



The Effect of Long Term Annual Compost Application on the Distribution and Stability of Soil Organic Matter

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IAEA

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Nuclear Techniques in Food and Agriculture

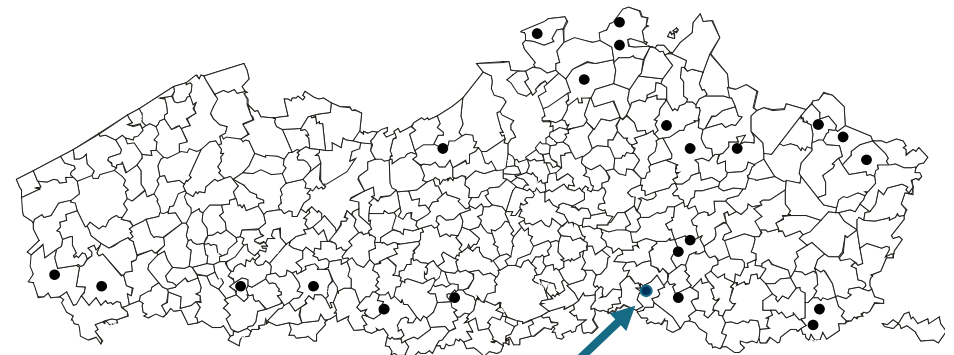


VFG Compost Experiment

- Set up in 1997



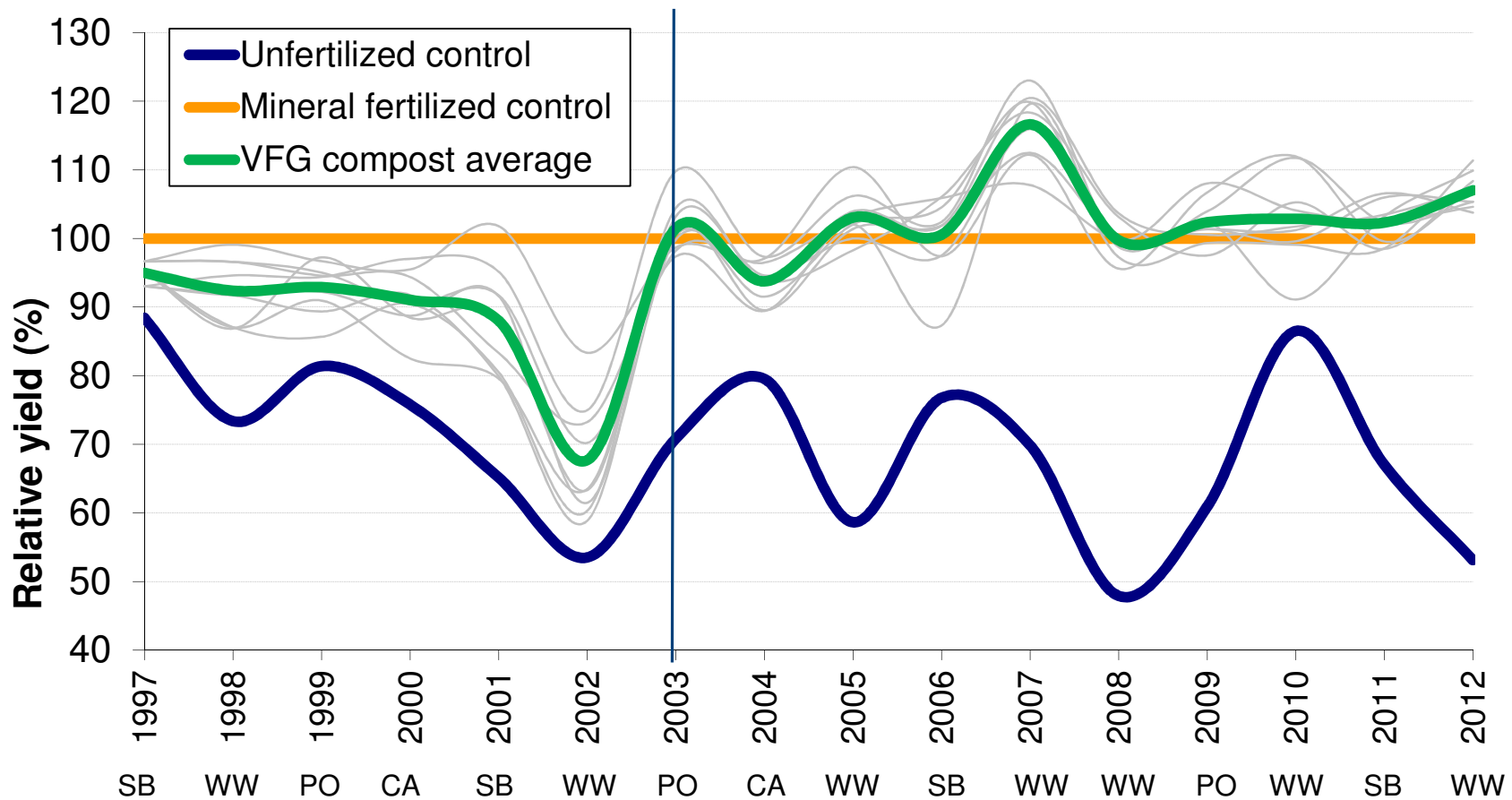
- 12 treatments
 - 3 levels of VFG compost (15, 30 and 45 t/ha)
 - 3 application frequencies (every 1, 2 or 3 years)
 - Mineral fertilized control
 - Unfertilized control
 - Bare control
- Crop rotation: beet, wheat and potatoes



