



Challenges in life cycle assessments of waste application to agricultural land

Bruun, Sander; Birkved, Morten; Magid, Jakob; ten Hoeve, Marieke; Stoumann Jensen, Lars; Cerutti, Alessandro; Hauschild, Michael Zwicky

Publication date:
2012

[Link back to DTU Orbit](#)

Citation (APA):

Bruun, S. (Author), Birkved, M. (Author), Magid, J. (Author), ten Hoeve, M. (Author), Stoumann Jensen, L. (Author), Cerutti, A. (Author), & Hauschild, M. Z. (Author). (2012). Challenges in life cycle assessments of waste application to agricultural land. Sound/Visual production (digital)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

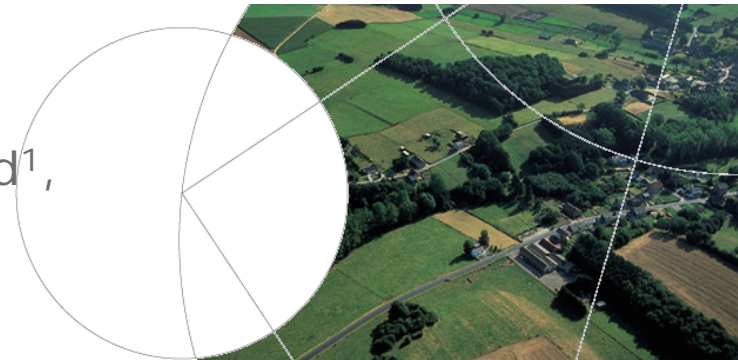
1. Department of Agriculture & Ecology, University of Copenhagen
2. Management and Engineering, Technical University of Denmark
3. Department of Agriculture, Forestry and Food Science, University of Turin



Challenges in life cycle assessments of waste application to agricultural land



Sander Bruun¹, Morten Birkved², Jakob Magid¹,
Marieke ten Hoeve¹, Lars Stoumann Jensen¹,
Alessandro Cerutti³, Michael Hauschild²



Life cycle assessment

Cradle

Gate

Grave

Material extraction	Manufacture	Use	Disposal
---------------------	-------------	-----	----------

Overview of life cycle/hot spot identification

Avoiding "burden shifting"



