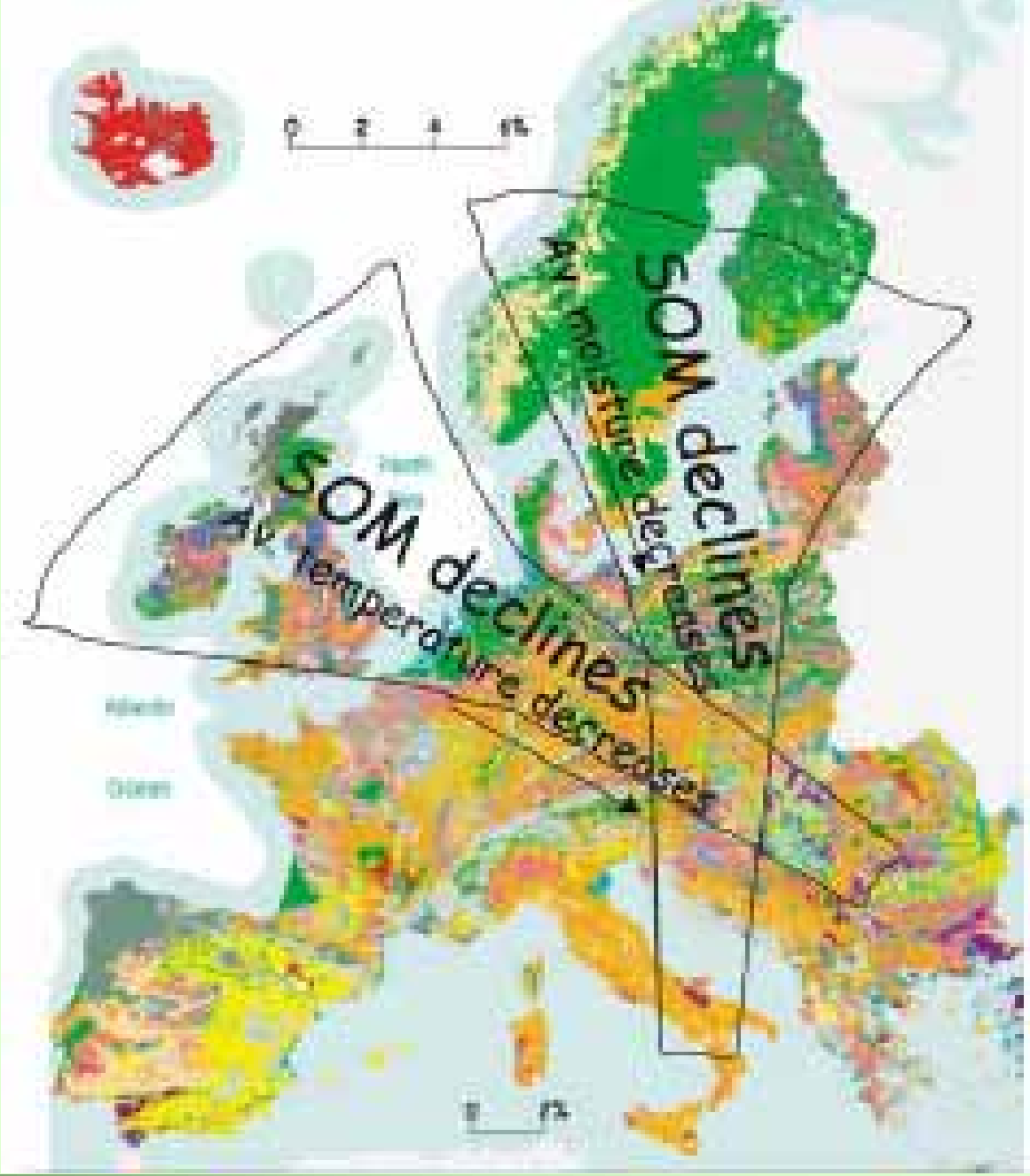
Organic Matter

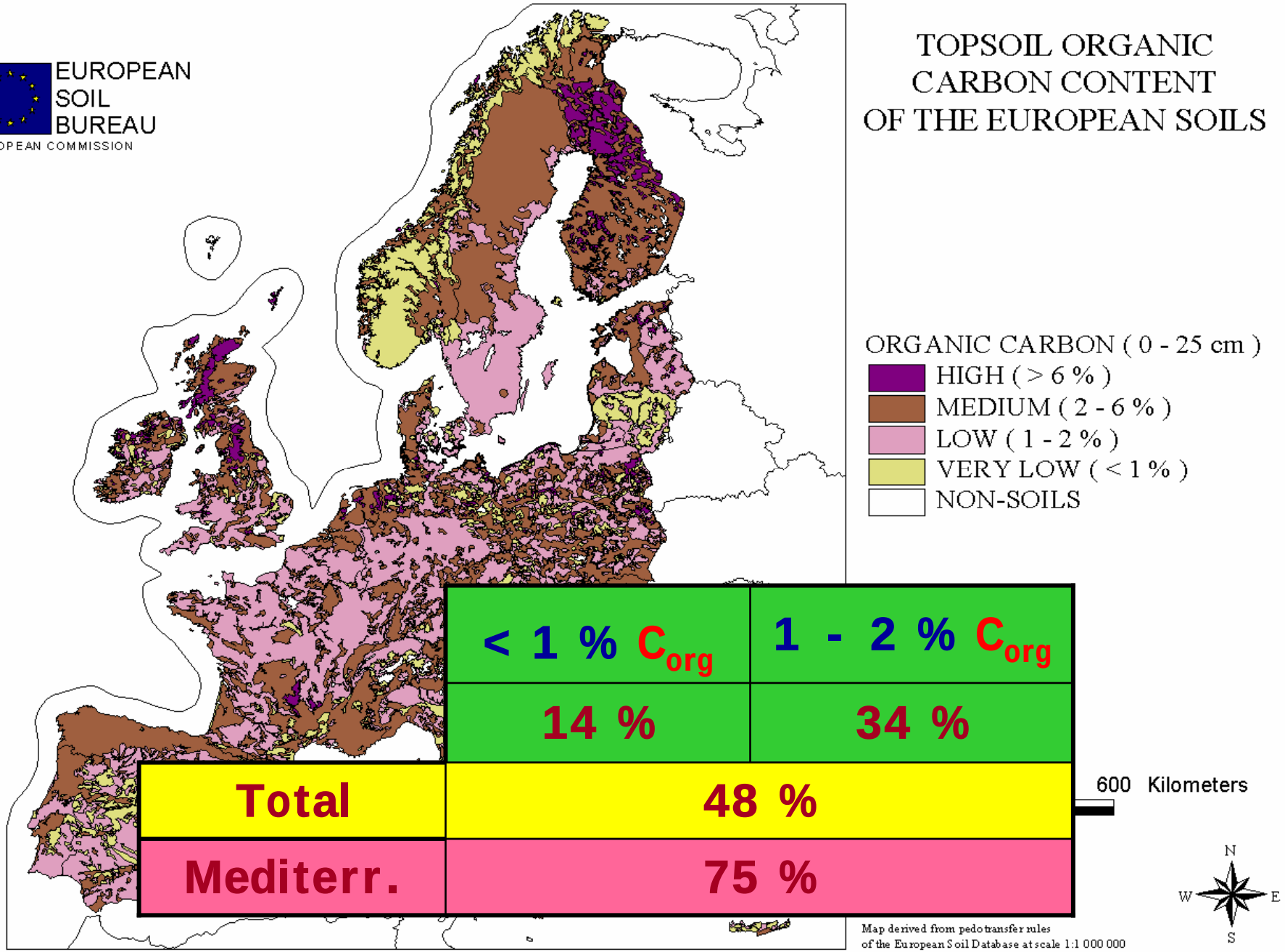


Florian Amlinger

EU-Soil Thematic Strategy

Some Aspects of the Soil Strategy as emphasised inthe concept of the SFD

- Arguments for BINDING EU ACTION
  - ✓ Impacts of soil degradation to other media (quality of water and air,, biodiversity,, climate change)
  - ✓ Food safety … potential uptake of contaminants by food crops
- OBJECTIVES
  - ✓ Prevent the THREATS (degradation of SOM)
  - ✓ Preserve SOIL FUNCTIONS
  - ✓ Ensure SUSTAINABLE USE
- RISK AREA
  - ✓ for certain threats … Erosion … OM decline


EUROPEAN SOIL BUREAU
EUROPEAN COMMISSION
TOPSOIL ORGANIC CARBON CONTENT OF THE EUROPEAN SOILS
ORGANIC CARBON (0 - 25 cm)
HIGH (> 6 %)
MEDIUM (2 - 6 %)
LOW (1 - 2 %)
VERY LOW (< 1 %)
NON-SOILS
< 1 % Corg
1 - 2 % Corg
14 %
34 %
Total
48 %
Mediterr.
75 %
600 Kilometers
N
W
E
S
Map derived from pedotransfer rules
of the European Soil Database at scale 1:1 000 000

Area coverage with critical OM contents in some countries

Country	% Coverage		
	< 2 % OM < 1.2 % C_{org}	2 - 4 % OM 1.2 – 2.4 % C_{org}	< 4 % OM < 2.4 % C_{org}
