

Odder 14th of October 2016
Camilla Husted Vestergaard
Flemming Gertz
Plants & Environment

WP 5 - TRENDS

TReNDS

Transport and Reduction of Nitrate in Danish Landscapes at various Scales



Innovation Fund Denmark

RESEARCH, TECHNOLOGY & GROWTH



**Instruments for measuring
nitrate concentrations by hand**



TWO PART STUDY

Development of new concepts for an emission based regulation based on measurements of nitrate leaching from agricultural land

- Test of instruments in lab
 - Equipment
 - Results
 - Conclusions
- Measuring nitrate concentrations in drainage water
 - Need for measurements
 - Possibilities/limitations
 - Experiences
 - Perspectives
 - User guide

The purpose was not to set up a scientific study design but to evaluate the practical use of instruments

TEST OF INSTRUMENTS IN THE LAB



METHOD FOR THE STUDY IN LAB

- Calibration of instruments – for those needed (standards for 1 mg NO₃-N/l and 10 mg NO₃-N/l)
- Test of instruments along a standard curve of milliQ (300 mM stock solution of KNO₃)
- Test of instruments in drainage water sample (Matrix effect for max of 10% stock volume in sample)
- Comparison with a certified lab analysis of the sample

Standards for 0-80 mg NO₃-N/l

NO ₃ -N (mg/L)	0	5	10	15	20	25	30	40	50	60	70	80
NO ₃ -N (mM)	0	0,36	0,71	1,07	1,43	1,78	2,14	2,86	3,57	4,28	5,00	5,71
V kolbe (ml)	500	250	250	250	250	250	200	200	100	100	100	100
V stock µl	0	297	595	892	1190	1487	1428	1094	1190	1428	1666	1904

