



Welcome to the workshop:

USE OF SATELLITE OR SENSOR DATA TO DETERMINE OPTIMAL N-RATE OF WINTER WHEAT ON FIELD LEVEL OR POSITION LEVEL FOR VARIABLE RATE APPLICATION



STØTTET AF

Promilleafgiftsfonden for landbrug



9.00 – 10.15: Introductory talks

- 9.00-9.30: **Leif Knudsen** - Introduction to the workshop
- 9.30-10.15: **Stefan Reusch** – Use of sensor technologies to determine nitrogen demand on field level and for variable rate application

10.30-11.45: New results and experiences from Denmark

- Setting the nitrogen demand – general description
- Results from trials in 2019, including satellite data in an N-decision model
- Results from big scale trials in 2019 with variable rate application in winter wheat
- How to achieve the protein level in malting barley to optimize the price

11.45 – 12.30: Already working IT-models for farmers to decide the absolute nitrogen demand or rest demand from sensor data

- **Dimitri Goffart** - The BELCAM platform: a tool for a better nitrogen management through the use of Sentinel-2 data in Belgium.
- **Mats Söderström** – Determination of N-demand by drones in combination with satellites.
- **Jörg Jasper** – N-sensor and Atfarm – practical VRN solutions combining

13.15-14.00 Presentation of actual activities, results from trials and modelling to determine the nitrogen demand in crops at field level and variable rate application

- **CG Petterson** – Protein control in Malting barley
- **Ingemar Gruveaus** – Use of Yara-N-sensor in practice in Sweden to determine N-demand in winter wheat in Sweden
- **Daniel Kindred** – Actual activities on Nitrogen fertilization in UK

The aim of the workshop:

- To discuss how to include sensor data in finding the nitrogen demand on field level and position level
- To use the experience from the different countries and researchers

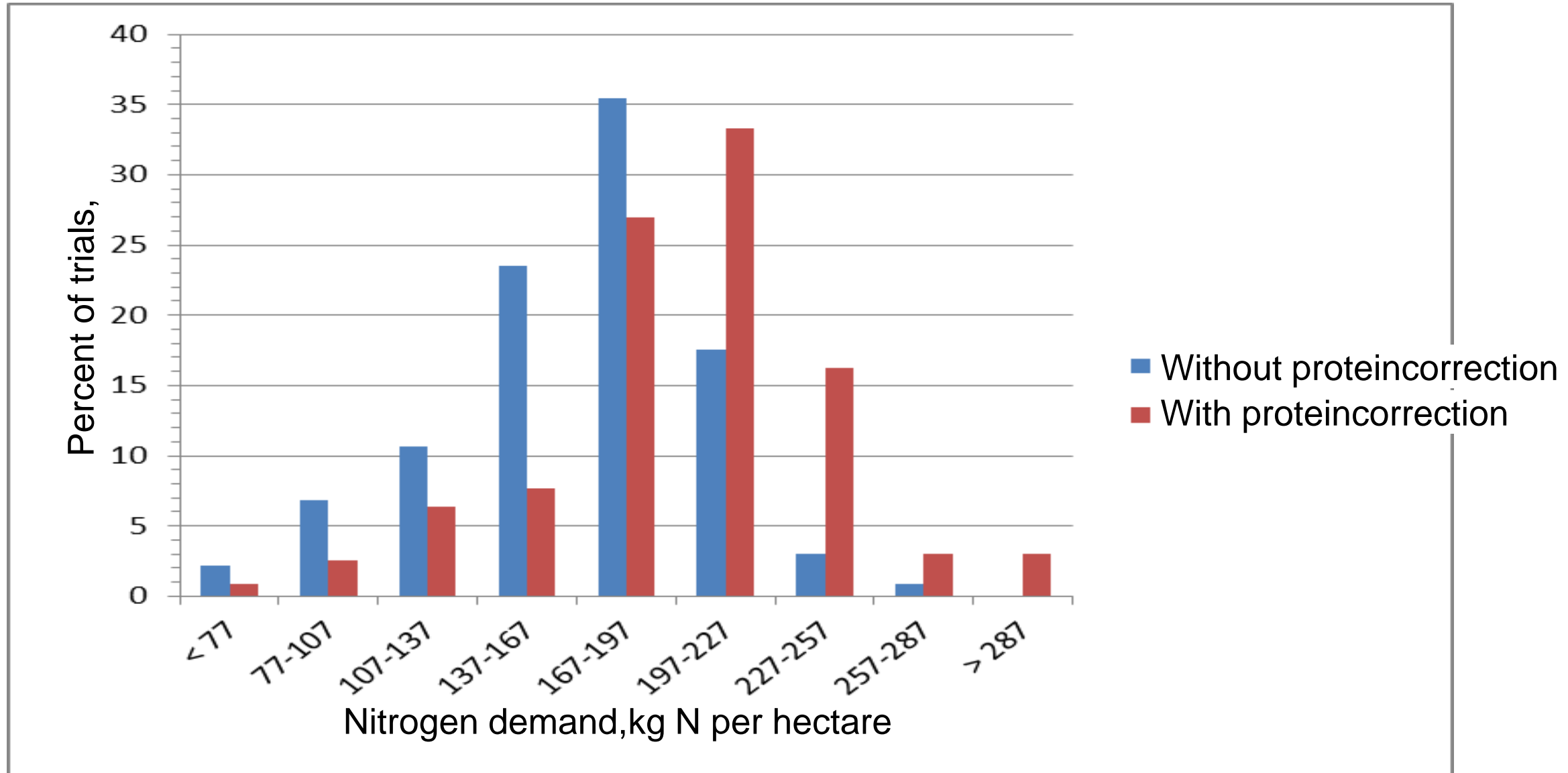
Our objective at SEGES is to create a system in DK, that will be used at least at 50 percent of the danish agricultural area when deciding nitrogen fertilization!