Austria	14.4	8.2	22.6
France	11.6	25.4	37.0
Germany	41.6	8.9	50.5
Ireland	4.6	3.0	7.6
Netherlands	20.0	23.1	43.1
Estonia	---	73.2	73.2
Latvia	---	35.1	35.1
Romania	62.5	11.3	73.8

Utermann, Düwel, Nagel, 2004

Organic Matter Status ...
Key policy recommendation by the Soil Strategy

- **Land use patterns in areas where the European map identifies soil OC < 2.0% should be critically examined with a view to making changes to agricultural and other land management practices to stabilise or increase soil OC levels.**

The Link between the Objectives of Waste and Soil Organic Matter Management

Waste Dir./Annex II/ **R10:** Land treatment resulting in **benefit to agriculture or ecological improvement**

- Maximise benefits ! … Enhance soil quality and fertility

  ➔ transformation, filter, buffer, production, genetic heretage →

  ***(f)* biodiversity**

  ➔ water retention, sorption of nutrients and metals

- We need a better understanding of the complex quantitaive and qualitative relationship between

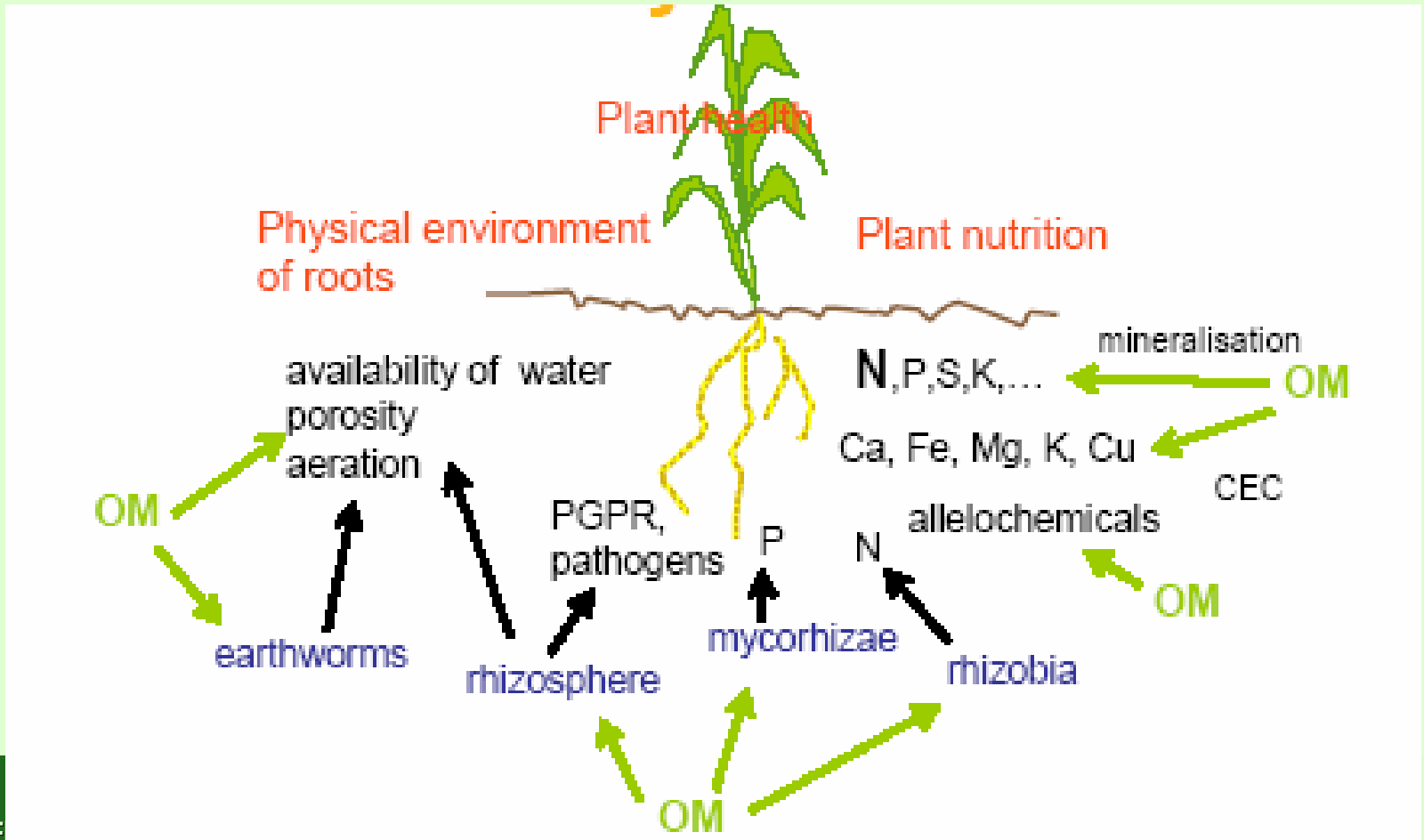
  SOM ←➔Soil properties ←➔ soil functions ←➔