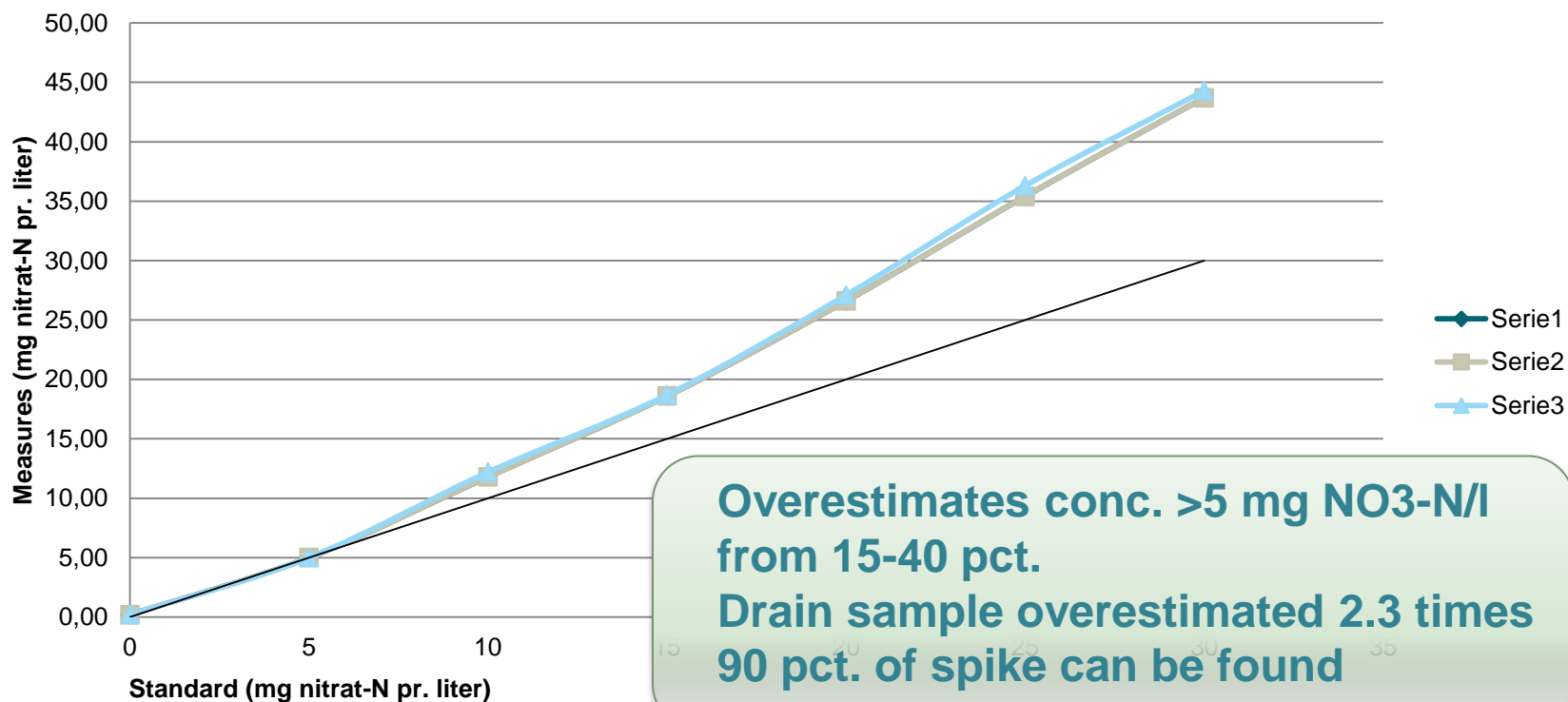
INSTRUMENTS

Method	Product	Range (mg NO ₃ ⁻ -N L ⁻¹)	Protocol	Waist
Nitrate sensor	NeuLog NUL-241	0,1-14.000	Appendix 1	Non
Nitrate sensor	YSI Professional Plus	0-200	Appendix 2	Non
Nitrate sticks	AquaChek	0-50	Appendix 3	Nitrate sticks
Spectrofotometry	Spectroquant Colorimeter	0,3-30	Appendix 4	Cadmium



