

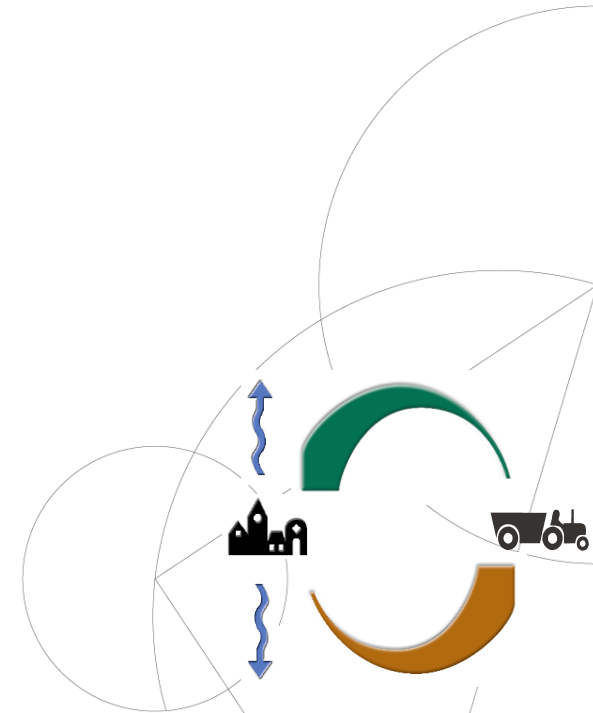


Organisk affald fra byer – problem eller resource?

100+ års tilførsel af biogødning og komposteret husholdningsaffald.

Hvordan påvirker tilførsel af organisk affald dyrkningjordens frugtbarhed og robusthed

Jakob Magid



Passende recirkuleringsløsninger..

Teknisk avancerede løsninger til kontrol af risici har ofte uønskede følger

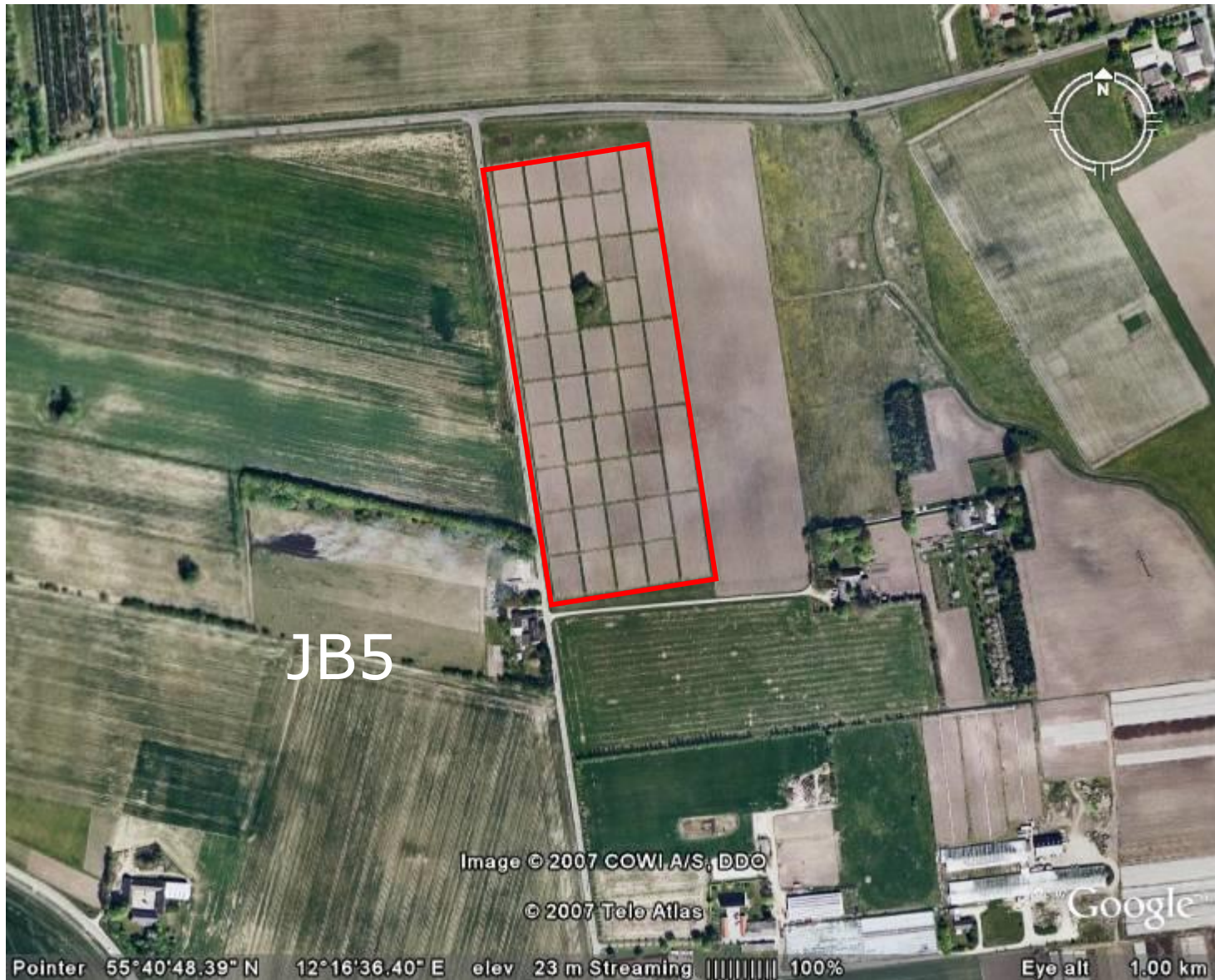
- Et højt udgiftsniveau
- Et højt forbrug af energi og kemikalier
- Tab af næringsstoffer og/eller nedgang i tilgængeligheden af næringsstoffer

