WaterCAP Taskforce

WaterCAP Taskforce

Report of Meeting

WaterCAP-Taskforce accumulates knowledge and experience on water and climate change adaptation from many countries and multiple sectors in the North Sea Region. The lessons learned and experiences gained in former InterReg projects dealing with water and climate change issues form a comprehensive knowledge base for the region and this is made available to stakeholders through the international taskforce.

Exloo (Drenthe)
June 17th and 18th 2014

Content

Introduction

Chairman **Ben van Os** (Province of Drenthe) welcomes the participants of the WaterCap Task Force Meeting in hotel De Hunzebergen within the Province of Drenthe (the Netherlands) and wishes us a fruitful meeting.

WaterCAP-Taskforce accumulates knowledge and experience on water and climate change adaptation from many countries and multiple sectors in the North Sea Region (NSR). The knowledge and experience is gained through the former InterReg projects dealing with Water and climate change. The project aims to supply water solutions in the NSR and to define ideas for projects in the InterReg V programmes with the slogan: How can a farmer earn more euros with less water?

This meeting had a focus on experiences with and ideas about irrigation on farms in the North Sea Region. The meeting was attended by participants of agro and environmental organisations and crop farmers in Denmark, Germany and the Netherlands (see Appendix one).

During this WaterCap Task Force meeting several speakers gave their opinion on irrigation matters. After that a series of short presentations were held. The meeting ended with a visit to the Hunebedcentrum (Megalithic Museum), followed by dinner, during which the participants discussed several statements. The programme can be found in Appendix two and the statements in Appendix three.

Sensor-controlled advisory systems for farmers

(Louis Nannes-DACOM)

Louis Nannes is a senior advisor of . DACOM. This is an innovative high-tech company that develops and supplies specialized hardware, software and online advisory services to arable farms and the agribusiness around the world (with a focus on yield optimization for arable crops).
The presentation of Louis Nannes can be found in the appendix.

During the Aquarius/WaterSense project the moisture content of the soil was made visible to farmers by the use of sensors as part of the development of an integral Decision Support System (DSS). Data could be obtained daily by the farmers, at home on their pc.
The WaterSense project had different goals: agriculture (optimizing crop yields and saving fertilizers, water and pesticides), drinking water production and operational water management (including water quality). There were about 100 moisture sensors (20,000 hectares) in the fields of farmers in the area of the Waterboard Hunze & Aa's. The irrigation software advises when and how much water should be given with per individual farmer. General results of WaterSense were: sensors in the water quantity model can optimize the use of water but to optimize the use of fertilizers and pesticides is much more complicated. At the moment there are no usable sensors for pesticides, but sensors for nutrients in the unsaturated soils are in development.

Louis Nannes talked about eco-hydrological effects of climate change. Salinization – the accumulation of salt in the soil after irrigation with salty surface water from ditches – is a major issue to be dealt with. There are risks of over or under irrigation. In (delta) regions such as the Netherlands we have to deal with different tolerances towards salt. For example, while wheat has a high tolerance – onion has a low tolerance to salt in soil and irrigation water, resulting in different losses in yield.

Optimization of yield is possible by investigation of the main defining, limiting and reducing factors. Water and nutrients are the main limiting factors; measures on yield increasing could be more focussed on these factors. For example by a cycle of activities such as sensing, irrigation, field mapping, soil sampling, planting maps, etcetera (see Nannes' presentation). The variety in soils and soil fertility between fields should be taken into account. For that, techniques such as gamma radiation¸ mapping, soil sensing and close sensing with crop sensors could be applied for precision irrigation of the fields. Good results with this approach have been attained in other regions, such as Sudan, Saudi Arabia and the UK.

Farmers could apply more of these techniques! It is a challenge to work together on more smart and simple applications for farmers. With the use of apps, QR codes and so on.

Question: What are the experiences with the used water model? Does it work?
Answer: It is a complex, dynamic model which has been calibrated and tested at the start and corrected during the experiment (dynamic).

Question: Is one sensor per field sufficient?
Answer: As a trigger to alert the farmer, yes. For precise farming, more sensors/techniques are advisable.

Question: What about the soil mapping with quads?
Answer: At the moment this is being investigated in a project about deeper drainage (winter) due to salinization. Results are promising.

Use of the irrigation planner
(Bert Aasman, DLV Plant)

Out of a passion for plants, **Bert Aasman** talked about his experiences with irrigation. Bert is manager at DLV Plant, an independent firm for consulting, research and projects in the field of agriculture. DLV has 215 employees, 9500 clients and works in 55 countries (mainly Europe) being home based in the Netherlands).

A relevant tool is the DLV Irrigation Planner which is tested in recent years with farmers (potatoes, carrots, sugar beets etcetera). The DLV irrigation planner is a decision-supporting tool for irrigation. Satellite data provides the farmer with the spatial information he needs. This tool provides information about when to irrigate, the amount of water and gives an overview about the farm and field irrigation conditions and advice about improvements. It's a practical, easily managed tool that works well in 'clear sky' circumstances (satellite). Soil moisture sensors (e.g. DACOM) could be used additionally.

Training farmers in the practical use is an important activity of DLV; they deal with both active and passive participants using a step to step approach (see slides in the appendix). Already existing information on soil and crop has been used. Additional meteo information (rain, evaporation) in the field is gained from satellites and weather stations providing information for a practical advice per field/farm. With DACOM more precise information could be gained – combinations are possible.

Main issue at the moment is how to work in cloudy weather: satellite images (5 times a week) cannot provide sufficient information then. So, DLV and farmers are working on alternatives such as drones, airplanes, cameras, and so on. Facing new risks and disadvantages but providing (potentially) useful information on biomass and evaporation as well as working towards solutions by combining and testing several techniques and working on mutual goals (farmers, waterboards, consulting firms).
A combination of airplane pictures and growth models could probably be successful.

Question: These are a lot of techniques, is this profitable for the farmer?
Answer: Yes, it's possible if one builds the irrigation systems step by step and per farmer or group of farmers (sensor, pictures, etcetera).

Question: What about legislation for irrigation (for environmental reasons such as nitrates)? This is a major issue in Denmark.
Answer: This is not a big issue in the Netherlands. With a good irrigation system N loss from the soil can be avoided.

Question: Is data from Denmark available?
Answer: Exchange of information between Germany and Denmark.

Threats and opportunities of irrigation within the WFD (Hans Roust Thysen, DAAS - VFL Denmark)

Hans Roust Thysen gives the presentation due to absence of Søren Kolind Hvid. Hans works at the agro consulting firm Danish Agricultural Advisory Service - VFL in Denmark, a non-profit organisation owned and paid by farmers with 3200 employees in 31 regional advisory companies. Irrigation, about 96% from ground water, is needed mostly in the western part of Jutland in up to 50% of the cultivated area. Permits are needed but are complicated to get due to different, and very strict, requirements (permissions corresponds to the average irrigation requirement over a long period of years). Irrigation in Denmark is limited because it is a lower priority then drinking water. In the near future it is likely that more restrictions will be made by the government due to the Water Framework Directory (WFD) and reduction in stream flow due to climate change. At the moment, no new permits are being issued and all is postponed till the next generation of WFD plans (2016-2021). These restrictions could be more catastrophic for the farmers. Therefore it is wise to start a campaign for the right to use water and to draw up some regional legislation. At least in the western part of Denmark where ground water and streams (summer) resources are sufficient and the requirement values need to be updated.

Question: How about these difficulties in Germany and in the Netherlands?
Answer: In the Netherlands a rather efficient system of irrigation exists within the legislation. In Germany rules are more flexible and regional then in Denmark.

Short presentations of new developm and sustainable water use by farmers

Rinke van Veen (Province of Drenthe) talks about new developments in efficient and sustainable water use by farmers: a variety of draught related projects, often in combination with nature conservation. Strategy on the higher grounds is to increase the amount of groundwater by keeping water in nature areas, higher water levels in and meandering of small rivers and changes in forestry. Farmers are advised to work towards a more efficient water use, irrigation with groundwater and a more sustainable soil management. Measurements to be worked out are: famer's weirs; steered drainage; infiltration with drainage; water storage with weirs; other crops; sprinkling techniques and green manure. Famers have a key role to improve water management!
By following this web link, you can find more information about measurements like this in the area of Waterboard Hunze & Aa's: http://www.hunzeenaas.nl/werk-in-uitvoering/Paginas/regelbare-drainage.aspx



Question: What are your experiences with the combination of nature conservation and irrigation for agriculture?
Answer: This is not always integrated due to different goals e.g. water retention and water removal. A good strategy is to work on sufficient water conservation and make arrangements with local farmers.

Angela Riedel (Landwirtschafskammer Niedersachsen) gives a presentation about their experiences with irrigation techniques in general and then more specific about modelling/ calculation by using applications such as BOWAB (soil water calculation) for different crops. With aspects such as calibration and differences when applying these models in the test phase of this project. The irrigation works good when enough detailed information is used in the models and models could be adapted/improved during the project. The challenge is to work towards a good water ' footprint ' and to work with correct data. The regional government finances this project.