  ←➔functional "biodiversity"

  in order to establish REGIONAL threshold levels for SOM

SOM & Soil Functions

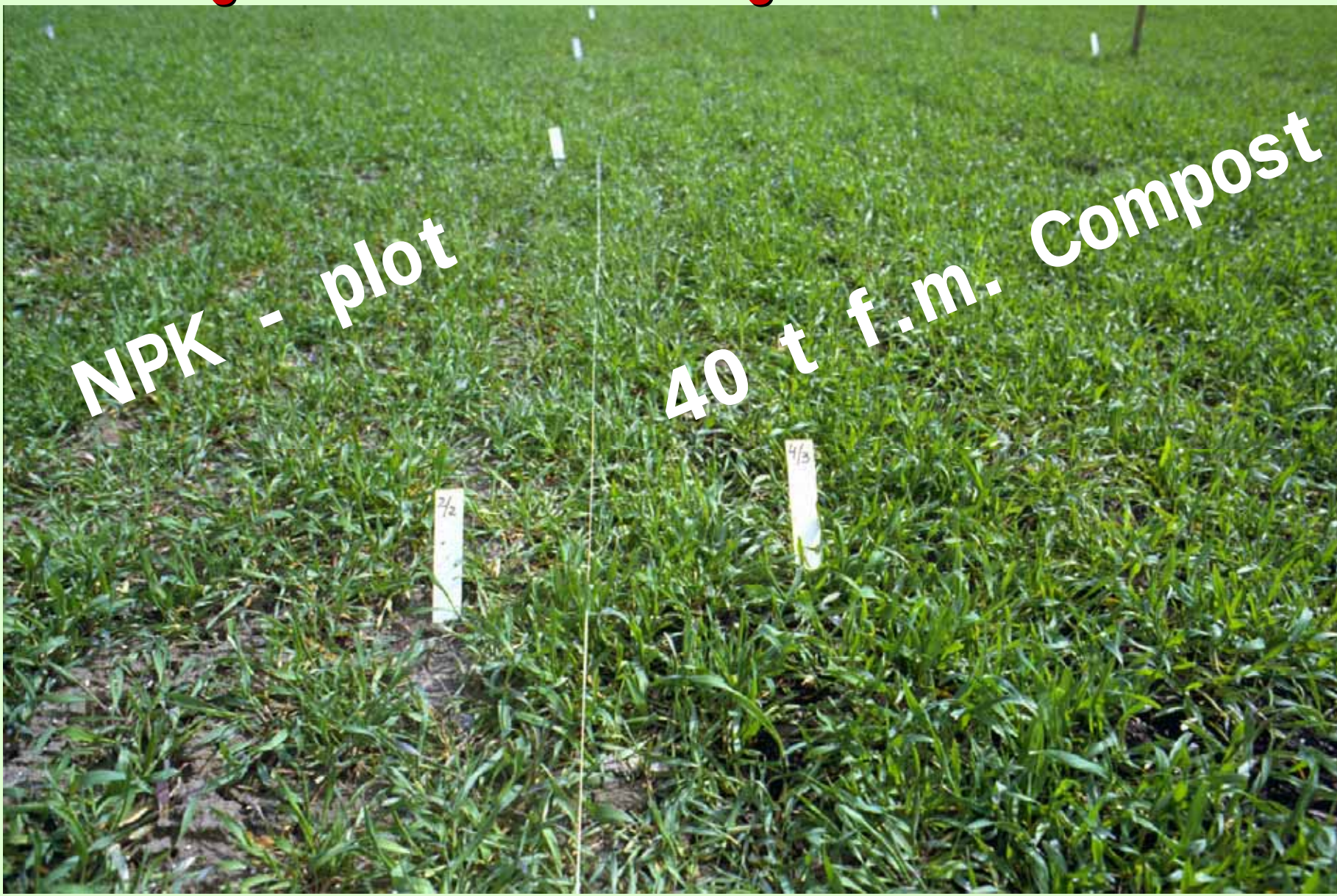
- „It is important to indicate that all the practices which permit C increase in soils are win-win situations for protection against erosion and desertification) with often an associated increase in soil biological functioning and soil biodiversity!“



Further roles of SOM

- ... Increases aggregation
- ... Increases porosity and water infiltration
- ... Increases water retention
- ... Reduces soil loss & run-off
- ... Increases buffer capacity
- ... Increases filter capacity for nutrients, inorganic and organic pollutants
- ... Induces robustness of crops against plant deseases
- ...➔ Serves as a carbon sink ... contributes to the fulfIment of the Kyoto Protocol.
  - ✓ ... Reduces the use of synthetic fertilisers
  - ✓ ... Reduces the use of pesticides
  - ✓ ... Improves workability of soils implying less energy consumption for ploughing, tilling
  - ✓ ... Reduces N_2O and NH_3 formation

