

Does a reduction of organic matter input reduce nitrate leaching and crop yield?

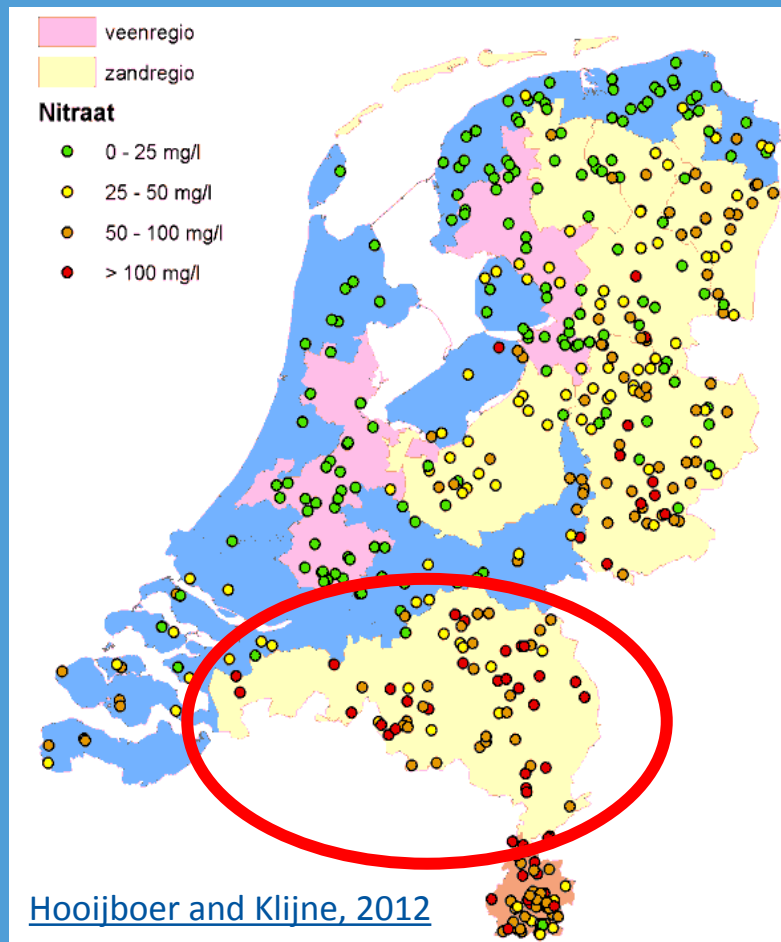
Leads short term result to long term negative effect?

Janjo de Haan & Willem van Geel

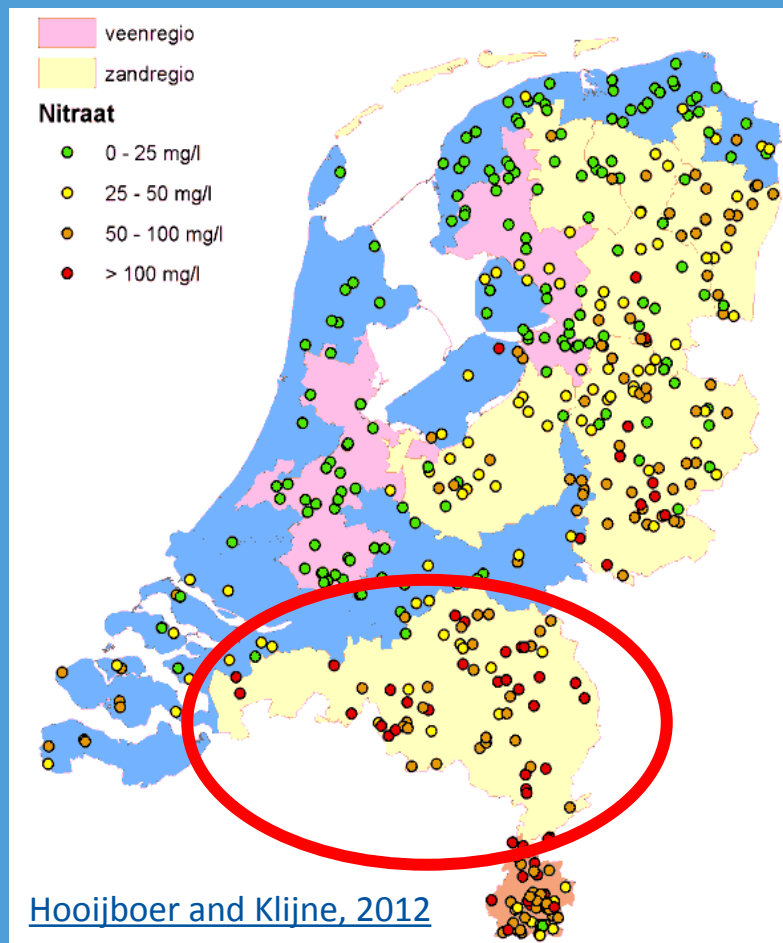
LUWQ-conference The Hague, 12 June 2013



High nitrogen concentrations in groundwater in South East NL



High nitrogen concentrations in groundwater in South East NL



Organic matter input is hot topic (1)