Boutersem, Belgium



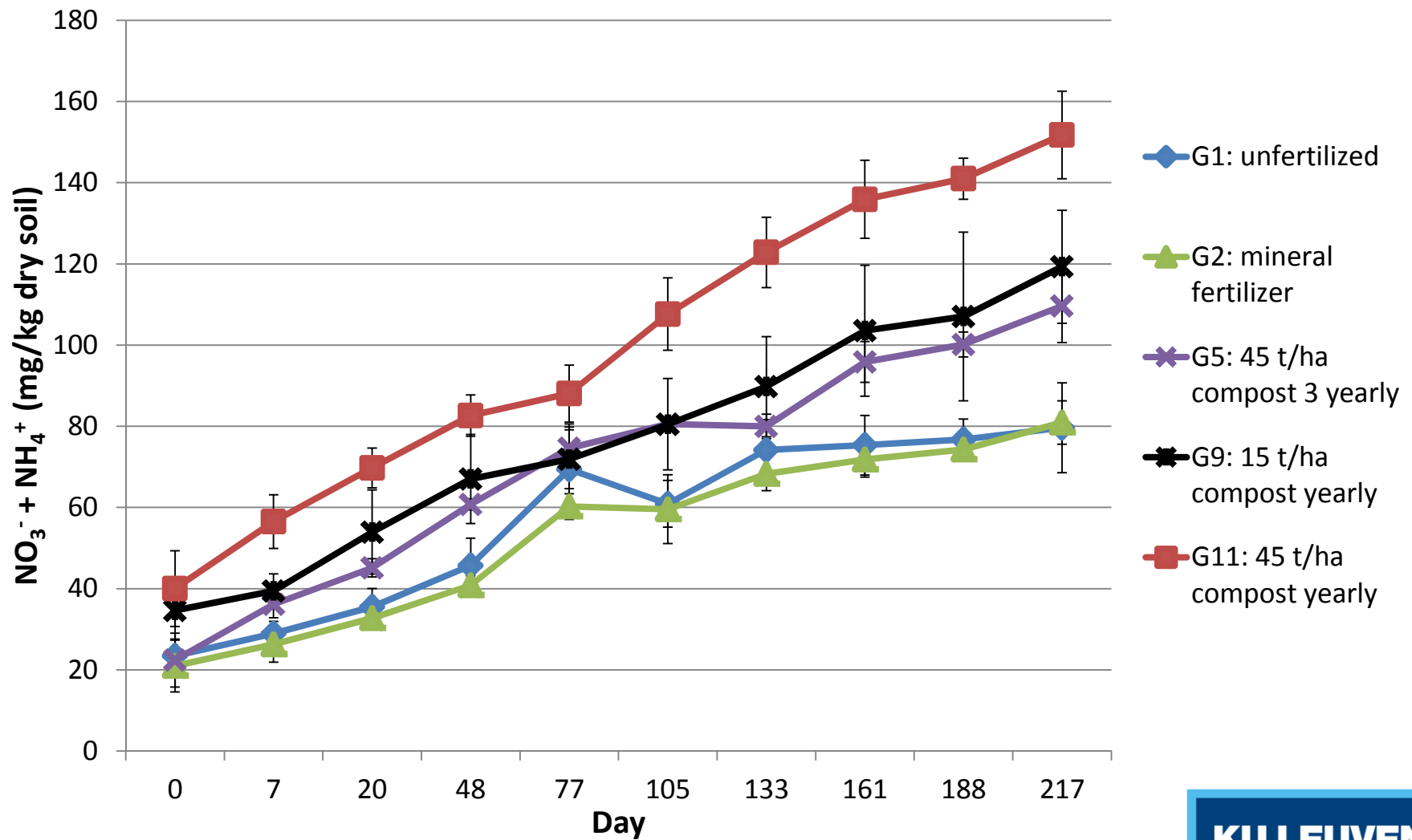
Relative Yield after 16 Years



SB: sugar beet
CA: carrots