Nøgle spørgsmål

- Robusthed af jorden og af økosystemet
- Acceptable risici







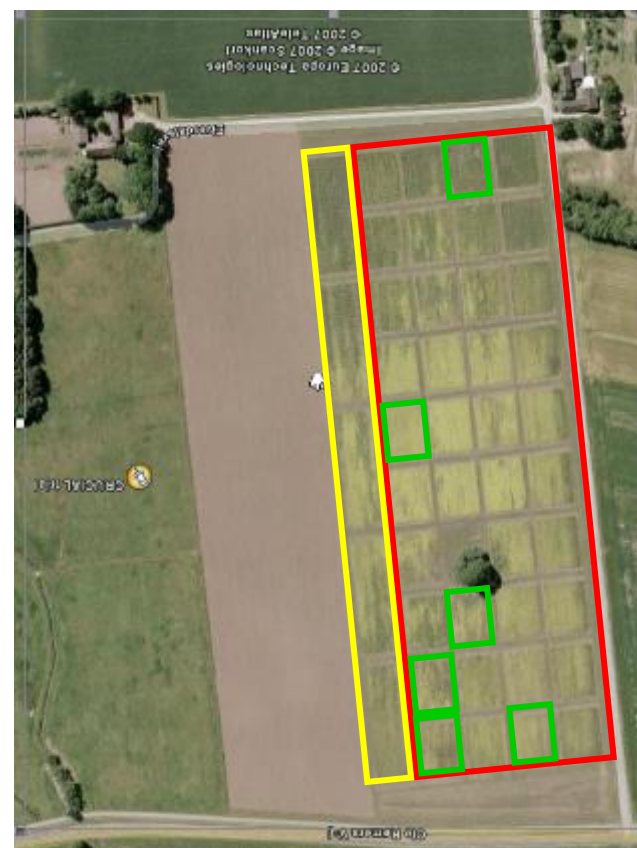
CRUCIAL - langtidforsøget

Behandlinger:

- Komposteret husholdningsaffald ('normalt' og accelereret niveau)
- Spildevands slam/biogødning ('normalt' and accelereret niveau)
- Human urin

- Kvægmøg (accelereret niveau)
- Dybstrøelse
- Kvæg gylle
- NPK gødning
- Ugødet med undersået kløver
- Ugødet

- En/to ekstra behandlinger mulige
- One ekstra blok ved siden af exp.



