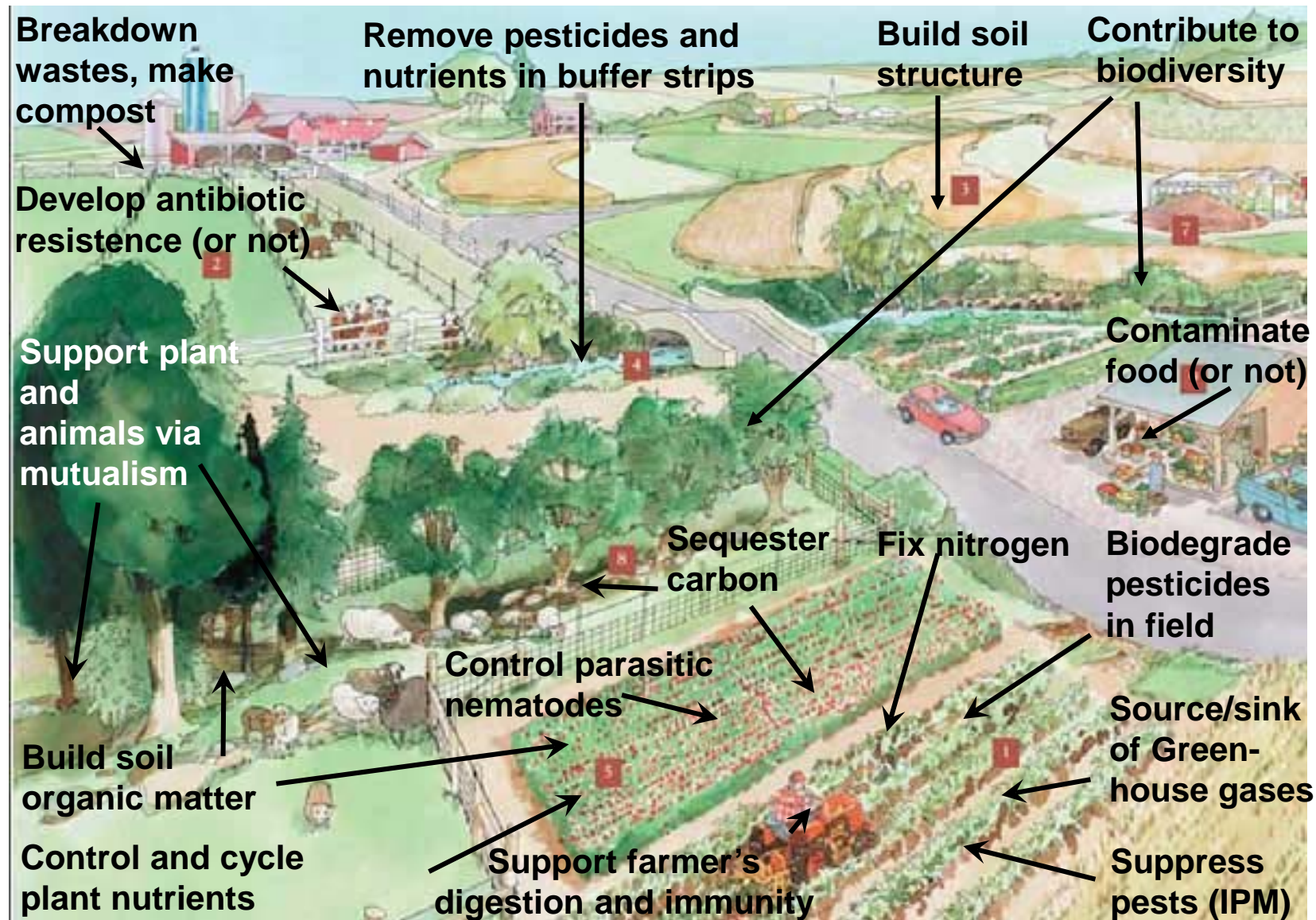
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Major risks are: erosion, degradation, pollution, mining of sand, gravel, fossil energy, etc.



Urbanization (in 10 years size of Luxembourg) and modern farming.



