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AN EMISSIONBASED APPROACH FOR REGULATION OF NITROGEN LOSS FROM AGRICULTURAL LAND TO SURFACE WATERS



EMISSIONBASED NITROGEN REGULATION

- Some complaining over agricultural regulation
- What farmers want
- Possibilities and challenges of giving it to them

DANISH NITROGEN REGULATION

- Mandatory nutrient management plans
- Statutory norms for N application ~20% below economic optimum
- Mandatory catch crops on 14% of arable land
- Deadlines regulating the timing of sowing of catch crops, tillage, manure application etc.
- Mandatory 9 m buffer zones around streams and rivers
- Environmental assessment of expanding animal husbandry
- Ecological focus areas

Cost ~150 € pr. ha



A REGULATION BASED ON QUANTIFYING EMISSIONS

Farmers want an emission based regulation because:

- They want to be set free!
- They mistrust the models on which the general nationwide regulation is based
- They want an individual nitrogen regulation based on their actual N emissions: "I want to be regulated based on my farming practice"

Project aim:

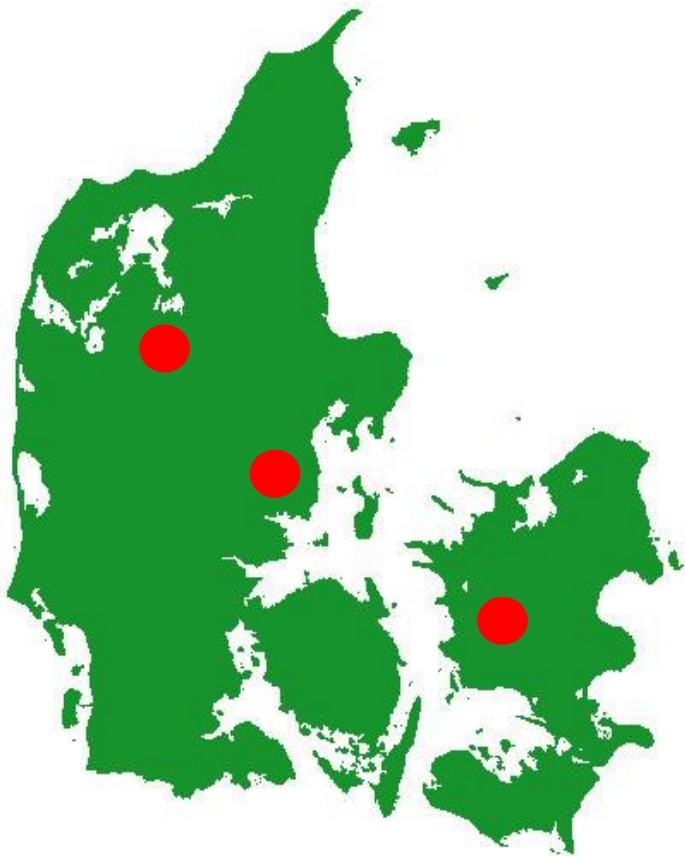
Develop and test concepts that allows farmers to be regulated on measured emissions, rather than on N-input

BENEFITS OF AN EMISSION BASED REGULATION

Effective N reduction measures	Free choice of N reduction measures
Reward for optimizing the effect of N-reduction measures	All N-reduction measures can be used – cheapest and non-approved
Less detailed regulation No inspection of N-reduction measures (type of catch crops, specific dates for tillage etc.)	

THREE METHODS FOR QUANTIFYING EMISSIONS

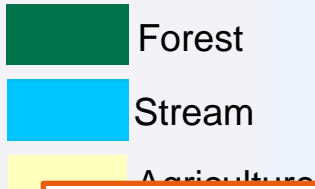
Project July 2014 – December 2018



Three pilot areas differing in geology, precipitation and agricultural practice. ~15-30 km²

Emissions are measured with three different methods

STREAM TRANSPORT



Climate normalization: Precipitation has a large influence on N transport

WFD targets on catchment scale, but needs to be set on farm level or sub catchment scale. Farmers are to get an emission permit – new scientific and legal framework

Crop and nutrient management plan must ensure that the farmer stays within his emission permit – can we advise him well enough? What's the legal framework?