Frankenstein effekten



Hvor galt kan det gå?

⇒ Accelererede plots
p.t. > 100 års dosis

**Hoved resultater om
påvirkning af
frugtbarhed og jordens
og økosystemets
robusthed**



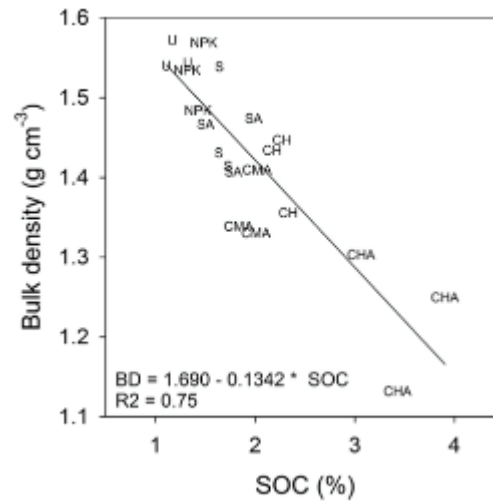
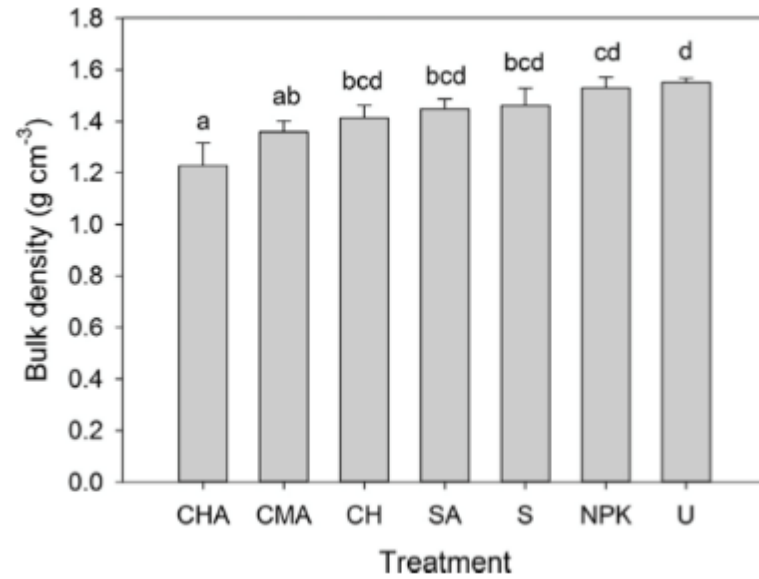
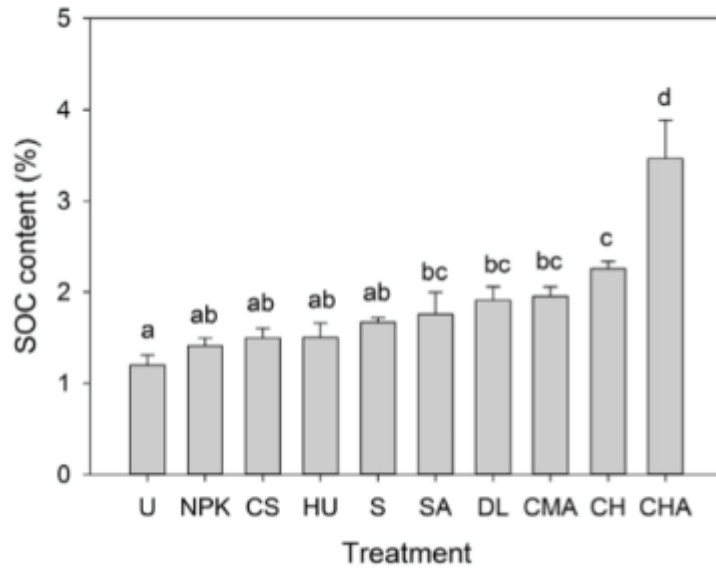


