

PRECISION AGRICULTURE

WE CAN'T MEASURE IT...

WHY DON'T YOU MODEL IT?

WHAT IS PRECISION AGRICULTURE?

Precision agriculture (PA) is the *spatial and temporal* adaptation of management according to crop status or other factors.

The term covers several technologies and concepts relating to soil treatment, fertilization, pesticide use, driving optimization and more...

It's often based on image analysis and on-the-go decision algorithms – but not only.

AND WHAT'S MY PROBLEM?

—
My problem is...

- I have tried to simulate effects of PA, mainly on N leaching and productivity.
- It's difficult and I don't know how to do it properly.
- Here are some of the reasons...

1. Scale and time

SIMULATE N LEACHING FROM A FARM

FARM SCALE

General soil properties
for the area

Weather data for the area

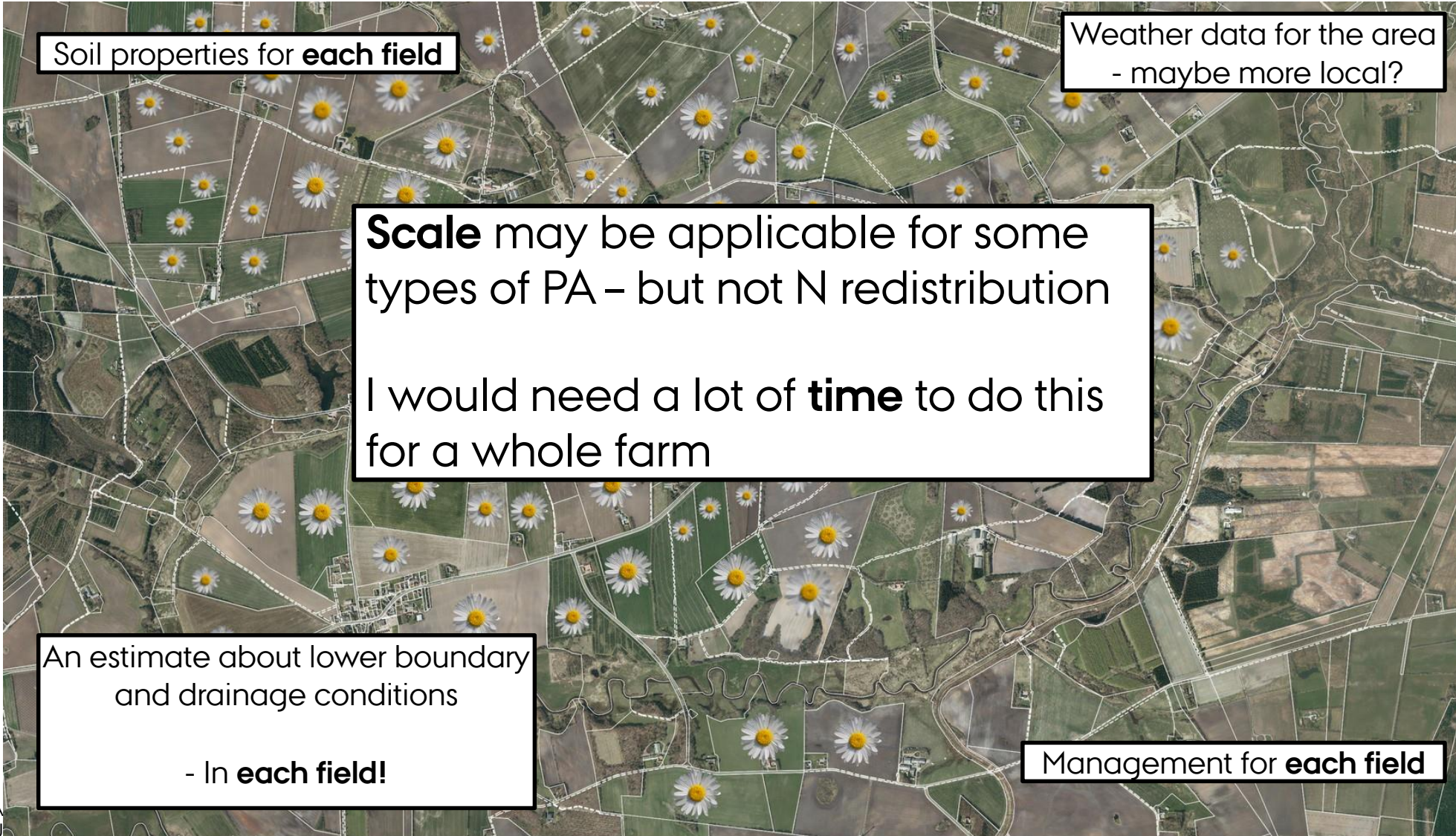
Scale and **time** is reasonable –
but it is not relevant for PA

An average estimate about lower
boundary and drainage conditions

General (statistical) management for
this farm type

SIMULATE N LEACHING FROM A FARM!

