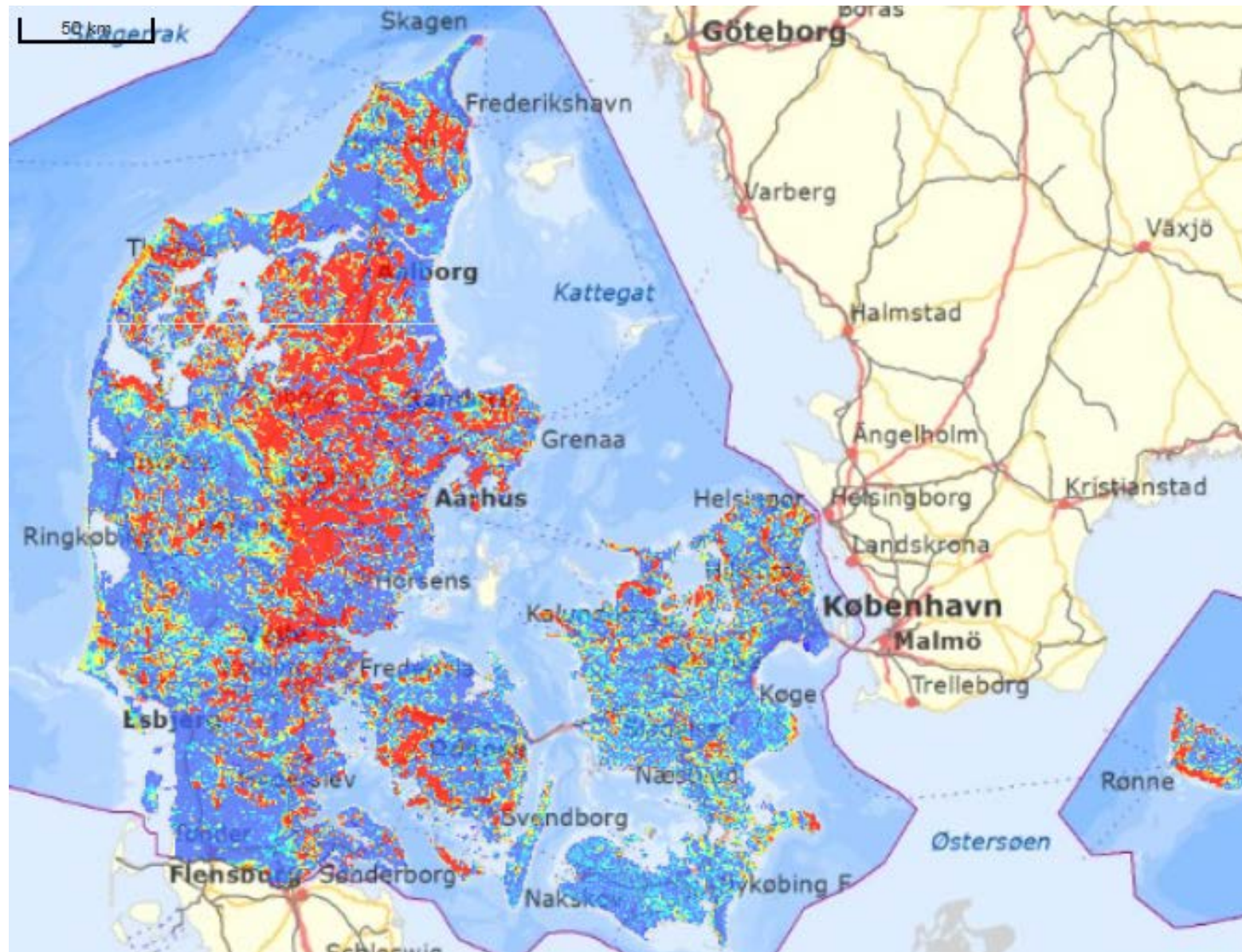


Consequences of rising groundwater level – from the agricultural point of view

By Rikke Krogshave Laursen, SEGES

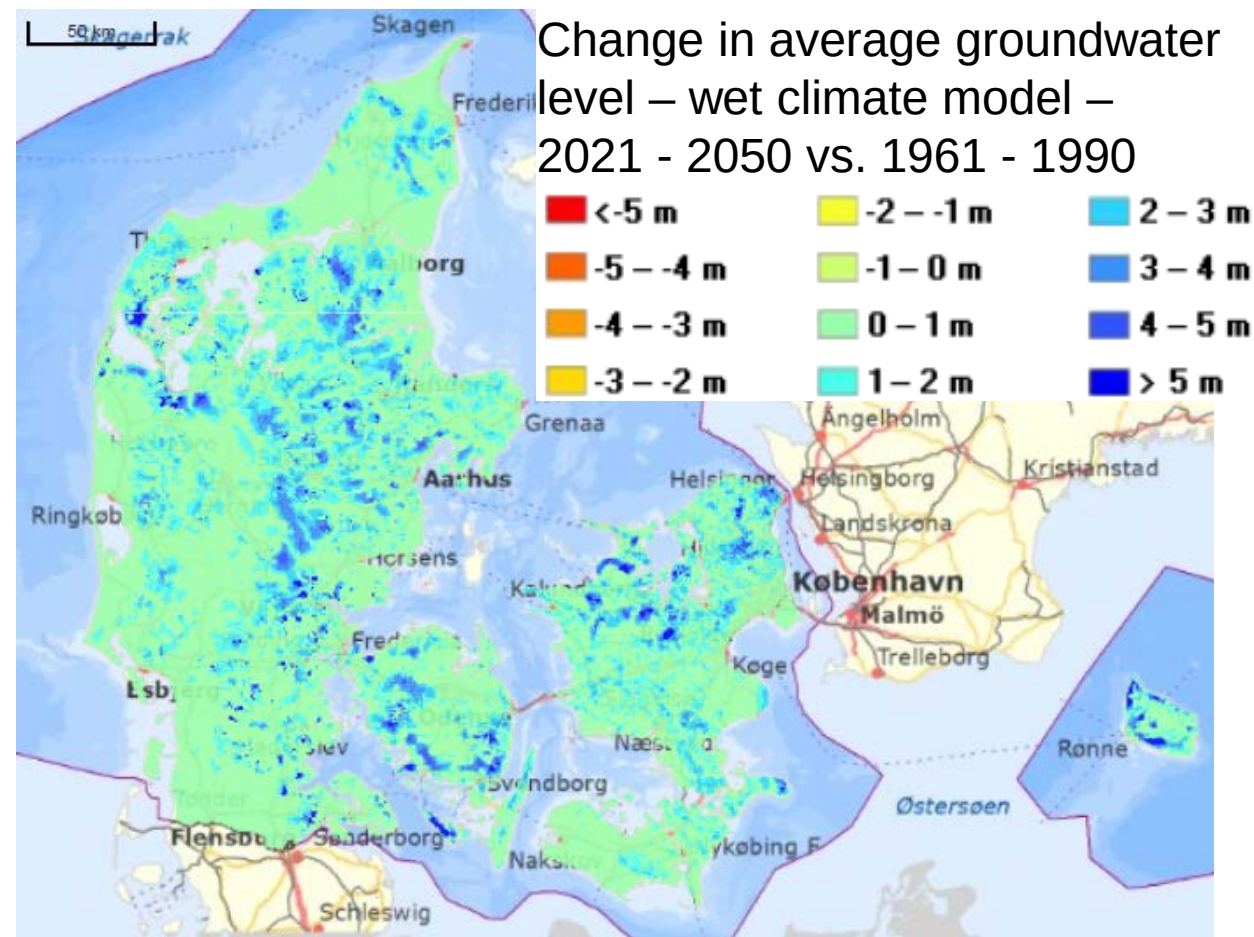
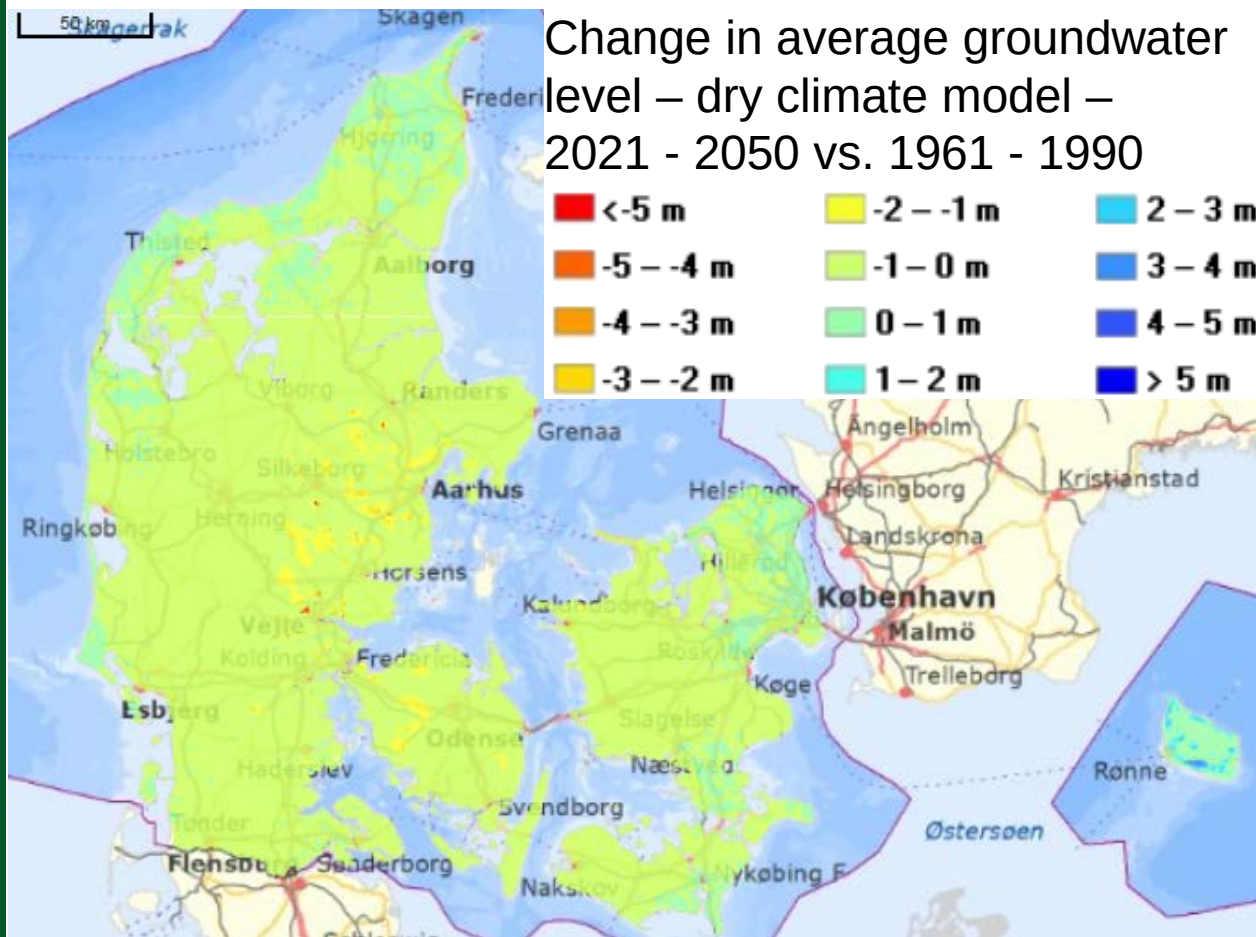
In Denmark the groundwater level is relatively high