- EU-Nitrate directive → Action plans → Manure legislation
 - Input of organic manure restricted by P-norms
 - 5th Action plan in negotiation with EU
 - New steps to reduce leaching needed
 - Further restrictions on organic manure use expected



Organic matter input is hot topic (2)

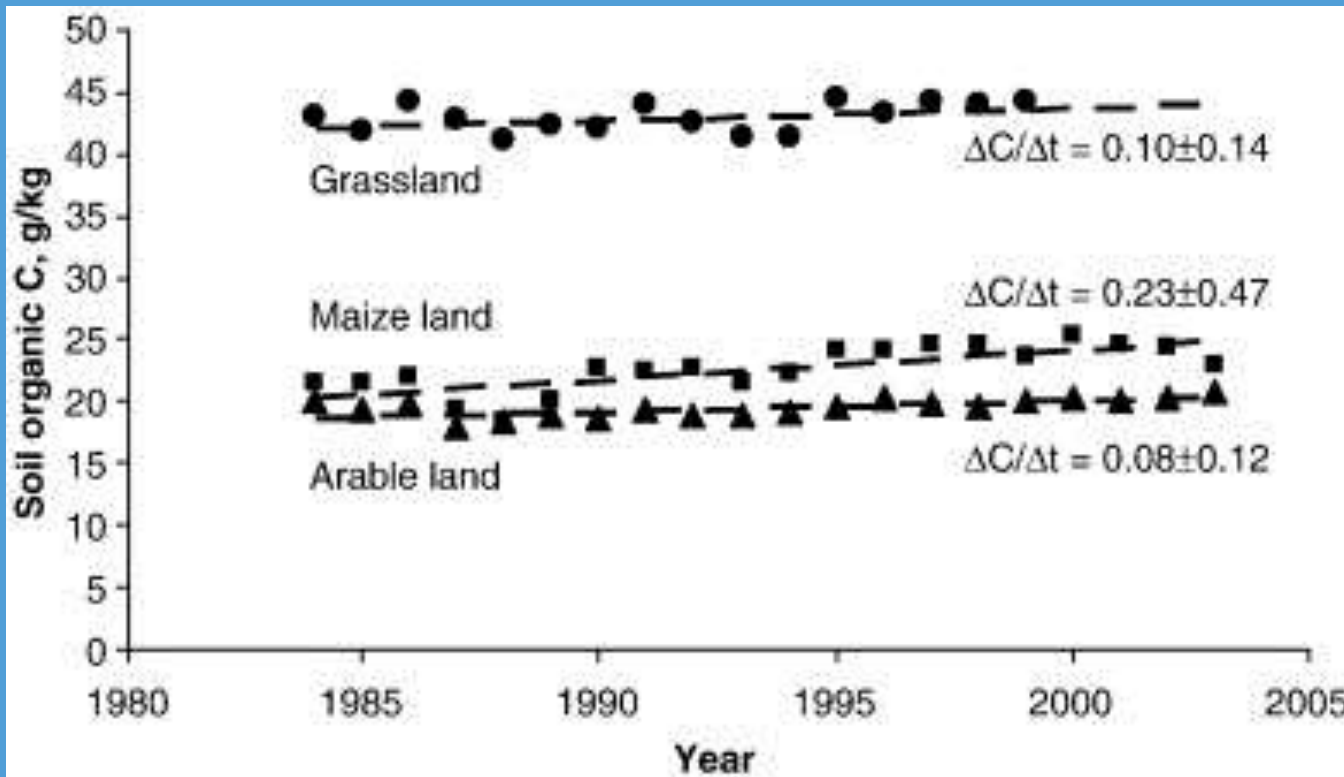
Jaap Haanstra: Foreman arable farmers, farmer union:

- *"We can not maintain soil fertility any more"*
- *"Soil fertility is already declining"*
- *"We need more possibilities for organic matter input"*



Organic matter input is hot topic (3)

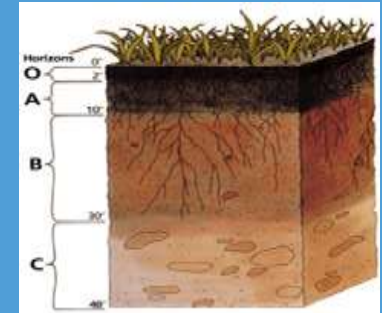
- Decline in soil fertility can not be proven scientifically