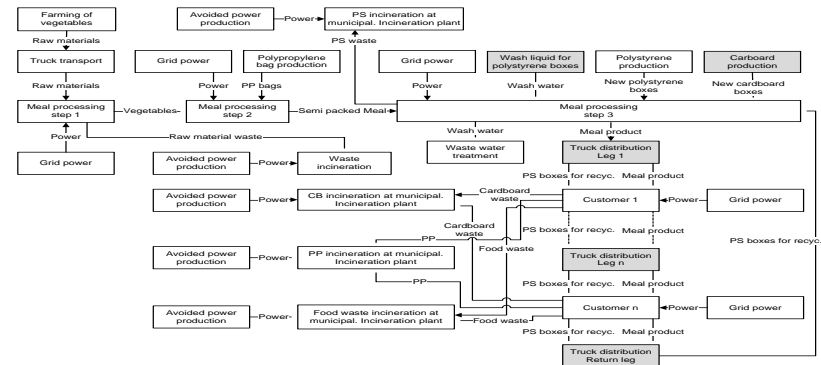
Life Cycle Assessment in practise

Inventory of environmental exchanges

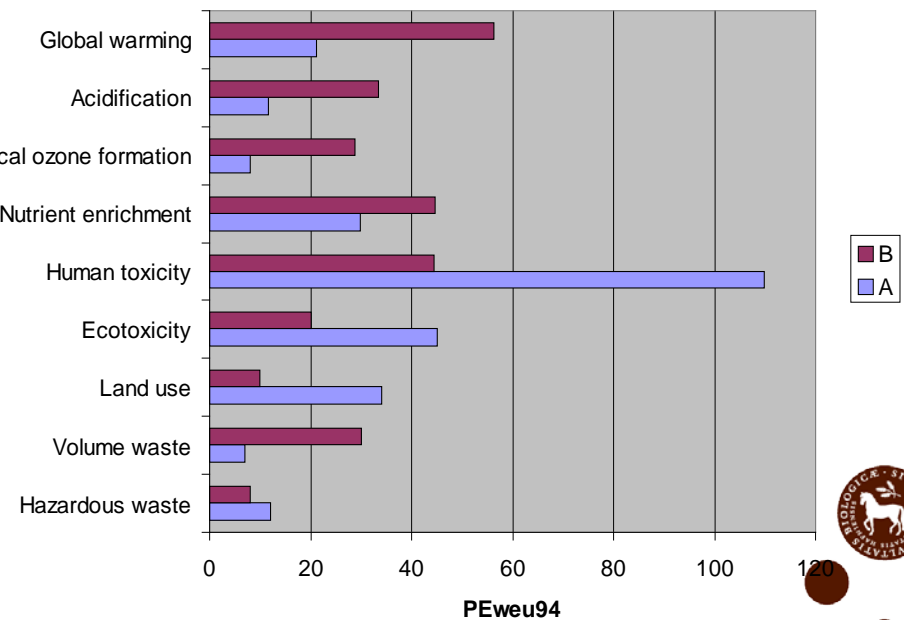
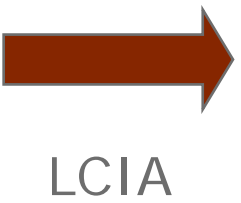
Substance	CAS.no.	Emission to air	Emission to water
		g	g
2-hydroxy-ethanacrylate	816-61-0	0,0348	
4,4-methylenebis cyclohexylamine	1761-71-2	5,9E-02	
Ammonia	7664-81-7	3,7E-05	4,2E-05
Arsenic (As)	7440-38-2	2,0E-06	
Benzene	71-43-2 (cur)	5,0E-02	
Lead (Pb)	7439-92-1	8,5E-06	
Butoxyethanol	111-76-2	6,6E-01	
Carbon dioxide	124-38-9	2,6E+02	
Carbon monoxide (CO)	630-08-0	1,9E-01	
Cadmium (Cd)	7440-46-9	2,2E-07	
Chlorine (Cl2)	7782-50-5	4,6E-04	
Chromium (Cr VI)	7440-47-3	5,3E-06	
Dicyclohexane methane	86-73-6	5,1E-02	
Nitrous oxide (N2O)	10024-97-2	1,7E-02	
2,4-Dinitrotoluene	121-14-2	9,5E-02	
HMDI	5124-30-1	7,5E-02	
Hydro carbons (electricity, stationary combustion)	-	1,7E+00	
Hydrogen ions (H+)	-		1,0E-03
i-butanol	78-83-1	3,5E-02	
i-propanol	67-63-0	9,2E-01	
copper (Cu)	7740-50-8	1,8E-05	
Mercury(Hg)	7439-97-6	2,7E-06	
Methane	74-82-8	5,0E-03	
Methyl i-butyl ketone	108-10-1	5,7E-02	
Monoethyl amine	75-04-7		7,9E-06
Nickel (Ni)	7440-02-0	1,1E-05	
Nitrogen oxide (NOx)	10102-44-0	1,1E+00	
NM VOC, diesel engine (exhaust)	-	3,9E-02	
NM VOC, power plants (stationary combustion)	-	3,9E-03	
Ozone (O3)	10028-15-6	1,8E-03	
PAH	ikke specifik	2,4E-08	
Phenol	108-95-2		1,3E-05
Phosgene	75-44-5	1,4E-01	
Polyeter polyol	ikke specifik	1,6E-01	
1,2-propylenoxide	75-56-9	8,2E-02	
Nitric acid	7782-77-6 (c)	8,5E-02	
Hydrochloric acid	7647-01-0 (c)	1,9E-02	
Selenium (Se)	7782-49-2	2,6E-05	
Sulphur dioxide(SO2)	7446-09-5	1,3E+00	
Toluene	108-88-3	4,8E-02	
Toluene-2,4-diamine	95-80-7	7,9E-02	
Toluene diisocyanat (TDI)	26471-62-5	1,6E-01	
Total-N	-		2,6E-05
Triethylamine	121-44-8	1,6E-01	
Unspecified aldehydes	-	7,5E-04	
Unspecified organic compounds	-	1,5E-03	
Vanadium	7440-62-2	1,8E-04	
VOC, diesel engine (exhaust)	-	6,4E-05	
VOC, stationary combustion (coal fired)	-	4,0E-05	
VOC, stationary combustion (natural gas fired)	-	2,2E-03	
VOC, stationary combustion (oil fired)	-	1,4E-04	
Xylene	1330-20-7	1,4E-01	
Zinc (Zn)	7440-66-6	8,9E-05	