<http://images.google.com/imgres?imgurl=http://www.sare.org/publications/explore/images/scenewide2.jpg>

Modern farming
reduces soil biodiversity
and by-passes
natural functions of
Soil life

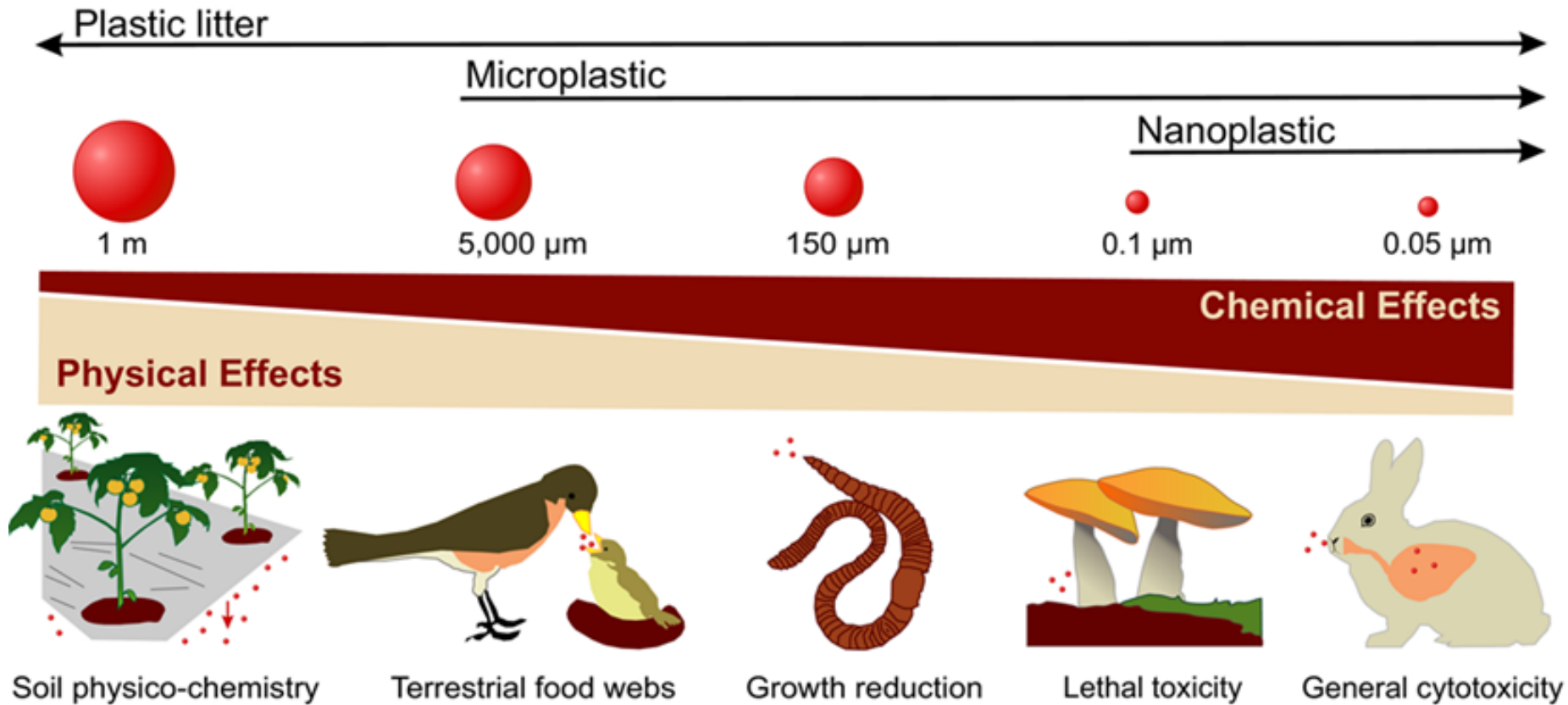


Rothamsted (UK) long-term trials: yields increase, but crops take up less micronutrients (although still available in soil)