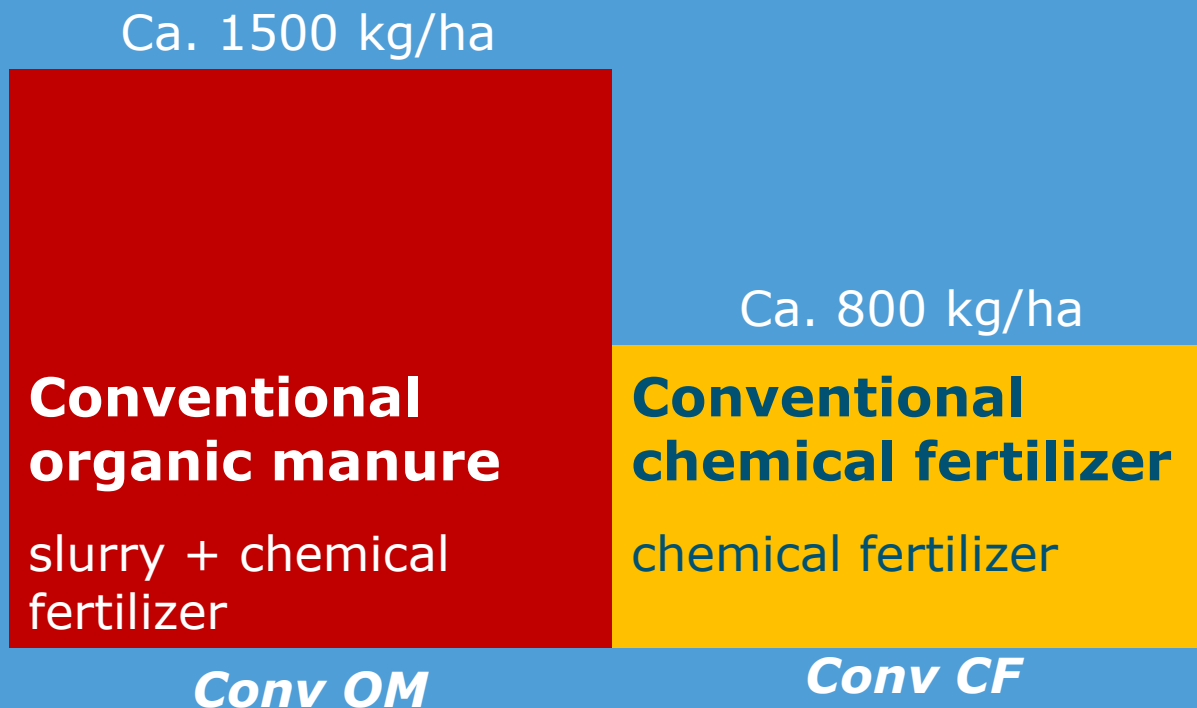
Reijneveld et al.
2009



Comparison effect of no organic manure application on leaching, yield and soil



Comparison effective organic matter input



Shifted focus over years



Location Vredepeel, SE NL, Farming systems research, since 1988



Crop rotation



- Important crops in region, various types
 - Arable crops, vegetables and feed crops
 - Mow crops and root crops
- Full crop rotation
- Maximum use of green manure crops
 - Dependent on nematode populations
- 2005-2008 lily included in rotation