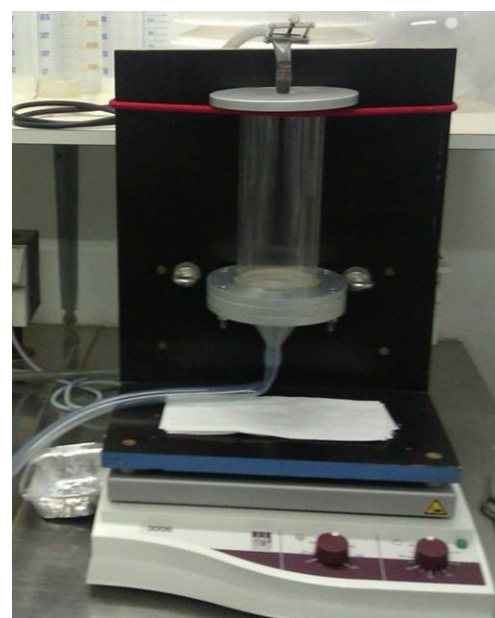
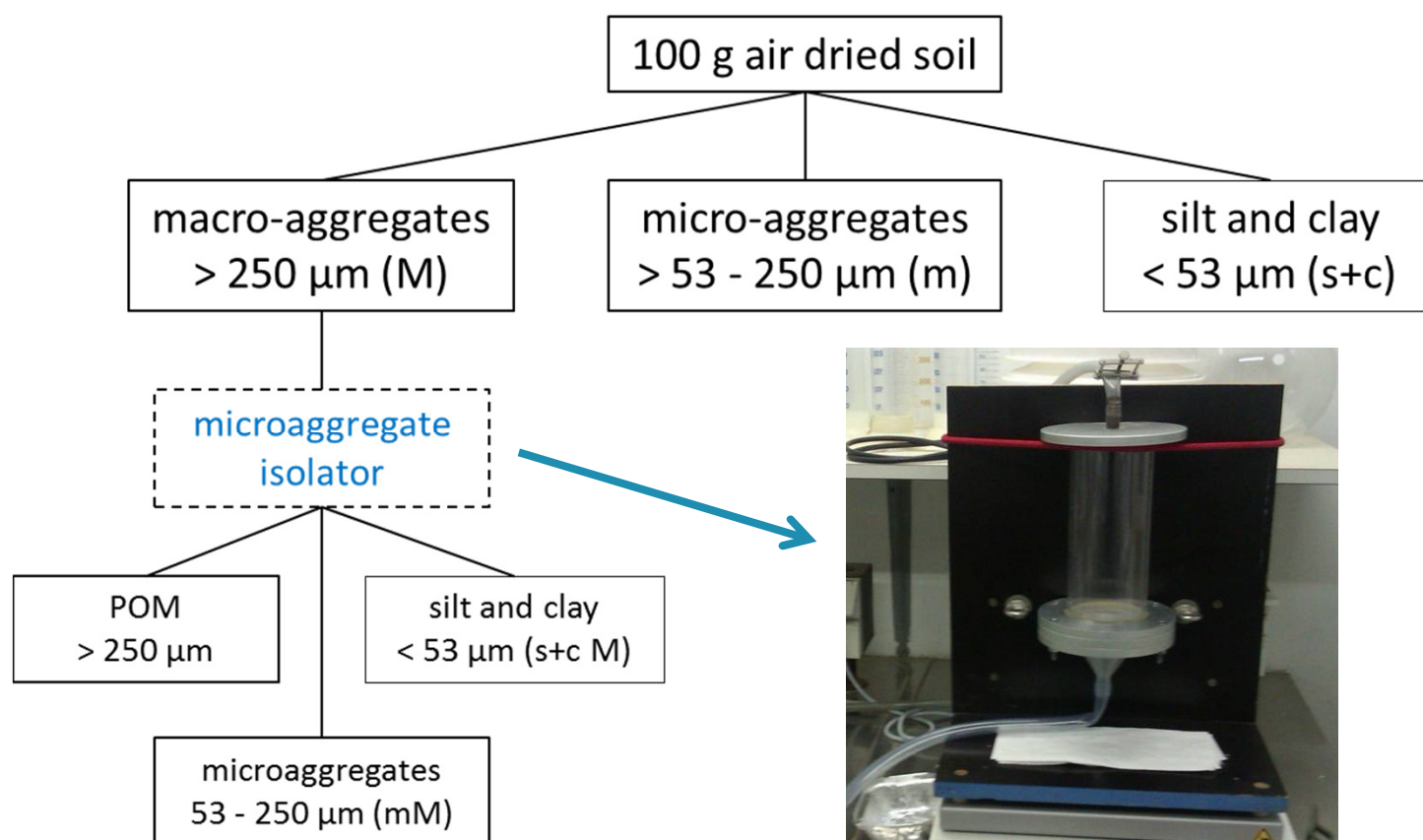
WW: winter wheat
PO: potatoes