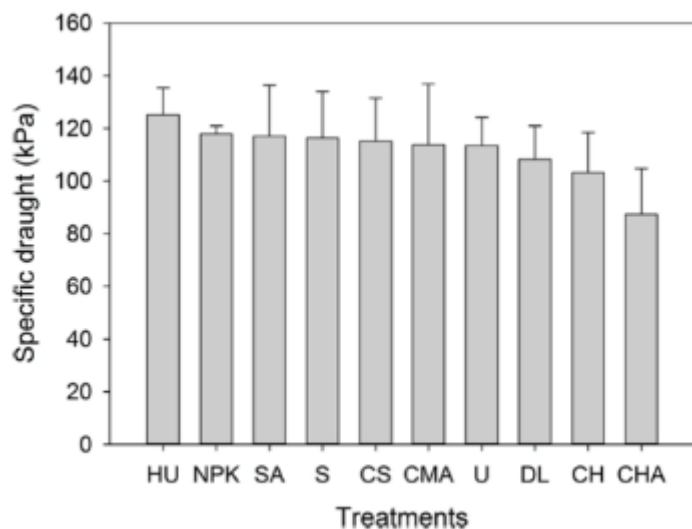
Repeated soil application of organic waste amendments reduces draught force and fuel consumption for soil tillage

Clément Peltre^{a,*}, Tavs Nyord^b, Sander Bruun^a, Lars S. Jensen^a, Jakob Magid^a

^a Department of Plant and Environmental Sciences, Faculty of Science, University of Copenhagen, Thorvaldsensvej 40, Frederiksberg DK-1871, Denmark
^b Department of Engineering, Aarhus University, Høngsvej 2, 8030 Aarhus, Denmark







<u>BEHANDLING</u>	<u>BRÆNDSTOF FORBRUG (L PER TIME)</u>		<u>BRÆNDSTOF BESPARELSE (% IFHT NPK)</u>	
CHA	3.4	0.5	-25	11
CH	3.8	0.5	-14	11
DL	4.0	0.4	-11	10
U	4.1	0.3	-7	8
CMA	4.1	0.7	-7	16
S	4.2	0.5	-5	12
CS	4.2	0.5	-5.2	12
SA	4.2	0.6	-5	13
NPK	4.5	0.4		
HU	4.7	0.1	5	3