We have in 2019 started a project – N-Tool-Precise - together with Aarhus University to make such a system and include it in SEGES electronical fertilizer planning program, which are used at 85 percent of the agricultural land.

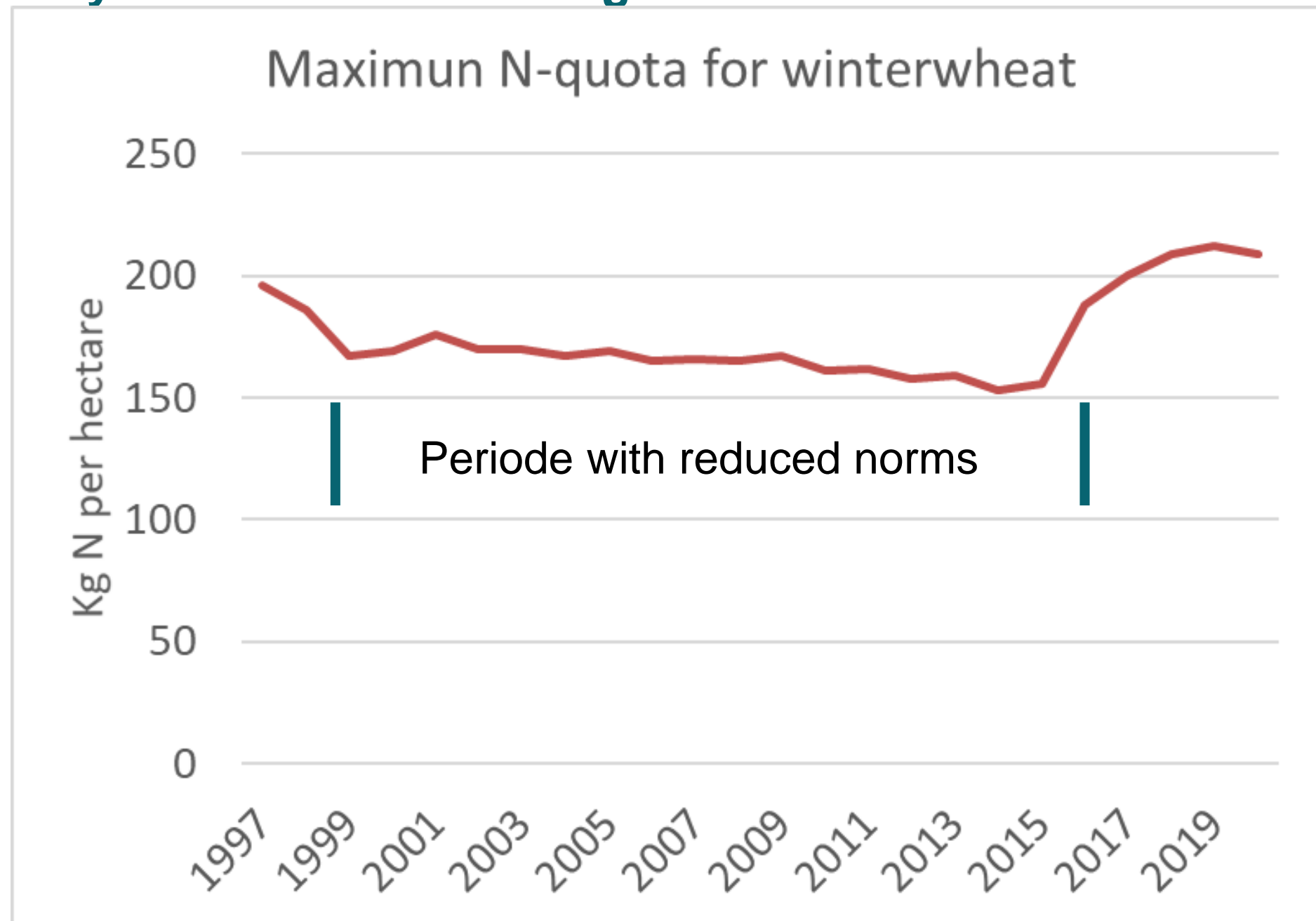
SEGES



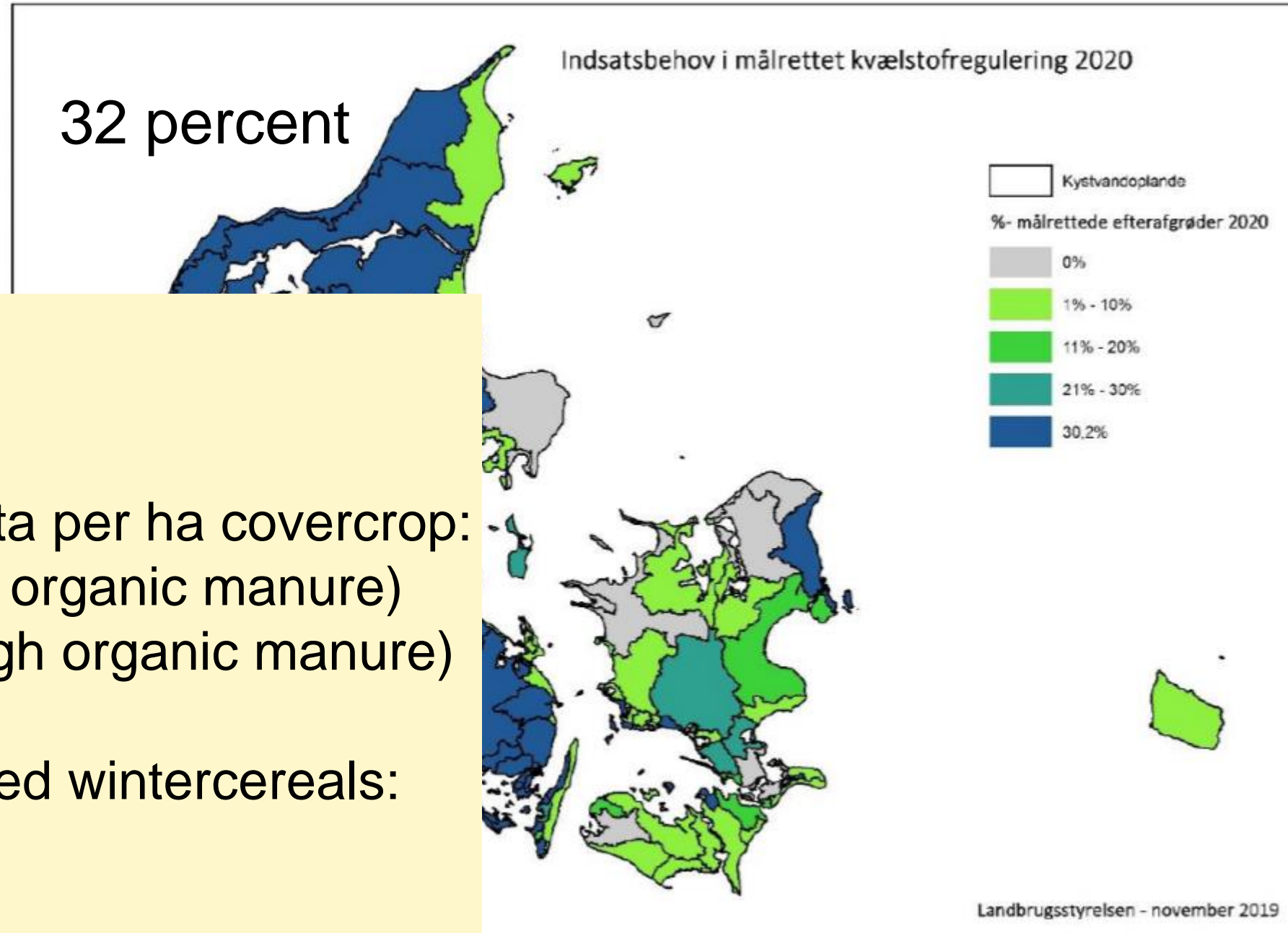
Variation in nitrogen demand in trials in winter wheat from 2006-2015