Nitrogen Mineralization Potential



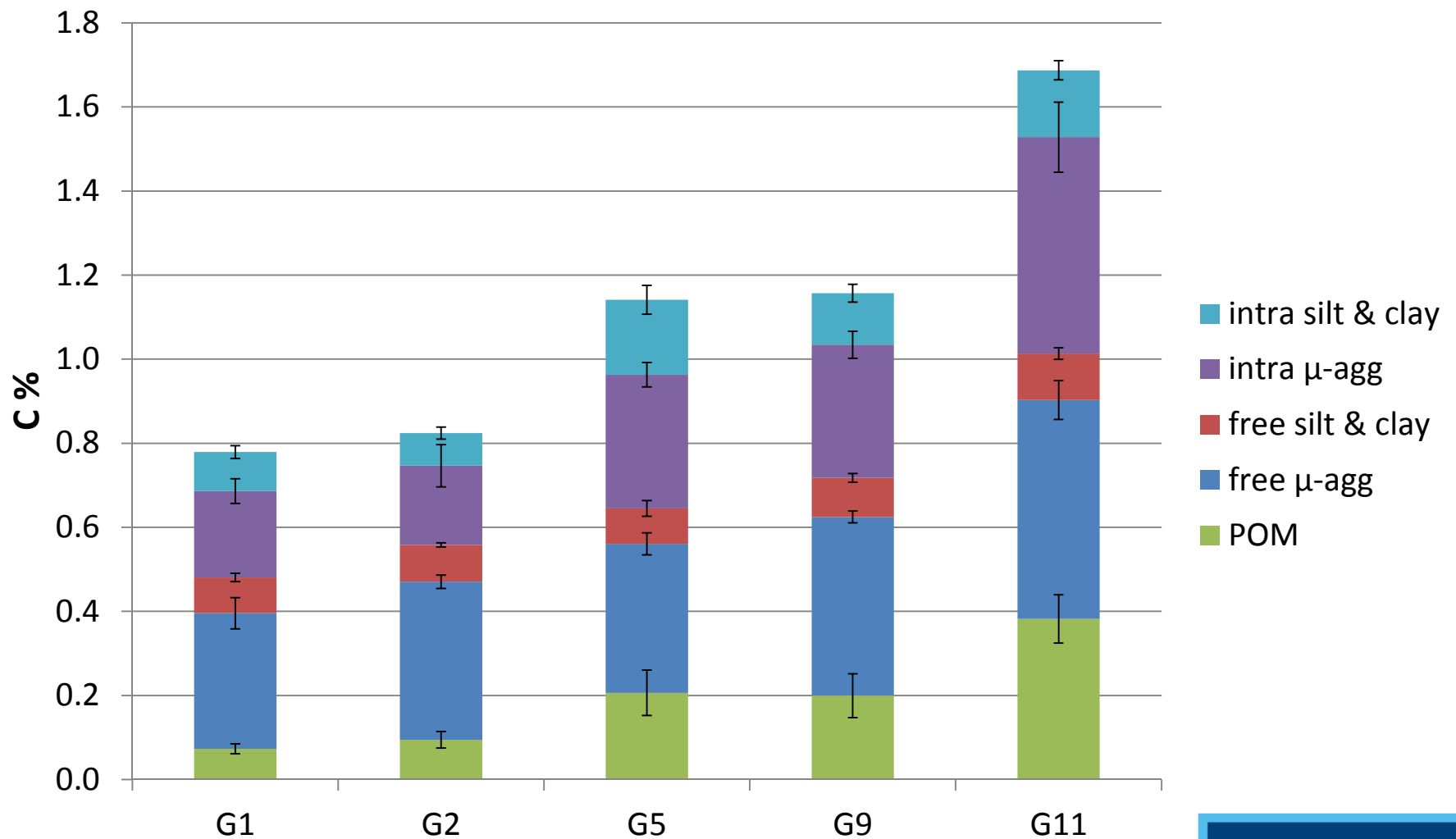


Isolation of Main SOC Fractions



Based on Six *et al.* 2002

SOC Distribution among Fractions



Determining Relative SOC Stability