Retentions kurver for udvalgte behandlinger i CRUCIAL

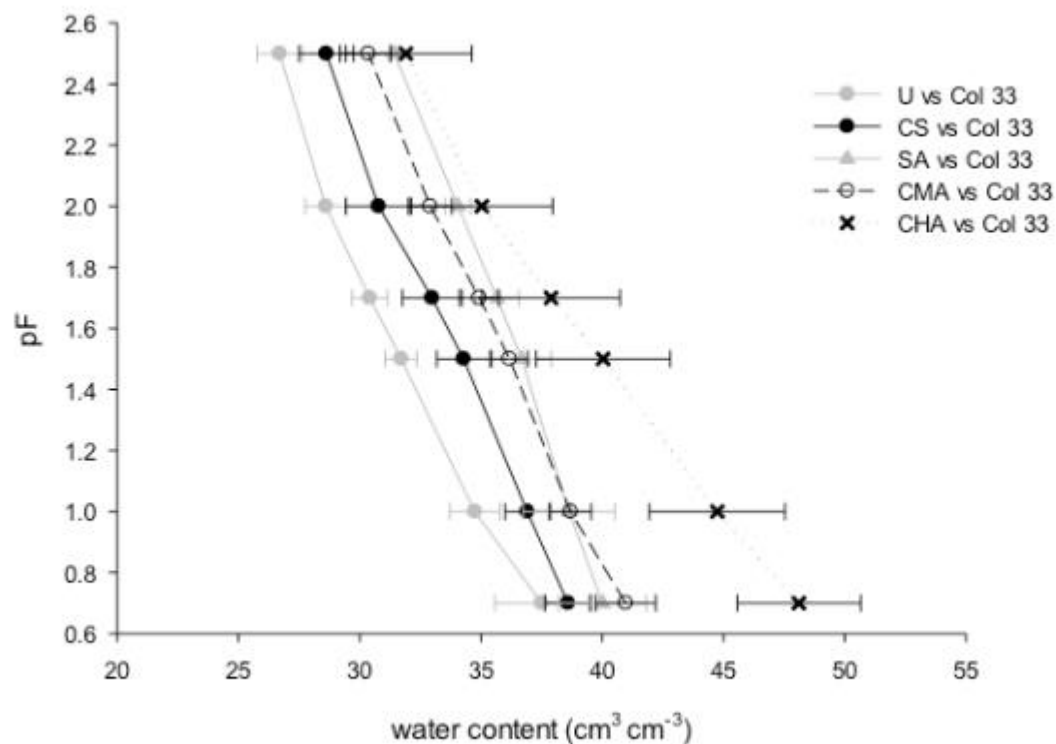


Fig. 1: Retention curves for 100 cm³ samples. Each point is a mean of six replicate samples (+/- sd). Amendments: U) unfertilized (since 2002); CS) Cattle Slurry; SA) Accelerated Sludge; CMA) Cattle Manure Accelerated; CHA) Composted Householdwaste Accelerated

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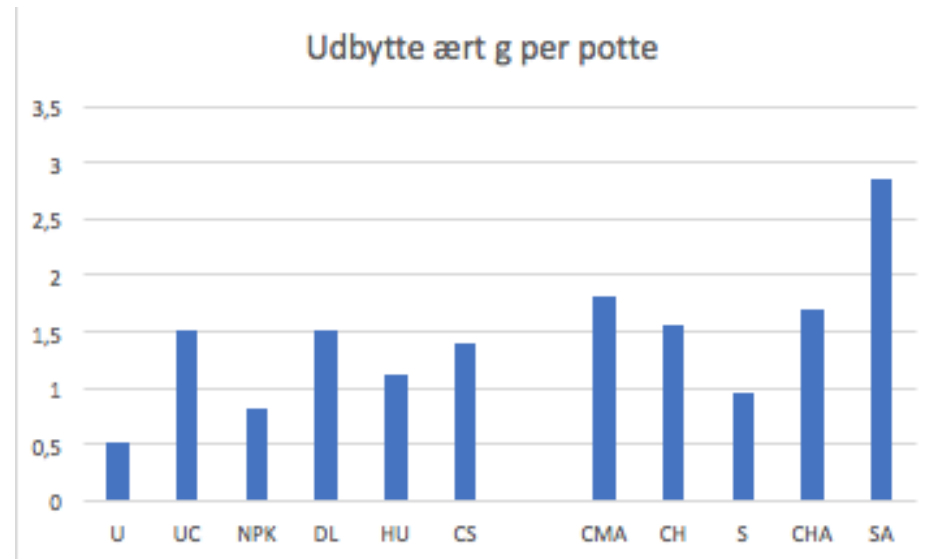
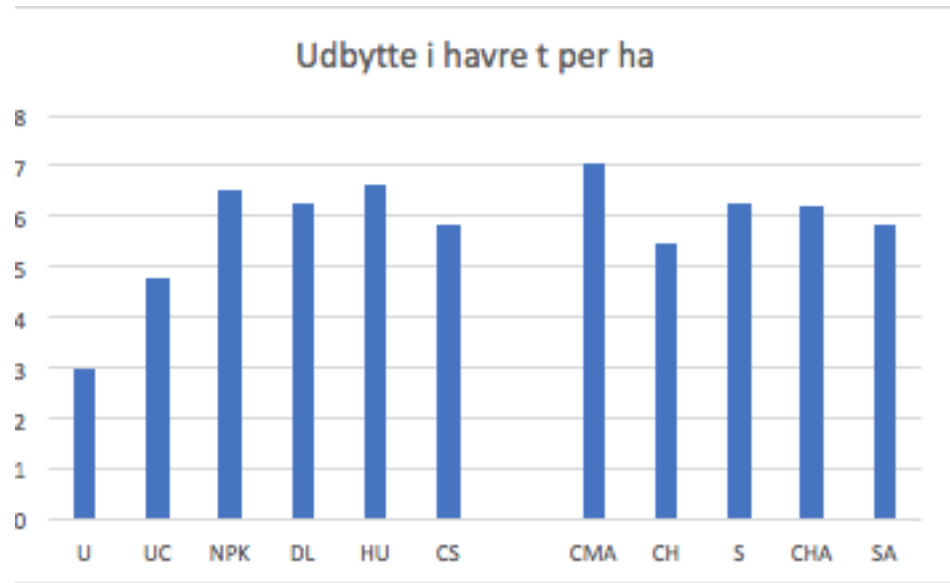
Long-term amendment of urban and animal wastes equivalent to more than 100 years of application had minimal effect on plant uptake of potentially toxic elements