Very much focus on Nitrogen and N-fertilization in Denmark



Mandatory cover crops 2020



Cover crops can be replaced by:

Reduction of N-quota per ha covercrop:
93 kg N per ha (low organic manure)
150 kg N per ha (high organic manure)

2 ha early established wintercereals:
1 ha set-a-side

How is N-demand decided today

Quota system

- Soil type
- Previous crop
- Long term effect of organic manure
- Residual effects of catch crop
- Yield average (documented for 5 years)

SEGES

Electronic fertilizer planning system

- Soil type
- Previous crop
- Soil pools of organic N (Keeps track of plant and manure organic N)
- Yield expectation



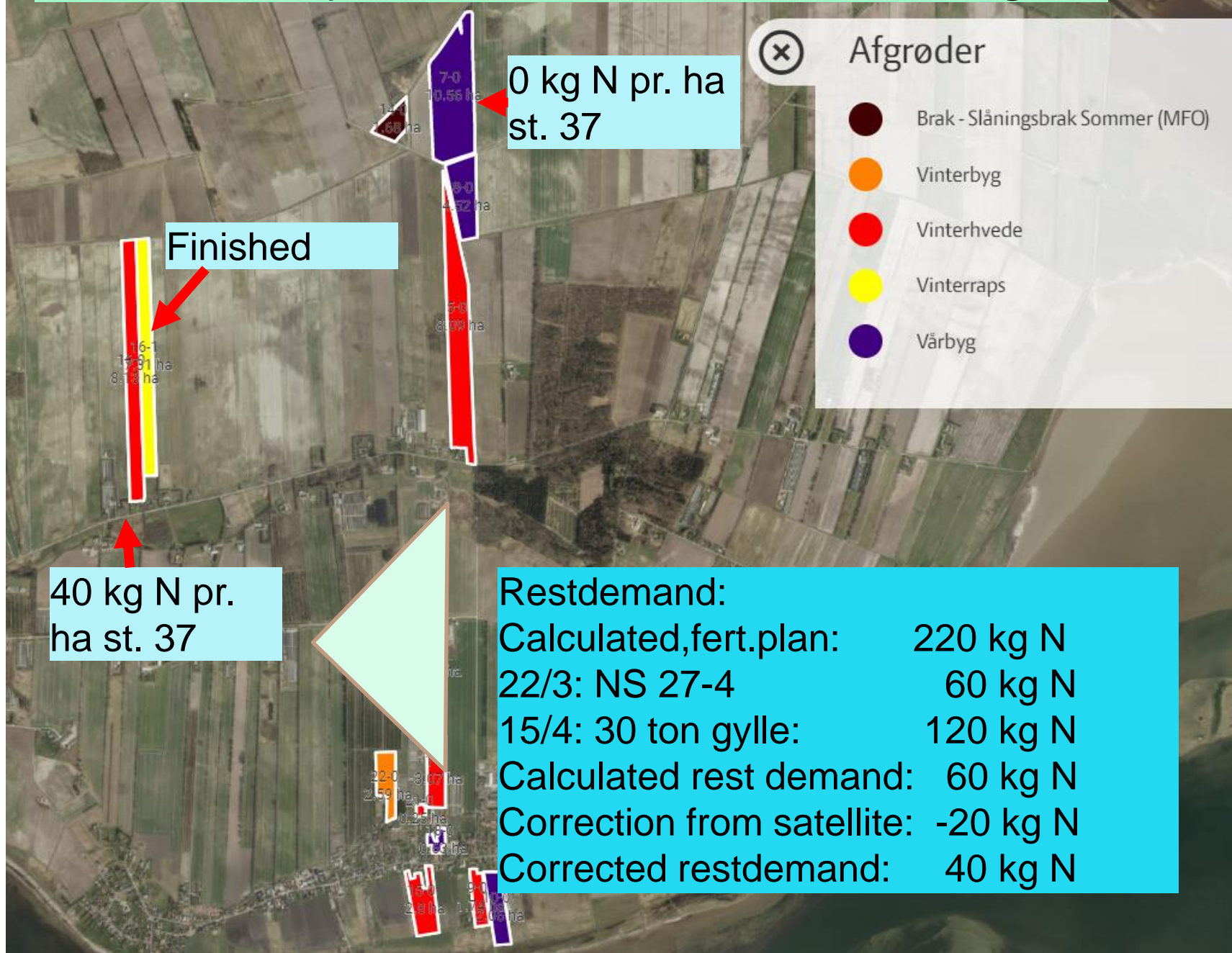
**Improvement by adding
Satellite Data**



GUDP – Project N-Tool-Precise

- New tool for determination of N-Demand
- Supplement to the "Soil-model" in MarkOnline
- Focus on winter wheat and spring barley for Malt
- Running from 2019-2022 (Trial 2019-2021)
- Participants: SEGES and Aarhus University
- Many field trials

17th of May, Rest Demand for Nitrogen



Challenges in the project:

- Yield forecast, Can it be improved in the growing season?
- How precise can satellites/drones measure N-uptake
- Relation between N-uptake and N-demand
- Determination of grow stage
- Utilization of all ready added fertilizer – Dependent of the time from spreading to measurement
- How to present data for the farmer
- Relation to N-quota

Trial program

- 30 trials in winter wheat per year 2019-2021
- 10 trials in spring barley per year 2019-2021
- 2 big scale trials in malting barley per year
- 2-6 measurements by drone in each trial

