

Nutrients Waterproof

Systems research on reducing nitrate leaching in intensive arable farming on sandy soils in SE-NL

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Situation agriculture in Southeast Netherlands

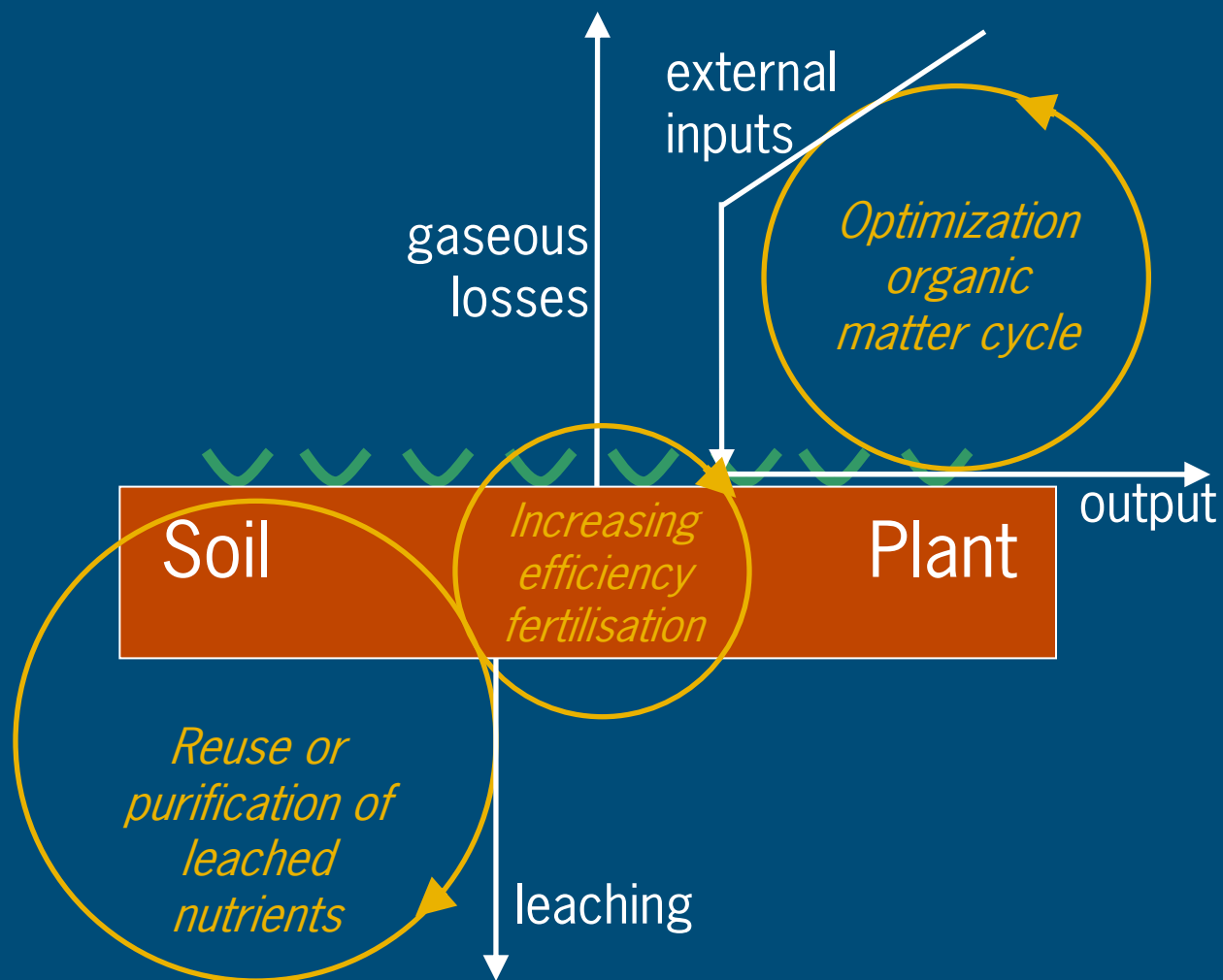
- Sandy soils: vulnerable for nitrate leaching
 - Poor reclaimed peat soils
 - Rich, man-made “enkeerd” soils
- Large manure surplus
 - High manure use in past
 - Maximum use of manure within borders legislation
- Intensive arable farming and horticulture
 - Less grain crops, more silage maize, more horticulture
 - Many crops are inefficient in nitrogen use
- Nitrate leaching far above limits nitrate directive
 - Arable farming in region has to comply with nitrate directive

Objective and time span

- Developing intensive arable farming systems on sandy soils with minimal nitrogen losses to ground and surface water
 - Nitrate Directive – Water Framework Directive
 - Keeping economic perspectives
 - Developing innovative measures in a system context
 - Arable and horticultural crops
 - Integrated/conventional and organic farming

- 2004 design – 2005-2008 experiment – 2009 report

Vision



Systems

■ Integrated

1. Potato
2. Triticale
3. Lily
4. Fresh peas – leek
5. Silage maize
6. Sugar beet

■ 2 variants fertilization

- High: pig slurry, compost and chemical fertilizer
- Low: chemical fertilizer only