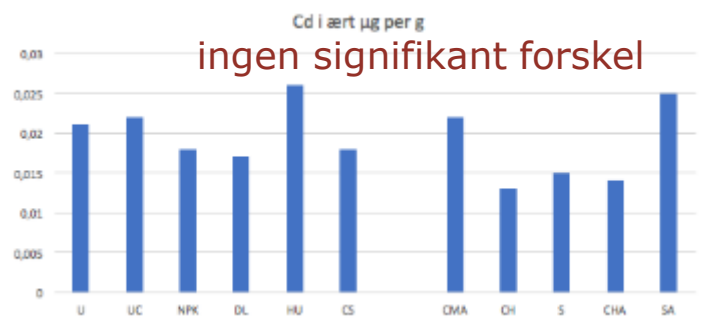
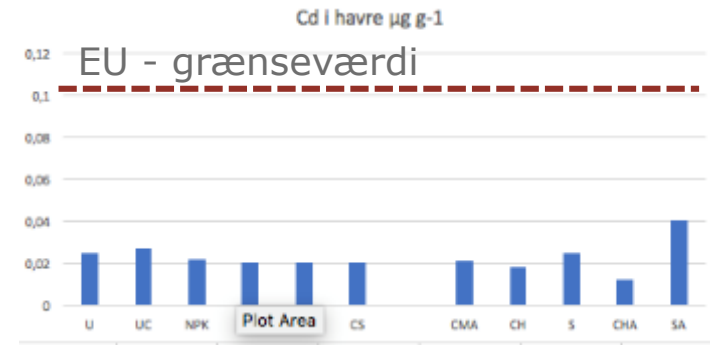
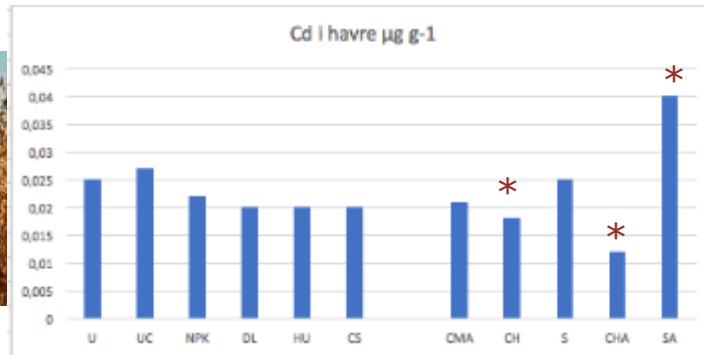