Question: Why did they start to irrigate these fields?
Answer: The farmer decided.

ents in the field of efficient

Elisabeth Schulz (Landwirtschafskammer Niedersachsen) talks about governance and projects on groundwater in the region (sub continental area between Hamburg and Hannover). As a result of the WFD round tables with stakeholders are being held and they are finding 'no regret' measures' together, such as more efficient water use. For example groundwater storage/infiltration in the high areas in combination with other forests. This is a complicated process!
A second strategy is to work with water ponds (Aquarius programme): with public benefits as well.
A third strategy is the storage of cleaned waste water in the forest.

Cristina Aue (OOWV) gives a presentation (no sheets) of the water supplier in water win areas in Germany. Conflicts about water rights occurred with local farmers: a challenge for landscape water management with farmers! In these projects organisations are discussing other crops, forestry, meandering rivers, nutrients, etcetera. There is a willingness to learn from each other!

Question: If there is less ground water, don't we need other nature goals?
Answer: It is time for a better water body management facing ground water at risk. Tools are welcome!

Hanne Binderup Jacobsen (JYSK Denmark) gives detailed information about the evaluation of irrigation machinery (recent field test) due to serious yield losses caused by draught in 2013. The water distribution of self-propelled irrigators (60 m wide when fully extended) is being surveyed. It appears that an uneven spread occurs in these fields causing crop damage: in a worst case scenario there was no water in large areas of the field. A strong wind from one direction would have a major influence on the water distribution in the field in this case.
When planning irrigation it is advisable to make simple water balances, to choose a priority between crops, to take the soil texture into account, to measure and incorporate irrigation and precipitation and to use meteorological data.

Question: Why don't the farmers choose for other, more suitable, techniques?
Answer: This hardly happened due to traditions / culture of the farmers in this project.

Statements and conclusions

At the end of the meeting, Deirdre presents the speakers a ´trechterbeker´ from Drenthe and other gifts. Statements are shortly presented by Rinke van Veen with the invitation to the participants to discuss these statements during dinner (see Appendix 3).
Following the closing words from chairman Ben van Os, the participants were taken on a visit to the Hunebedcentrum (Megalithic Museum) for a guided tour, ending with dinner at this museum.

Hunebed and Trechterbekervolk

Dinner

Appendix 1
Participants of WaterCap Task Force Meeting

Exloo, June 17th 2014

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Appendix 2
Programme

How can a farmer earn more euros with less water?

Location:
Fletcher Hotel-Restaurant De Hunzebergen | Valtherweg 36 | 7875 TB Exloo | The Netherlands
Tel. +31 591 549 131 | Fax +31 591 549 289 | www.hoteldehunzebergen.nl

Tuesday, June 17th

12:00 - 13:00	Lunch
13:00 - 13:30	Sensor-controlled advisory systems for farmers (Louis Nannes, DACOM, The Netherlands)
13:30 - 14:00	Use of the irrigation planner (Bert Aasman, DLV Plant, The Netherlands)
14:00 - 14:30	Threats and opportunities of irrigation within the WFD (Denmark)
14:30 - 15:00	Coffee break
15:00 - 15:30	Discussion
15:30 - 16:30	New developments in the field of efficient and sustainable water use by farmers Province of Drenthe; OWVV; Landwirtschaftskammer Niedersachsen; River Trust; KCA
16:30 - 17:00	Appoint promising developments for international projects based on the presentations
18:00 - 19:00	Visit to the Hunebedcentrum (Megalithic Museum) with guided tour
19:00 - 21:30	Dinner

Appendix 3
Statements for discussion

Head questions

1. What kind of a advise system for irrigation do you use for your farmers and do you have experience with other types of advice systems?
2. What should an advice system be able to do to give the best advice for irrigation?
3. What do we have to do to improve the advice systems to be able to deal with climate change?
4. Is there a connection between the WFD plans and irrigation?

Sub questions

Sensor controlled advisory systems for farmers (Louis Nannes, DACOM, The Netherlands):

- What information do farmers need to be able to take a good decision about whether or not to irrigate?
- Will the need for information change because of climate change?
- How can point information (sensors) be converted to spatial information?
- Are there more ways of gaining the right information beside the use of sensors and satellites?
- Do farmers benefit when they have continuous information on groundwater quality?

Use of the irrigation planner (Bert Aasman, DLV Plant, The Netherlands):

- What is your experience with hyper spectral data for temperature, evaporation and Nitrogen sufficiency?
- What kind of irrigation planner you use and what kind of data you need to get an advice?
- Do you have any experience with practical use of irrigation sensors in your country and what's the opinion of the farmers?

Threats and opportunities of irrigation within the WFD (Søren Kolind Hvid, KCA, Denmark):

- How are irrigation and the WFD plans corresponding? Is it still possible to get a permit?
- How do you administrate irrigation permits?
- Do you use service checks on irrigation machines?

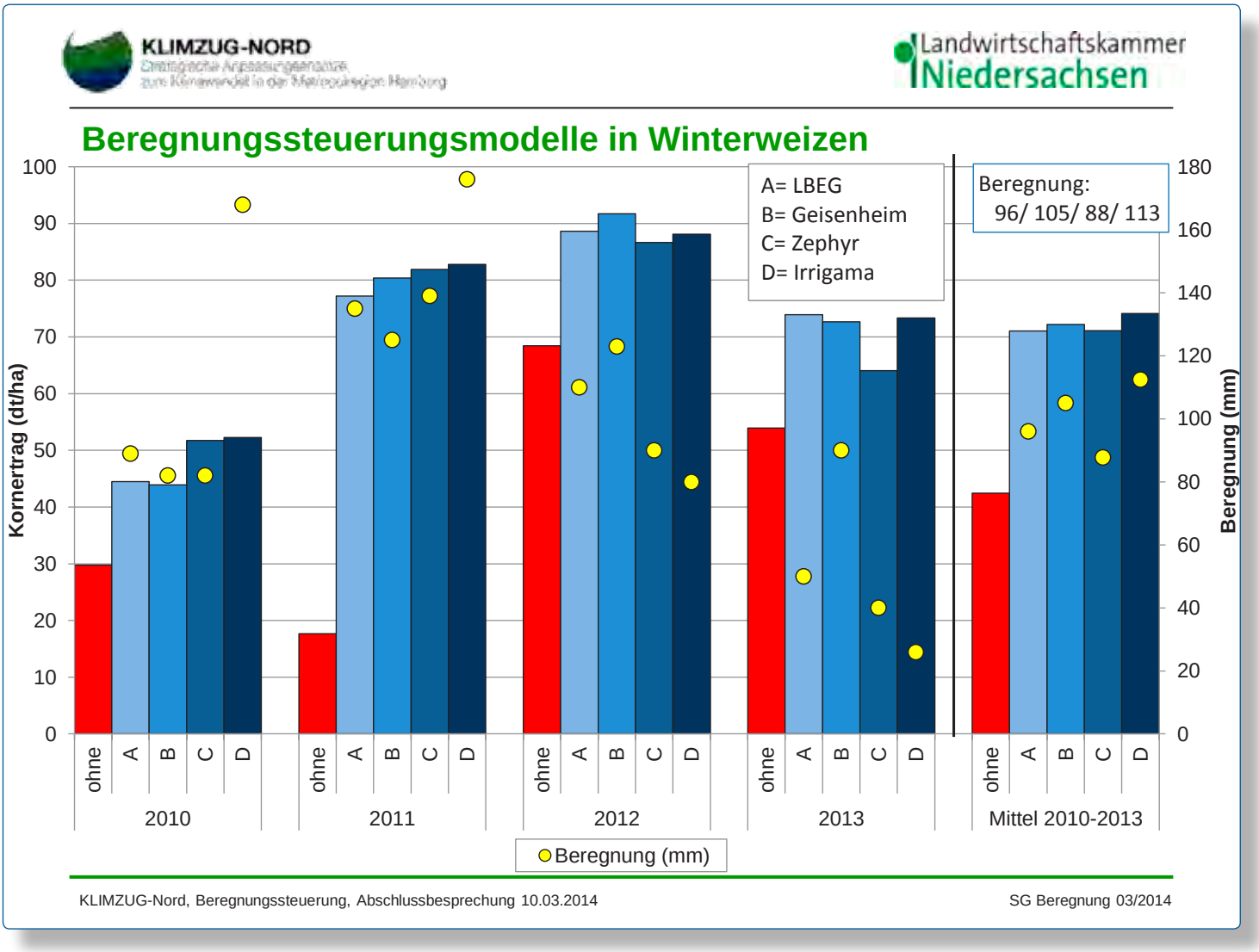
Appendix 4
Presentations Jun 17th 2014

KLIMZUG-NORD
Strategische Anpassungsansätze zum Klimawandel in der Metropolregion Hamburg