Average depth from terrain to the groundwater table (1990 – 2010)

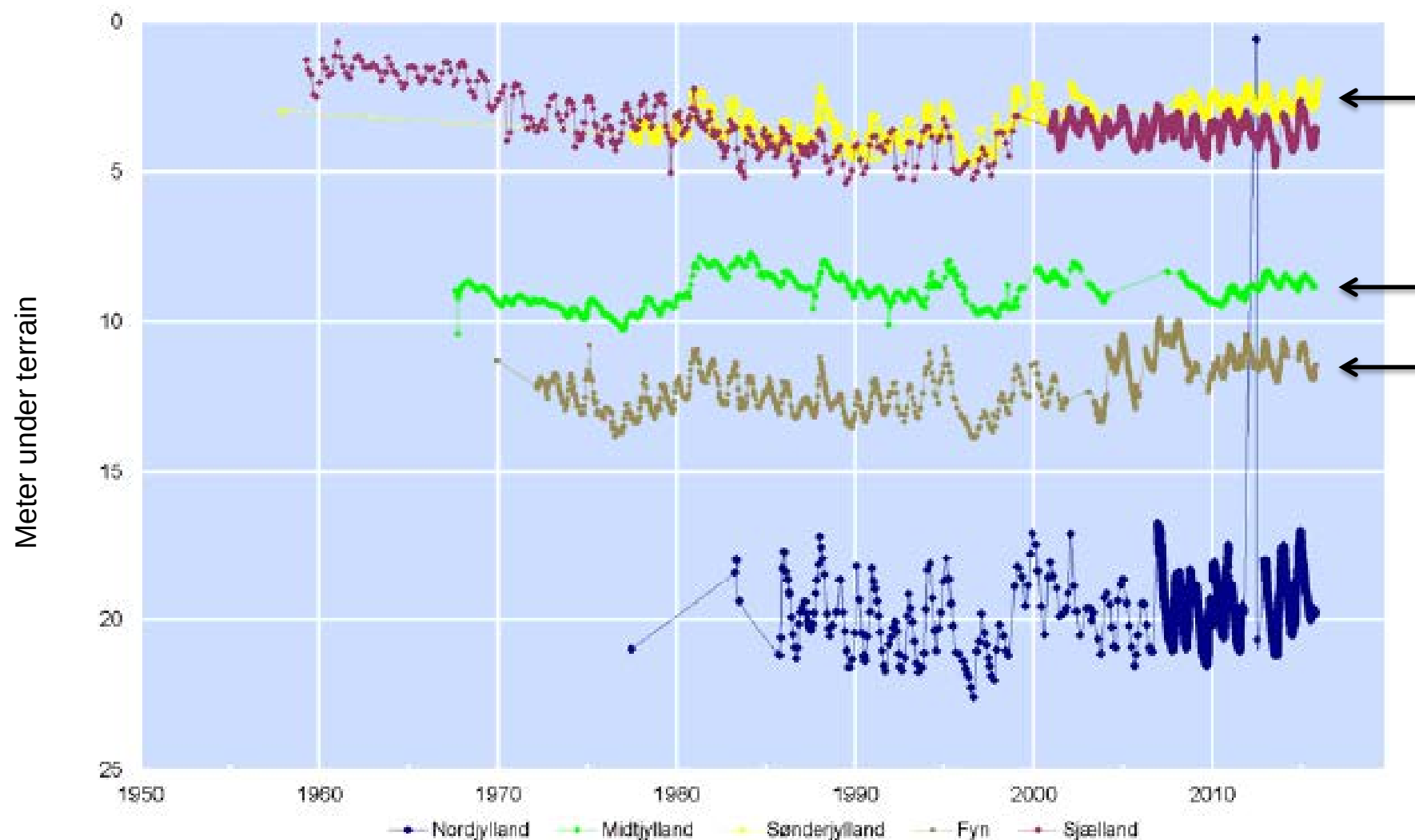


Predictions by climate models



Klimatilpasning.dk/grundvandskort

Observed changes in groundwater level – 5 locations



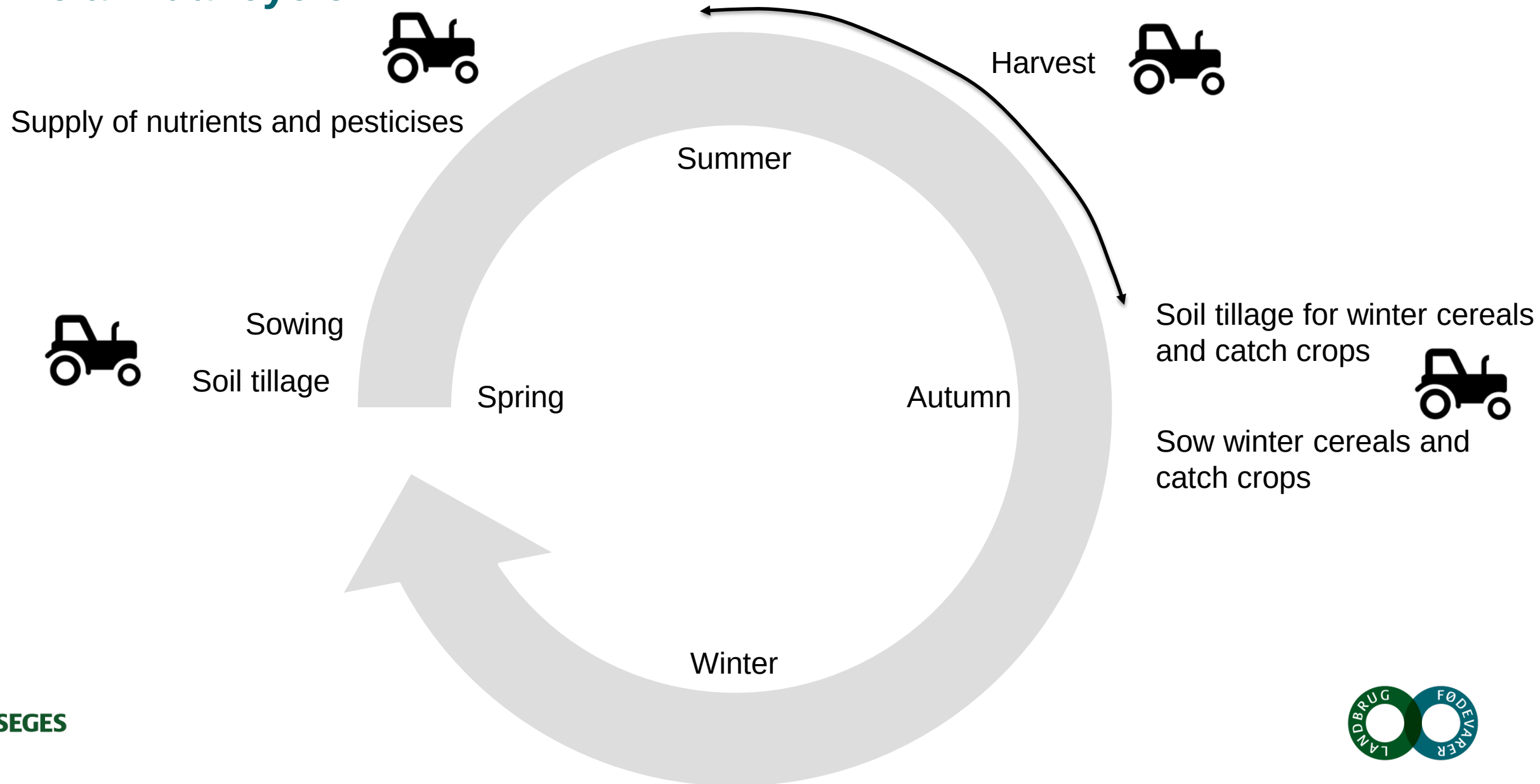
Rising groundwater level
specially after year 2000

- Spatial variation
- Temporal variation
- A relatively slow process