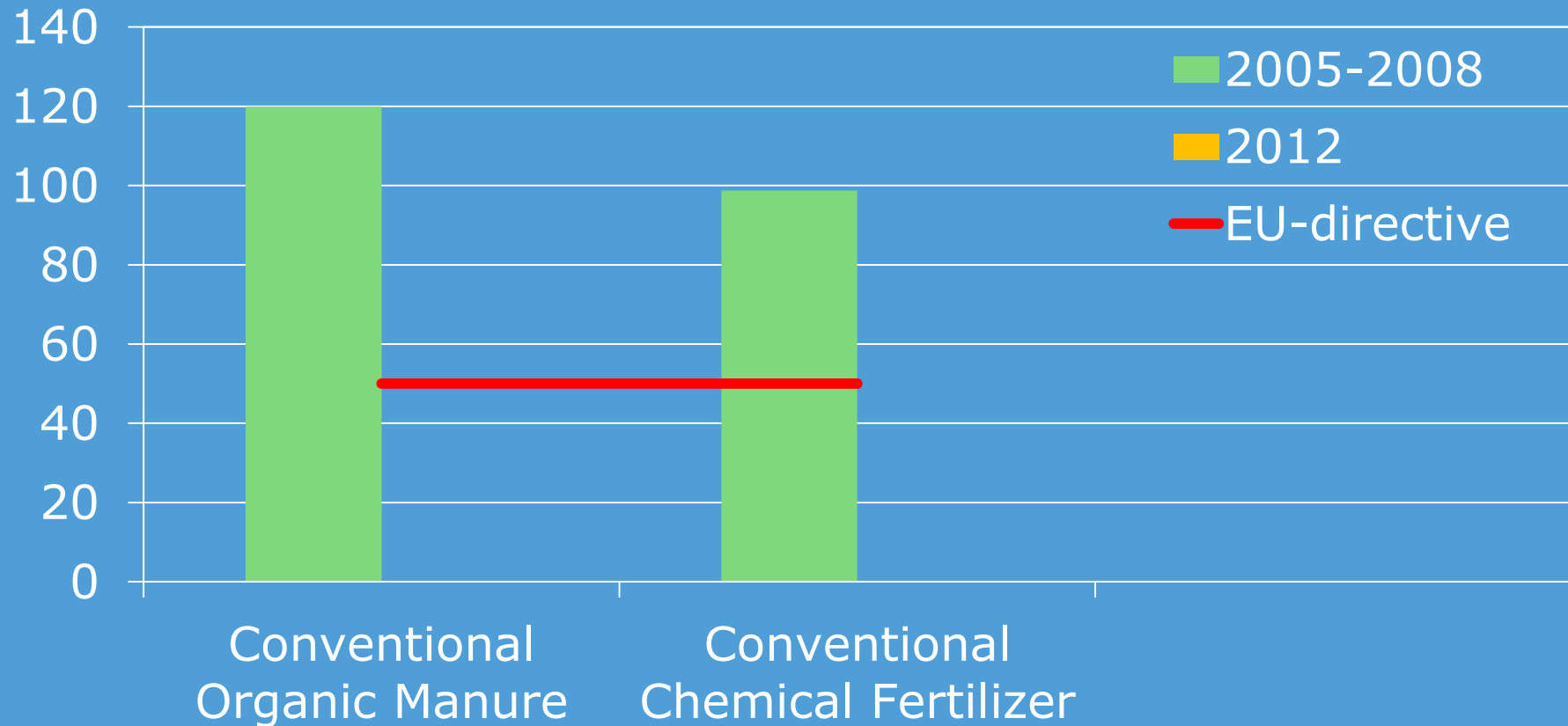


Difference in crop growth: Conv CF & OM



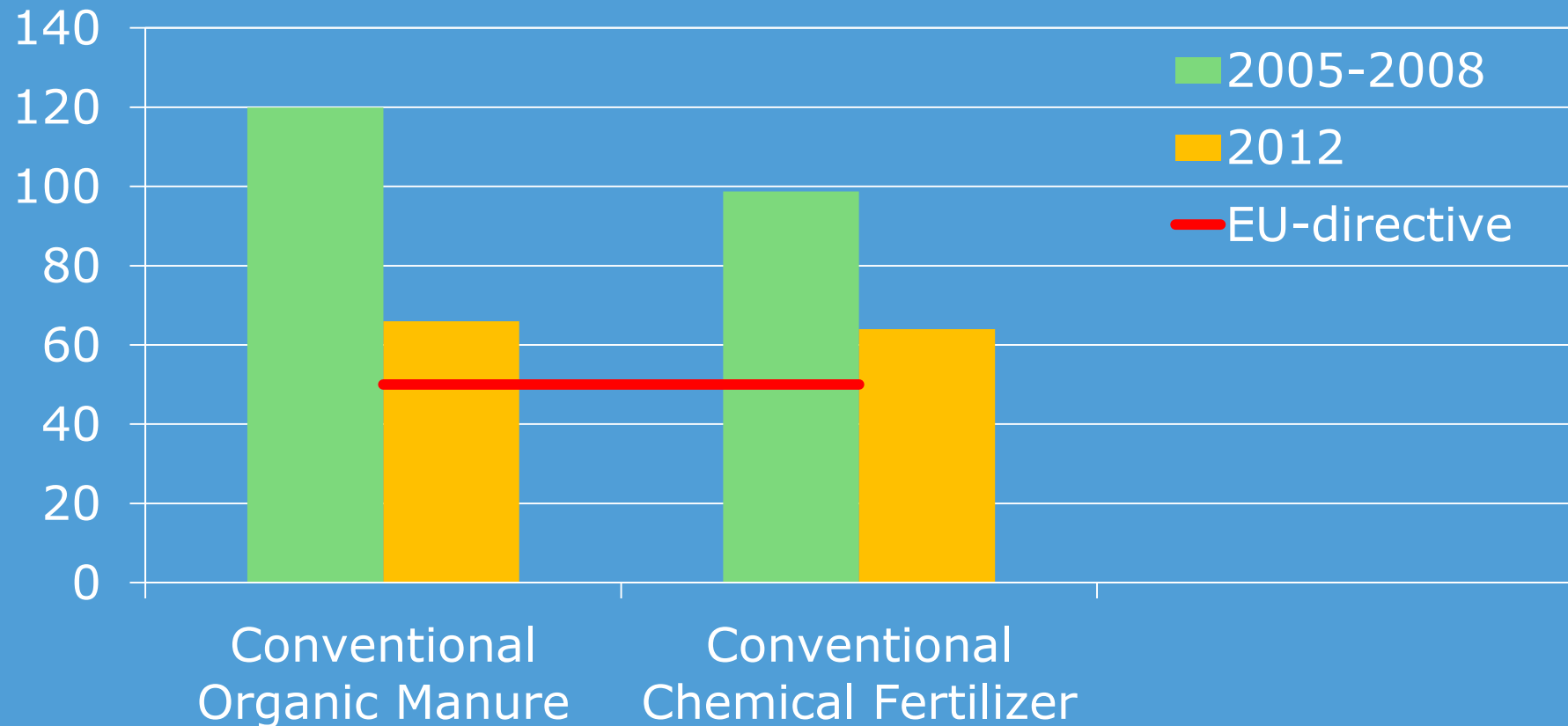
Nitrate concentrations groundwater

mg NO₃⁻/l



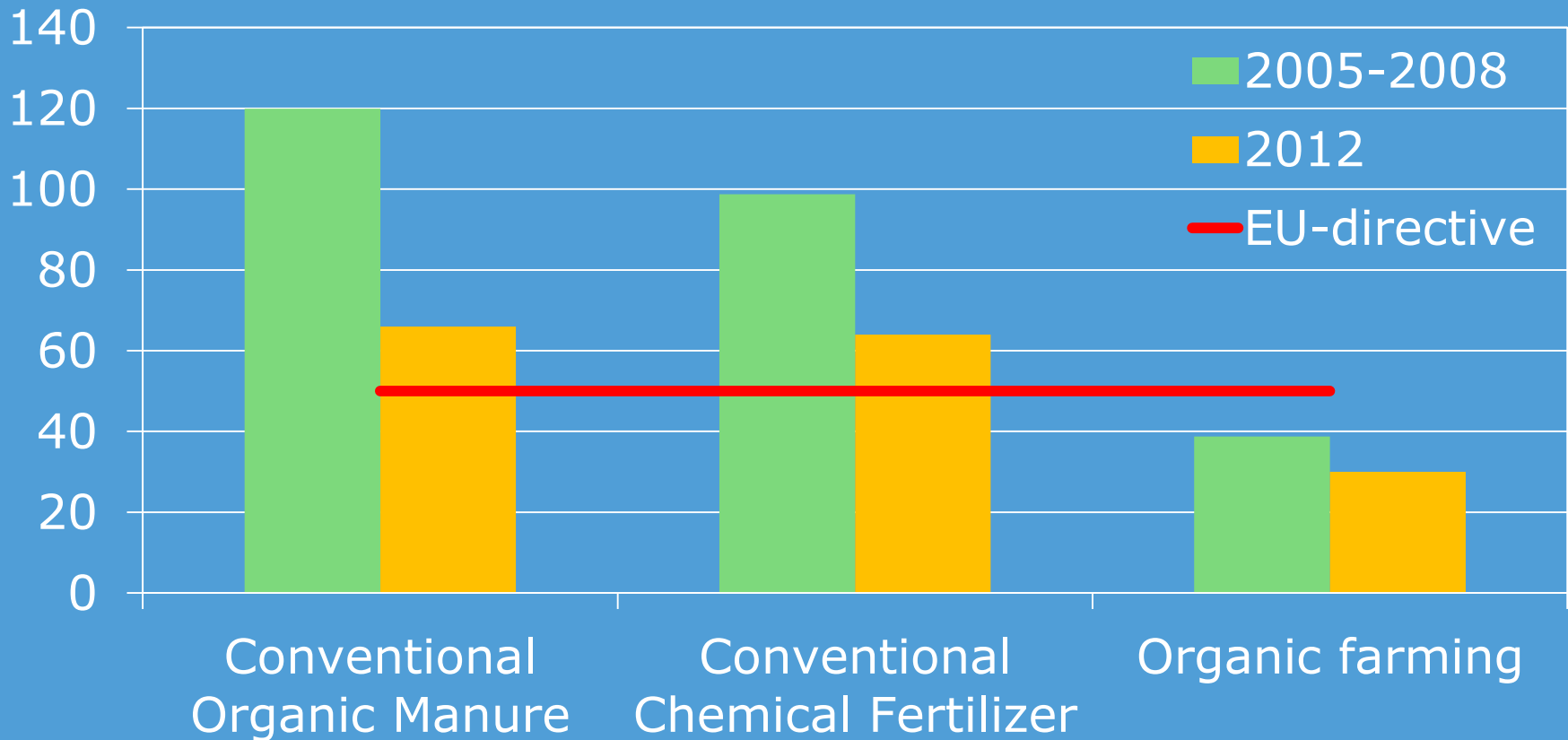
Nitrate concentrations groundwater

mg NO₃⁻/l

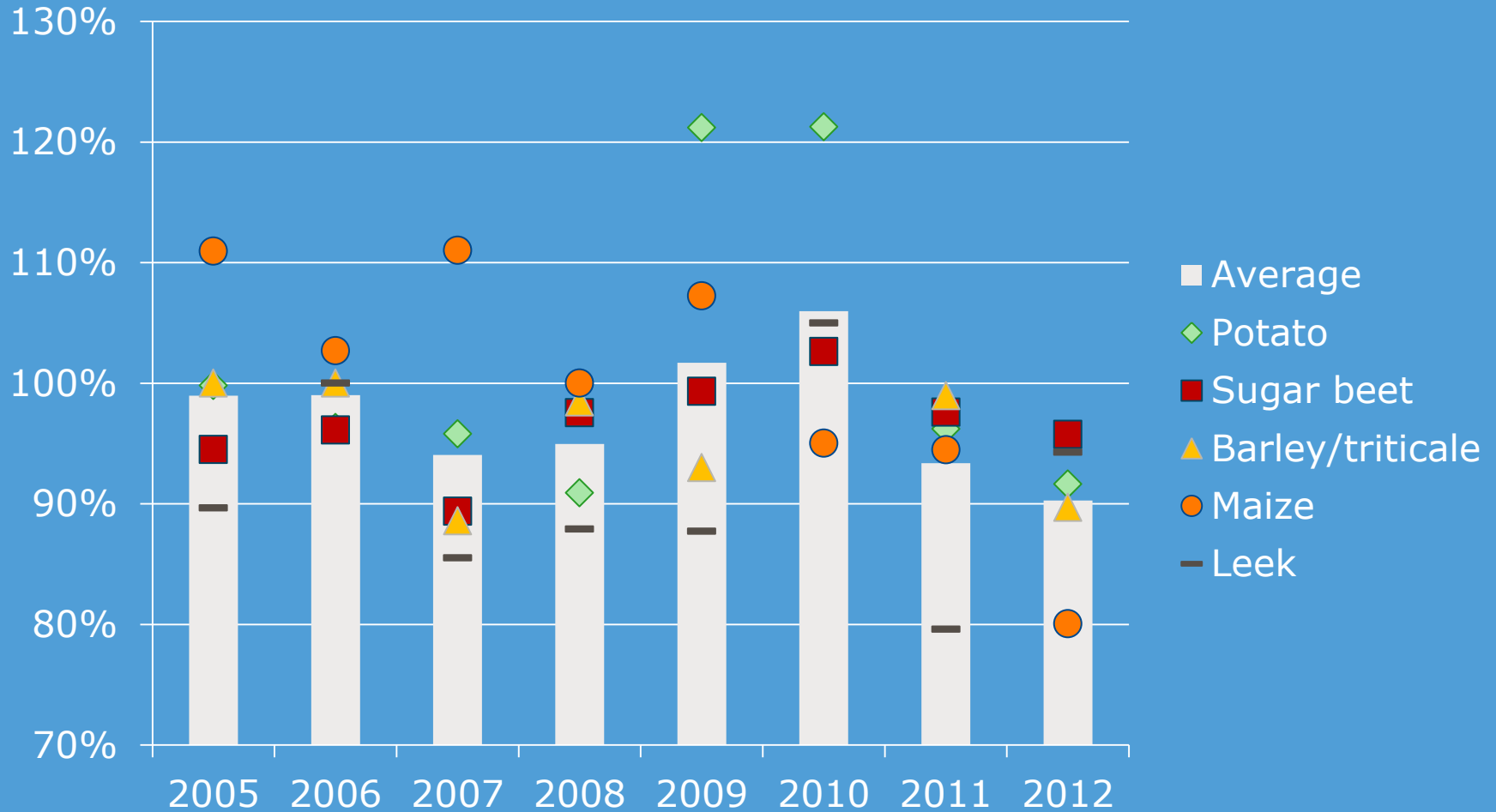


Nitrate concentrations groundwater

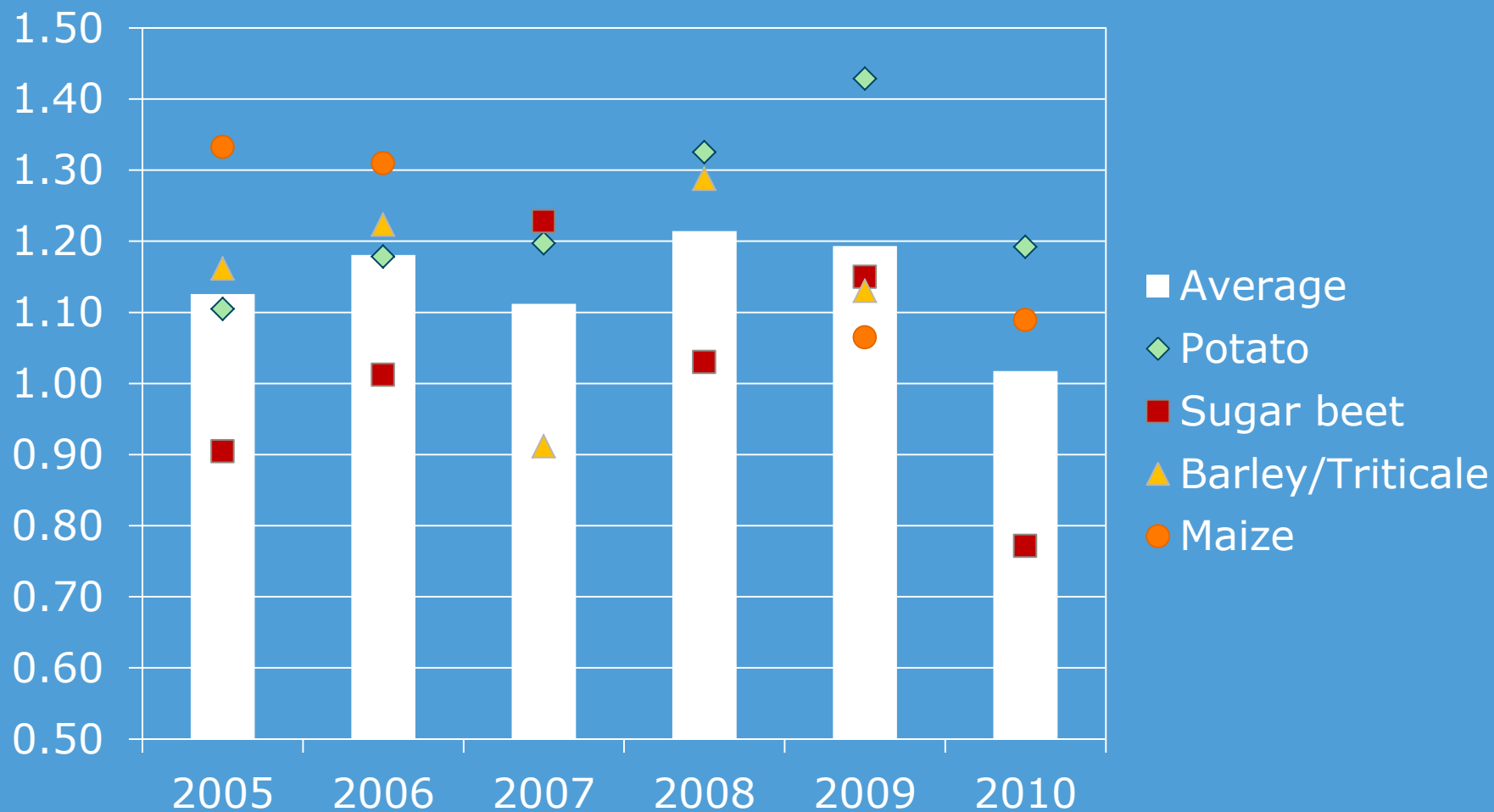