Landwirtschaftskammer Niedersachsen

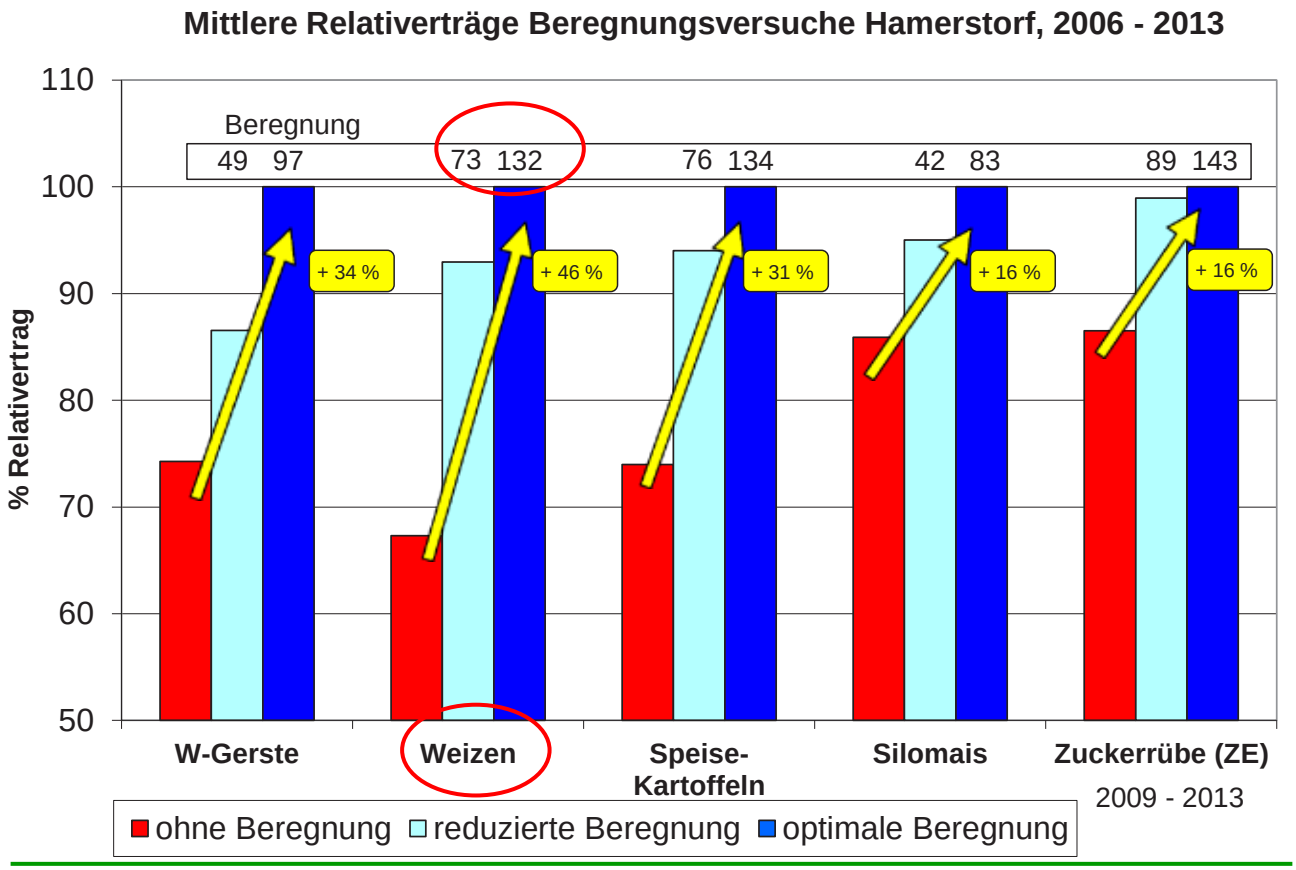
1. **results of field experiments with different models for the steering of irrigation**
2. **new application in Lower Saxony/Germany:**

   model „BOWAB“ (soil water calculation)


KLIMZUG-NORD
Landwirtschaftskammer Niedersachsen
Beregnungssteuerungsmodelle in Winterweizen
A= LBEG
B= Geisenheim
C= Zephyr
D= Irrigama
Beregnung:
96/ 105/ 88/ 113
Kornertrag (dt/ha)
Beregnung (mm)
ohne
A
B
C
D
2010
2011
2012
2013
Mittel 2010-2013
Beregnung (mm)
KLIMZUG-Nord, Beregnungssteuerung, Abschlussbesprechung 10.03.2014
SG Beregnung 03/2014

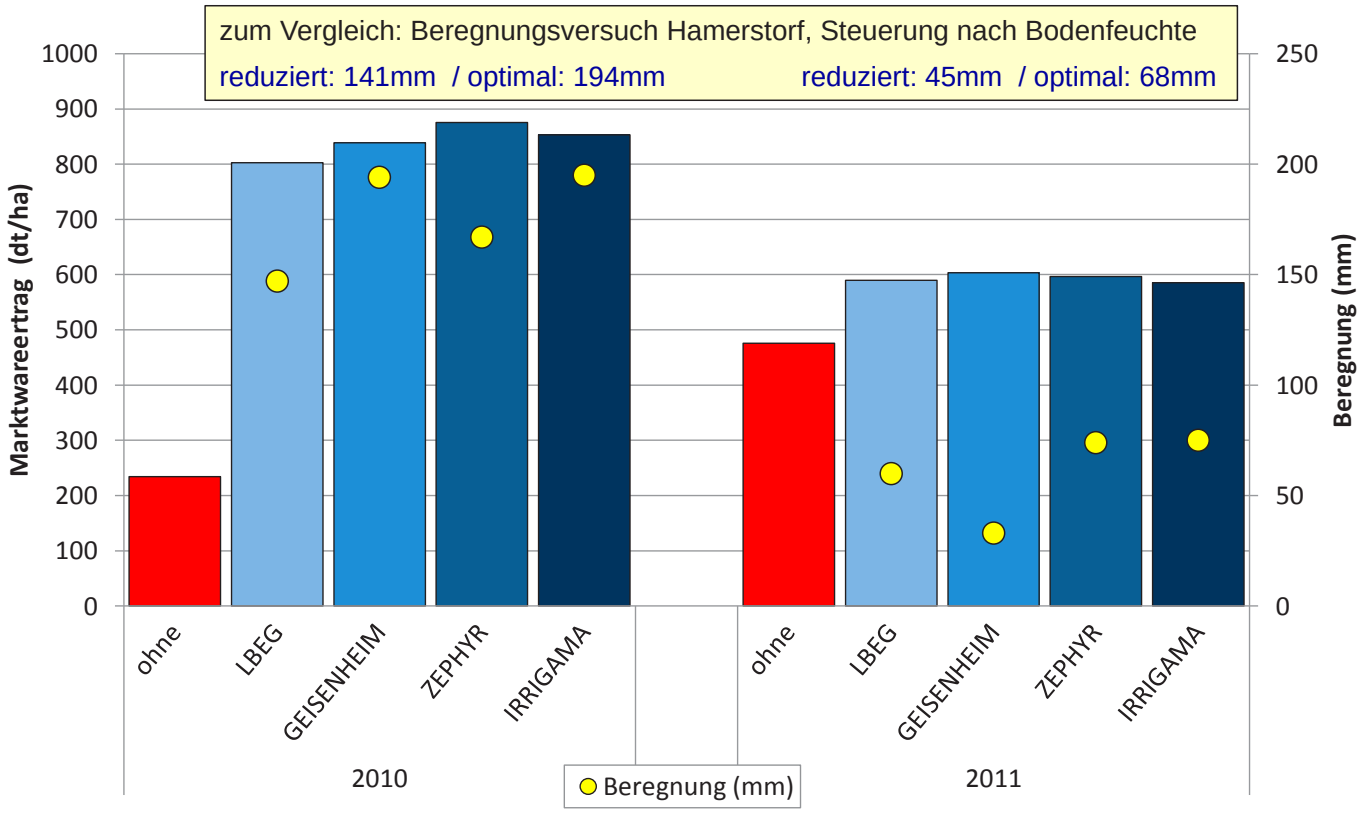
Ertragsergebnisse verschiedener Kulturen bei unterschiedlicher Beregnungsmenge