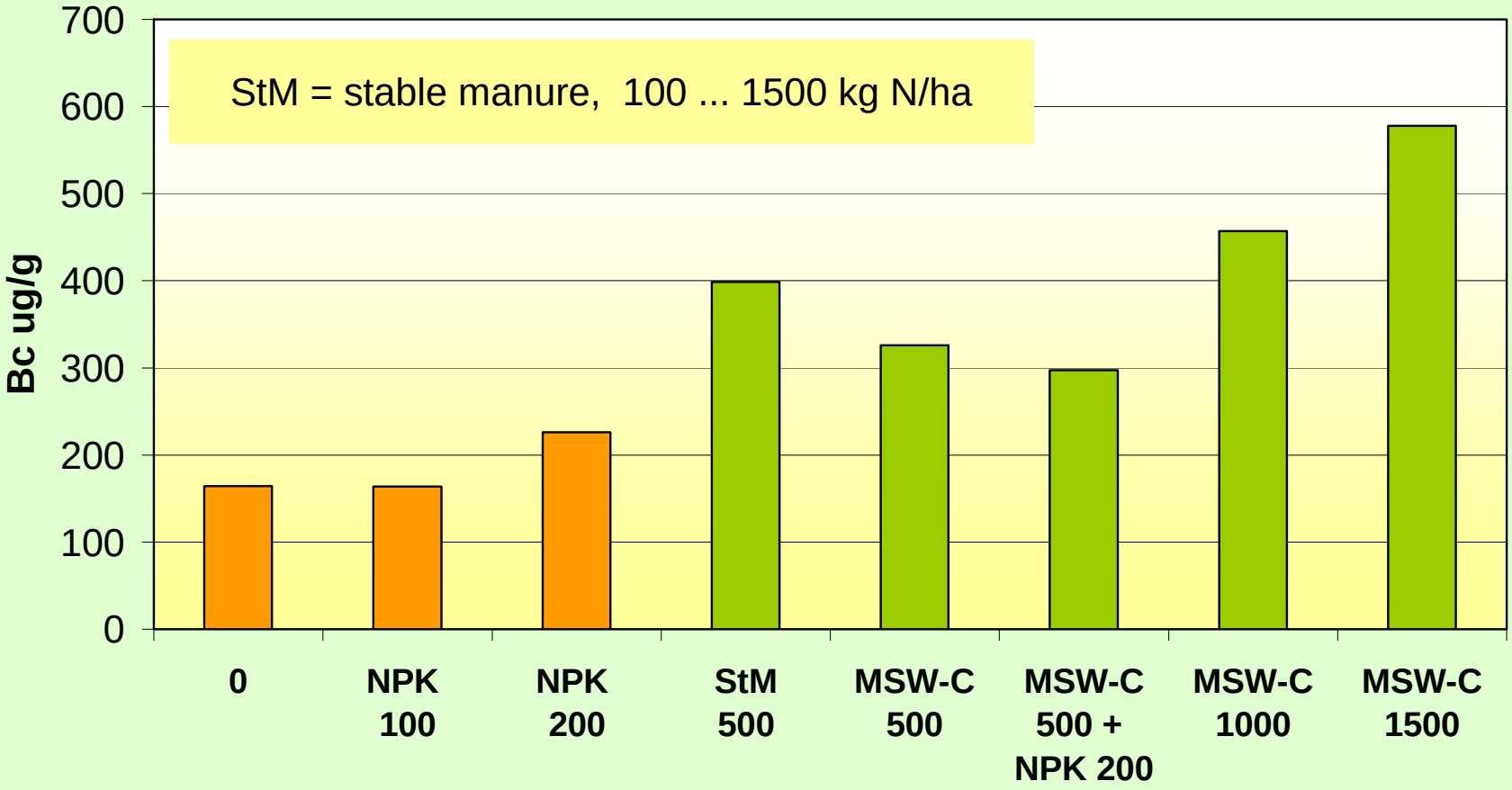
Org. Matter ... Making Soils Fertile



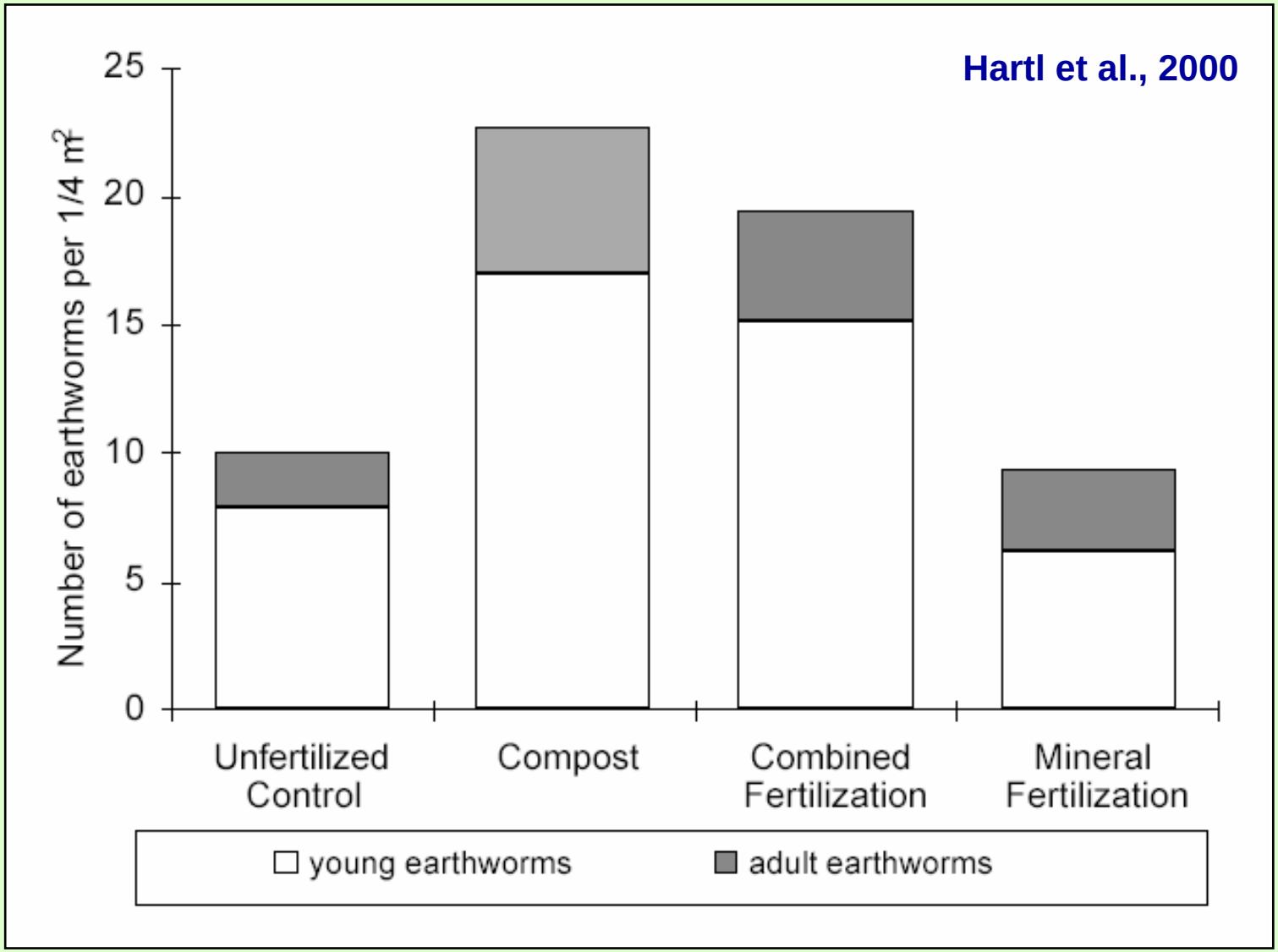
Organic Waste – EU Policies

Biodiversity and microbial activity on compost amended soils

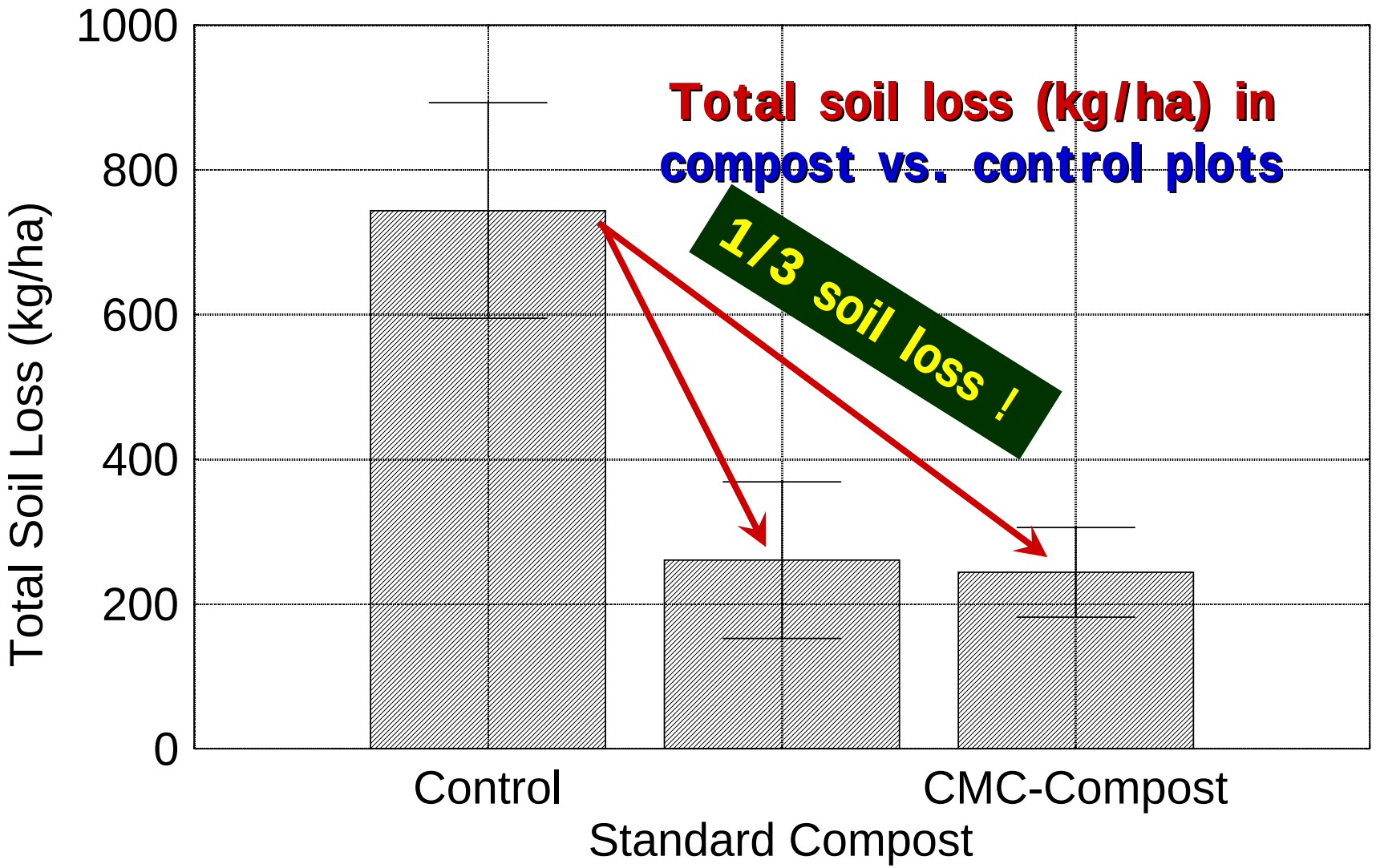
Impact of mineral and organic amendments on Microbial Biomass (Leita et al., 1996)



No. Of Earthworms in Different Fertilisation Systems



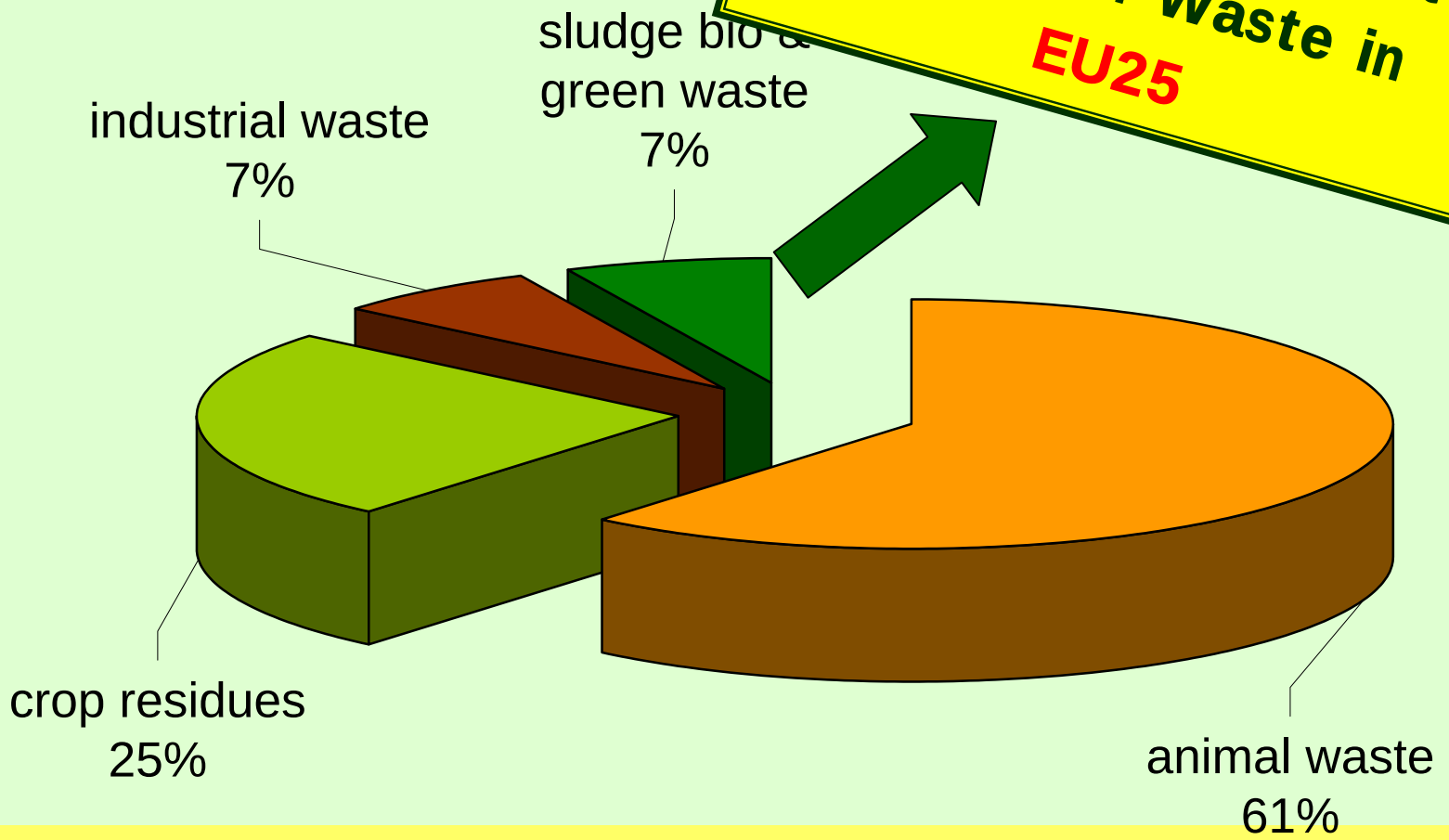
Erosion


Total soil loss (kg/ha) in compost vs. control plots
1/3 soil loss !
Total Soil Loss (kg/ha)
1000
800
600
400
200
0
Control
CMC-Compost
Standard Compost

Exogenous Organic Matter
an
example how to integrate the thematic strategies and policies !

Biodegradable wa… EU15

Ca. 100 - 130 Mio t Bio/Green Waste in EU25



- **1.6 billion tonnes are produced in the EU each year**

How much area is needed for the compost potrntial in EU25 ?