The basic idea by including satellite in setting N-demand in winter wheat

Winter: fertilizer -
plan calc.
N-Demand

40-80
Kg N

Rest
- 50
kg N

Rest N
SAT- deci-
ded



Decimalskala

10 12 14 16 20 30 31 32 37 41 45 53 59 75-90

Buskning

Strækning

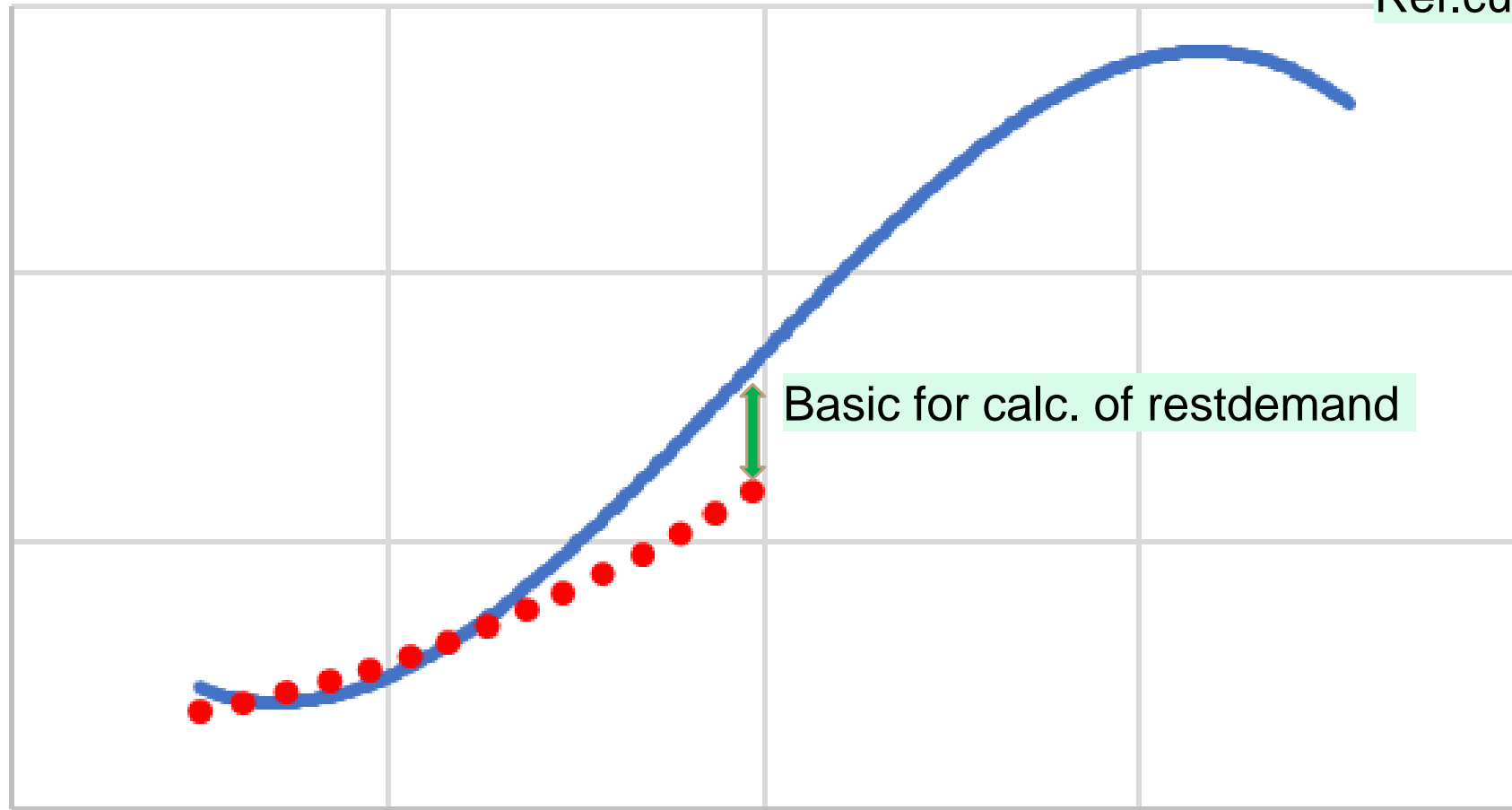
Skridning

Modning

Calculation of rest demand for N from satellite

Crop uptake of N, from satellite

150
100
50
0



Ref.curve

Basic for calc. of restdemand

04-feb

26-mar

15-maj

04-jul

23-aug



The focus at the workshop must be:

- Determination of absolute or rest demand of nitrogen from satellite – on field and position level
- Do information of soils, cropping history and climate improve the calculation of N-demand
- Do we need to include growth models?
- Machine learning?
- What is the environmental effect?