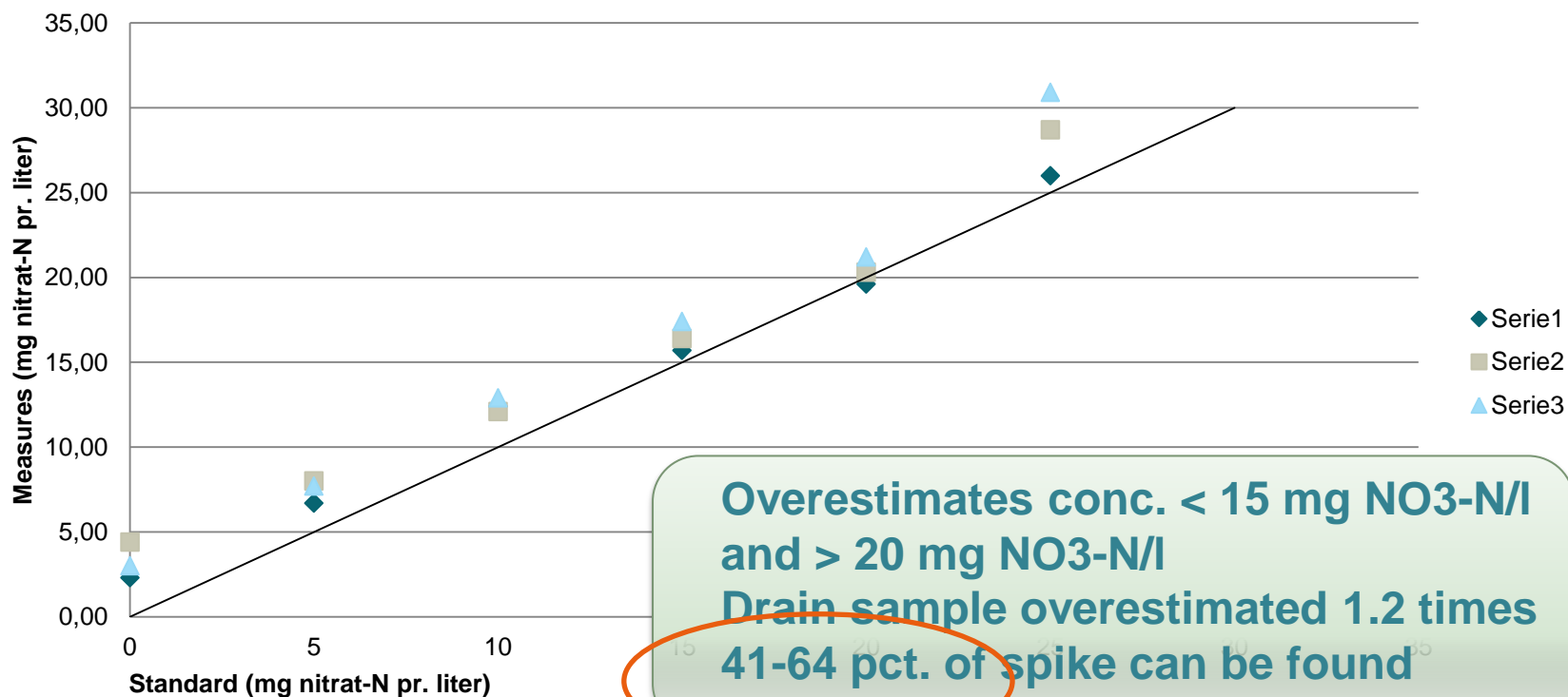
NEULOG SENSOR

Sensor NeuLog



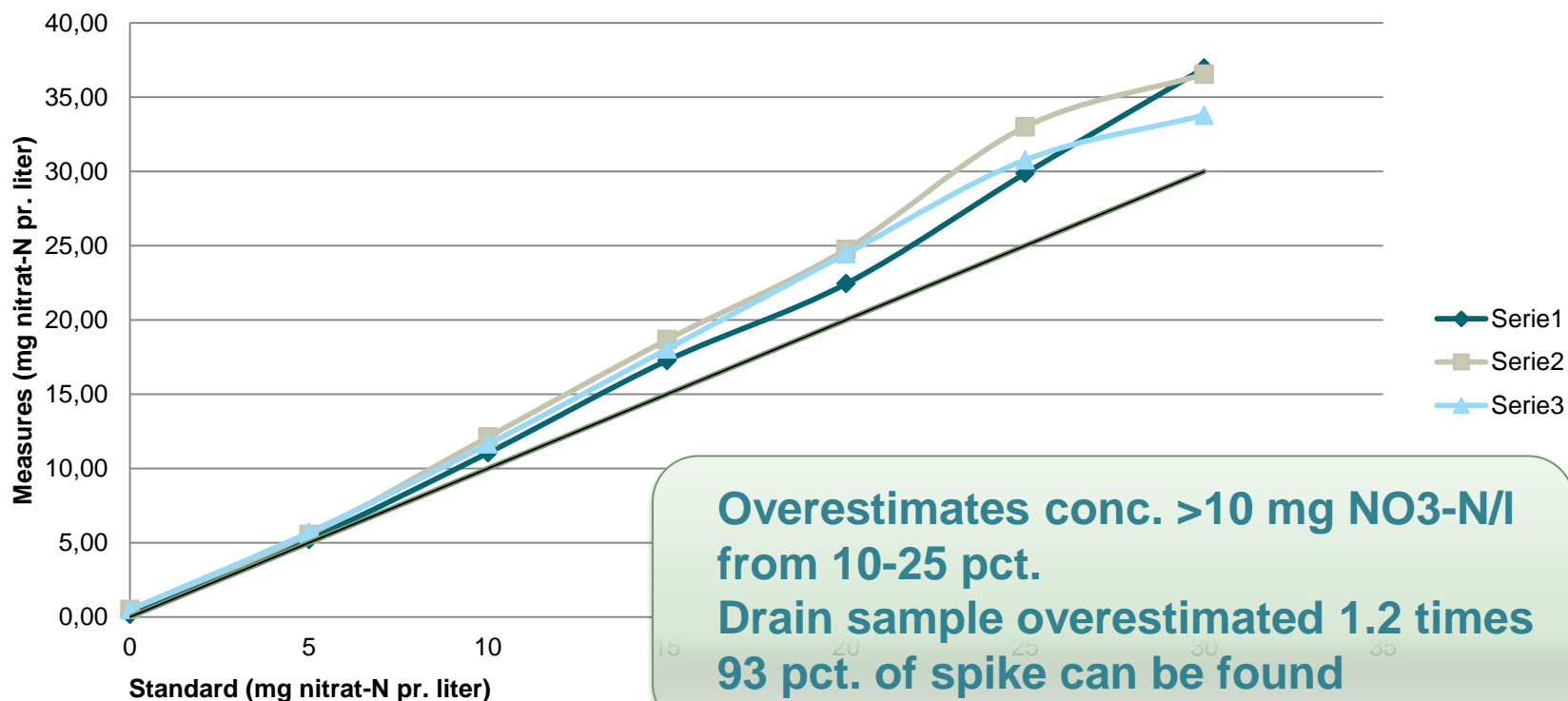
COLORIMETER

Spektrofotometer



YSI PROFESSIONAL PLUS

Sensor YSI




AQUACHEK STICS


Measures	0	5	10	15	20	25	30	40	50
Serie 1	0	5	10	20	20	20	20	50	50
		down	up	down	up	up	Up		
Serie 2	0	5	10	20	20	50	50	50	50
		up	up	up	up	down	down	down	
Serie 3	0	5	20	20	20	20	20	50	50
			down		up	up	up	down	