■ Organic

1. Potato
2. Grass clover
3. Leek
4. Grain maize
5. Broccoli
6. Summer barley
(Tree nursery crops)

■ Fertilization

- Farm yard manure, cow slurry and vinasse

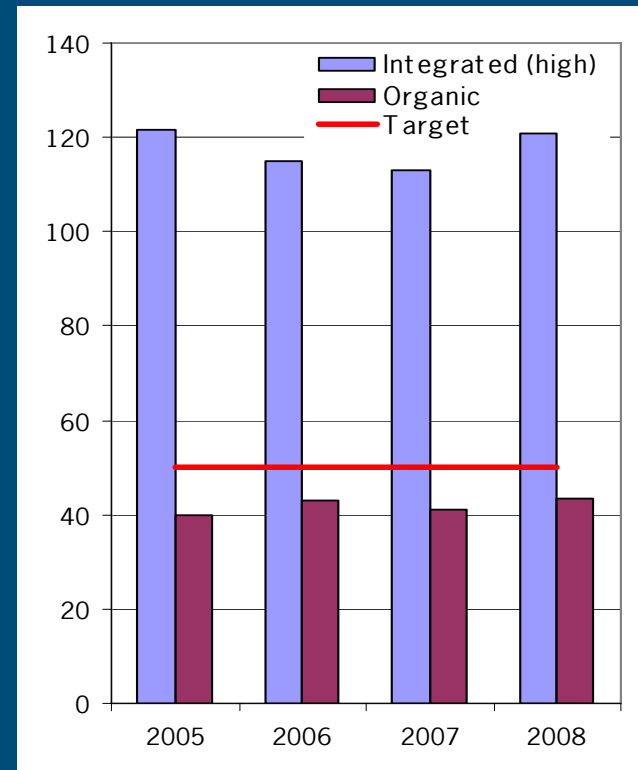
Experimental farm Vredepeel



Conclusion 1.

Nitrate leaching to groundwater in the intensive arable system is far above limits Nitrate directive

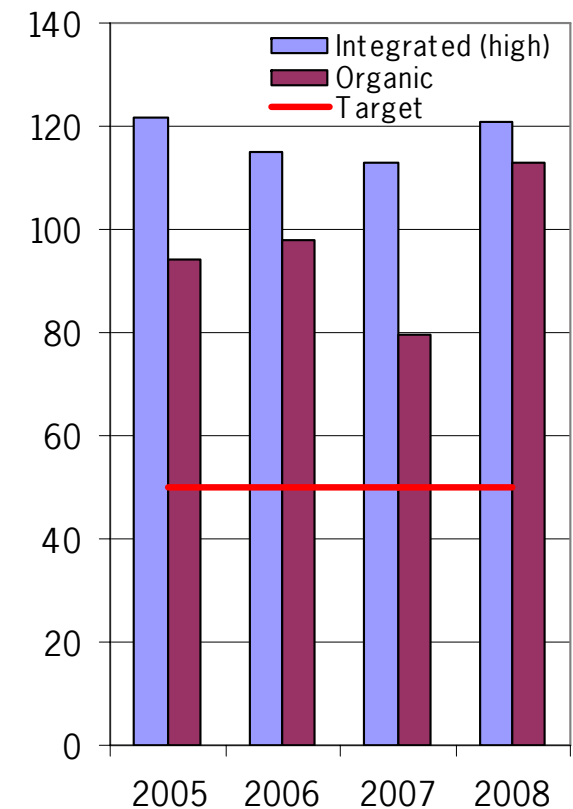
- Integrated system
 - >120 mg/l: potato, lily
 - <60 mg/l: sugar beet
 - Nitrogen fertilization \approx usage standards manure policy
- Organic system
 - >60 mg/l: grain maize
 - <30 mg/l: alfalfa, tree nursery crops
- Nitrogen efficiency is 62%



Conclusion 2.

No use of organic manure reduces nitrate leaching with 21 mg/l but crop yields on the longer term as well.

- Reduction leaching (21 mg/l)
- Lower total nitrogen input and surplus (40 kg/ha)
- Equal nitrogen uptake by crop
- Light colored crops from 2006
- Lower crop yields in 2007 and 2008 (av. 5%)
- Lower flower quality Lilly cropping 2006



Sugar beet 7 juli 2007, left no org. manure



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Conclusion 3.

Post harvest measures and effect oriented measures can reduce leaching more than reduction of fertilization.

- Removal of crop residues
 - 5-60% reduction of leaching depending crop
 - Need for processing of residues
- Green manure crops
 - Reduction of leaching of maximally 30 mg/l
 - Risk of propagation of nematodes
- Removal of nitrogen in constructed wetlands
 - Surface and drainage water only
 - Nitrogen removal in systems with water storage 60%
 - Cost effective but large claim on land



Constructed wetlands with water storage



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4. Alternative cropping systems

Integrated soil management

- Comparable soils give different yields
- High production with low fertilization is possible
- Soil is key point and a black box: more knowledge
- Development of new measures



4. Alt. cropping systems: Cropping out of the soil



The End

Acknowledgements:

Ministry of Agriculture Nature and Food Quality
Colleagues at the experimental farm in Vredepeel

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