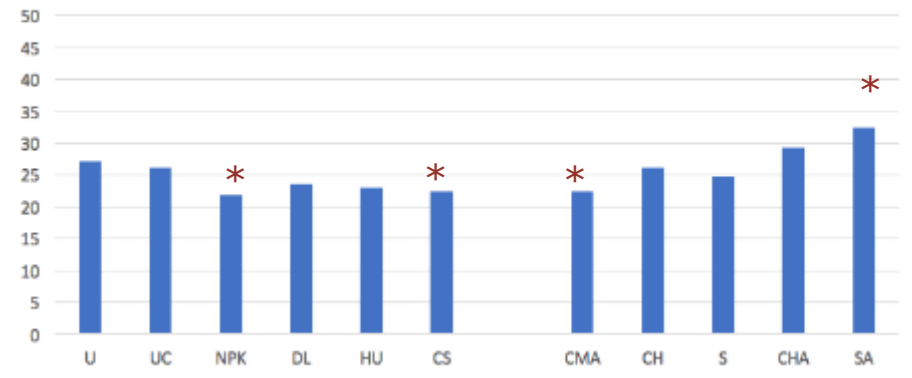
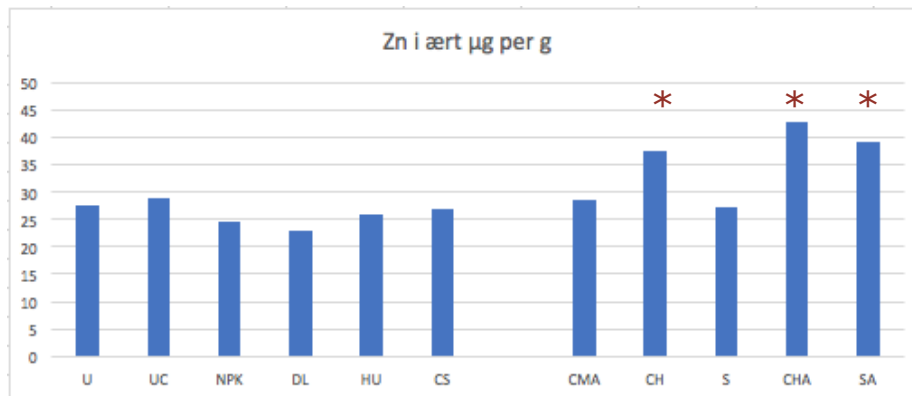
Sandra López-Rayó, Kristian H. Laursen, Jonas D.S. Lekfeldt, Fabio Delle Grazie, Jakob Magid*

Plant and Soil Science, Department of Plant and Environmental Sciences, Faculty of Science, University of Copenhagen, Thorvaldsensvej 40, Frederiksberg DK-1871, Denmark







Zn i havre $\mu\text{g per g}$ Zn i ært $\mu\text{g per g}$ 



RESEARCH ARTICLE

Exploring the immediate and long-term impact on bacterial communities in soil amended with animal and urban organic waste fertilizers using pyrosequencing and screening for horizontal transfer of antibiotic resistance

Leise Riber¹, Pernille H.B. Poulsen^{1,2}, Waleed A. Al-Soud¹, Lea B. Skov Hansen¹, Lasse Bergmark^{1,3}, Asker Brejnrod¹, Anders Norman^{1,4}, Lars H. Hansen^{1,5}, Jakob Magid⁶ & Søren J. Sørensen¹

¹Section of Microbiology, Department of Biology, University of Copenhagen, Copenhagen, Denmark; ²Danish Standards Foundation, Charlottenlund, Denmark; ³National Food Institute, Technical University of Denmark, Lyngby, Denmark; ⁴Department of Earth and Planetary Science, University of California Berkeley, Berkeley, CA, USA; ⁵Department of Environmental Science, Aarhus University, Roskilde, Denmark; and ⁶Department of Plant and Environmental Science, University of Copenhagen, Frederiksberg C, Denmark

Antibiotikaresistens af pseudomonader blev kun påvirket i kort tid (3 uger) efter tilførsel af kvægmøg, slam og kompost.

***P. putida* stammer kunne fange resistensgener fra bakterier tilført kvægmøg, slam og kompost, men kun i en uge efter tilførsel. Dette tyder på at tilstedeværelsen af overførbare resistens gener var tidsbegrænset.**



Soil Biology & Biochemistry 57 (2013) 794–802



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Soil Biology & Biochemistry

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Effects of fertilization with urban and agricultural organic wastes in a field trial – Waste imprint on soil microbial activity

Pernille Hasse Busk Poulsen^{*}, Jakob Magid, Jesper Luxhøi, Andreas de Neergaard

Department of Agriculture and Ecology, Plant and Soil Science, Faculty of Life Sciences, University of Copenhagen, Thorvaldsensvej 40, DK-1871 Frederiksberg C, Denmark

Soil Biology & Biochemistry 57 (2013) 784–793



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Soil Biology & Biochemistry

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Effects of fertilization with urban and agricultural organic wastes in a field trial – Prokaryotic diversity investigated by pyrosequencing

Pernille H.B. Poulsen^{a,b,*}, Waleed Abu Al-Soud^b, Lasse Bergmark^b, Jakob Magid^a, Lars H. Hansen^b, Søren J. Sørensen^b