**Overestimates in all intervals if not
 prober used**
Drain sample overestimated 1.2 times
No test on matrix effect


CONCLUSIONS ON LAB TEST




Overestimates too much
Easy to use
No matrix effect



Overestimates
Accurate and easy to use
No matrix effect



Fine standard curve
Matrix effect
Injurious to health

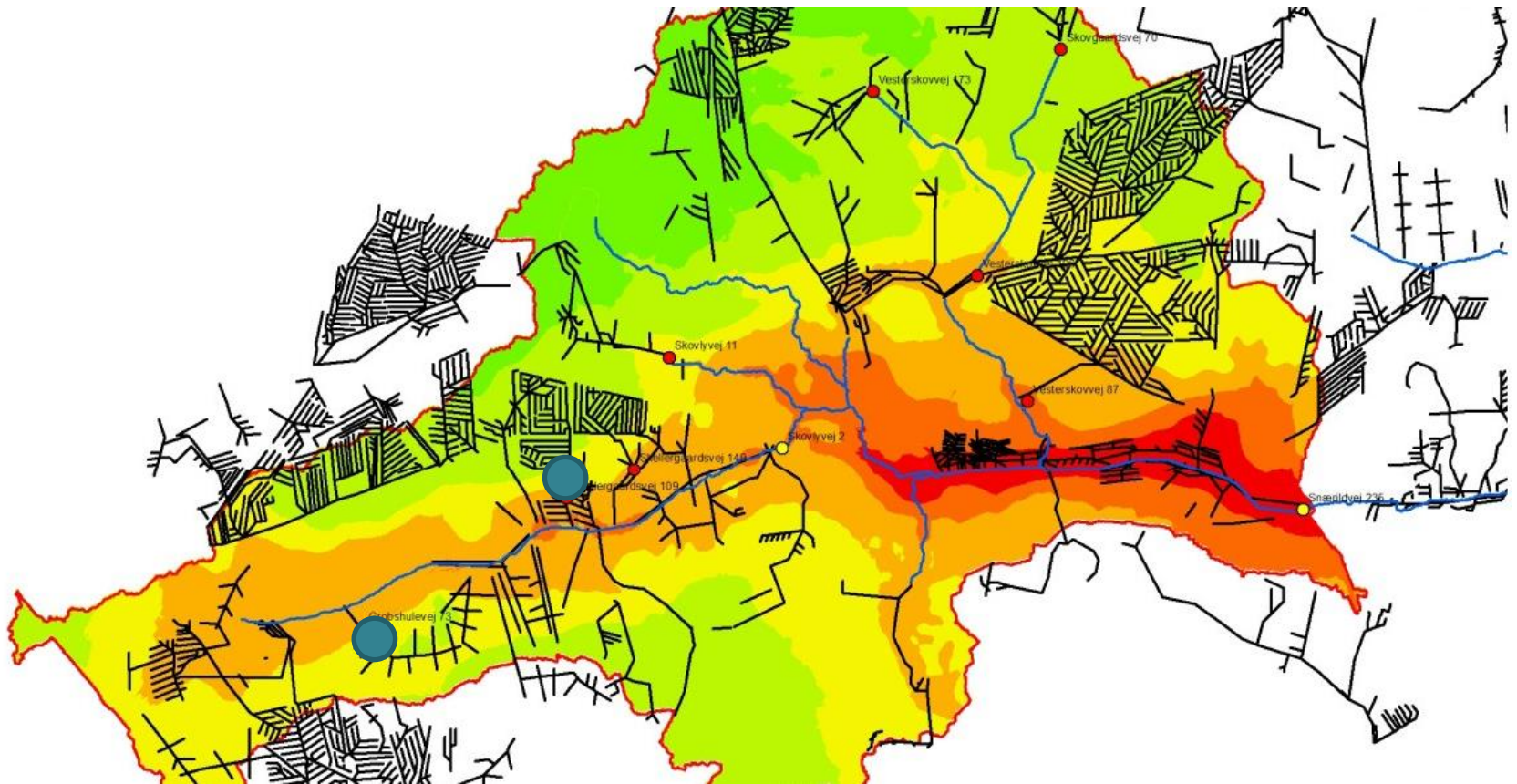


Imprecise
Easy to use
No matrix effect expected

TEST OF INSTRUMENTS IN THE FIELD



LOCATIONS IN FENSHOLT

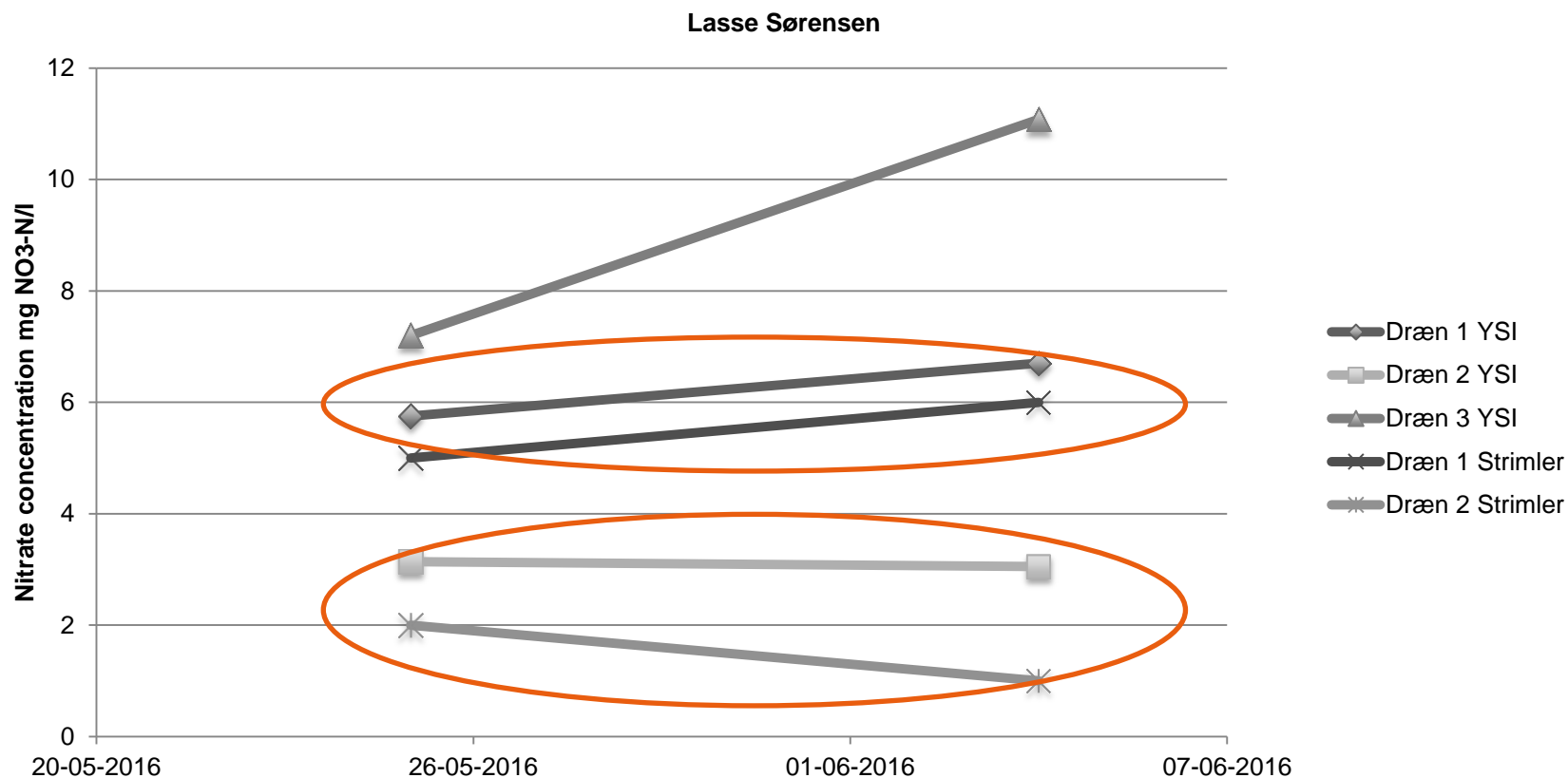


METHOD FOR THE STUDY IN FIELD