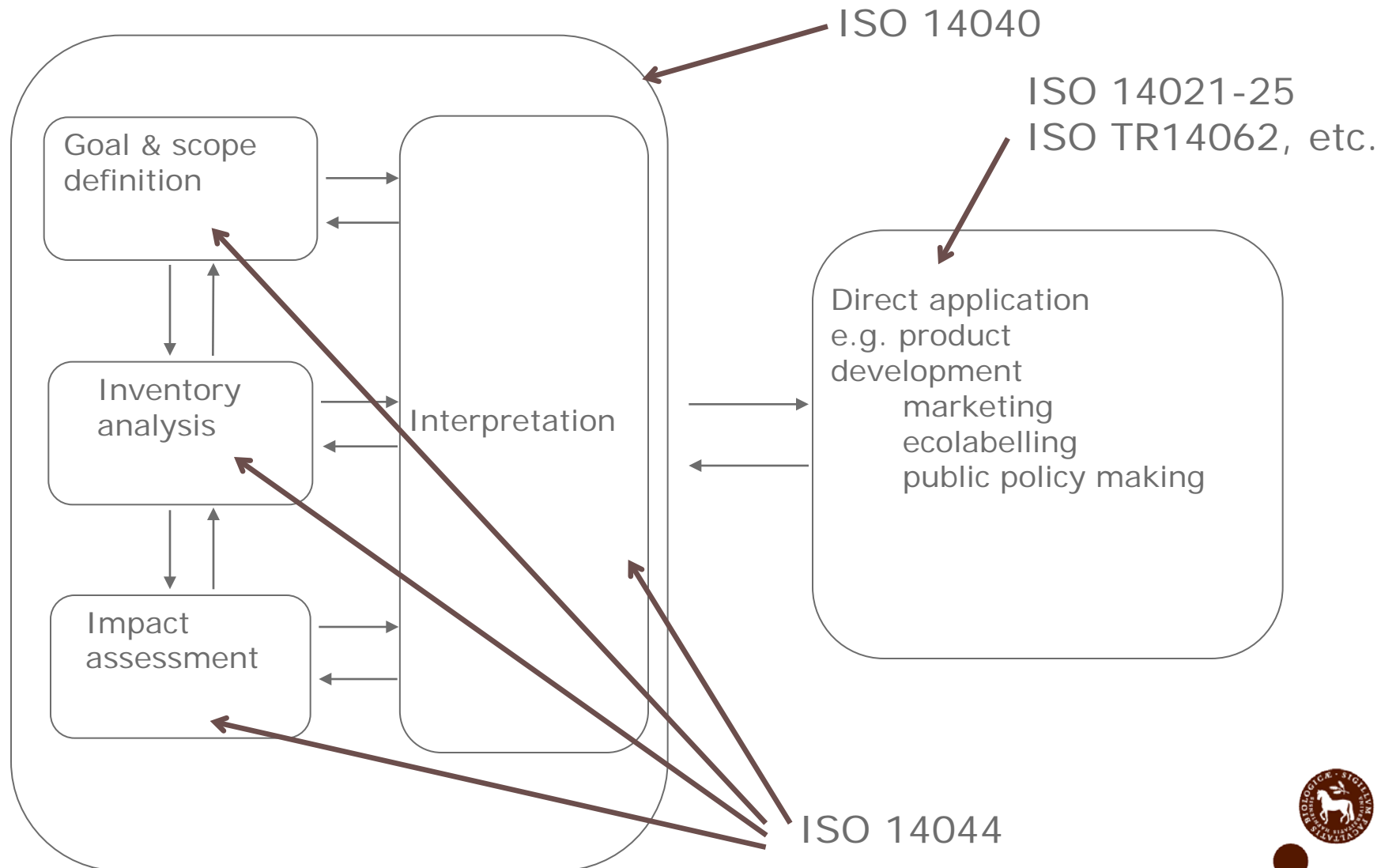
Analysed system (life cycle)