$$f_N = 1 - e^{\left(\frac{\delta_m - \delta_p}{\epsilon}\right)}$$

$$f_C = f_N + (1 - f_N) \cdot \left(1 - \left(\frac{r_m}{r_p}\right)\right)$$

$$n = \frac{C_m}{C_p \cdot (1 - f_C)}$$

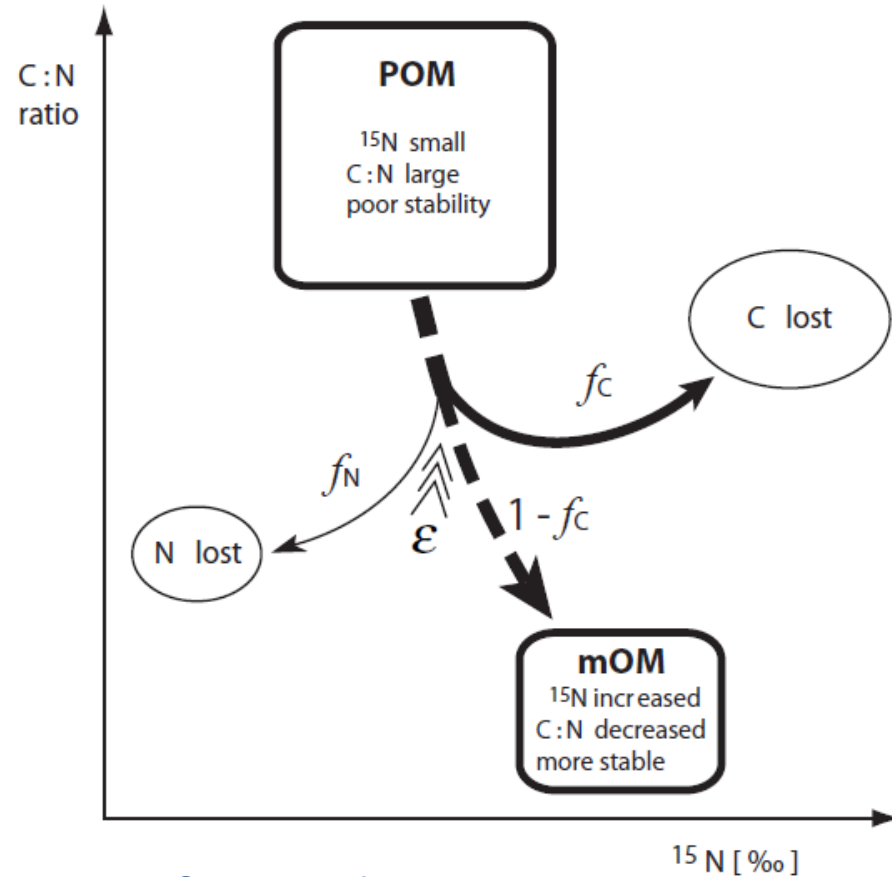