Biowaste	100 - 130 Mio t
Compost	60 Mio t
Land demand at 12 t f.m. compost / ha * yr	5 Mio ha
Agric. Land with < 1% OM	66,5 Mio ha
Land restorable with compost	ca. 7.5 %

Compost substitutes mineral fertiliser...
EU25 Estimates for Nitrogen and Phosphorus

		N	P_2O_5
Biowaste	(t)	100 -130 Mio	
Compost	(t)	60 Mio	
Tons	(f.m. / ha)	12	
Land demand	(ha)	5 Mio	
Concentration	(kg / t FM)	11	6
Nutrients	(kg/ha)	130	70
total potential nutrient substitution	(t)	660.000	360.000

Recommendations … Exogenous Organic Matter

- **The use of Exogenous Organic Matter (EOM) is recommended if …..**
  - ✓ if applied according to good practices & at appropriate quality.
  - ✓ Aim: maintain or achieve optimised site specific SOM level
  - ✓ positive list of high quality source materials [source separated household waste and green waste as well as organic industrial waste] = essential to guarantee high quality compost.
  - ✓ Bridge the gap between the diversion targets for biodegradable waste from landfills and a sustainable use of the biodegradable waste
    ➔ incentives [TARGETS] for the recycling of source separated biowaste are essential.

    Member States are encouraged to explore the best solution for implementation considering local conditions.

Special Recommendations for: Biowaste – Sludge - Manure

- In medium-term a SFD should cover the spreading of animal manure (➔ Cu, Zn, pharmaceutical residues)
- Thresholds and application criteria have to be harmonised for all types of fertilisers.
- Reduction activities for PTE have to be started – especially at the source
- Process- and treatment guidelines have to be established (Hygienisation ➔ Animal By-Products Regulation (EC) No. 17774/2002)

More Specific Aspects of the SFD Working Unit

- Measures to achieve Target
  - ✓ A non exhaustive list of measures in an ANNEX e.g. farming / forestry etc.
- Possible measures for Risk Areas … Erosion & SOM
  - ✓ use of rganic soil improvers / exogenous organic matter (also combating salinisation)
  - ✓ humus supporting crop rotation / catch & interim crops / winter cover / buffer strips
  - ✓ Conservation tillage / mulching
  - ✓ Change of arable to grass land
  - ✓ Incorporation of crop residues

Integration into existing Policy

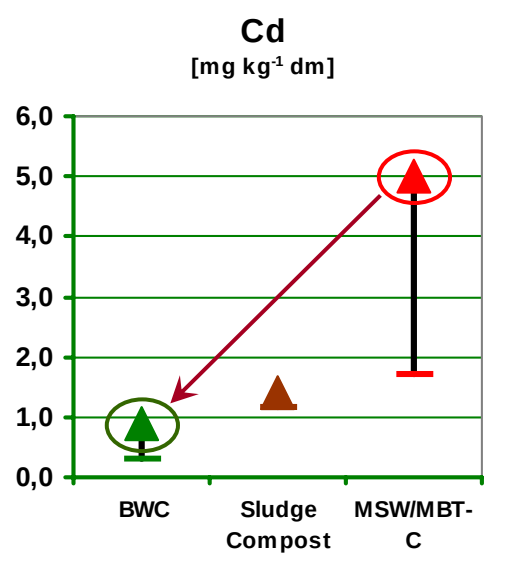
- the case of BIOWASTE -

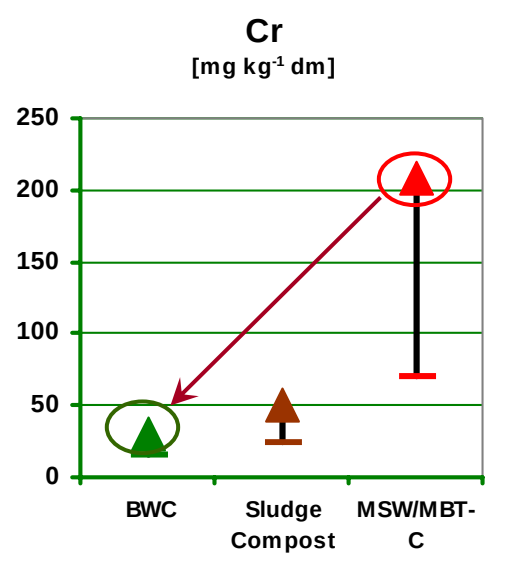
Current plans of the Commission

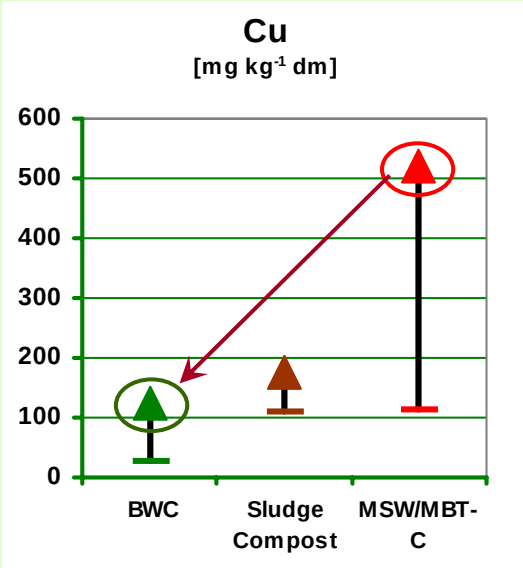
- Commission currently considers to establish only quality requirements for compost as a pre-requisite for ceasing the waste regime in an ANNEX of the Waste Framework Directive

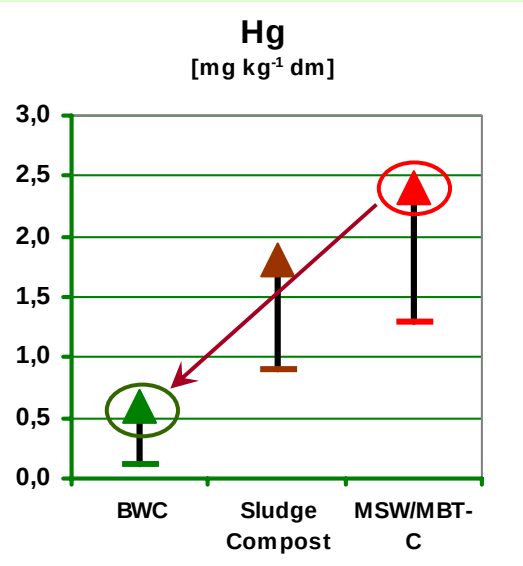
Mixed Waste Composting ???