Observed groundwater level (meter under terrain (m u.t.)) for intake 0 – 30 m u.t. (Thorling et al., 2016)

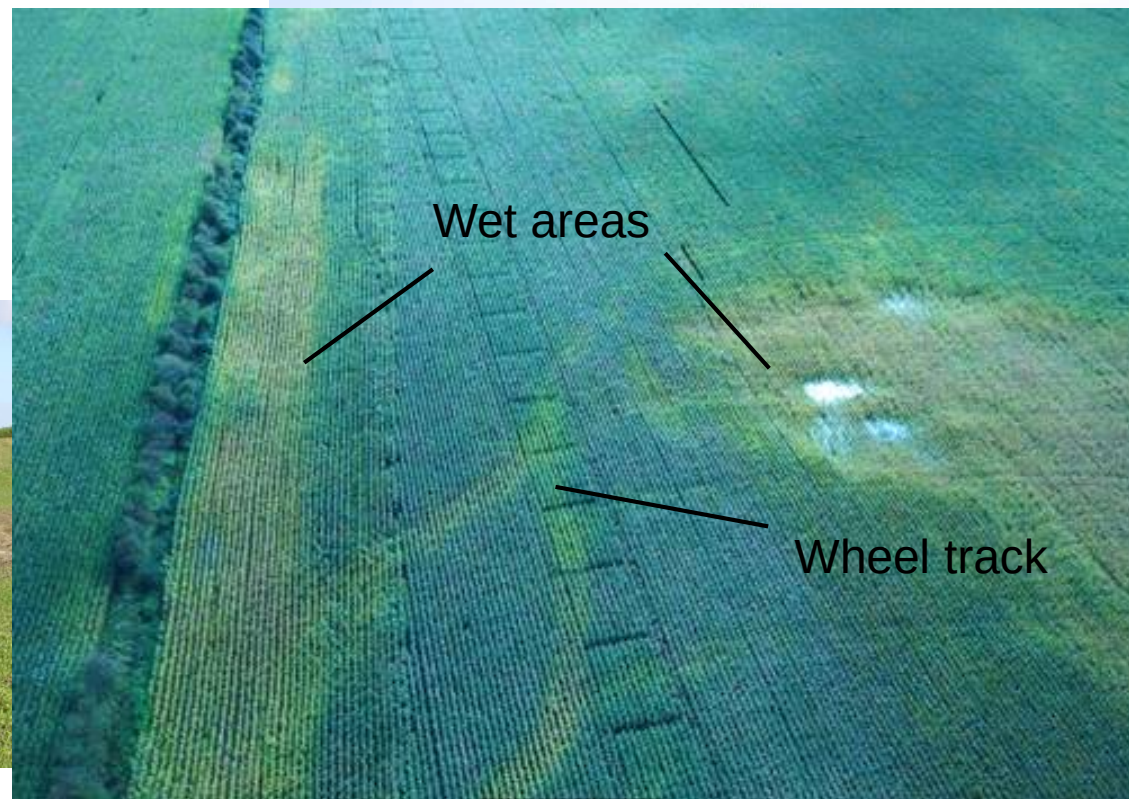


The annual cycle



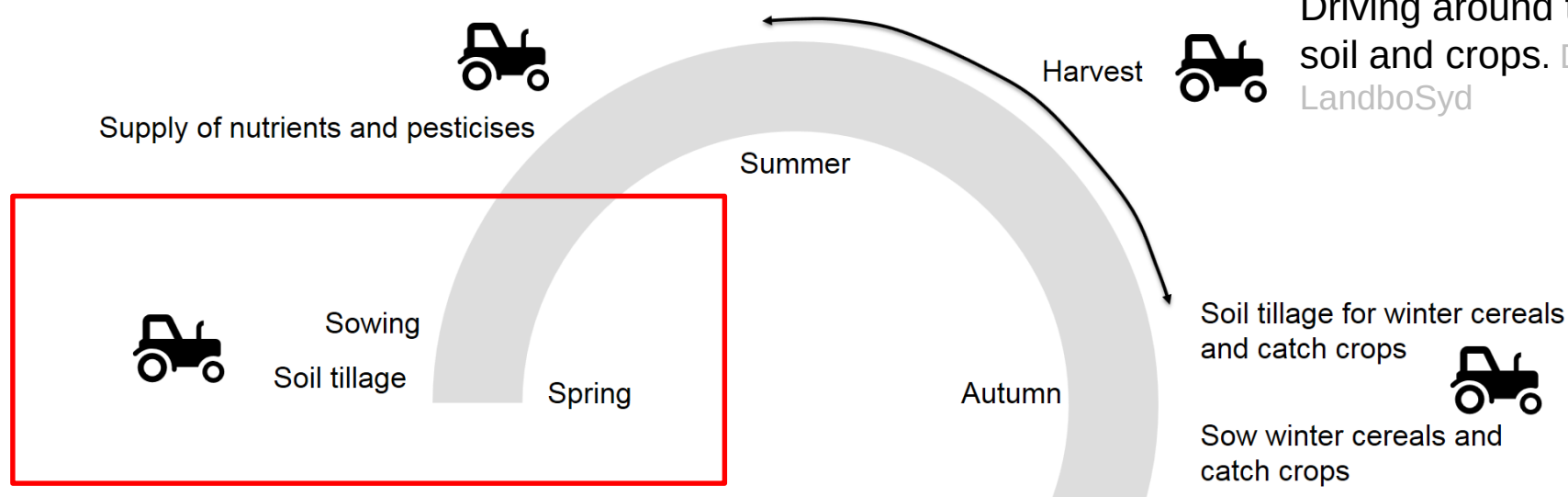
High groundwater level gives problems

- Field operations may be delayed
- The soil's carrying capacity is lower
- Increased soil compaction
- The length of the growing season decreases