Environmental profile of solutions



LCA a standardized assessment methodology



Odour reducing technology

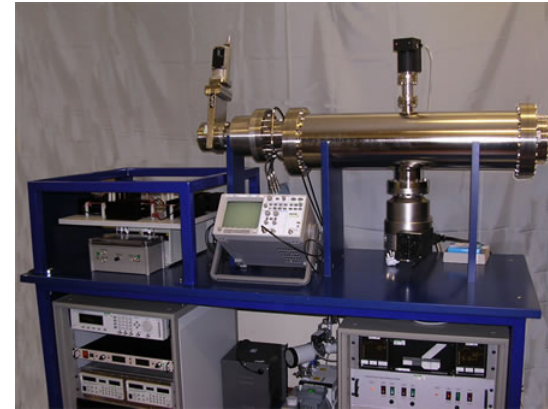
Odour



Sensory panel



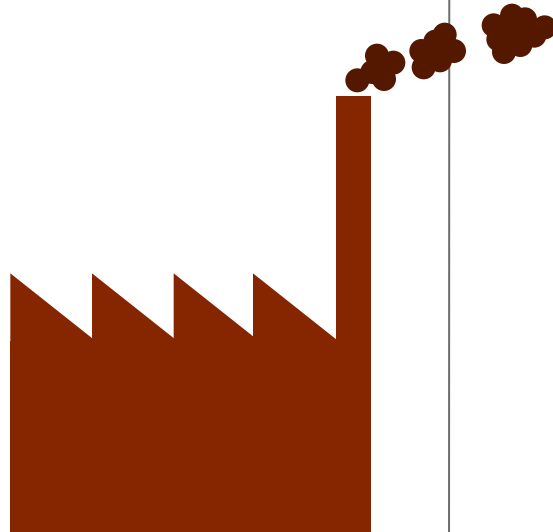
Measuring odourant emissions



Development of an impact assessment method