mg NO₃⁻/l



Crop Yield, Conv CF/Conv OM



Crop yield, Commercial prod./Conv OM



Conclusions

- Low organic matter input tends to give after 12 years
 - Lower yields and N uptake
 - First lower N-leaching, later equal leaching
 - Lower soil parameters
 - Organic matter%, CEC, Total N content, potential C and N mineralisation
 - Trends are uncertain
- Decline in soil fertility is slow but on going process
 - Comparison yields experiment - commercial fields
 - Moderate fertilization Conv OM for 25 years



What to do

- Waiting at the scientific proof is no solution
 - Lower yields is lower profitability farmer
 - Soil fertility is difficult to repair
 - Other measures to reduce N-leaching needed
 - “Healthy” soils: optimal support for crop growth
 - Physical, chemical and biological
 - Crop rotation:
 - Green winter cover, organic matter input
- System perspective needed, integrating knowledge

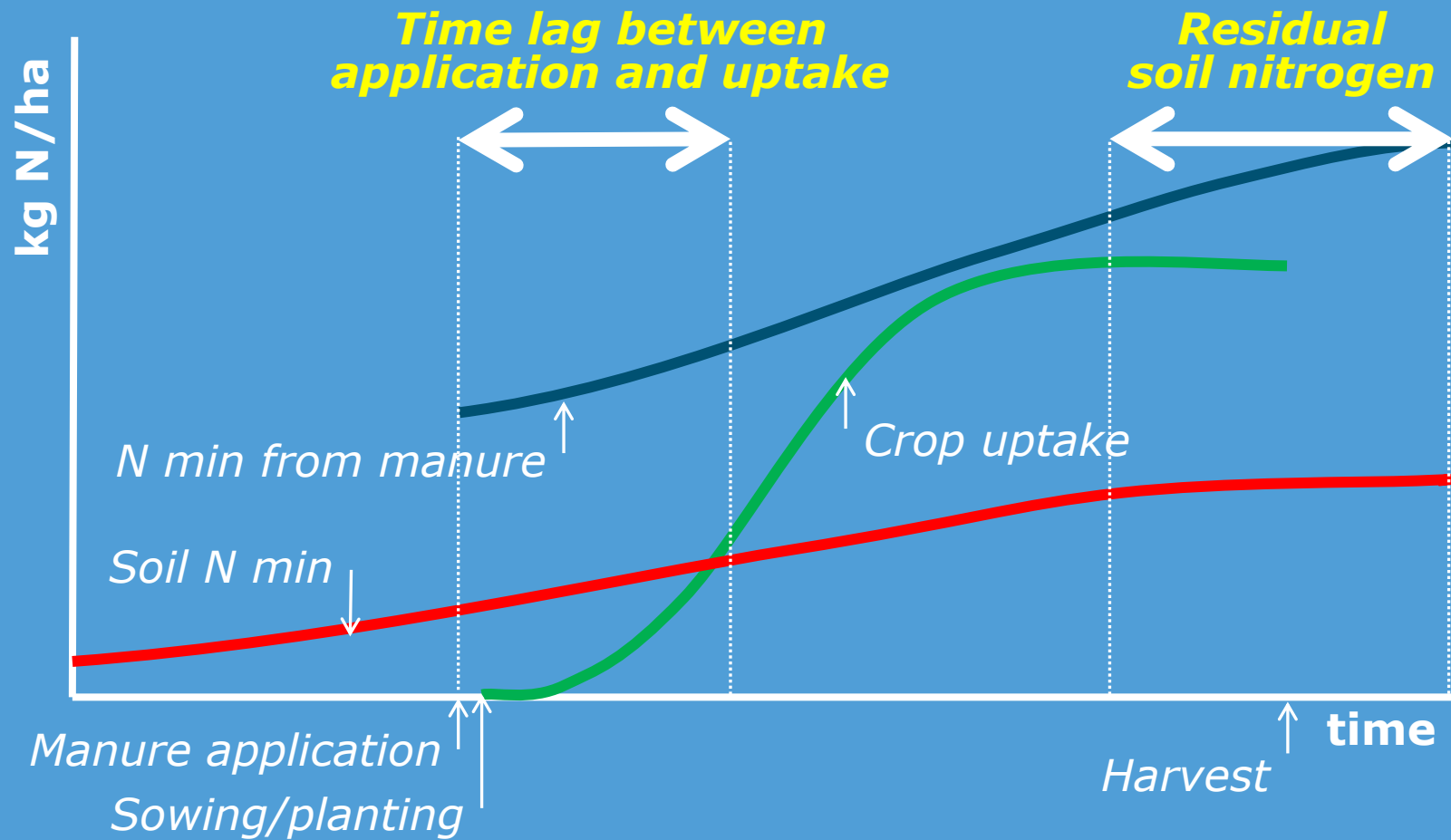


Thank you for
your attention

*and the farmer, he
continued plowing*



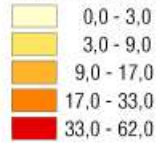
Organic manure application leads to more leaching