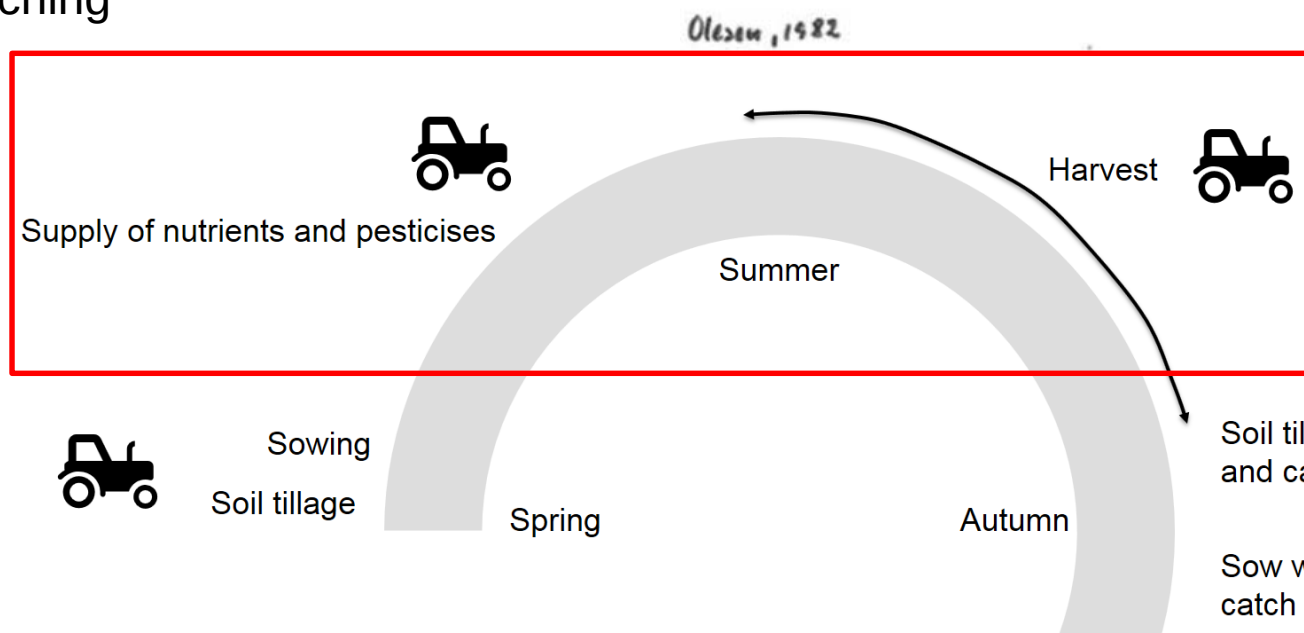
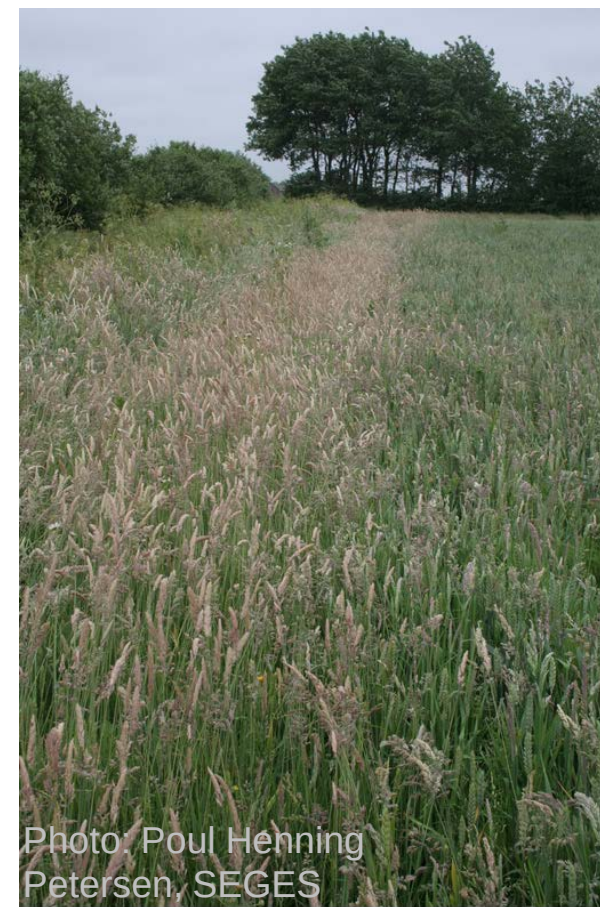
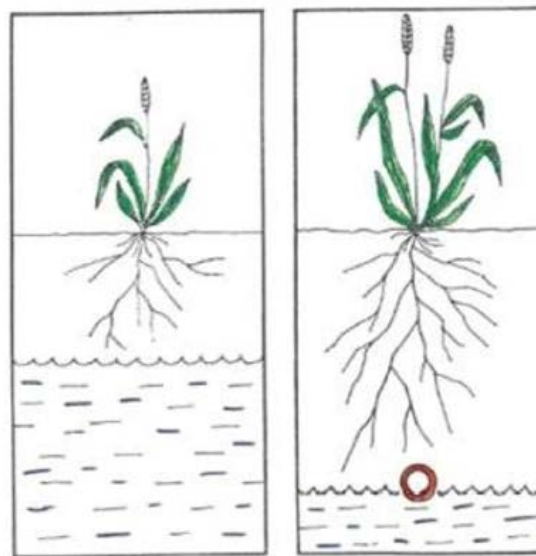
Driving around the wet areas affect the soil and crops. Dronephoto by Morten Steg, LandboSyd

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High groundwater level gives problems

- The soil temperature is lower
- The root zone is low
- The plants root development is limited
- Increased amount of weed
- The nutrient uptake decreases
- Increased leaching

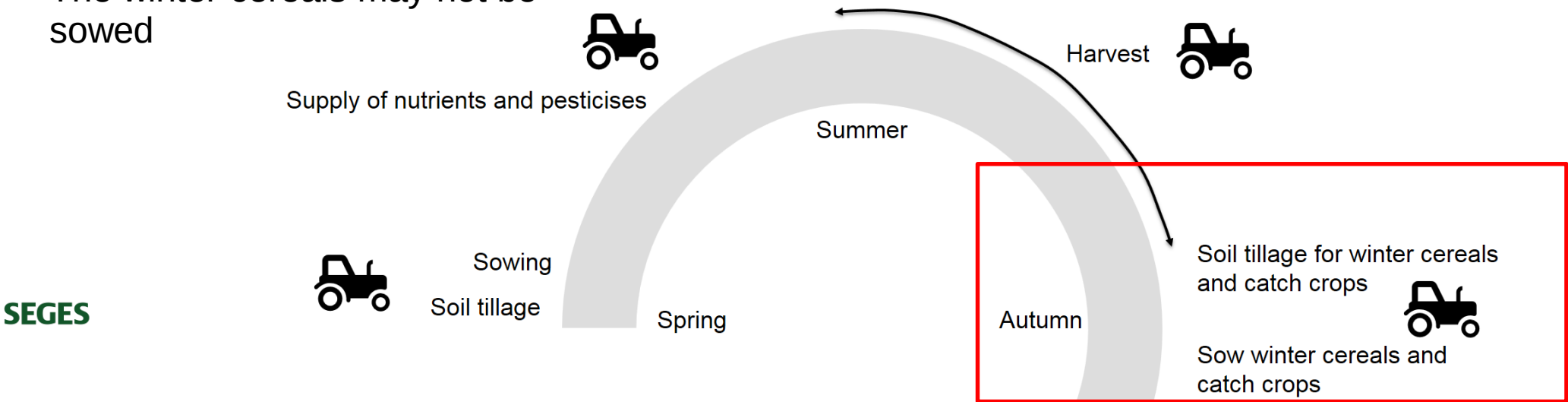


High groundwater level gives problems

- Field operations may be delayed
- The soil's carrying capacity is lower
- Increased soil compaction
- The yield is low (less profit)
- The catch crops might not be sowed or they do not develop properly
- The winter cereals may not be sowed