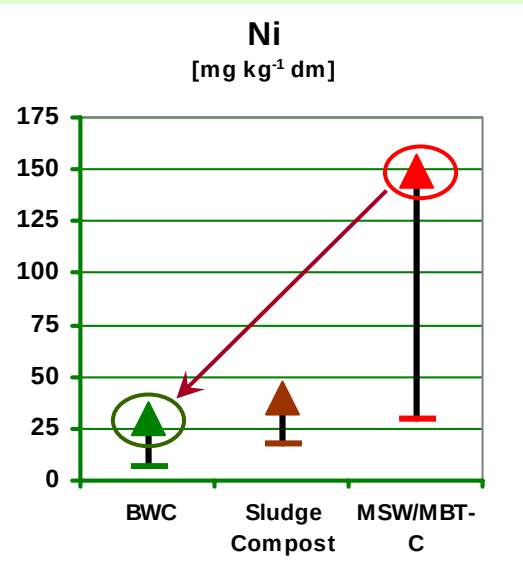
Quality as a Result of Source Separation
- a Clear Picture -

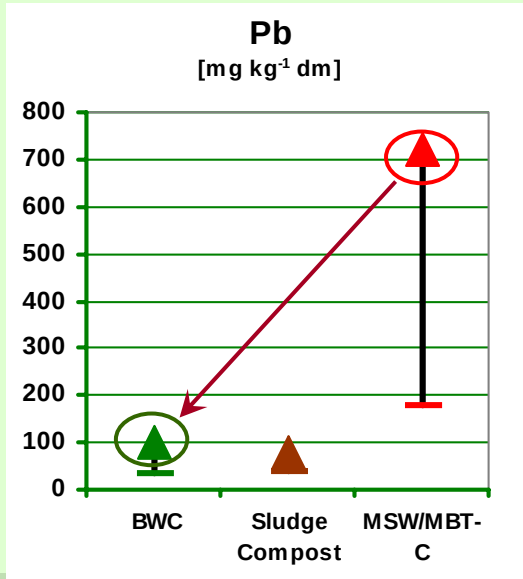












Organic Waste – EU Policies

Organic Pollutants ...

PCDD/PCDF ng I-TEQ/kg d.m.	BIOWASTE compost	GREEN compost	MSW compost	Sewage SLUDGE	Orientation values
range	0.3 – 31.6	0.3 – 31.4			
mean	**6.6**	**3.6**	38 - 103	14,5 - 20	**17 – 50**

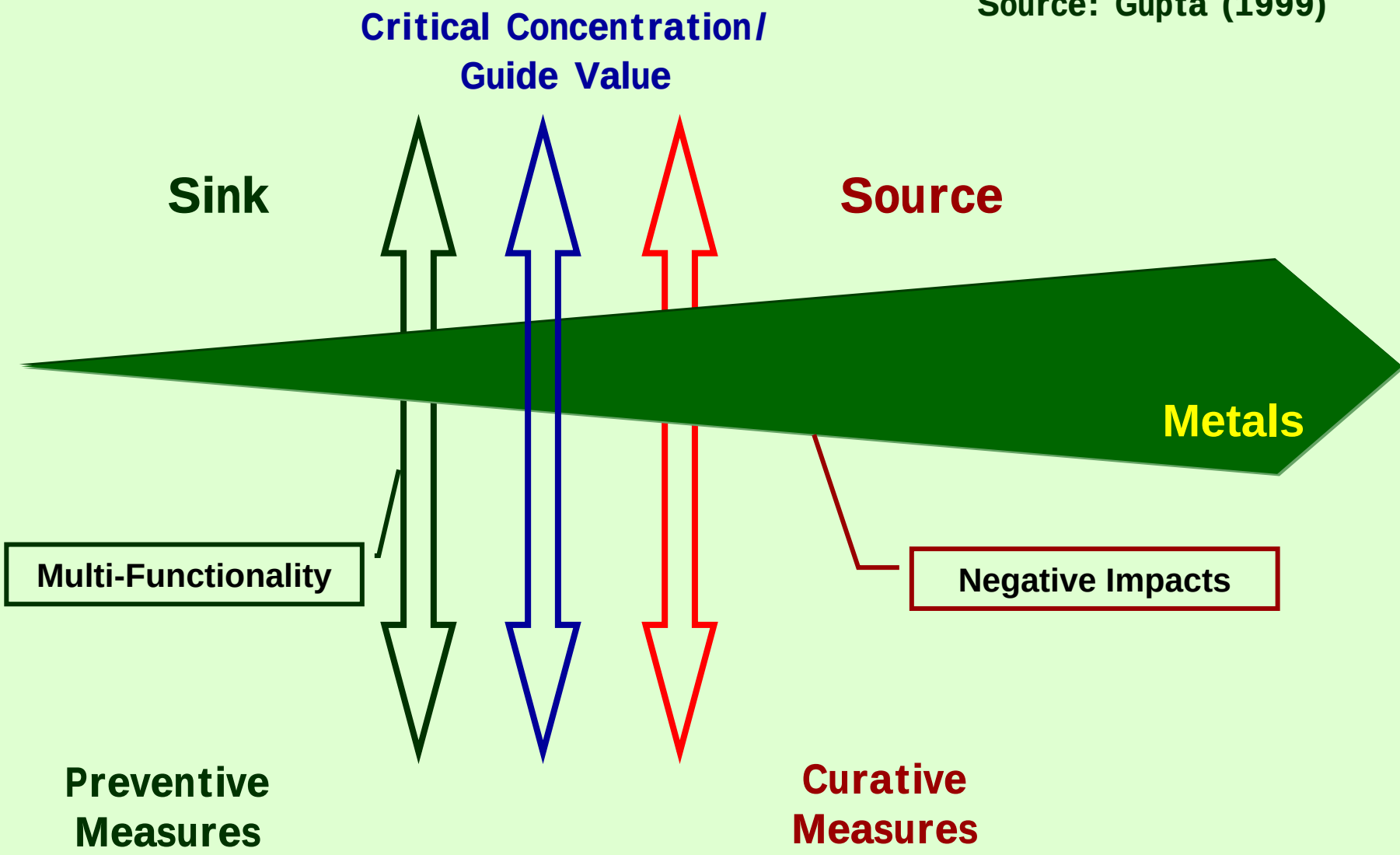
PCBs mg/kg d.m.	BIOWASTE compost	GREEN compost	MSW compost	Sewage SLUDGE	Orientation values
range	0 – 0,58	0 –0.12			
mean	**0,04**	**0,024**	0,7 – 1,6	0.01 – 0.05	**0,1 –0,2**

PAHs mg/kg d.m.	BIOWASTE compost	GREEN compost	MSW compost	Sewage SLUDGE	Orientation values
range	0.08 – 13.0	0.09 – 11.3			
mean	**2.45**	**2.15**	3.1 – 9.4	0.1 – 3.6	**3 – 10**

Organic Waste – EU Policies

Can we Define a Minimum Soil Quality ?

Source: Gupta (1999)



Approach for 2 levels of limit values considering precautionary accumulation scenarios

- ORIENTATION: Best Available Technology ....
  - ✓Source seperation of organic waste

	Cd	Cr	Cu	Hg	Ni	Pb	Zn
90%ile EU + 50 % **[LEVEL 1]**	1.3	60	110	0.45	40	130	400
Warranty values for plant Means	*1.1*	*70*	*110*	*0.5*	*60*	*120*	*380*
90%ile UK&ES + 50 % **[LEVEL 2]**	**1.9**	**64**	**170**	**0.65**	**63**	**200**	**470**

4 Steps to evaluate a Sustainable Fertilisation ….

➢ **4 Questions to be resolved in 4 Steps**

(1) Are there **BENEFITS** to the soil – plant system ?