for odourant emissions

System boundaries in life cycle assessment

Technical system



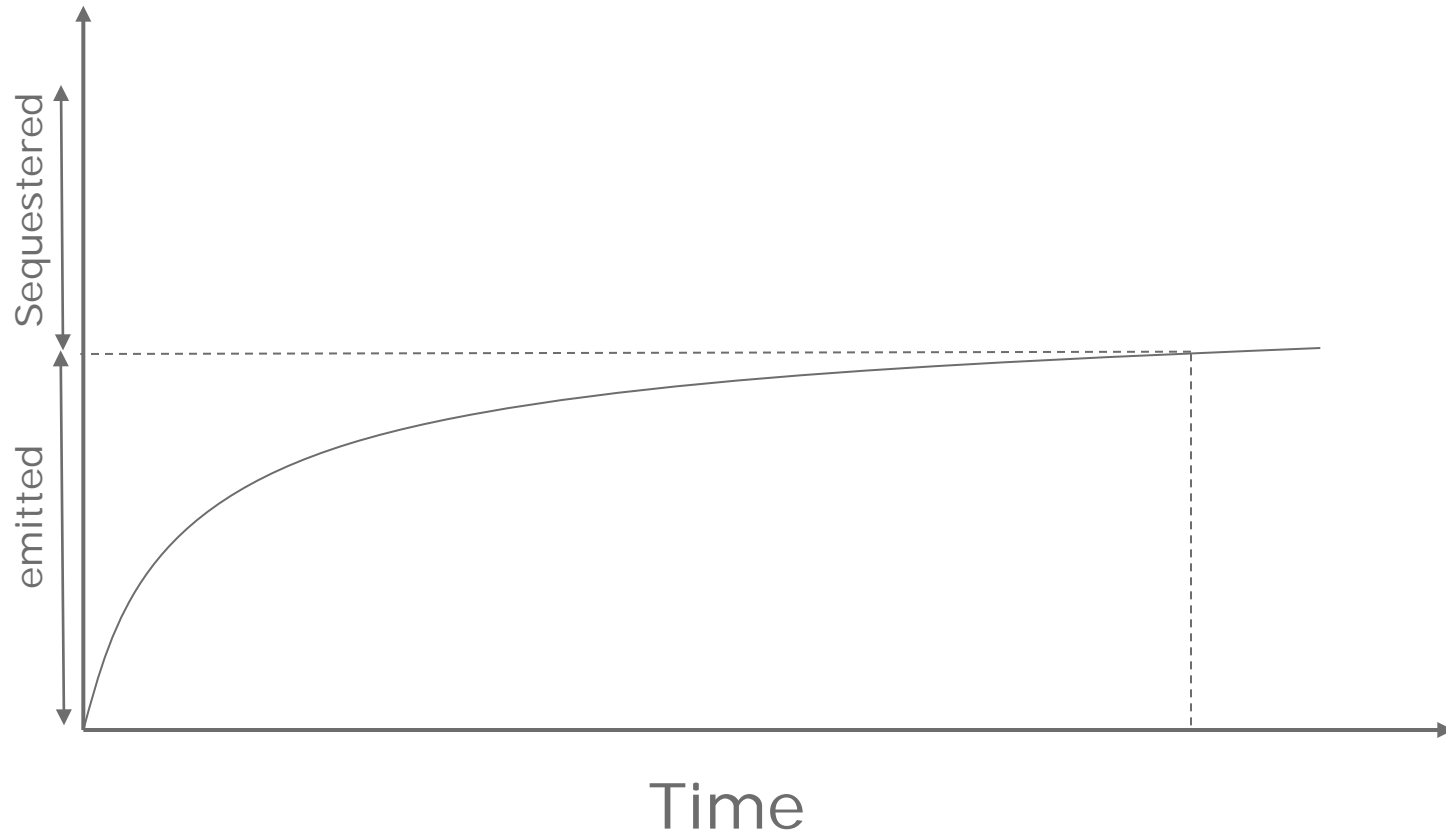
Natural system



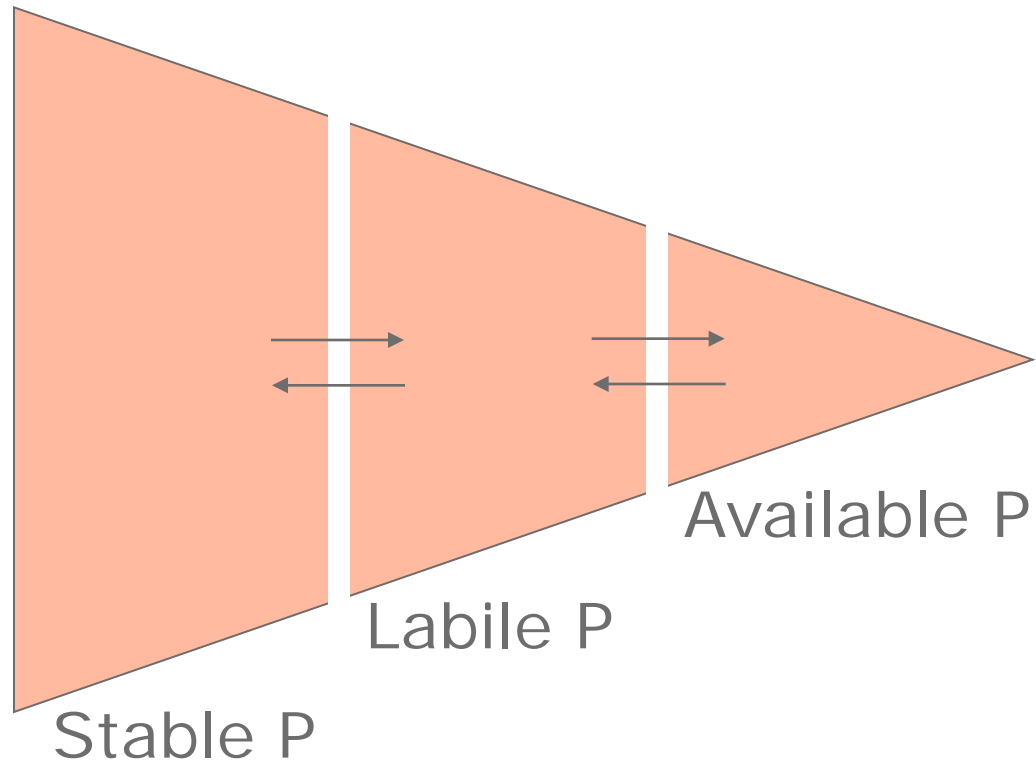
System boundaries in space
System boundaries in time
Technical delimitation