Clay soil	Depth to the groundwater table, cm						
	30	40 - 50	60	75	80 - 90	100	150
Crop	Yield, %						
-	-	-	-	-	-	-	-
Wheat	-	58	77	89	95	-	100
Barley	-	58	80	89	95	-	100
Oat	-	49	74	85	95	-	100

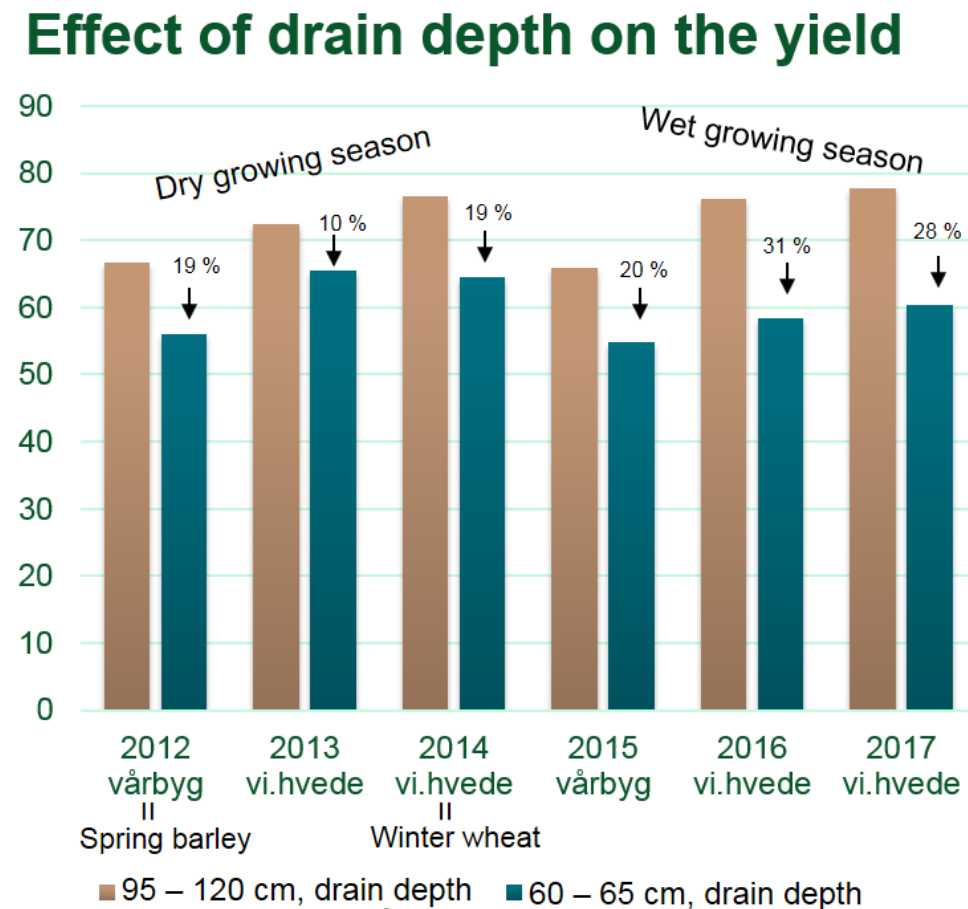
(Børgesen et al., 2012)