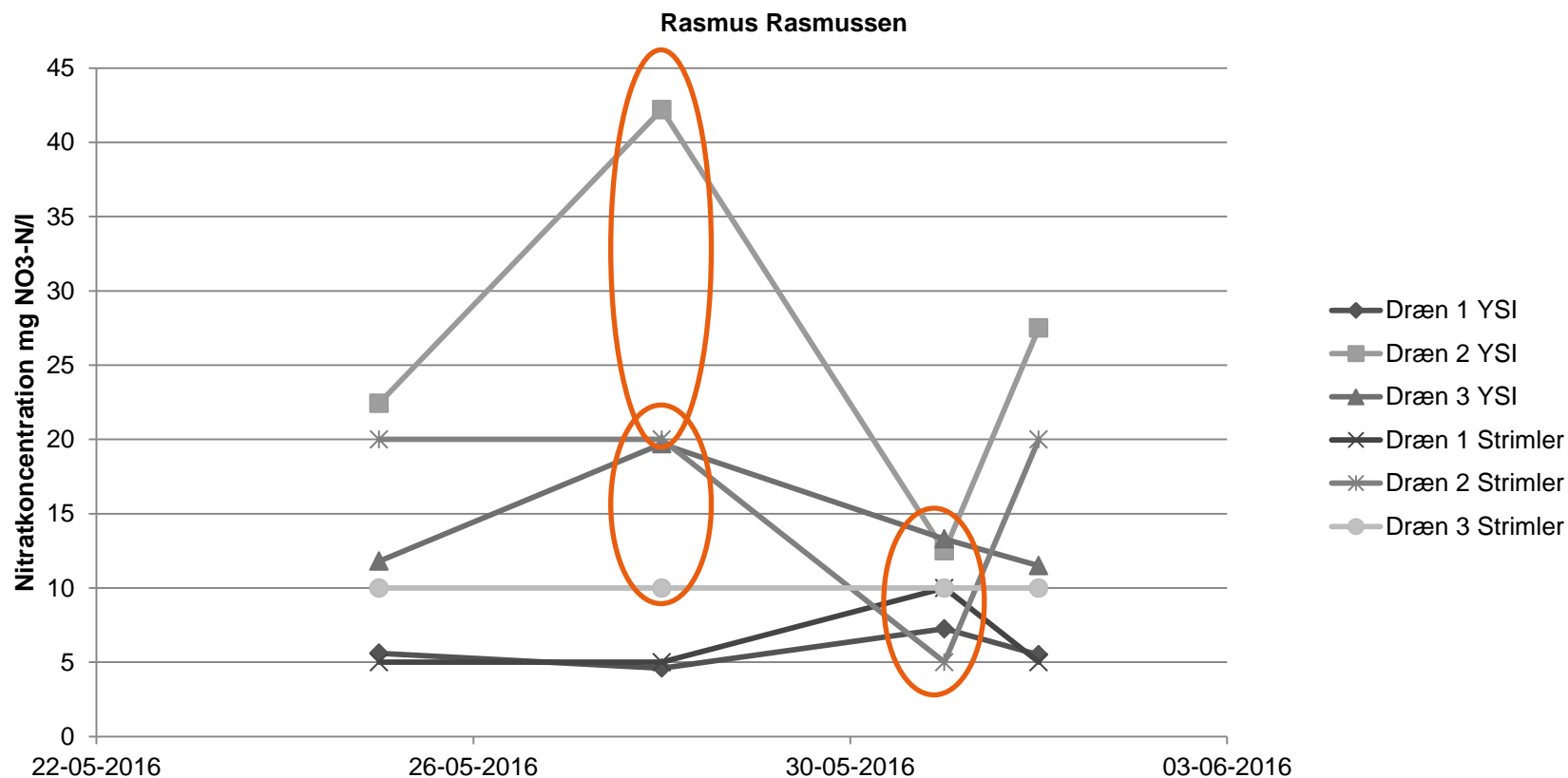
Introduction → testing → evaluation

- Collaboration with farmers and agricultural advisor/LMO
- Selection of three instruments for consultant test and two for farmer test
- Instruction of using the instruments
- Measurement experience over a period of time
- Evaluation in the group (interview and observation)

RESULTS FOR LASSE



RESULTS FOR RASMUS



CONCLUSIONS/PERSPECTIVES

- Both instruments are usable for farmers and advisors for measuring nitrate concentrations in streams and drainage outlets
- Farmers do not find it necessary to have YSI sensor themselves but the strips will do
- The agricultural advisor sees perspectives in using both instruments as screening tools finding suitable areas for constructed wetlands
- The two instruments can both be used for that purpose when the concentration levels are sufficient when measured continuously during winter discharge period
- Applications for smartphones might be a solution for more validated readings of the strips

WHAT IS NEXT

- Final evaluation in Holtum?
- Do we need to develop on automatic sampling?