Landwirtschaftskammer Niedersachsen



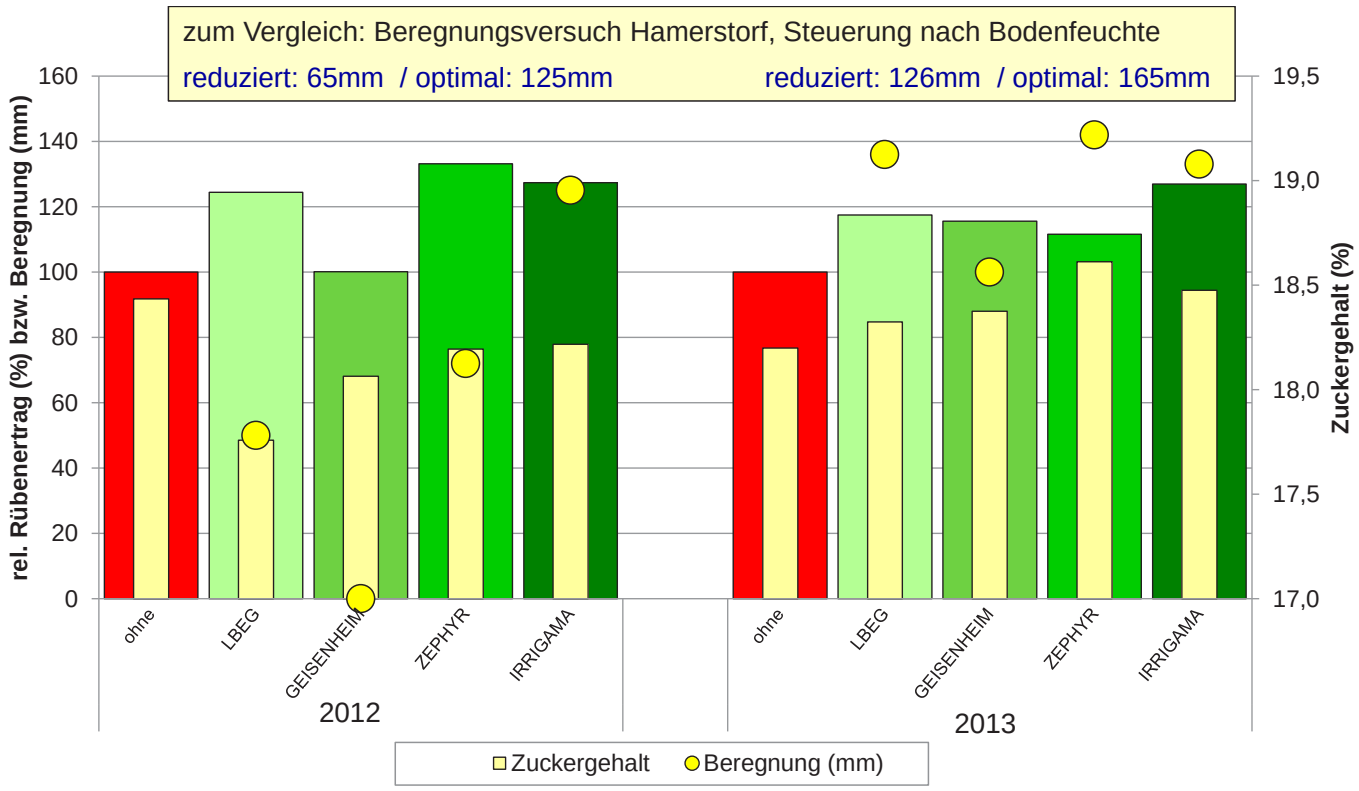
KLIMZUG-NORD
Landwirtschaftskammer Niedersachsen

Beregnungssteuerungsmodelle in Kartoffeln



KLIMZUG-NORD
Landwirtschaftskammer Niedersachsen

Beregnungssteuerungsmodelle in Zuckerrüben



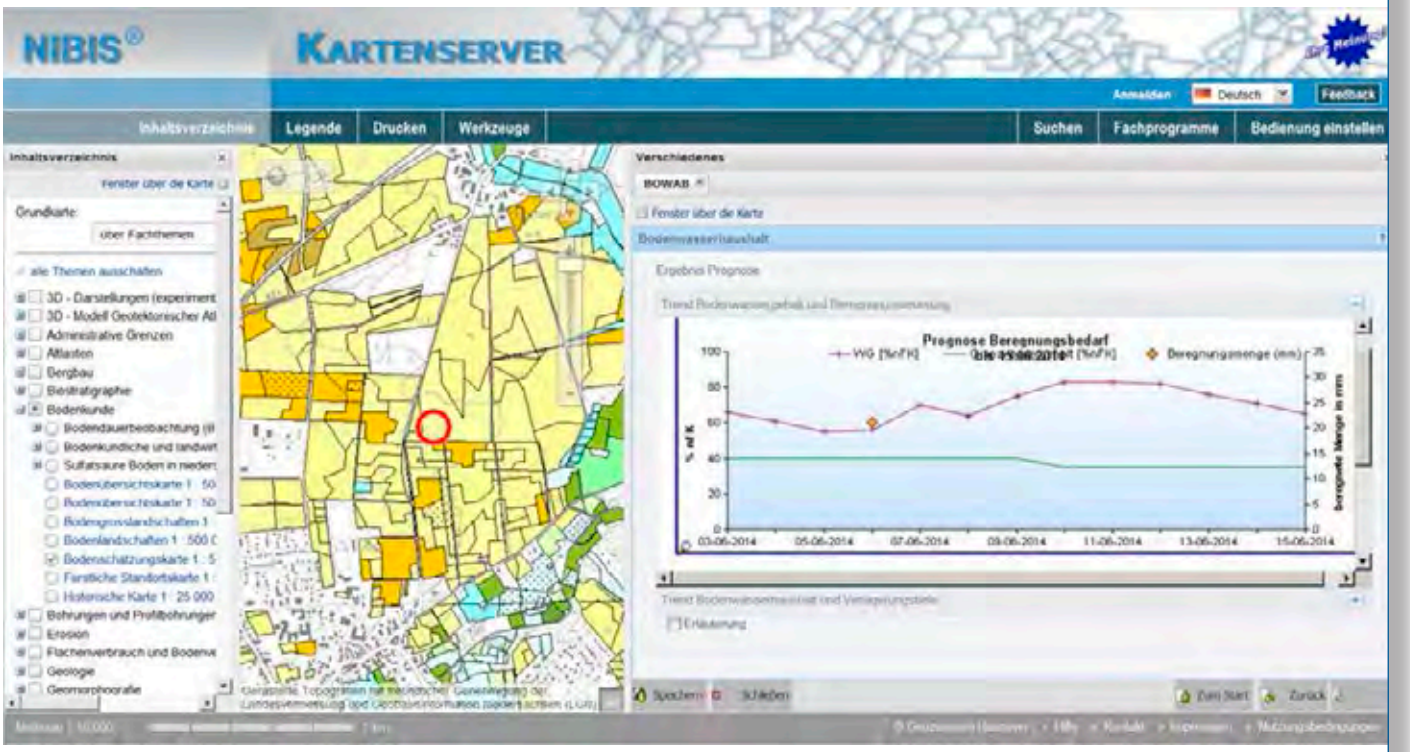
Schlussfolgerungen

Landwirtschaftskammer Niedersachsen

- Beregnung mit einer berechneten Empfehlung für die Wassergaben funktioniert gut, wenn die Modelle hinreichend genaue Standortdaten erhalten und an den Standort angepasst sind.
- Bei den Steuerungsmodellen gibt es keine eindeutigen Gewinner und Verlierer. Die Berechnungen wurden bei einigen Modellen während der Projektlaufzeit angepasst und die Empfehlungen verbessert.
- Für die Praxis hängt die Auswahl eines geeigneten Modellanbieters von den Vorgaben des Landwirts ab:
  - Wieviel Erfahrung hat er bereits selbst?
  - Wieviel Zeit kann und will er investieren für die Beregnungssteuerung?
  - Wie genau sollen die Informationen sein?
  - Wie relevant sind für ihn die Kosten ?
- welche Daten benötigt das Modell ?
- woher kommen die Daten?
- welche Daten muss der Landwirt eingeben ?