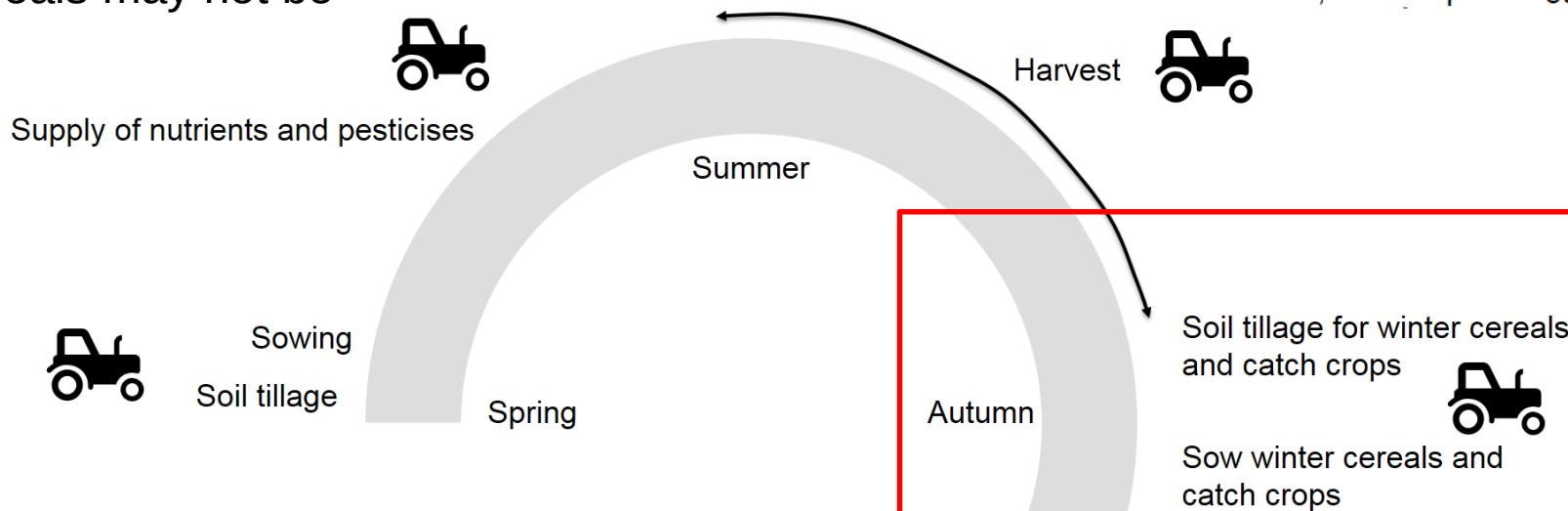
High groundwater level gives problems

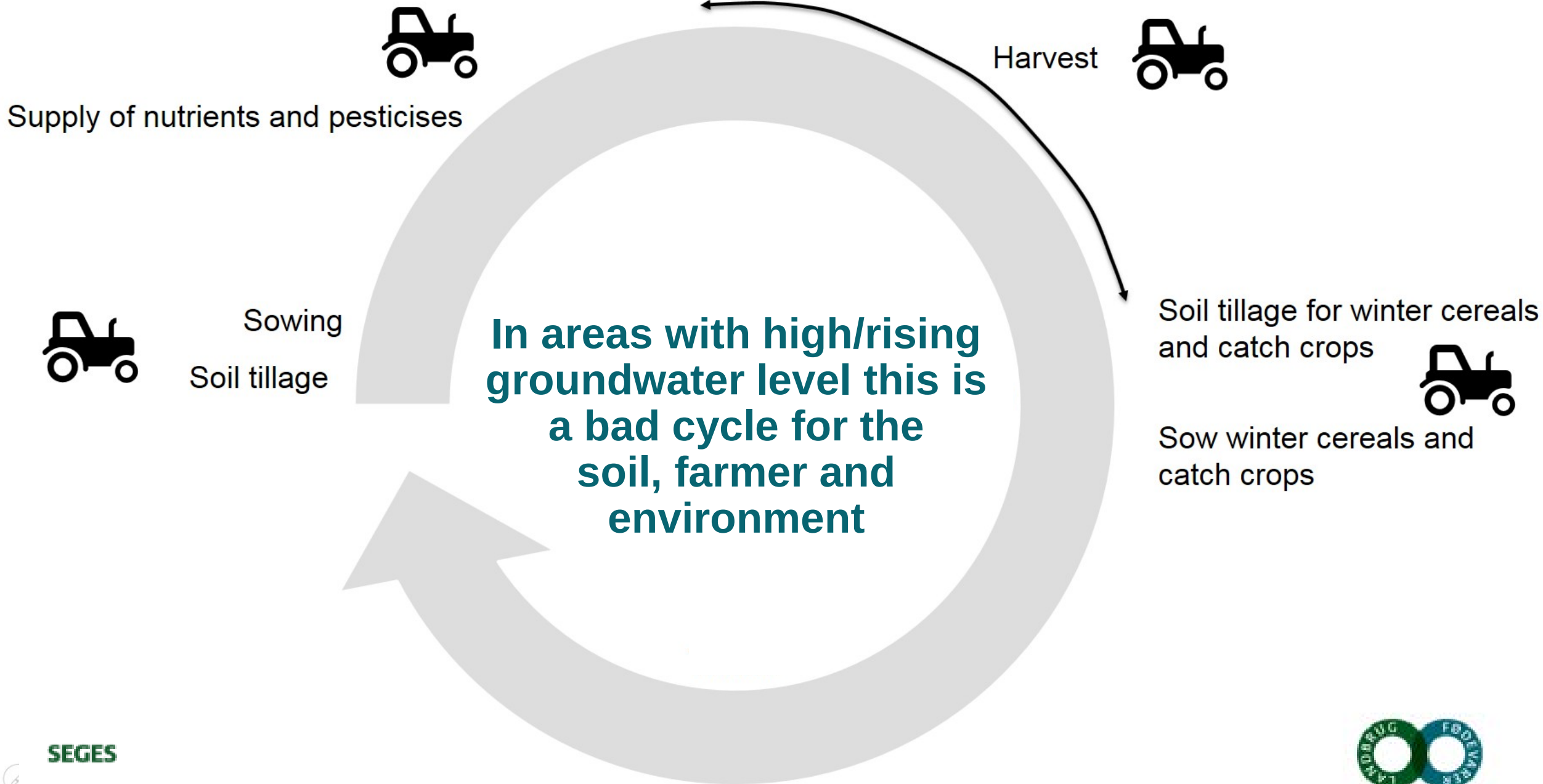
- Field operations may be delayed
- The soil's carrying capacity is lower
- Increased soil compaction
- The yield is low (less profit)
- The catch crops might not be sowed or they do not develop properly
- The winter cereals may not be sowed

Grain yield, Hkg dry matter per ha



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Possible solutions

- Drainage, trenches
- Pumping, abstraction
- Seek synergies
- Abandon areas



Increase the flow in streams and rivers

Opråb: Lodsejere sejler væk i åvand

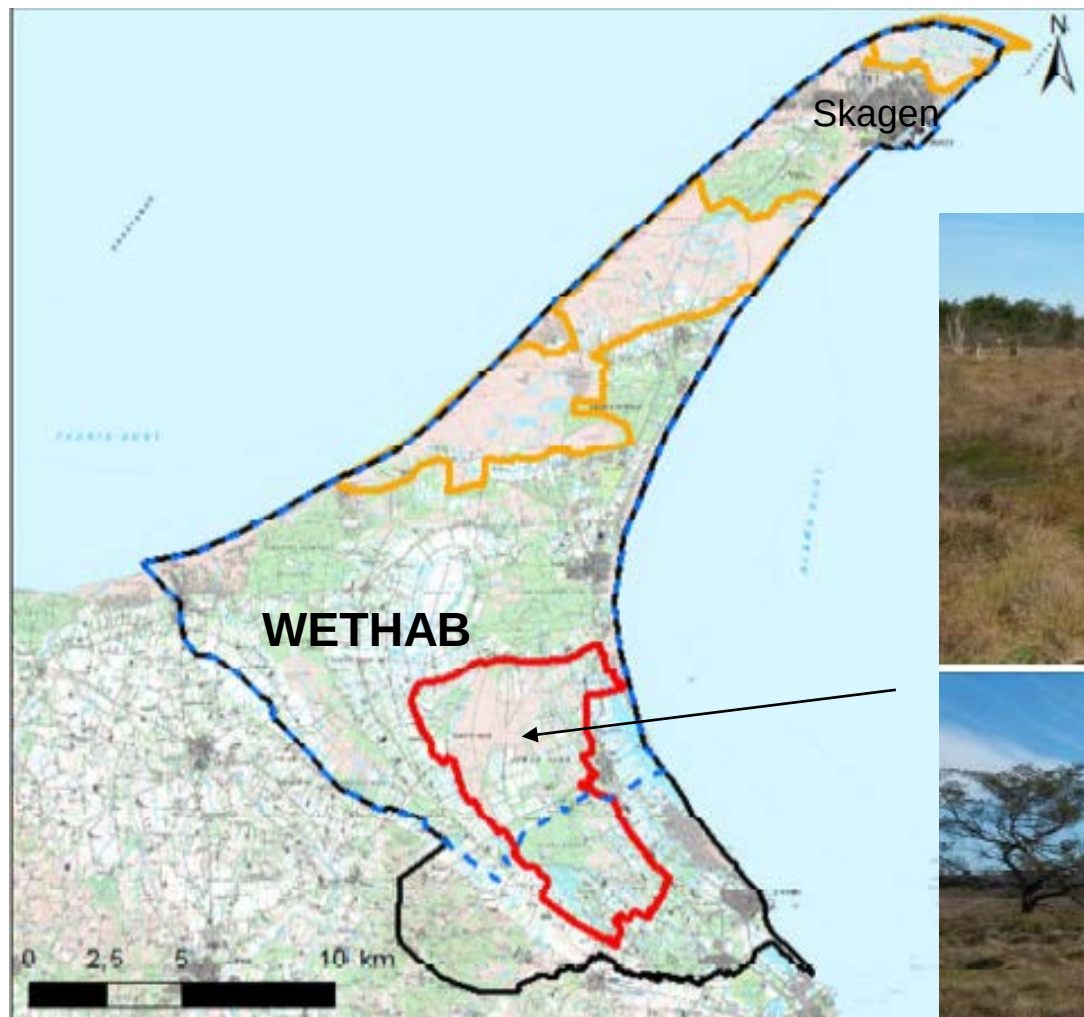
AF: PIA PAGAARD M. MADSEN, PIMA@AMTSAVISEN.DK
Publiceret 20. september 2017 kl. 08:32