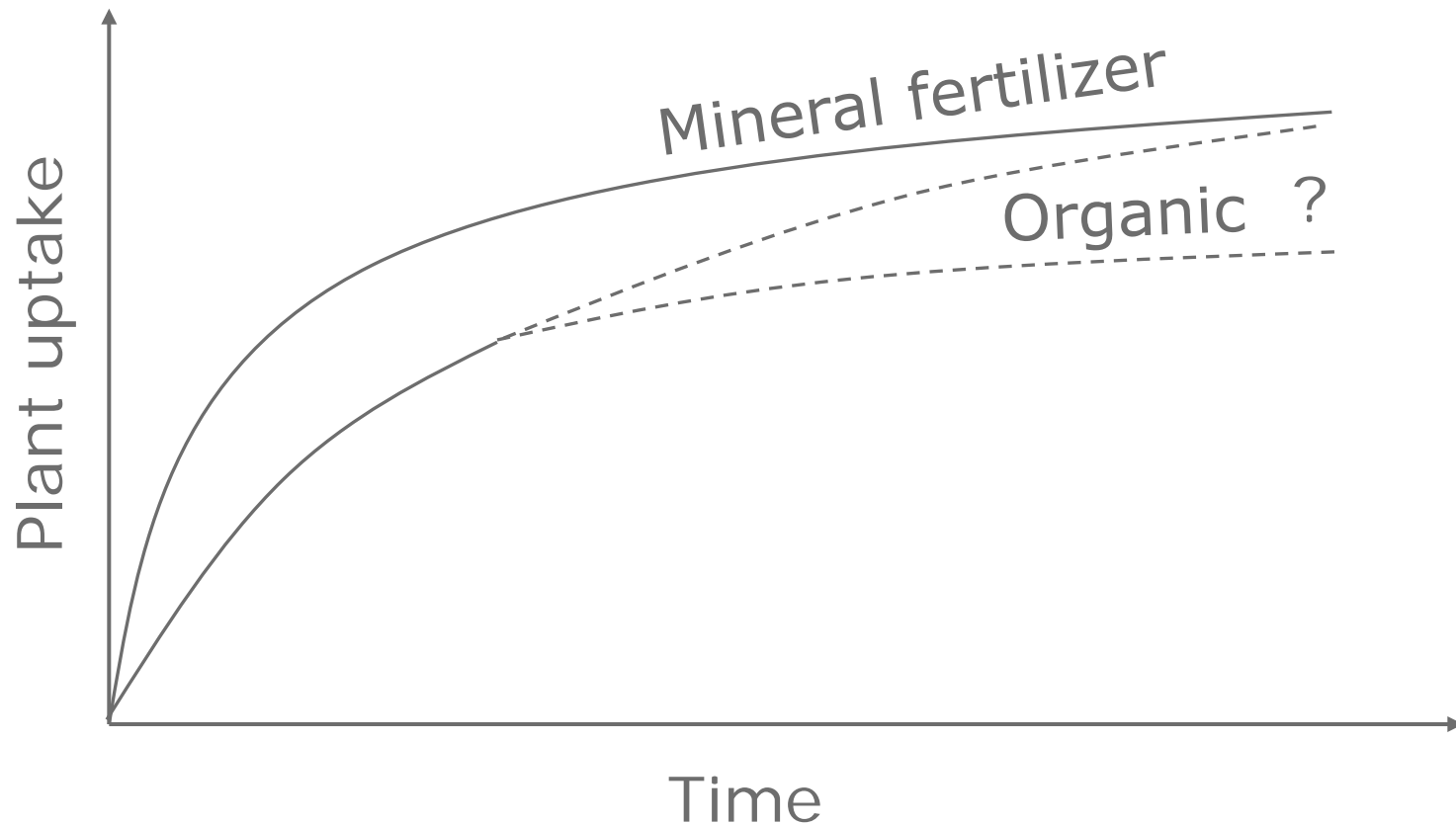
Carbon sequestration after waste application