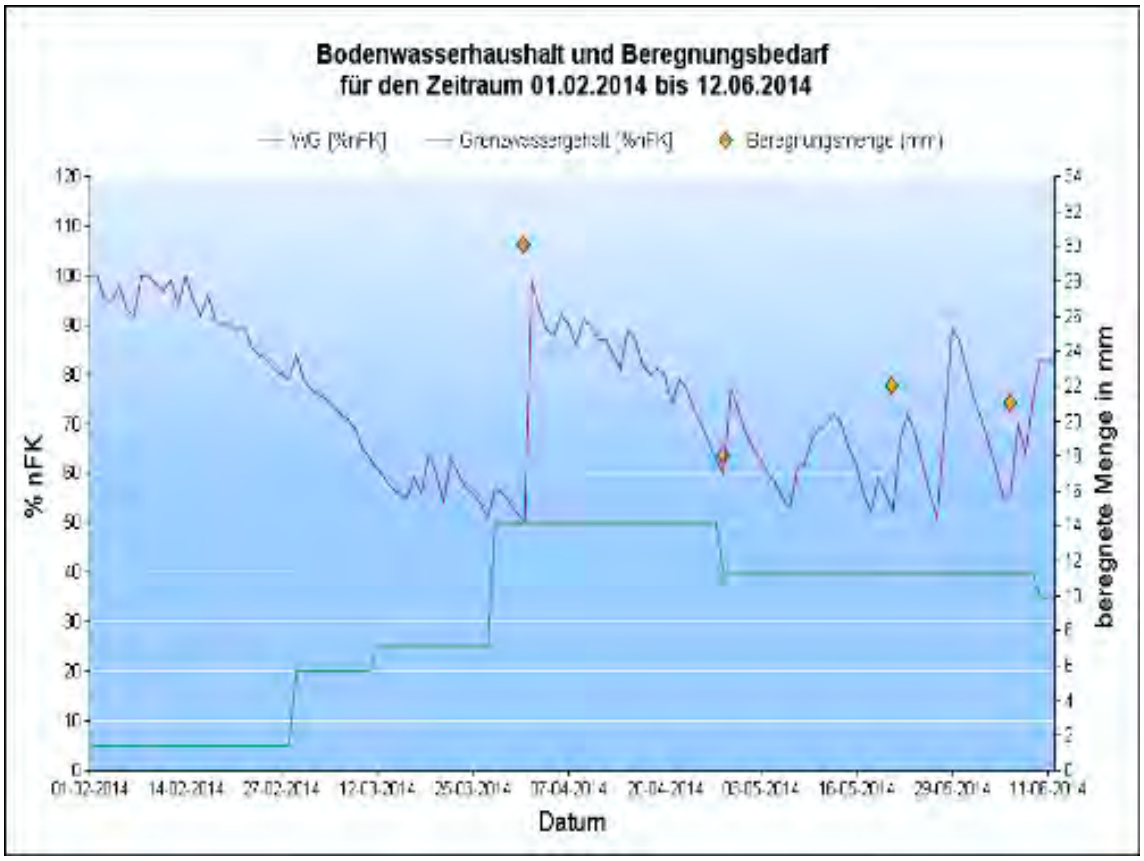
BOWAB Modell, irrigation planning

Landwirtschaftskammer Niedersachsen



Developement of soil moisture, critical value, date of irrigation

Landwirtschaftskammer Niedersachsen




advies projecten onderzoek internationaal
DLV plant
Welkcome
MTTF Meeting Drenthe
DLV Irrigation planner and new
instruction by
Bert Aasman DLV plant
+31653152389
17 june 2014
© DLV Plant

DLV Plant Advice and Reseach partner

Passion for Plants!

Jacco van der Weerd, Director DLV Plant

"DLV Plant appreciates its clients, partners and employees. I would like to thank DLV Plant clients and partners for the trust they have in us, and I would like to express my appreciation for all our employees who stand ready for our clients, and for each other, every day. It is my desire to work together on the innovative application of our knowledge and with this, to once again confirm our added value to entrepreneurs this year."

THE ORGANISATION Extension

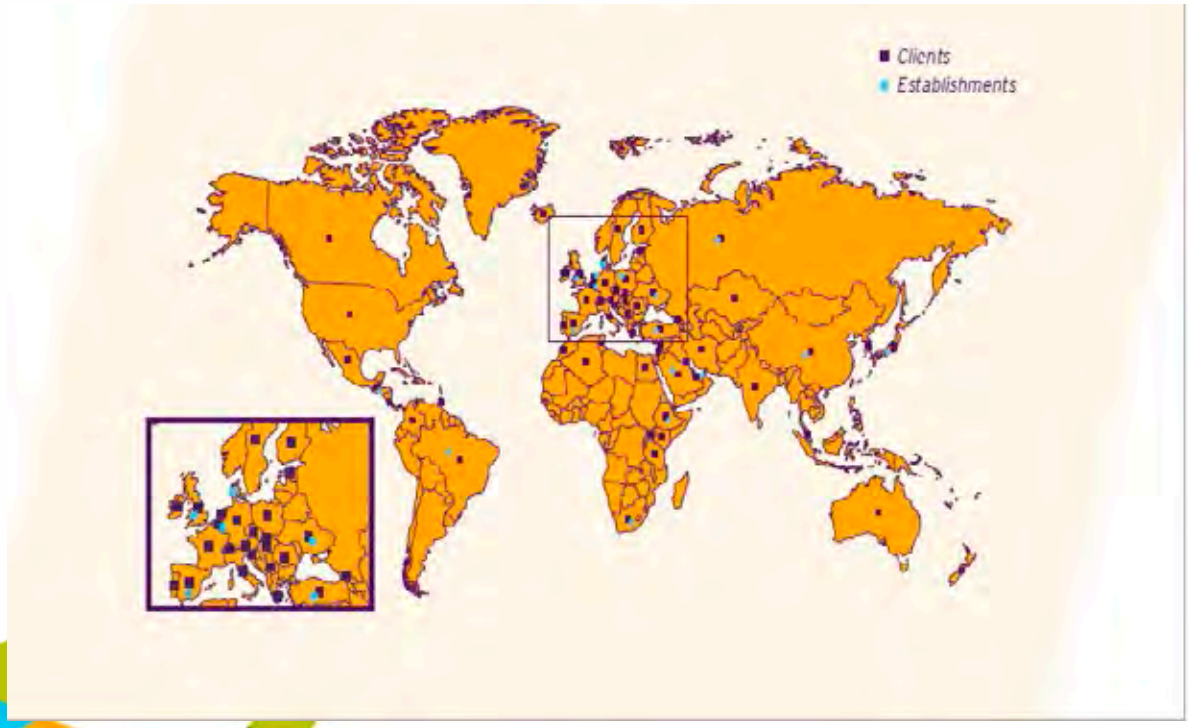
independent

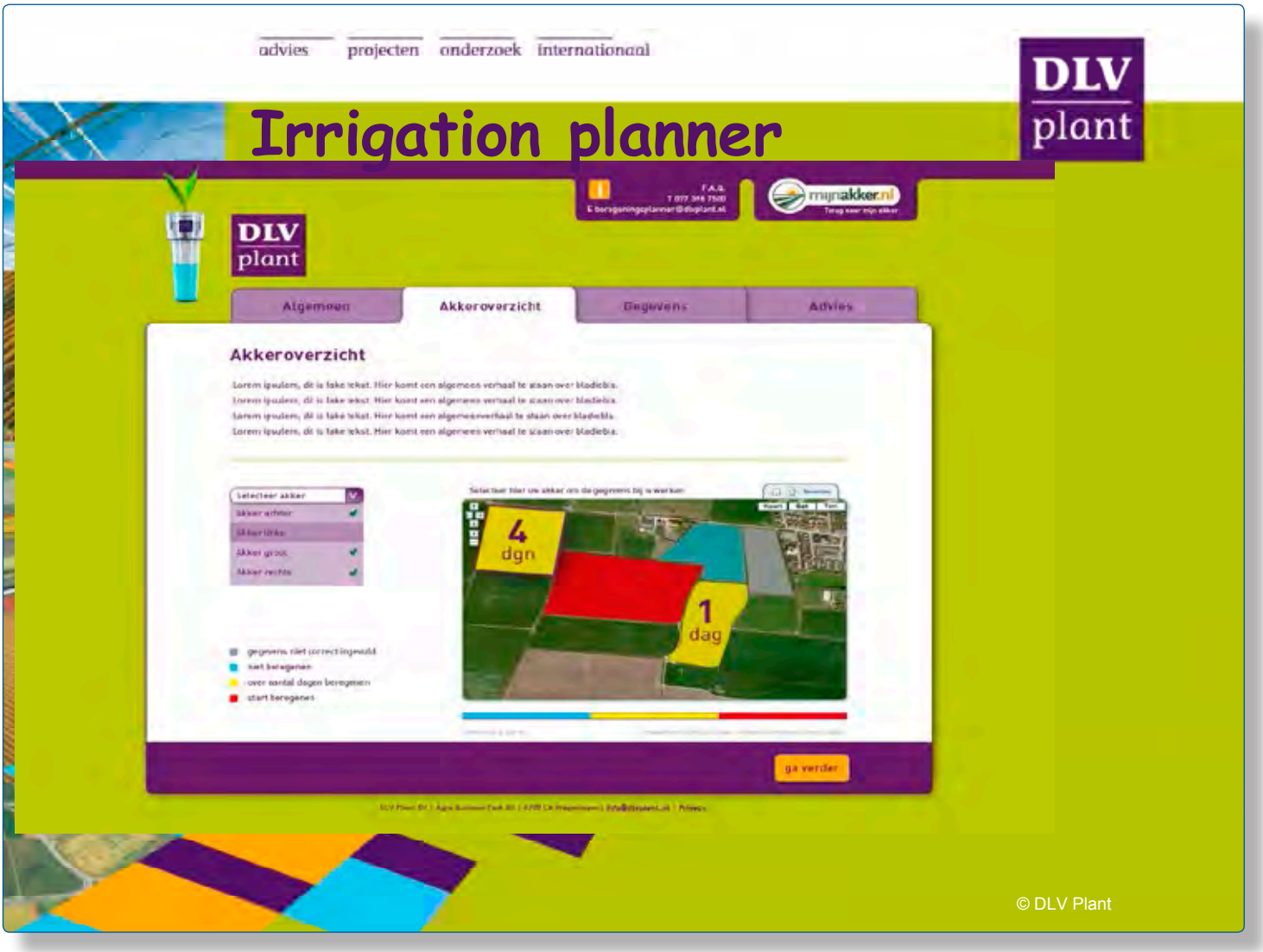
- Consultancy in practice
- Research/development
- Projects

THE ORGANISATION Extension

- 215 employes
- 9500 clients
- Cut flower, potted plant, greenhouse vegetables, arable farming, field vegetables, tree cultivation, fruit cultivation, strawberries, mushrooms and flower bulbs
- International: 55 countries:

THE ORGANISATION Extension




advies
projecten
onderzoek
internationaal
DLV plant
Irrigation planner
DLV plant
Algemeen
Akkeroverzicht
Gegevens
Advies
Akkeroverzicht
4 dgn
1 dag
ga verder
© DLV Plant

Irrigation planner: setup

- Providing advice about:
  - Irrigation yes / no
  - Moment to start irrigation
  - Amount of water to irrigate
- Gives overview
  - Situation of irrigation on the farm
  - Ranking of fields to irrigate
  - Per field
- Ready to use in arable crops and vegetables

Project with farmers

- 2012:30 farmers intensive and 68 extens
- potatoes, carrots and sugarbeets, leek, maize.
- Evaluation:
  - In is practical
  - Good advice with out cloud
  - Easy to manage
  - Irrigation planner and soil moisture sensor are additional, but can be used separate

Supply DLV Plant

- Soil mapping
  - Training
  - Self support

Training

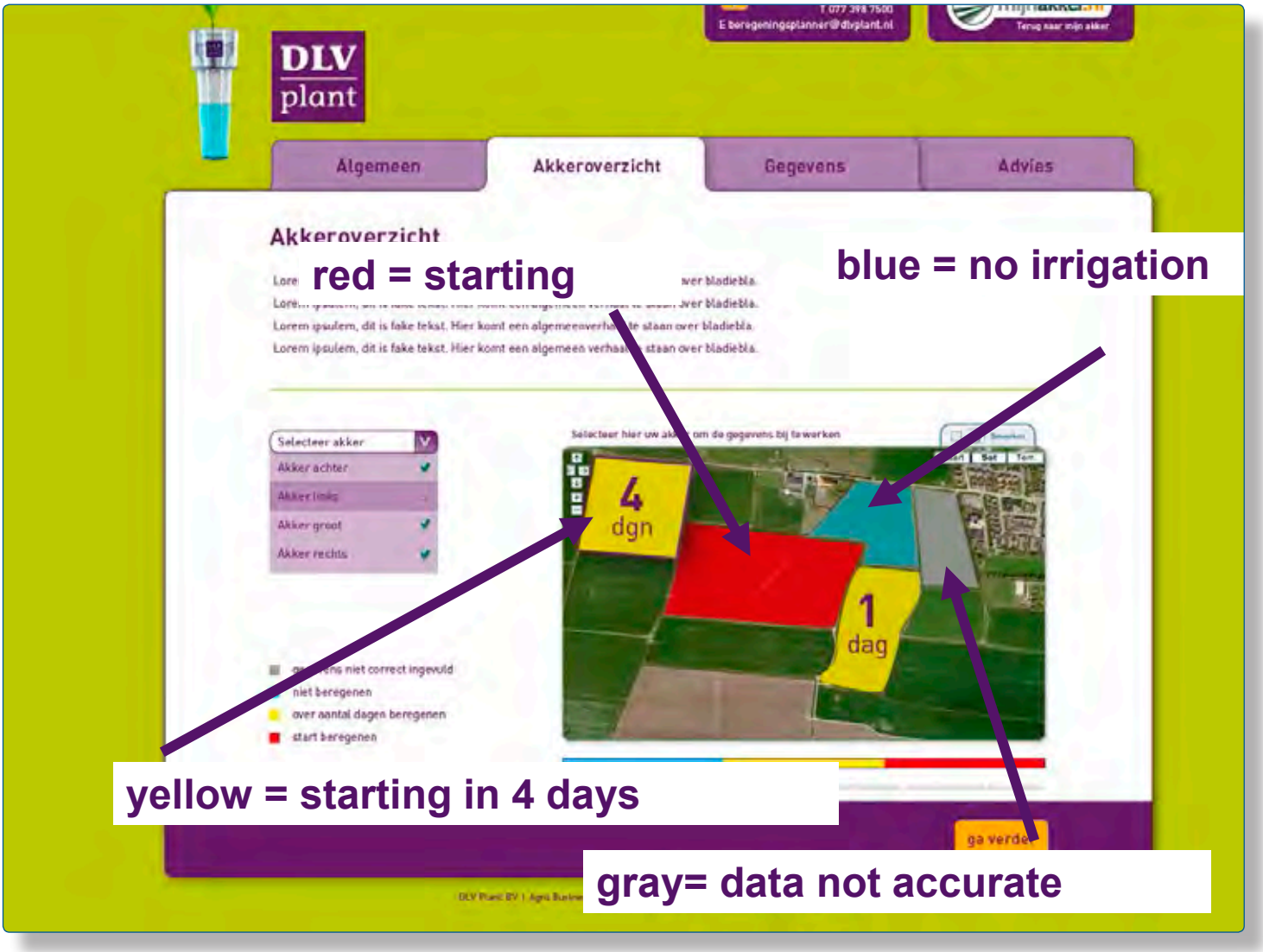
- Irrigation systems
  - How to use
  - Adjust irrigation system
  - Control irrigation system

Irrigation planner: active/passive-> advice

- **Active: Participant can change figures confirming the situation in the field such as:**

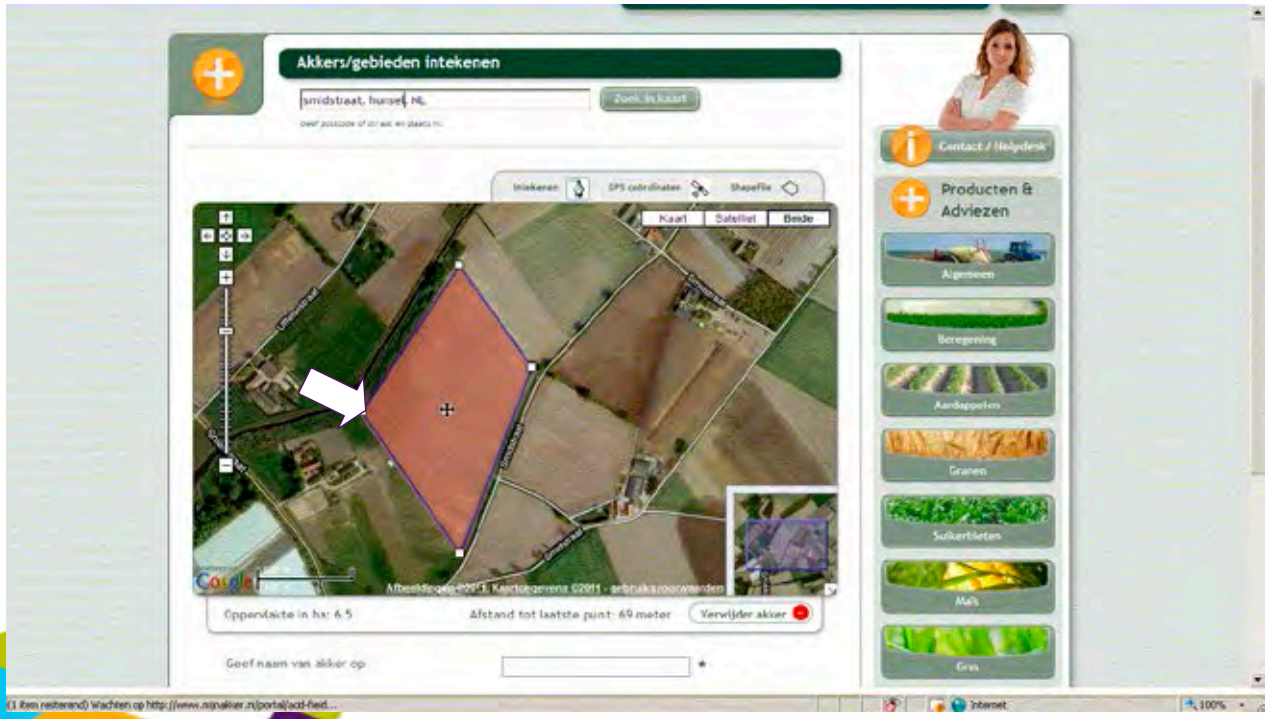
  Level of underground water, root zone, kind of soil, amount of rain, irrigation

- **Passive: Participant minimizes filling system with figures:**
  - Figures are taken automaticly from the system:
    - Kind of soil through "Stiboka"
    - Depth op root system (once) otherwise system
    - Amount of rain through radar images