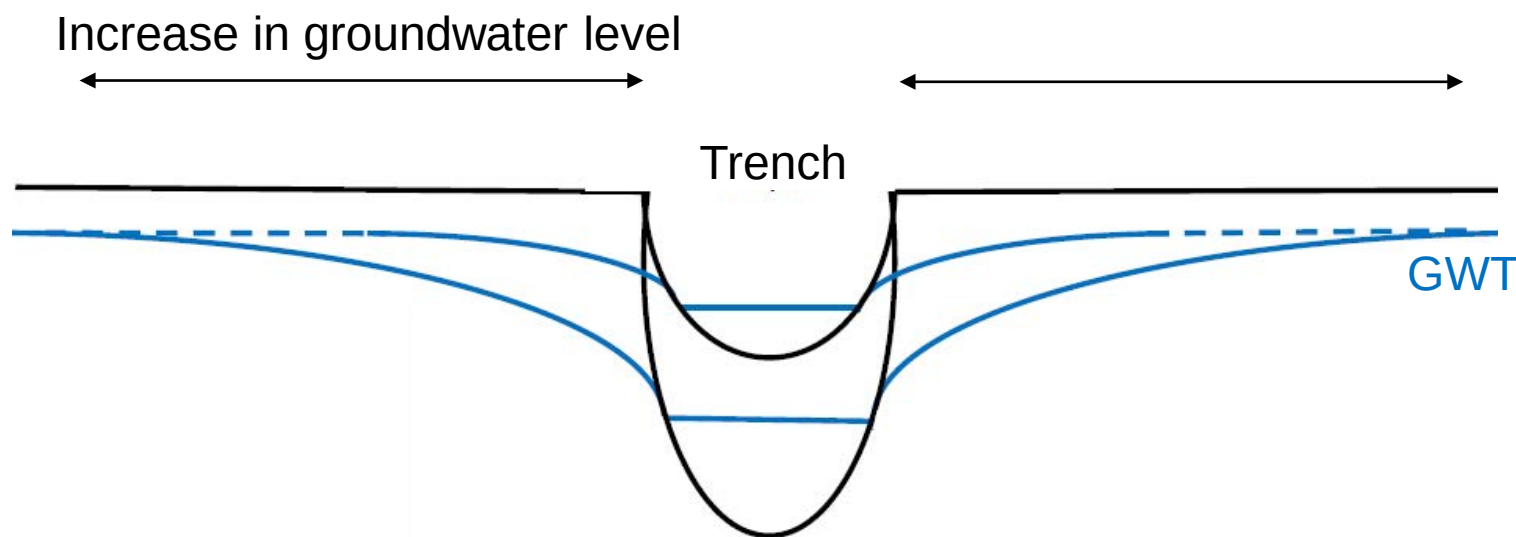
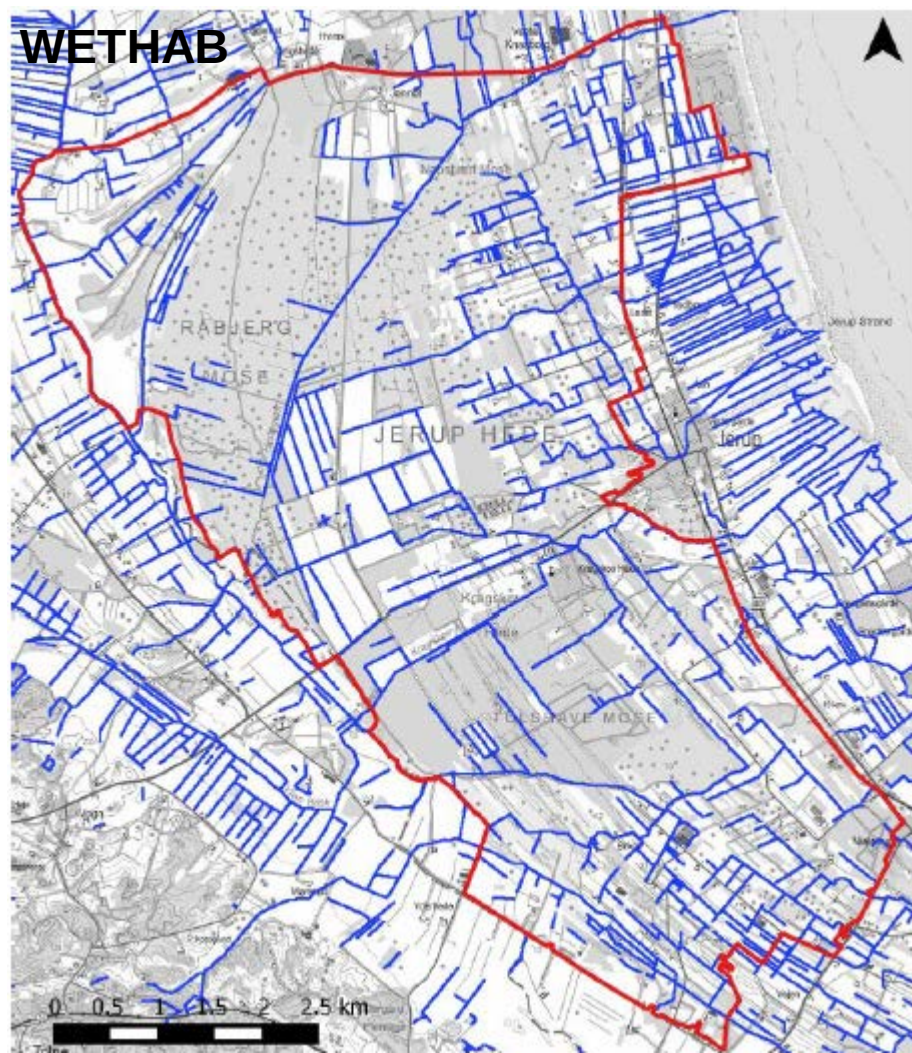
Skals Å, 0.9 m over normal water level



Groundwater and surface water is connected



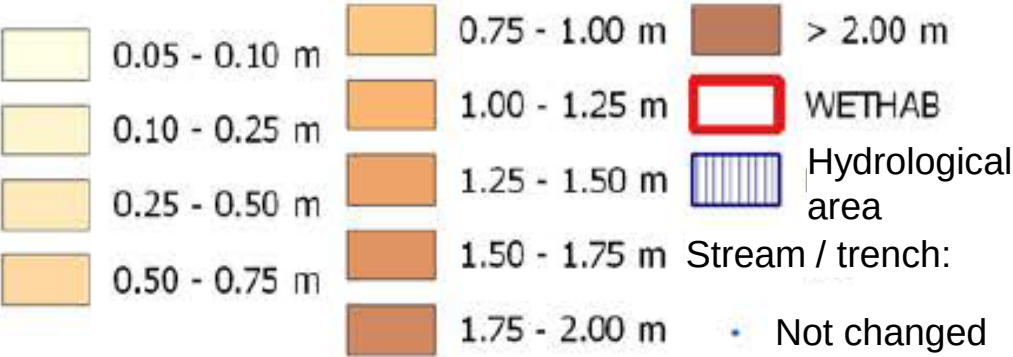
Groundwater and surface water is connected



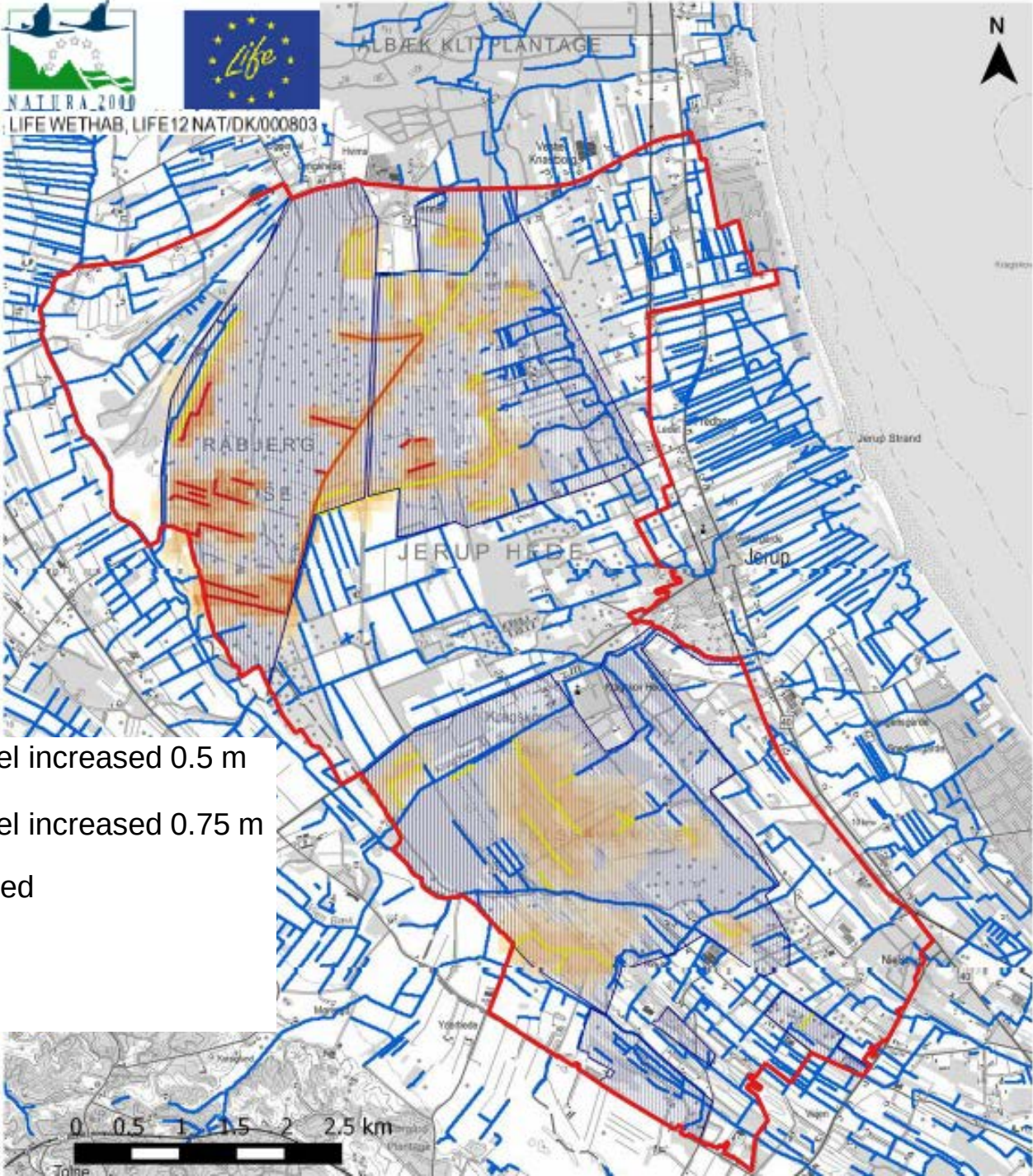
(NIRAS, 2016)