Socio-economics involved in sustainability: price comparison 1950-2015

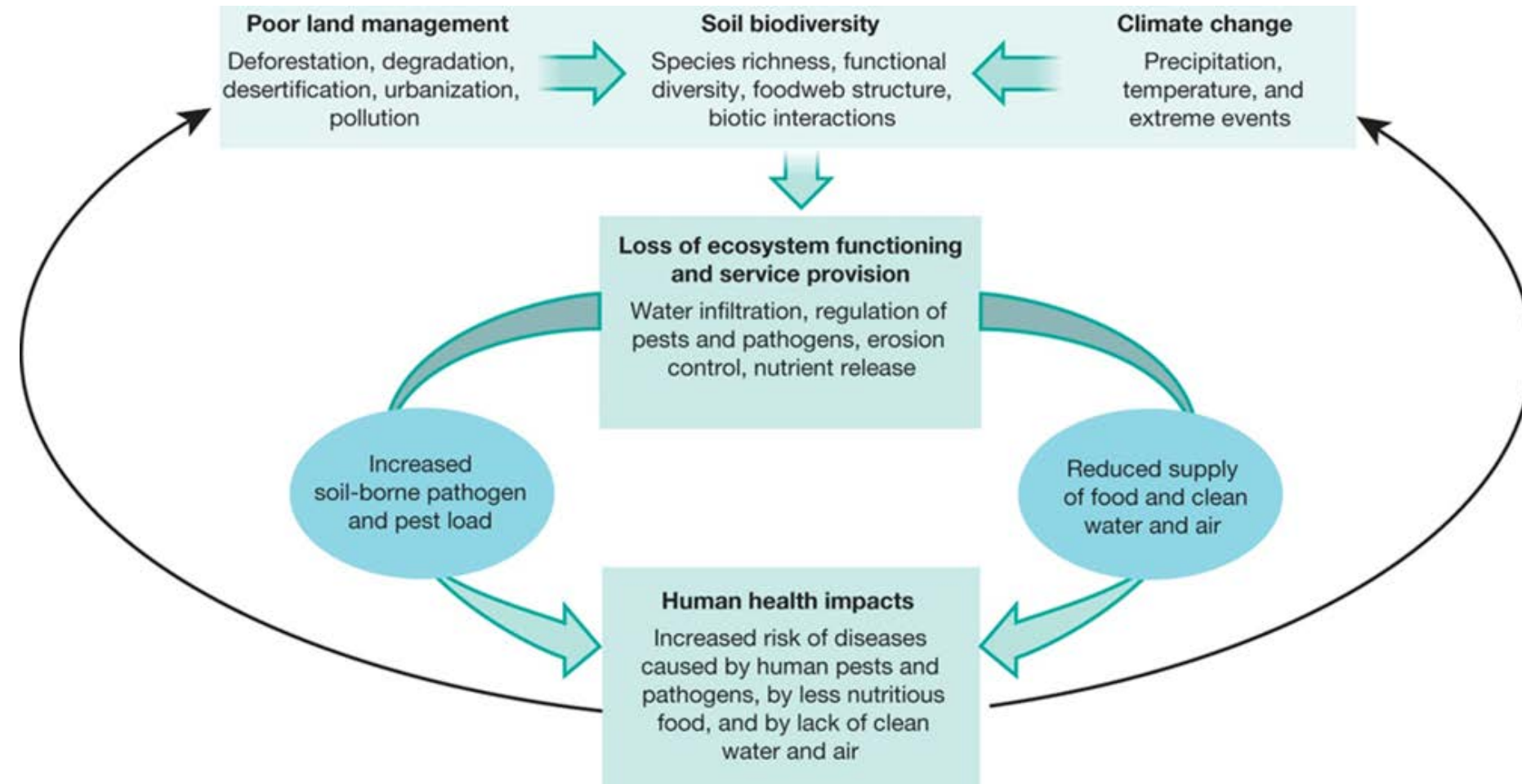
		1950		2015		Factor
Potato		0,07 E/kg?		0,9 E/kg?		13
Bread		0,17 E/bread		1,19 E/bread		7
Agricultural soil		2500 E/ha		50000 E/ha		20
Harvest winter wheat		4 ton/ha		12 ton/ha		3
Price wheat		800 E/ton		100 E/ton		0.125