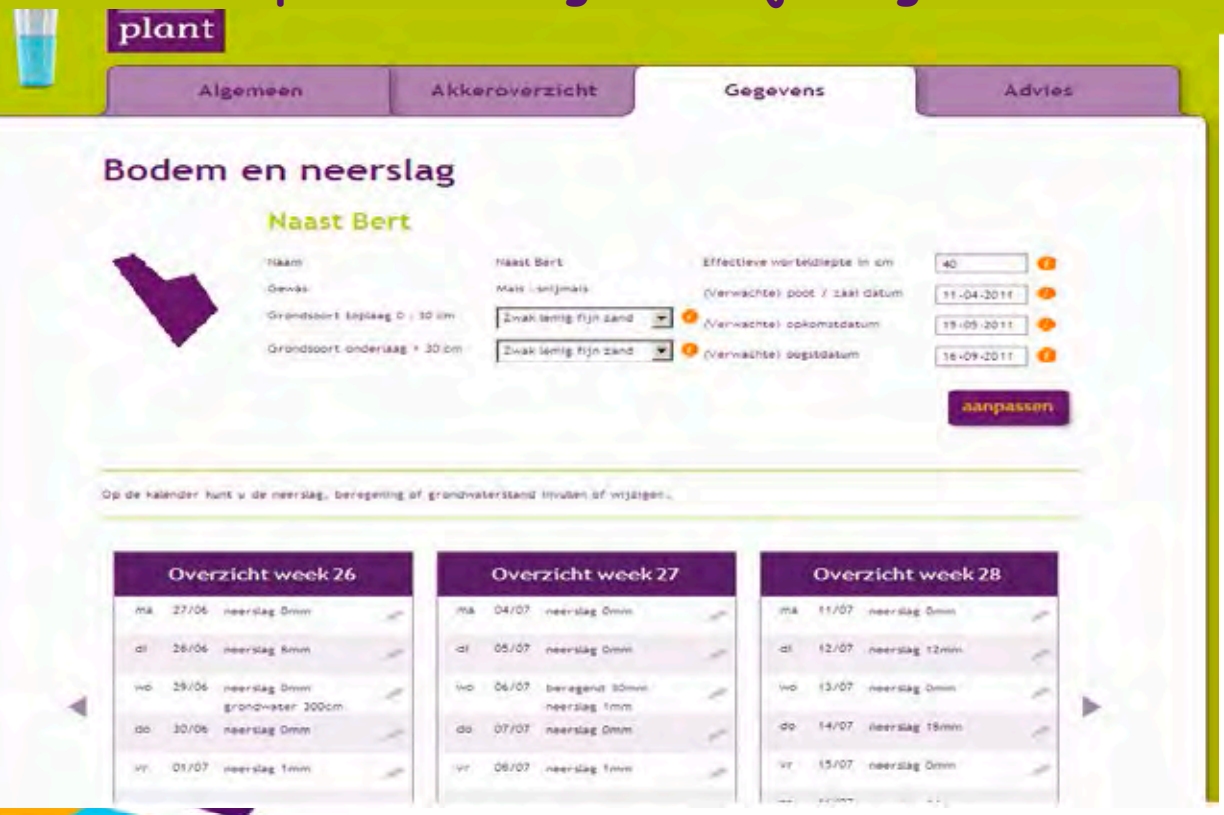

DLV plant
Algemeen
Akkeroverzicht
Gegevens
Advies
Akkeroverzicht
red = starting
blue = no irrigation
Selecteer akker
Akker achter
Akker groot
Akker rechts
niet beregenen
over aantal dagen beregenen
start beregenen
4 dgn
1 dag
yellow = starting in 4 days
gray= data not accurate