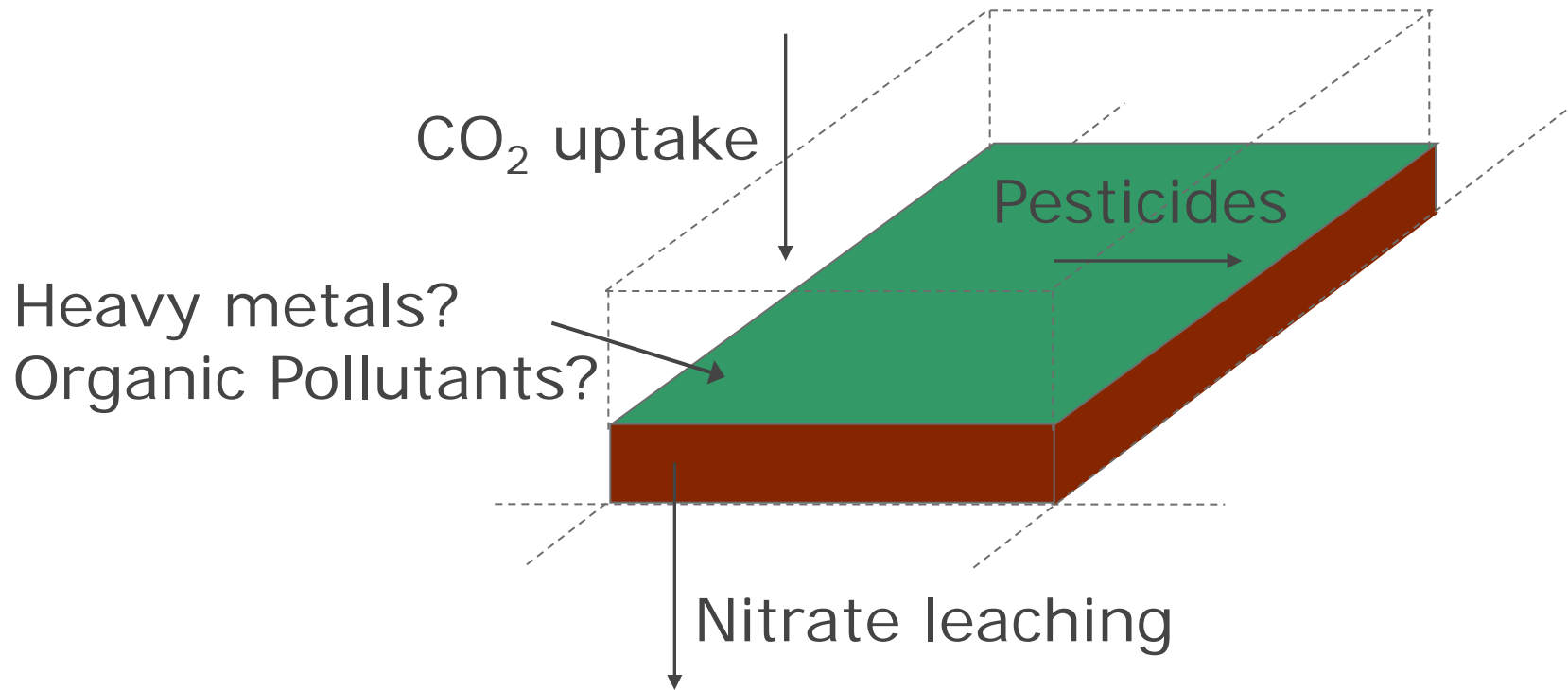
Availability of P in soil



Phosphorus – substitution of mineral fertilizer



System boundaries in agricultural systems



Emission quantification approaches

Pesticides as example