Groundwater and surface water is connected

Groundwater level increased



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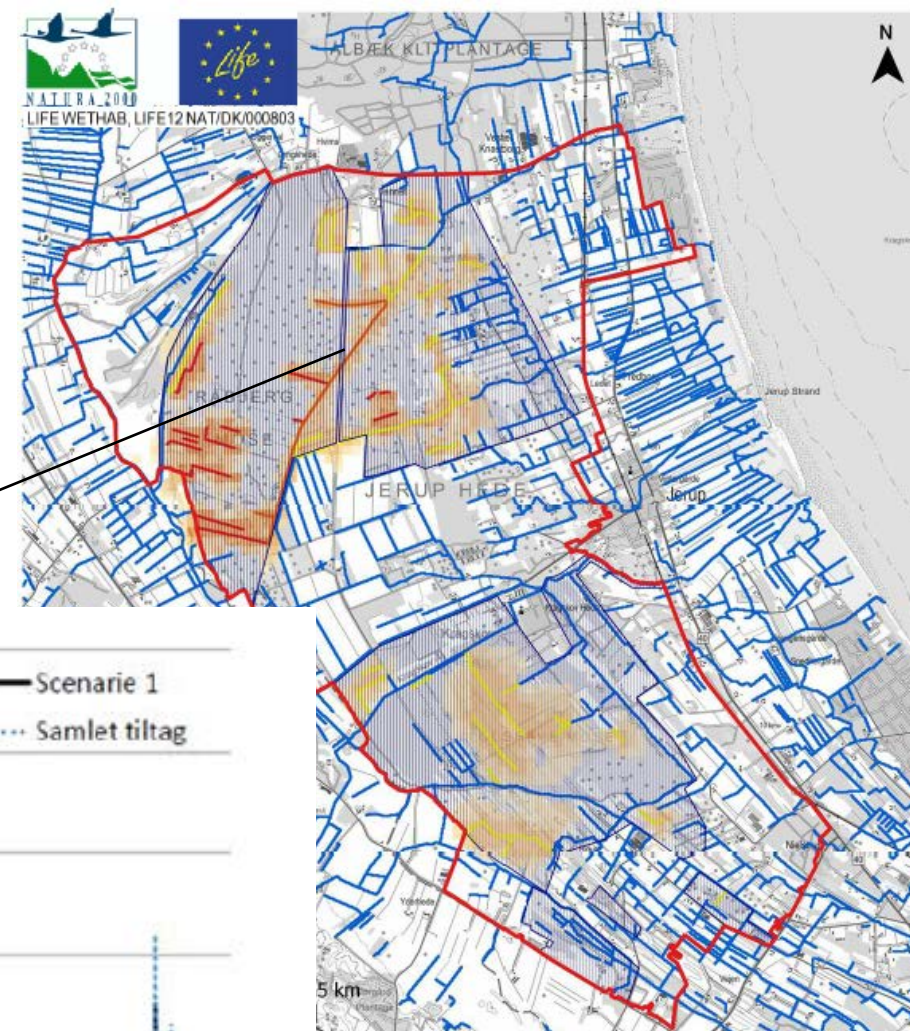
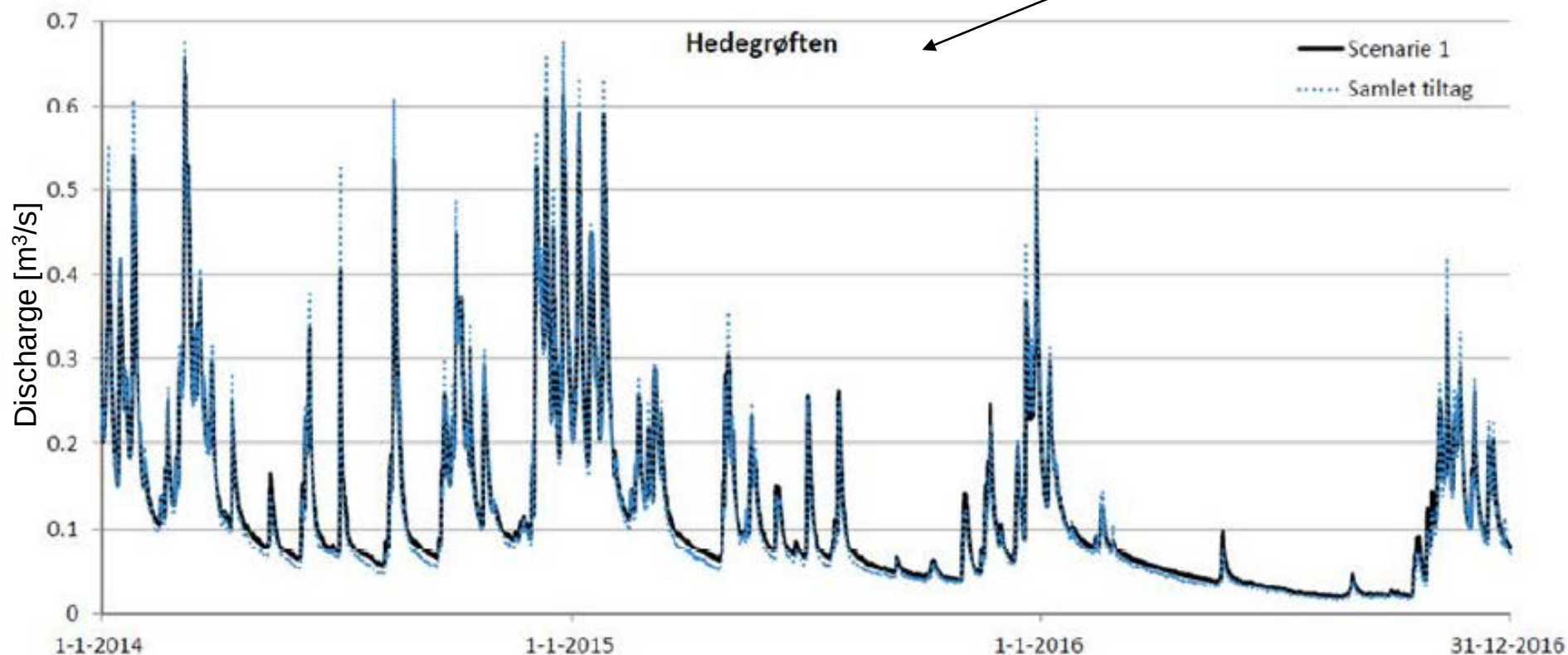


(NIRAS, 2016)

Groundwater and surface water is connected

- Increased peak flow

This is a problem not only for rural areas but also for urban areas!



(NIRAS, 2016)



To overcome the problems with rising groundwater level and other effects

- Large integrated solutions managing both groundwater and surface water
- New ways of thinking integrated water management
- Rural and urban areas should work together – catchment based cooperation
- We must start now!

Thank you for listening!

Questions?

References

Børgesen, C. D., Thomsen, I. K., Søegaard, K., Plauborg, F., & Vinther, F. P., (2012). *Notat om afvandingsdybder ved reduceret vandløbsvedligeholdelse*, Nr. 816425, Nr. Startet d 11-04-12 , 7 s., maj 10, 2012.

NIRAS, 2016. WETHAB, LIFE12 NAT/DK/000803. Hydrologisk forundersøgelse, April 2015 – Maj 2016. Rapport udarbejdet fra Frederikshavn Kommune og Naturstyrelsen.

Thorling, L., Hansen, B., Larsen, C.L., Larsen, F., Mielby, S., Johnsen, A.R., & Trolborg, L. 2016. Grundvand. Status og udvikling 1989 – 2015. Teknisk rapport, GEUS 2016.