Source: <http://statline.cbs.nl/>



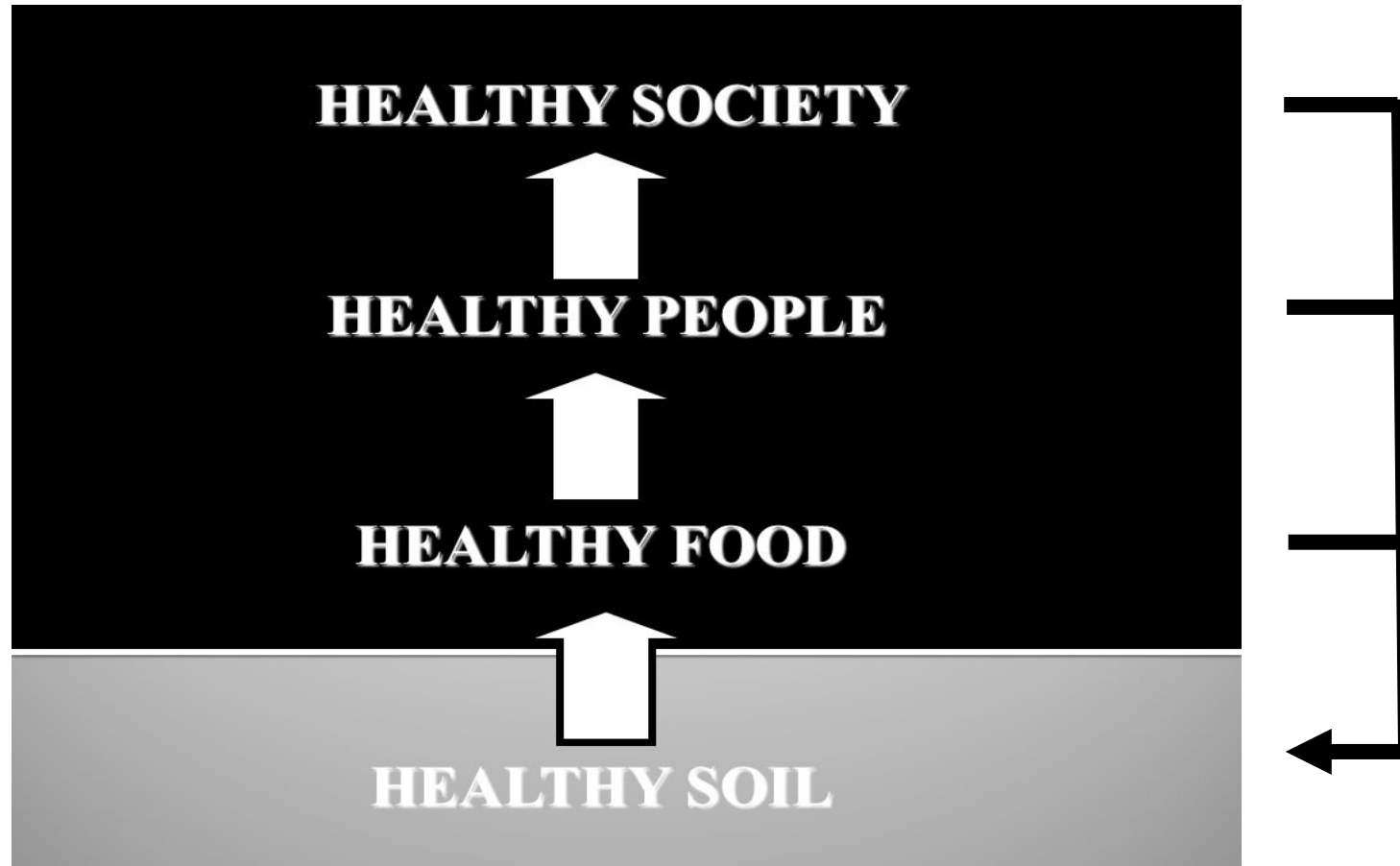
New threat: (micro)plastics in soil

Machado et al. 2018 Global Change Biology



Soil and plant / human health

Wall et al. 2016 Nature



**One-health concept provides
unexplored opportunities!**

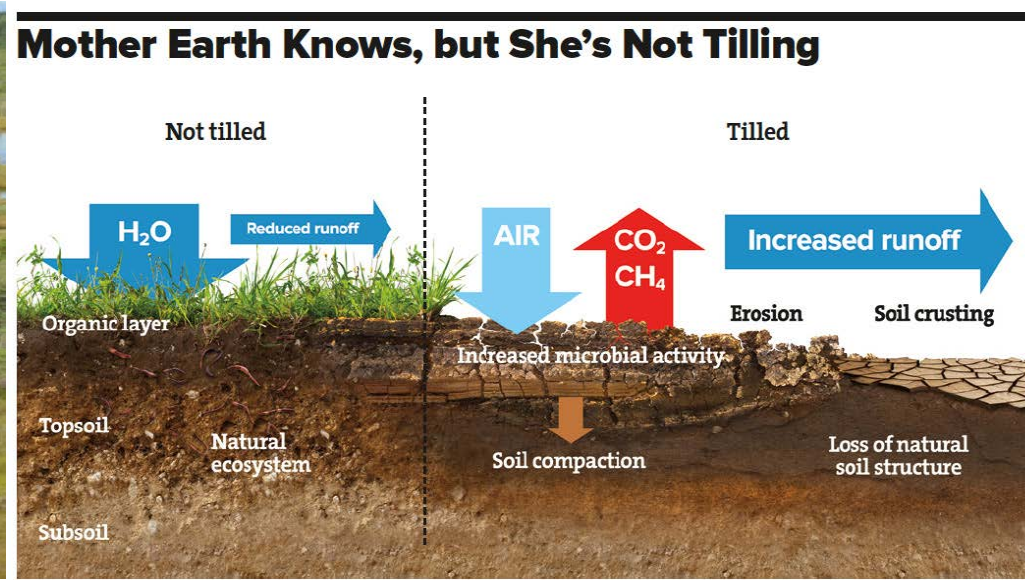
Climate control and consequences of climate change

Some figures

- Since start of agriculture (12,000 years ago) soils have lost 133 billion tonnes of carbon to atmosphere.
- Currently, there is still appr. 70-75 billion ton carbon left in European soils.
- Soil organic carbon is being lost at a rate equivalent to 10% of the total fossil fuel emissions for Europe .
- To support COP 21, carbon levels should become restored in soil.