Total N transport
(sub catchment scale)

Partition loading between
sources and individual farms

N Retention during
further transport in
the river network

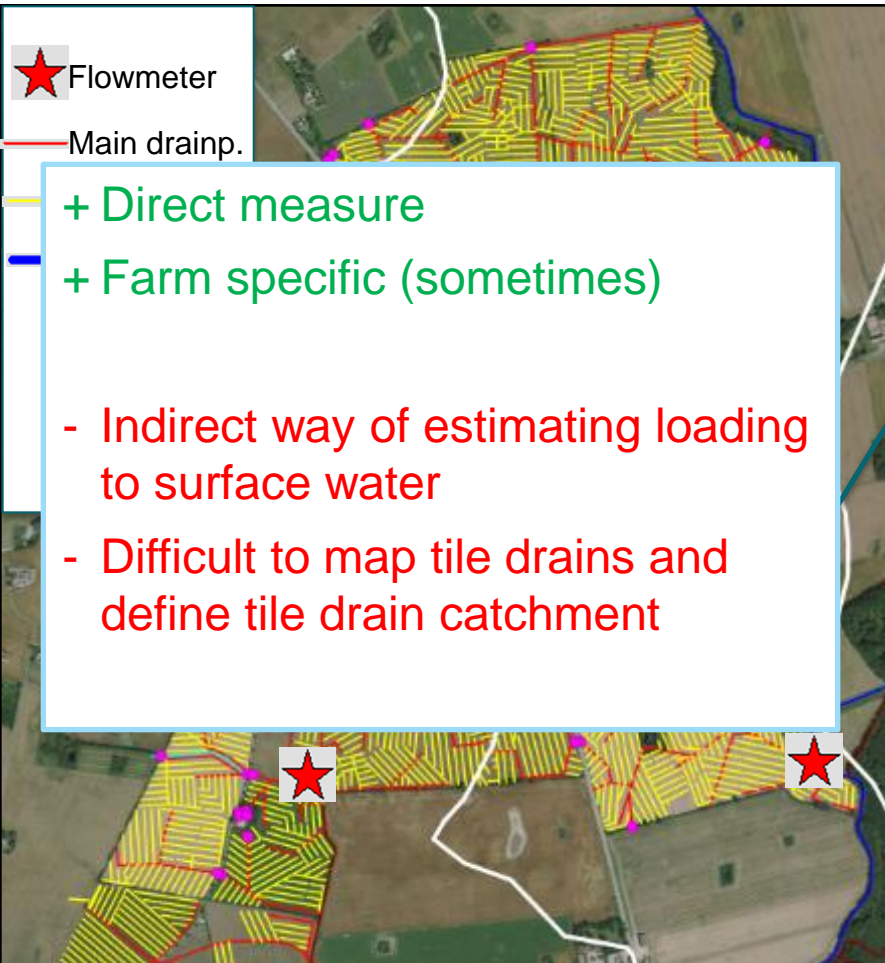
Climate normalization

Threshold value based on
acceptable loss to surface-
water or groundwater

Crop and nutrient management plan

TILE DRAIN TRANSPORT

Tile drain loss

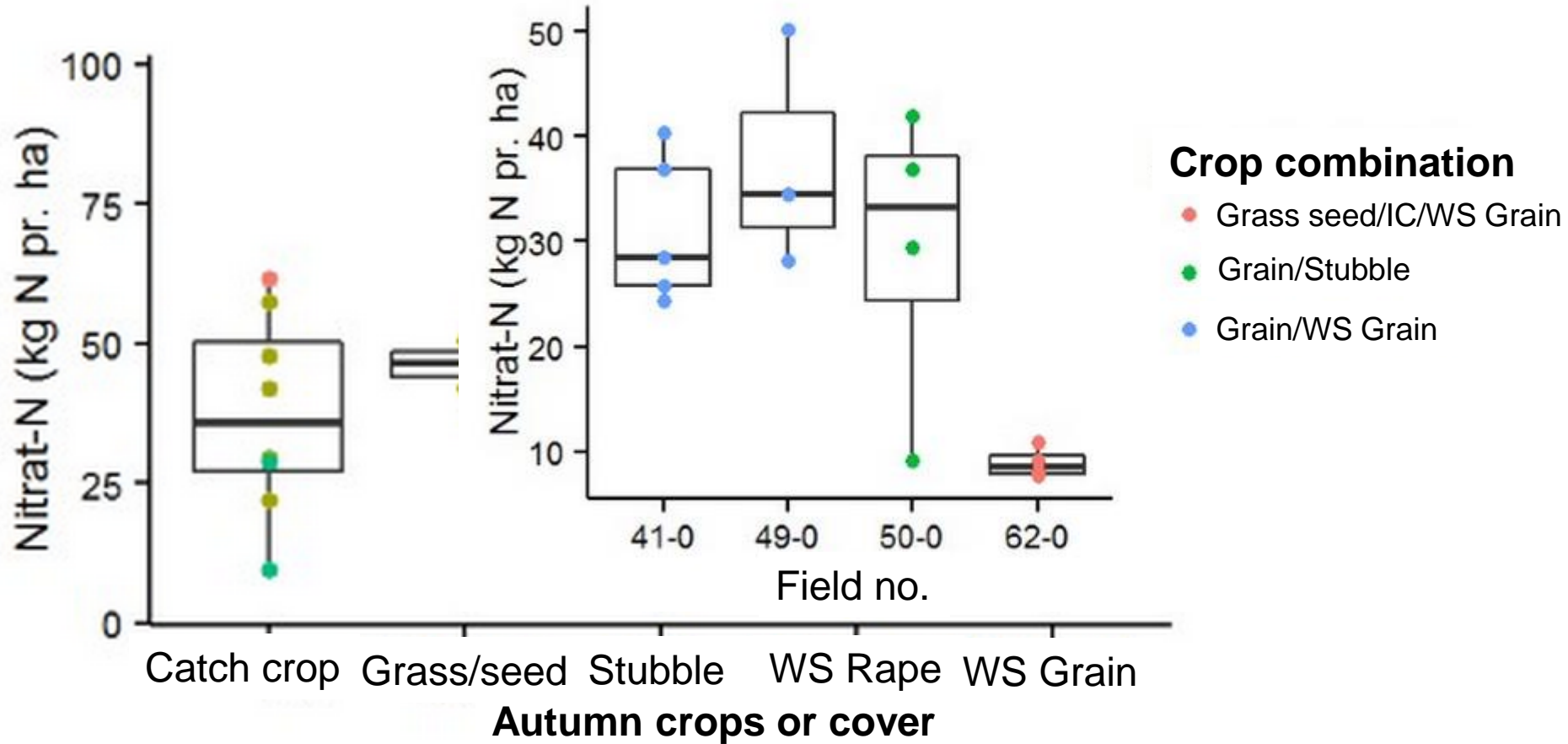


Crop and nutrient management plan

N-MIN METHOD

Mineral nitrogen in the autumn

Soil N-min autumn



N-MIN METHOD

Mineral nitrogen in the autumn



- + Direct impact of farming practice
- + Farm specific

- Defining the catchment and the fraction of total drainage via tile drains
- Variability in retention within sub catchment
- Cannot handle N reduction measures outside of the field, e.g. mini wetlands

Soil N-min autumn

N-min and leaching measured in field trials

Leaching = $f(\text{N-min})$

N Retention during transport



COMMON CHALLENGES

- WFD targets are on catchment level, need for targets on farm or sub catchment level
- New scientific and legal framework for sharing burden
- Handling climate normalization
- Translating the measured emissions to a crop and nutrient management plan that ensures that emission permits are not exceeded
- Description of when each method is appropriate and how the measurements should be carried out and processed
- Cost – benefit

In conclusion: Appealing but difficult

EMISSION BASED NITROGEN- AND LAND USE REGULATION

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