$\delta = \delta^{15}\text{N}$

m = mOM

r = C:N ratio

p = POM

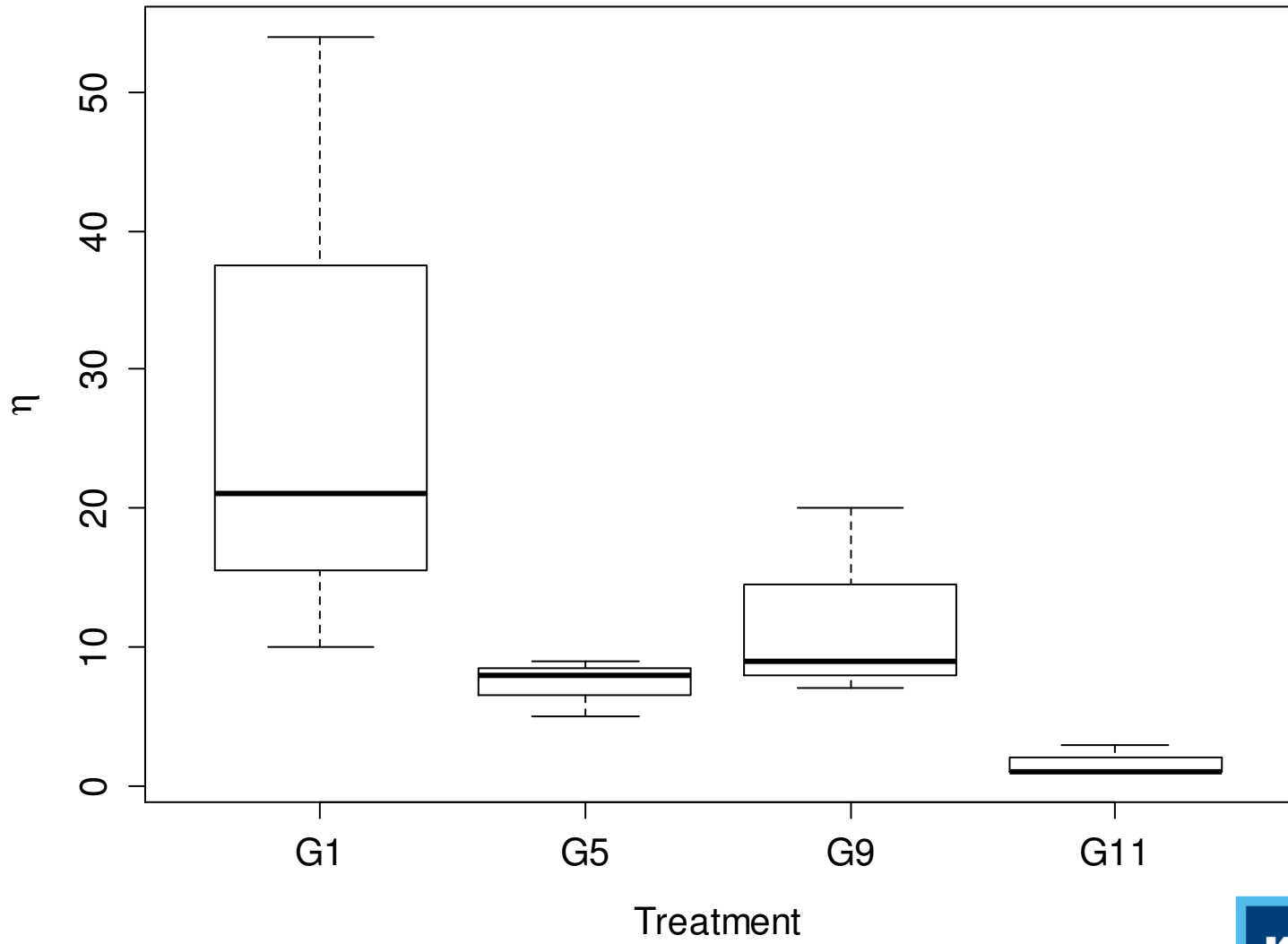
C = [C] mg/g soil



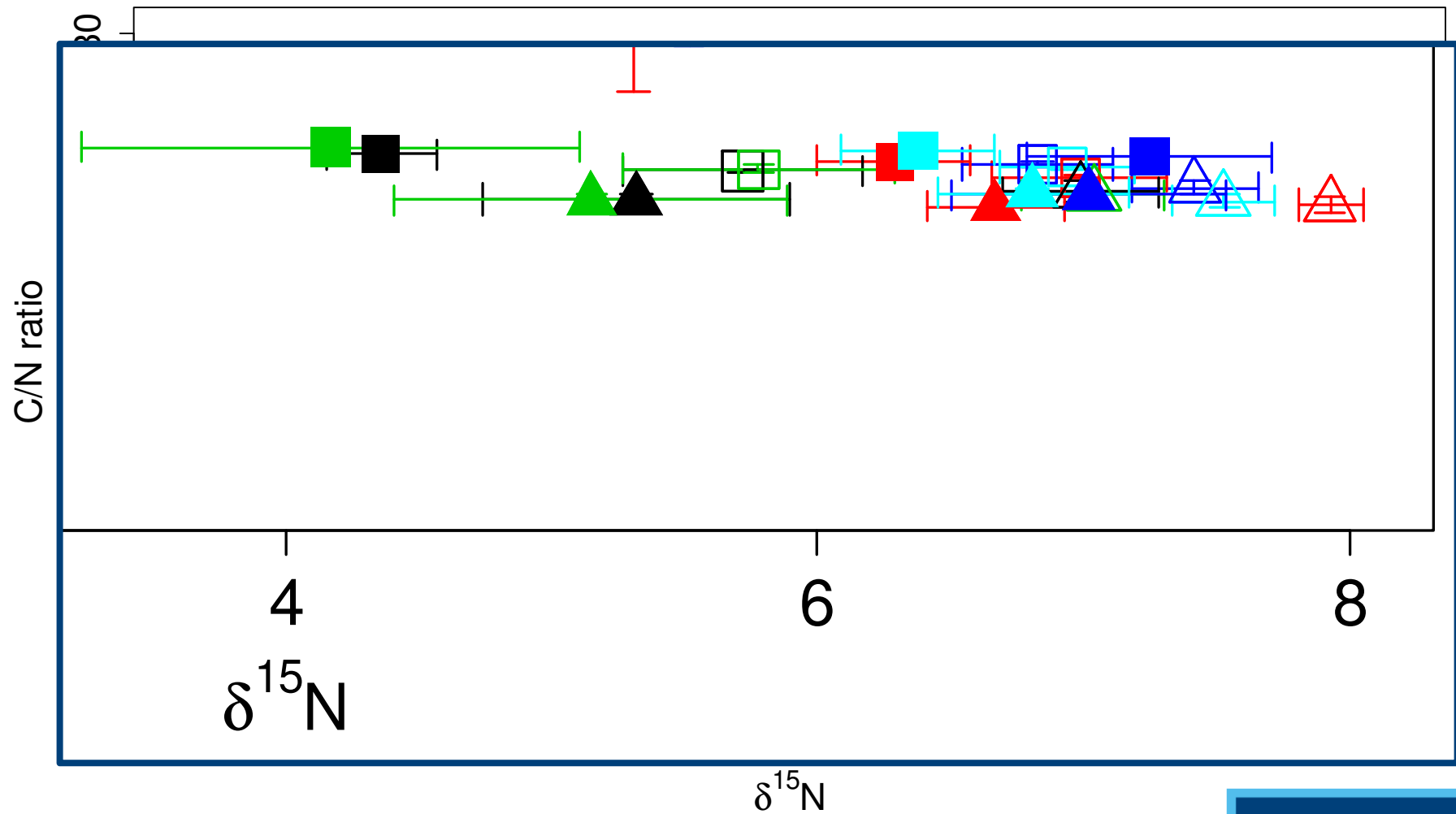
Conen *et al.* 2008



Relative Stability (η)