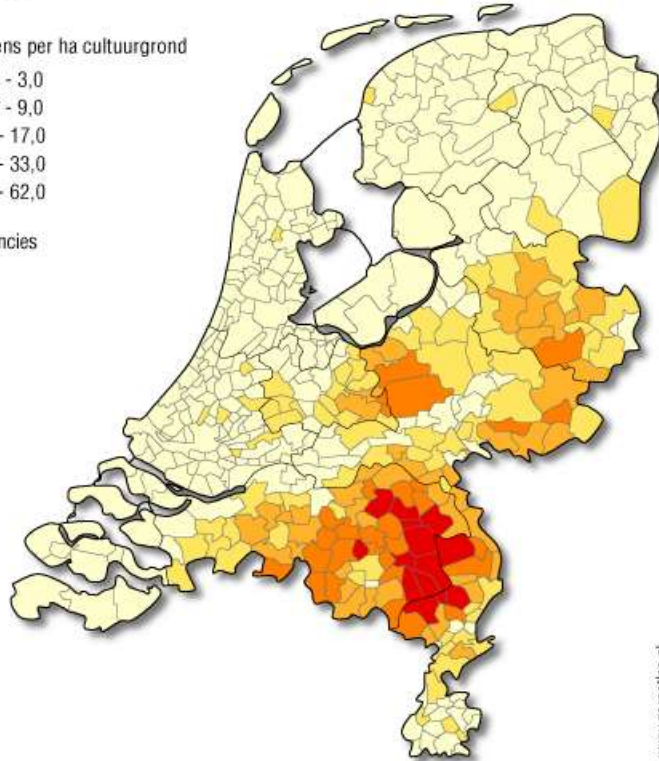
Intensive animal production

Aantal varkens 2006
per gemeente

Aantal varkens per ha cultuurgrond



— provincies

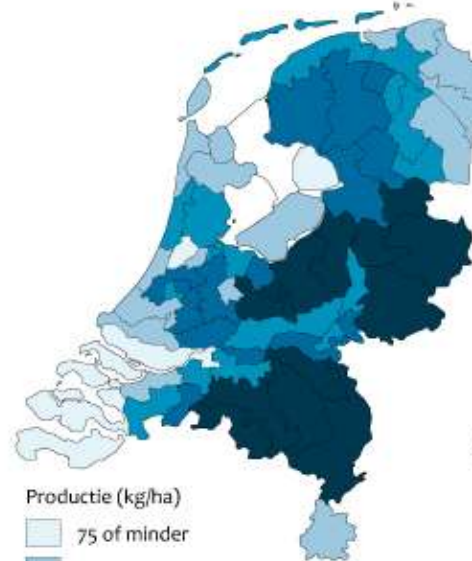


Bron: CBS

Stikstof- en fosfaatproductie per landbouwgebied, 2012*

Stikstof

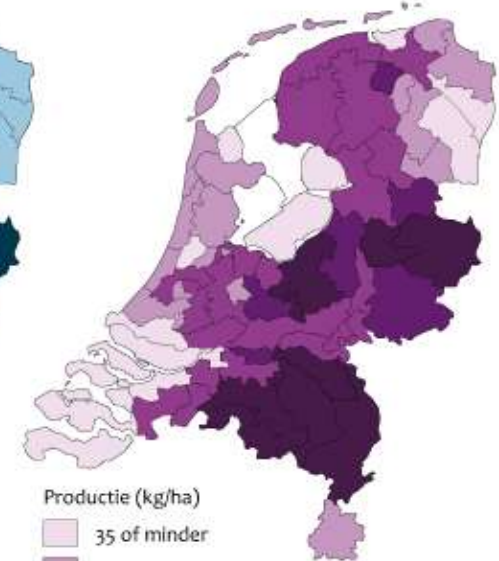
Fosfaat



Productie (kg/ha)



Bron: CBS.



Productie (kg/ha)



CBS/meit3

www.clo.nl/nl010514

Farming system research

Development of sustainable cropping systems and cropping strategies

- Holistic view
- Integrate knowledge
- Effects on total farm management
 - yield, income and soil quality
- Effects on environment
 - emissions

Characteristics

- Whole crop rotation
- Semi commercial scale (16 ha)
- No classical experimental design
- Integrated and organic farming



Comparison organic manure application

- Equal N and K application, targeted at 'good' yield level
 - N: Available mineral N during growing season
- P-application
 - Conv OM: rotation, balance fertilization
 - Conv CF: only P-needing crop
 - Application Conv CF = $\frac{1}{2}$ * application Conv OM
- Yield measurements
 - 4 plots per field
 - Comparison with commercial fields of experim. farm
- N-concentration ground water
 - 3 measurements per field, 4-6 times per season