FIELD SCALE



Soil properties for **each field**

Weather data for the area
- maybe more local?

Scale may be applicable for some types of PA – but not N redistribution

I would need a lot of **time** to do this for a whole farm

An estimate about lower boundary and drainage conditions

- In **each field!**

Management for **each field**

SIMULATE N LEACHING FROM A FARM!!

SUBFIELD SCALE



Soil properties for **each field zone**

Weather data for the area
- maybe more local?

Sub-field is a relevant **scale** for considering effects of PA.
I don't think I have that much **time** left

An estimate about lower boundary and drainage conditions

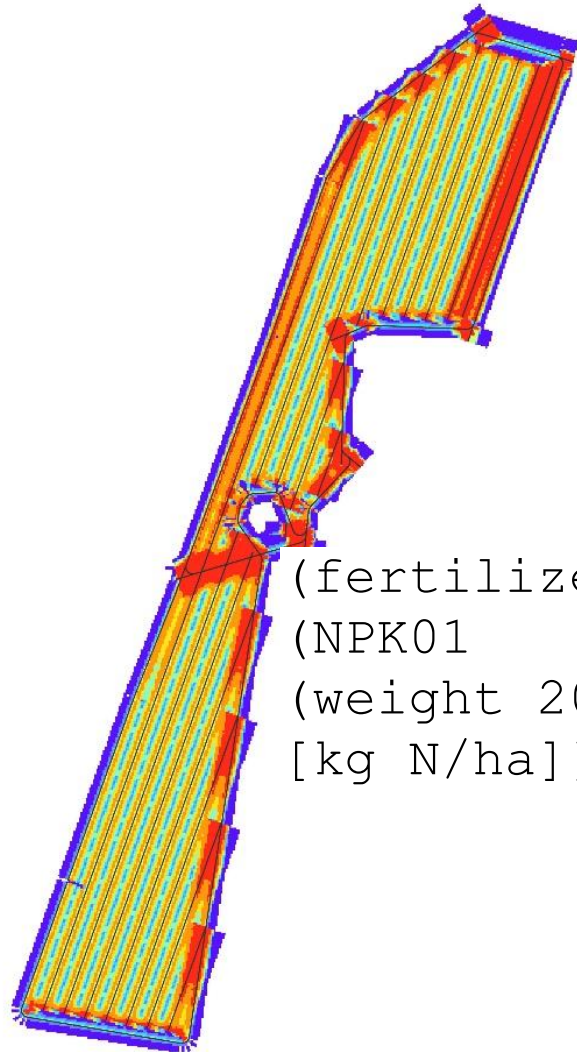
- In **each field zone!**

“Precision” management for **each field zone**

2. Hypothetical management

IF PA? IF NOT PA? -IN EACH SUBFIELD ZONE

collection at a relevant scale (often not even yield)



(fertilize
(NPK01
(weight 209
[kg N/ha])))



- | | |
|-----------------------------------|-------------------------------------|
| Zone 1 - Well drained clay loam | Zone 4 - Clay loam w. sandy subsoil |
| Zone 2 - Poorly drained clay loam | Zone 5 - Sandy soil |
| Zone 3 - Depression | Zone 6 - Shoulder |

3. Where are the measurements?

MAYBE IN THE PA PILOT PROJECT?

—
20 farmers included – we got measurements of N concentration in slurry tanks and some yield data.

Otherwise questionnaires about user experiences with implementing new equipment.

But how would you also measure the N leaching if you had used a different machine or fertilization strategy last year?

Let's just model it instead...

STATUS

- It's not that we haven't tried to simulate this.
- So far the conclusion is that the effect of precision agriculture on N leaching is 1/11 of the effect of catch crops.

<https://lbst.dk/tvaergaende/praecisionslandbrug/praecisionslandbrug-som-alternativ-til-efterafgroeder/>

- How would you address this question?



AARHUS
UNIVERSITY