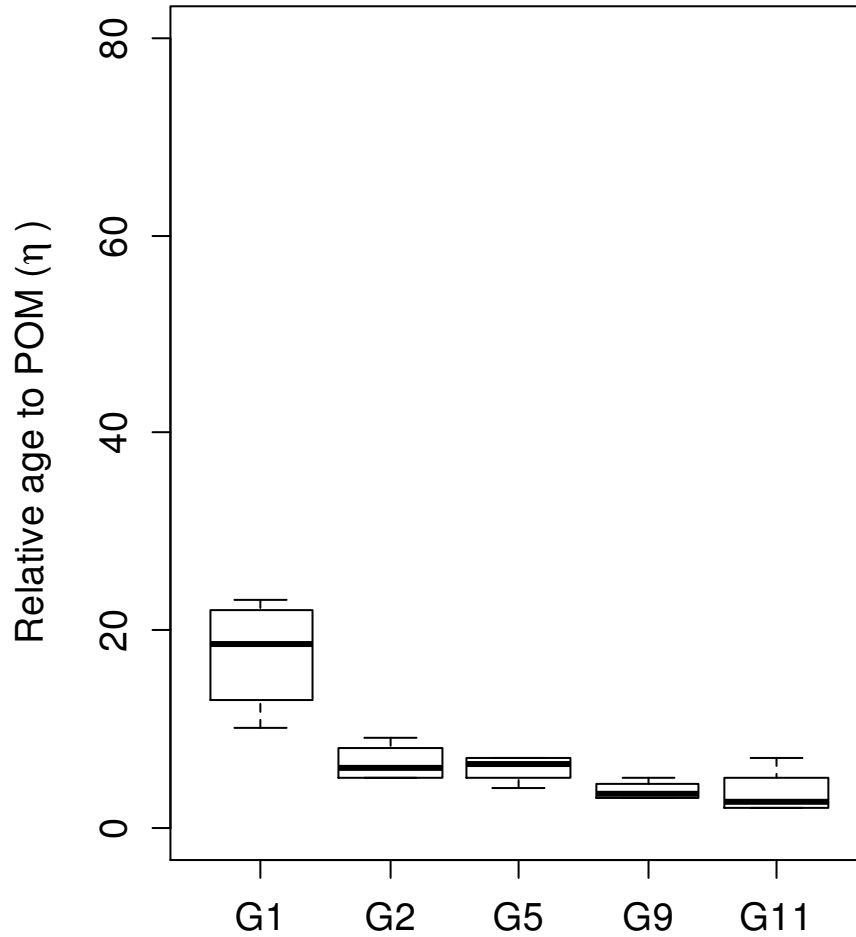
Signature of Isolated SOC Fractions



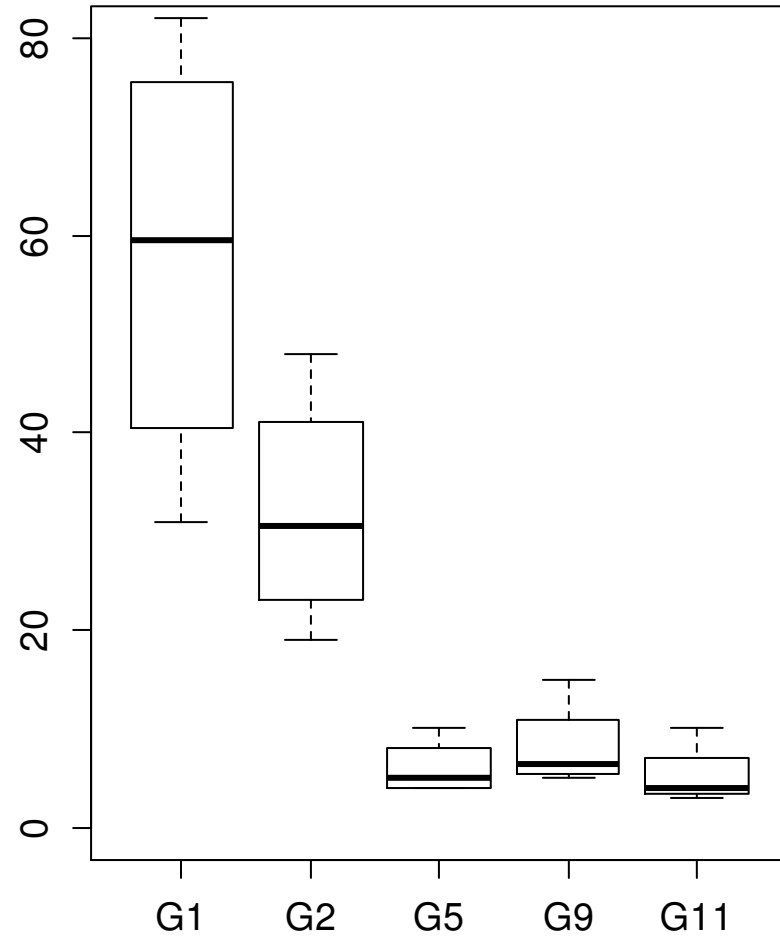
Relative Stability Multiple Pools (η)