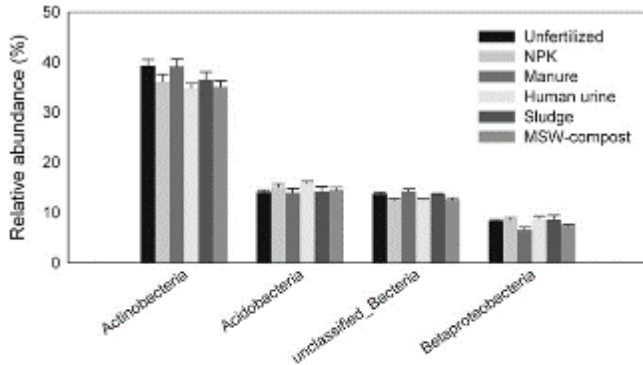
^aDepartment of Agriculture and Ecology, Faculty of Life Sciences, University of Copenhagen, Thorvaldsensvej 40, DK-1871 Frederiksberg C, Denmark

^bDepartment of Biology, Faculty of Science, University of Copenhagen, Sølvgade 83H DK-1307 Kbh. K, Denmark

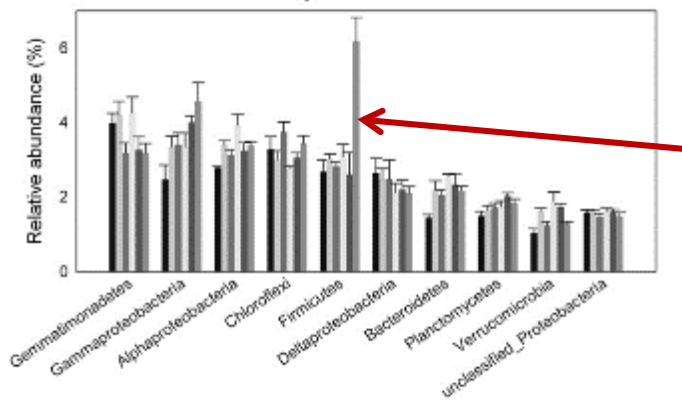
Den mikrobielle aktivitet er tæt forbundet med mængden af tilført kulstof og mikrobielle funktioner er upåvirkede



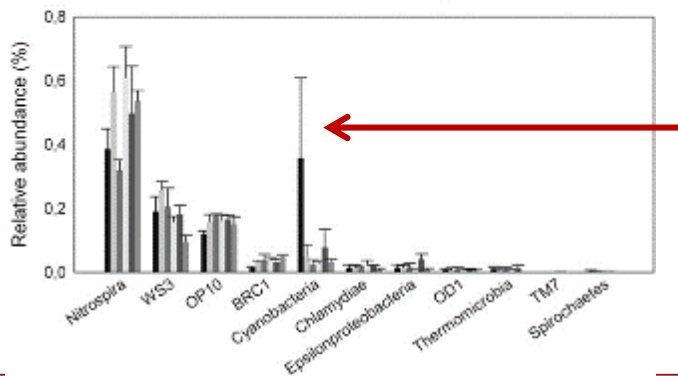
Analyse af 400.000 16S rRNA sekvenser fra 6 behandlinger



Meget robust mikrobielt samfund på phylum niveau



Høj population af firmicutes i kompost behandlet jord



Høj population cyanobakterier (fritlevende N-fikserende) i den u-gødede jord

Foreløbige konklusioner...

Jord som har fået tilført store mængder (svarende til 150-250 års lovlig dosis) organisk affald fra byer har haft gavnlige virkninger på frugtbarhed.

Indtil videre har vi ikke kunnet påvise forventede eller uventede negative effekter, bortset fra et u hensigtsmæssigt tab af næringsstoffer.

Vi er snarere blevet overraskede over jordens og økosystemets robusthed.



Muligheder for yderligere at belyse robusthed af jorden og økosystemet

Studier af udvaskning (f.eks. medicin rester og anden organisk forurening)

Studier af jordbundsfauna

Mikroplastik

Andet ...?



Tak for ordet ...