Thank you all for your attention

WP5 - EMISSION BASED REGULATION

Hypothesis H: In collaboration with stakeholders, new concepts for emission based regulation can be developed that allows the inclusion of local scale data and observations in future national regulations.

		2015				2016				2017				2018			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
5	Emission based regulation																
5.1	Catalogue of instruments to reduce nitrate load																
5.2	Monitoring concepts and techniques for emission based regulation																
5.3	Test passive sensors for in stream control monitoring																
5.4	Stakeholder involvement in evaluation of emission based monitoring																
D5.1	Principles for emission based regulation (papers/guidance)																
M5.1	Monitoring concepts ready for test																



5.1 CATALOGUE OF INSTRUMENTS TO REDUCE NITRATE LOAD

- Current knowledge described
 - In sketches
 - In photos
 - In simple words

miljøtiltag
MINIVÅDOMRÅDER MED ÅBNE BASSINER I KUPERET TERRÆN

Et minivådområde med åbne bassiner anlægges i tilknytning til markdrænen og fungerer ved, at drænevandet ledes over i åbne bassiner, hvor processer som sedimentation, planterøg og biokemi medvirker til at reducere koncentrationen af nitrat og fosfor.

PLACERING OG ETABLERING:
Minivådområder skal placeres i forbindelse med et dræningsland på mindst 20 ha og tilpasses terrænets hældning, for at undgå opstuvning eller tilbagehold i drænen. En effektiv fremtude af udsprængte sporde, hvis størrelse på et minivådområde er på 2% af dræningslandet.

OMKOSTNING
Etableringsudgifter ligger mellem 270.000-530.000kr. for 1 ha.

EFFEKT
N-effekten varierer mellem **20-30%** afhængig af dræneafstrømning og det aktuelle N-køb fra marken.
P-effekten varierer mellem **30-50%** afhængig af det aktuelle P-køb fra marken.

SÅDAN VIRKER TILTAGET
Underrubrik forklarer lidt mere om, hvad det er tværsnittet viser.

Og måske er der brug for nogle yderligere detaljer, som kan beskrives her.



KOMPENSATION
Der ydes kompensation for etablering under Landdistriktsprogrammet 2017-2020.

SEGES

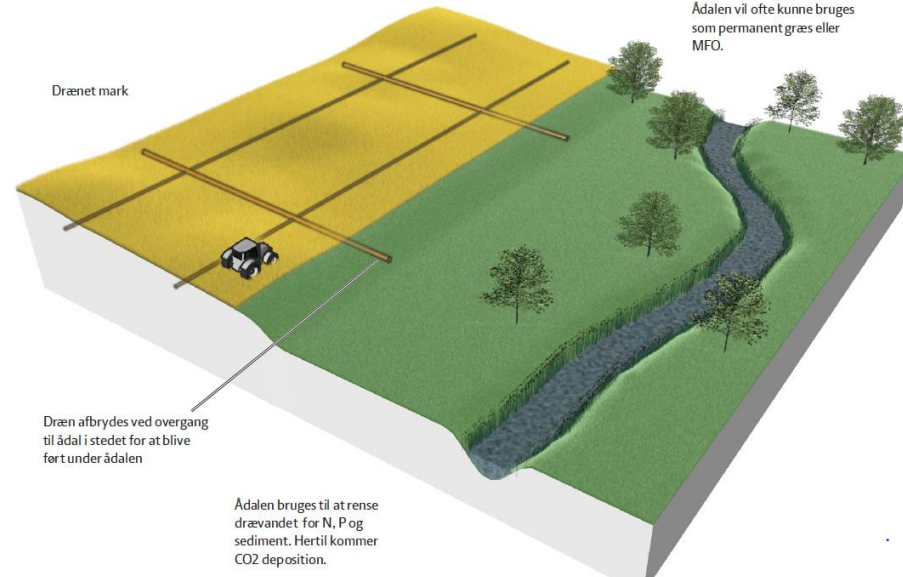
Afbrudt dræn

Drænet mark

Ådalen vil ofte kunne bruges som permanent græs eller MFO.