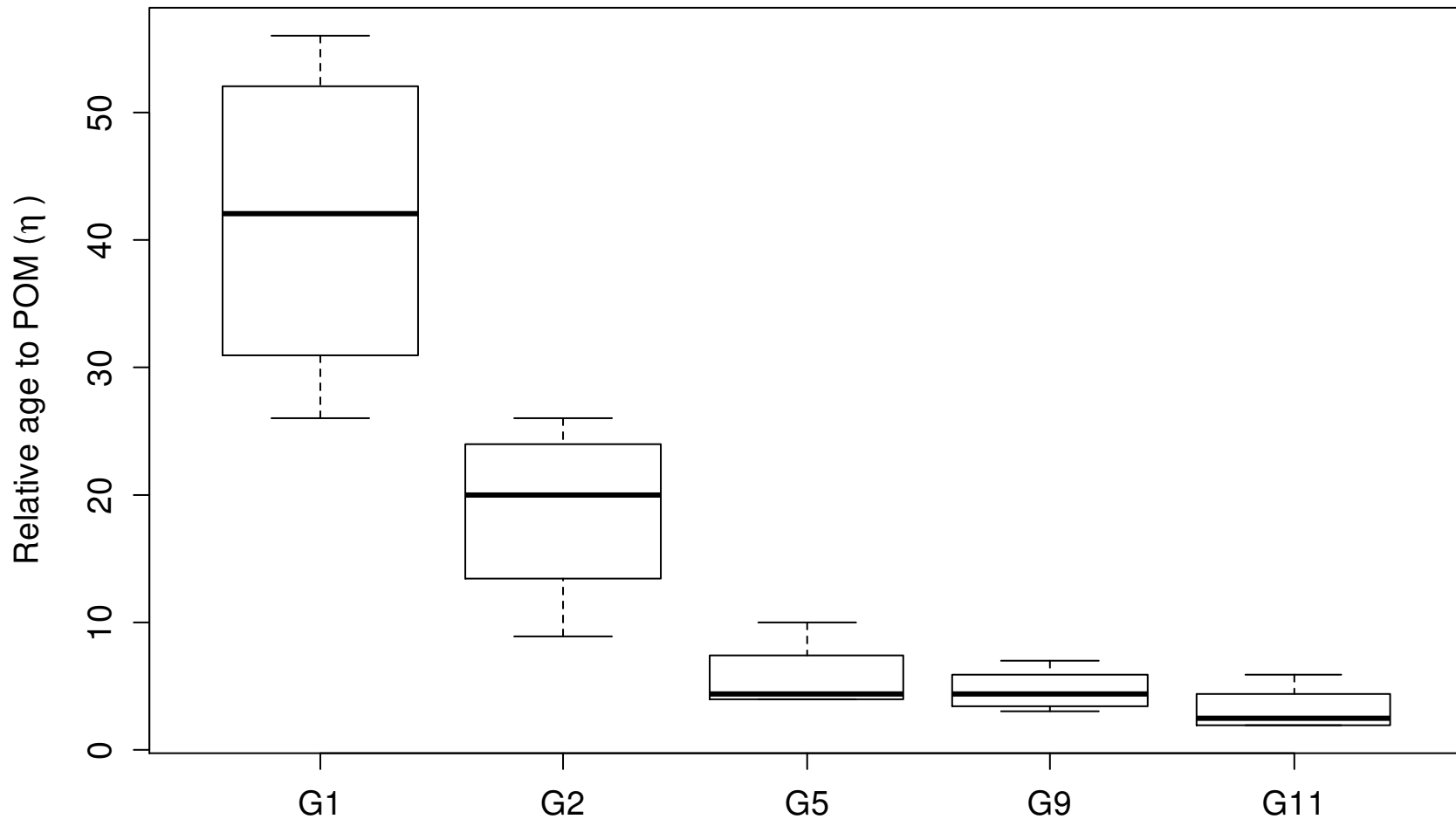
Intra μ -aggregates



Free μ -aggregates



Relative Stability Multiple Pools (η)





Conclusion

- VGF compost can replace (part of) mineral fertilizer need
- Long term compost application leads to:
 - Increased residual N mineralization potential
 - Altered SOC distribution
 - Decreased SOC stability
- Model is promising tool but needs validation with ^{14}C measurements



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Thanks for your attention



KU LEUVEN