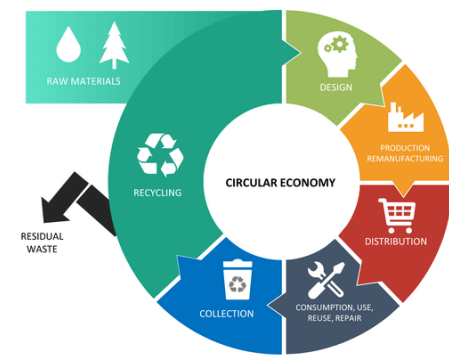


Keep carbon where it is (peatlands)



Prevent carbon loss by excessive tilling

CIRCULAR ECONOMY
Enter your sub headline here



Promote carbon storage and closing cycles

4 PER 1000

CARBON SEQUESTRATION IN SOILS FOR FOOD SECURITY AND THE CLIMATE

Ministère de l'Agriculture, de l'Agroalimentaire et de la Forêt



HOW CAN SOILS STORE MORE CARBON?

The more soil is covered, the richer it will be in organic material and therefore in carbon. Until now, the combat against global warming has largely focused on the protection and restoration of forests. In addition to forests, we must encourage more plant cover in all its forms.



*"This international initiative can reconcile the aims of **food security** and the **combat against climate change**, and therefore engage every concerned country in COP21."*

Stéphane Le Foll, French Minister of Agriculture, Agrifood and Forestry

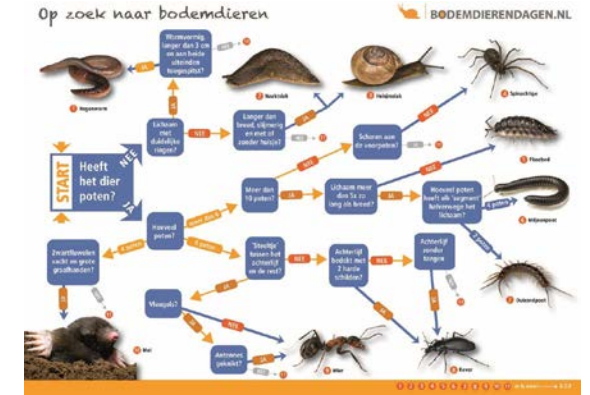
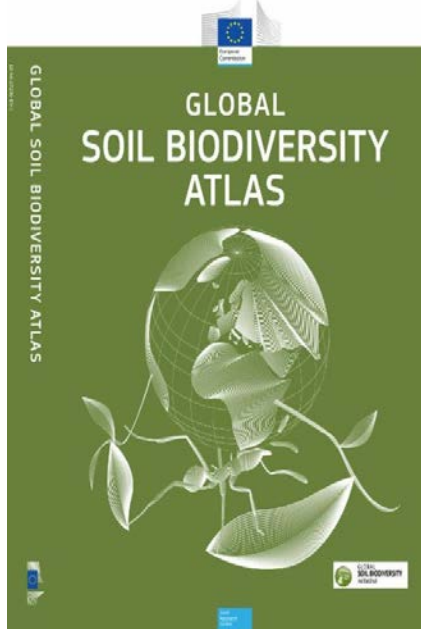
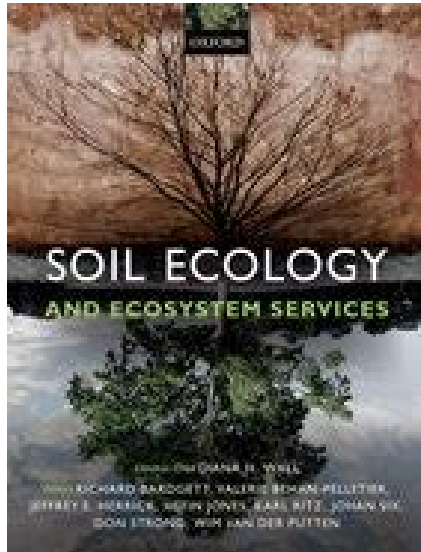
Following COP 21: 4 per mil initiative

- Is overoptimistic
- Should not prevent taking other measures

But: it is no-regret approach and should therefore be supported



Soil Biodiversity synthesis report February 2010
<http://ec.europa.eu/environment/soil/biodiversity.htm>



Education and independent extension services needed!



Thank you for your attention!