(2) Are any accompanying **POLLUTANTS** identified ?

(3) Optimised application under the condition of

- ✓ **Good agricultural Practise**
- ✓ Modelling of **Accumulation** in relation to guide-values of sustainable land use

(4) What is the limiting Factor ?

➢ **Keep an eye on your soil**

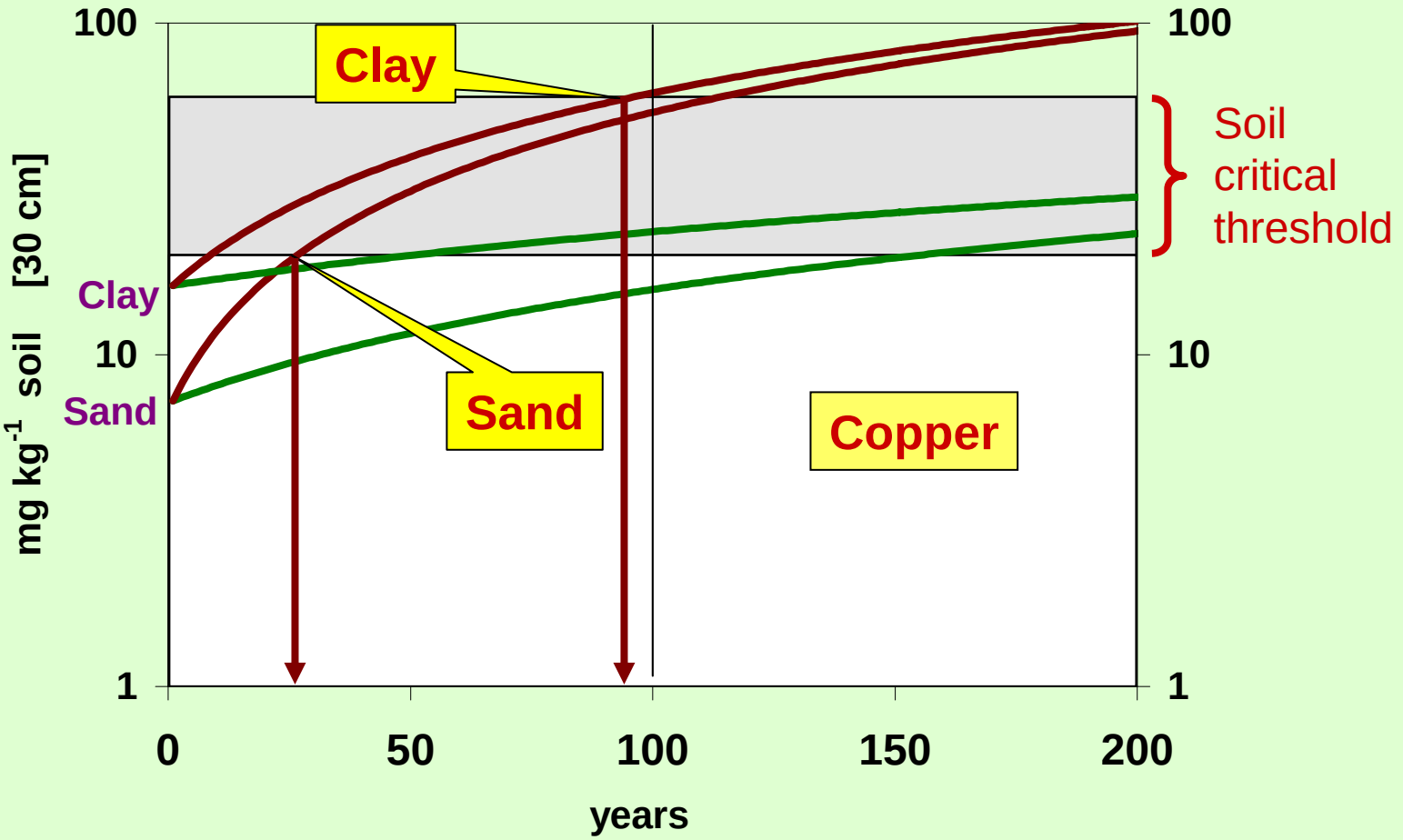
SOM

N-P-K …

PTEs (?)

Organic Waste – EU Policies

COPPER: Accumulation in Soil
MBT vs. Biowaste Compost [9.2 t]



Recent Attitudes of Memberstates and EU Institutiones

- Austria (2004)
  - ✓ The separate collection and organic waste recycling through composting (...) serves the targets of the Landfill Directive (...) and should - as a starting point - be an element of the soil strategy.
  - ✓ Austria objects the stand alone definition of quality requirements in the Waste Framework Directive
- Germany (2005)
  - ✓ ... Urgently we need the planed Biowaste Directive. We need Europe wide unique standards for the material recycling of biowaste
- Further commitments by
  - ✓ Spain, Finlkand, Czech Rep., Slovakia, Dutch Presidency, EP, Council

… Member States supportive towards a stand allone Biowaste Directive

- Spain (2004)
  - ✓ This new approach (of the EC, objecting separate legislation ob Biowaste) is essentially inconsistent with Soil Policy. (…)
  - ✓ (…) it is needed a specific legal tool (…) based on the waste hierarchy principles … promotion of recycling measures (specially composting).
- Finland
  - ✓ … we strongly urge that including sludge and biowaste directives into the soil strategy should not hinder or slow down their implementation. They are needed in the national legislative work which is now on hold.
- Dutch Presidency (2004)
  - ✓ The EC is encouraged to present draft legislation on biowaste. Standards for compost should address all relevant issues. Separate collection should be promoted

… Further Member States Statements

- Germany
  - ✓ … Urgently we need the planed Biowaste Directive. We need Europe wide unique standards for the material recycling of biowaste
- Czech Republic (2005)
  - ✓ … We intend to address the issue od biodegradable waste management … regarding not only composting, but also anaerobic digestion and mechanical biological treatment of municipal waste. In this respect we would appreciate the issuance of of relevant European legislaten
- Slovakia
  - ✓ … Source separation of biodegradable municipal waste fractions of municipal wastes as a key in order to fulfil the diversion targets of the EU Landfill Directive …

Some Conclusions for Organic Matter

- Recommendations on the requirements for the use of exogenous org. matter must be respected in policy measures
- Humus management (maintain or increase) can be optimised by multiple measures. Memeber States should set up programmes including incentives for a proper humus management (balance)
- When it is not possible to set definite targets for an optimum SOM level - programmes may choose from a list of measures which contribute to SOM maintenance or increase. This can be organised by means of an Humus Maintenance Index.
- Effective implementation and participation in such a programme (specified for identified risk areas) should be reported to the EC.

Some Conclusions for Diffuse Contamination

- Application of Soil amendments and fertiliser must be assessed following a standard weighing procedure BENEFITS vs. NEGATIVE IMPACTS
- An added value (benefit) is a conditio sine qua non
- Application has to follow allways GAP
- Precautionary critical soil threshold values for contaminants preserving multifunctionality give the orientation
- Modelling potential accumulation of contaminants by regular utilisation of a material against soil threshold values must guarantee long term safe soil use