Dræn afbrydes ved overgang til ådal i stedet for at blive ført under ådalen

Ådalen bruges til at rense drænevandet for N, P og sediment. Hertil kommer CO₂ deposition.

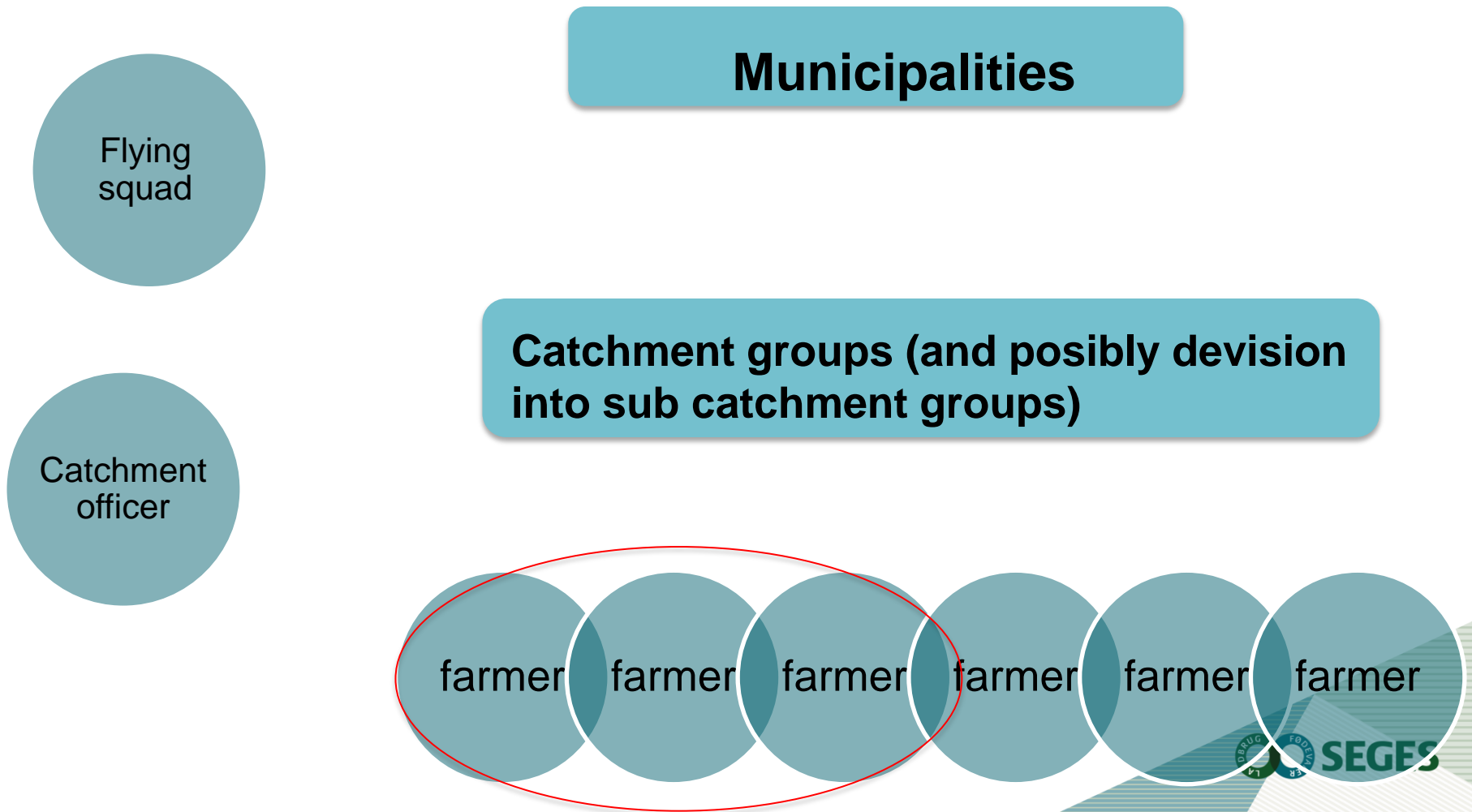


5.2 MONITORING CONCEPTS AND TECHNIQUES FOR EMISSION BASED REGULATION

- Concept
- Techniques (Camilla)

CONCEPT

ENVIRONMENTAL MEASURES ARE TO BE INITIATED “FROM THE BOTTOM” IN ORDER TO SUCCEED



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