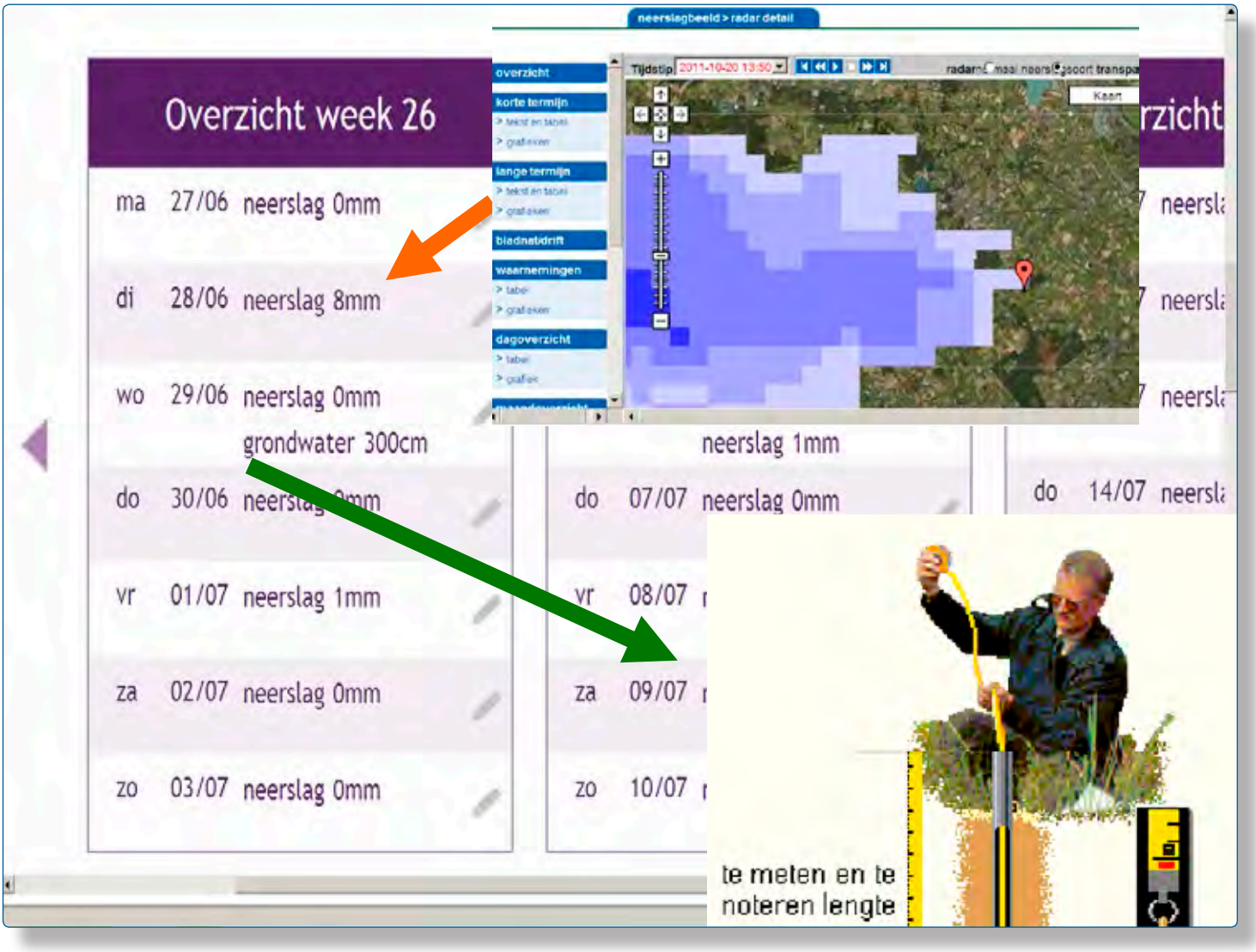
Step 1:boot into my field

Step 2: subscribe plot and crop

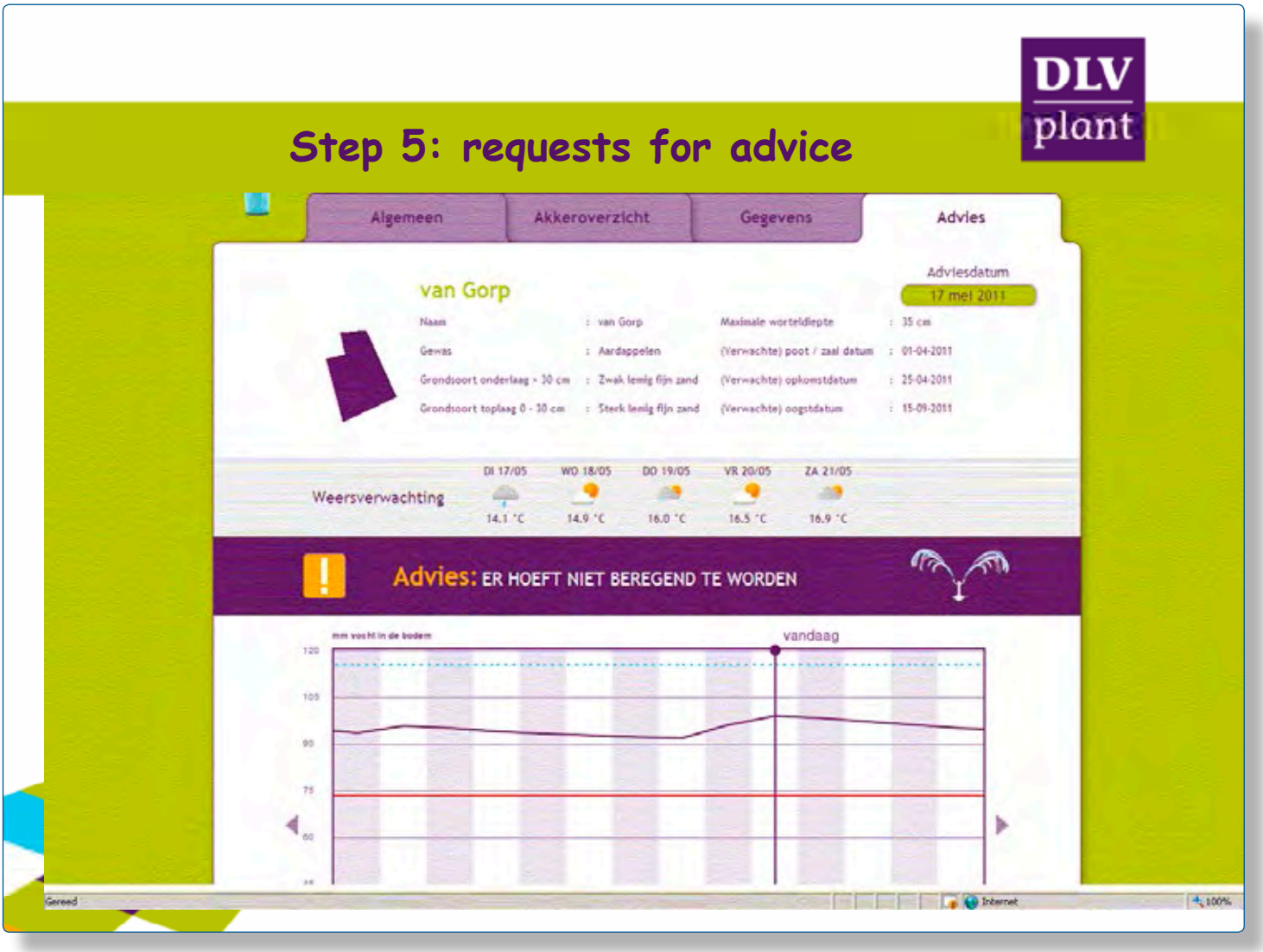


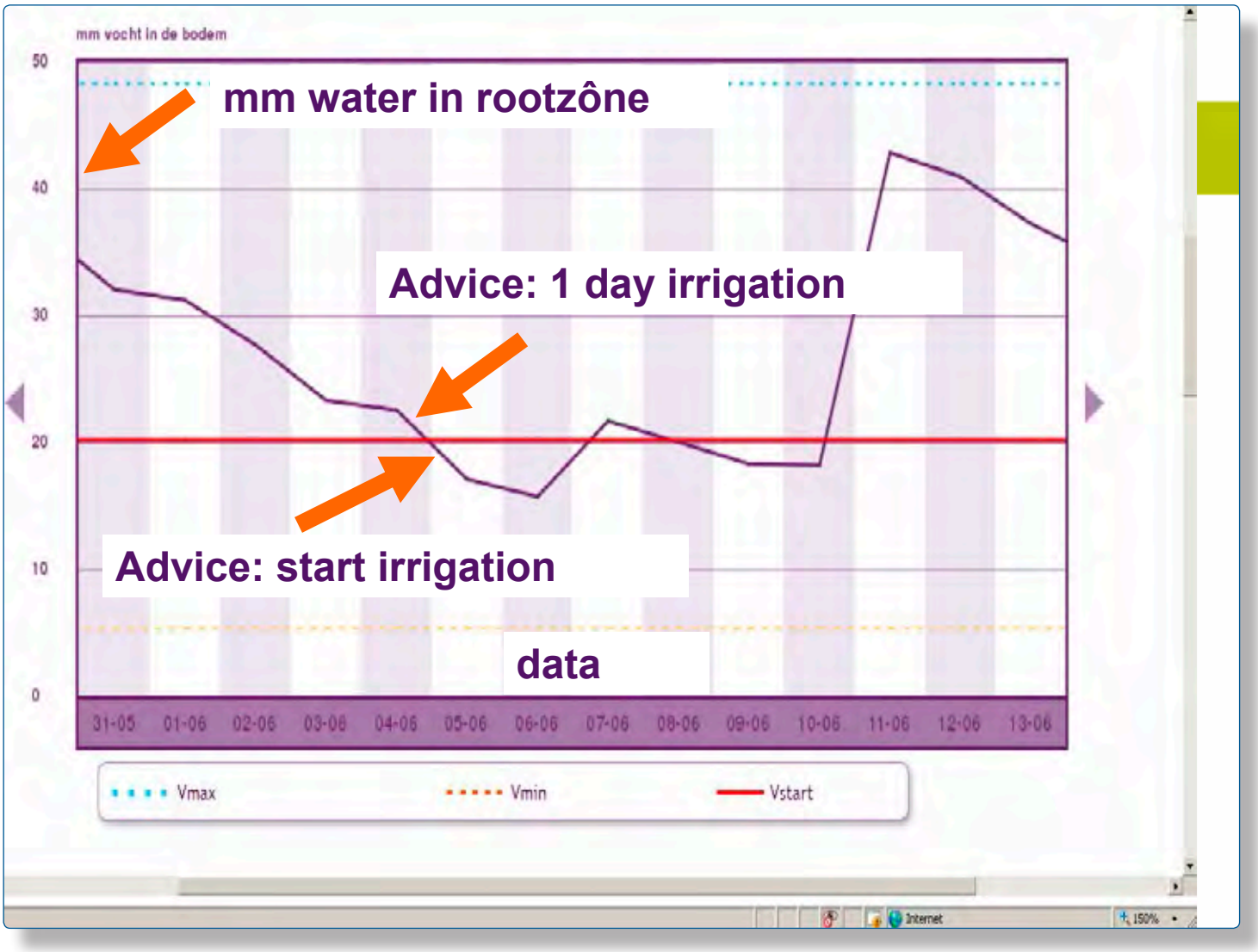
Step 3: Checking and adjusting

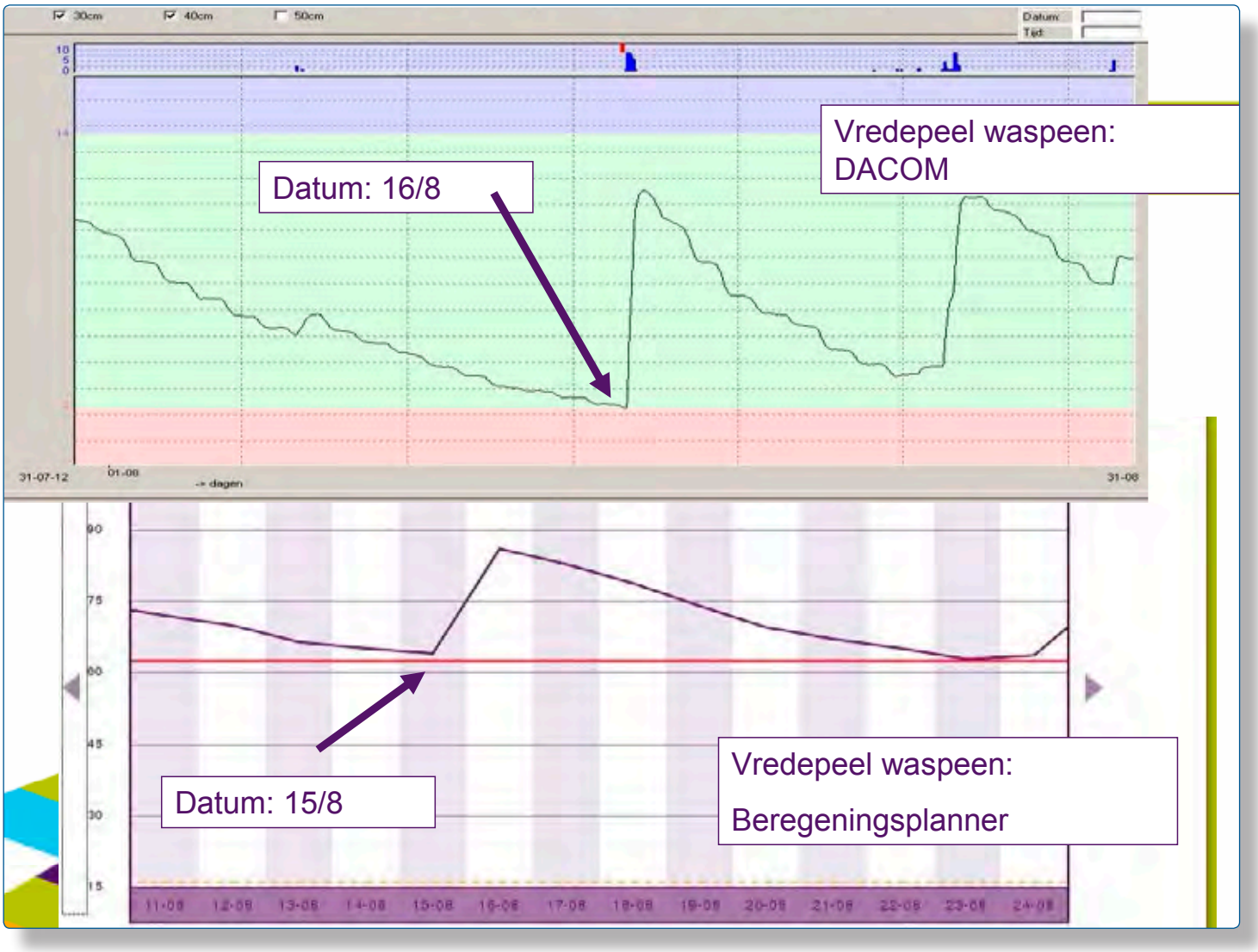


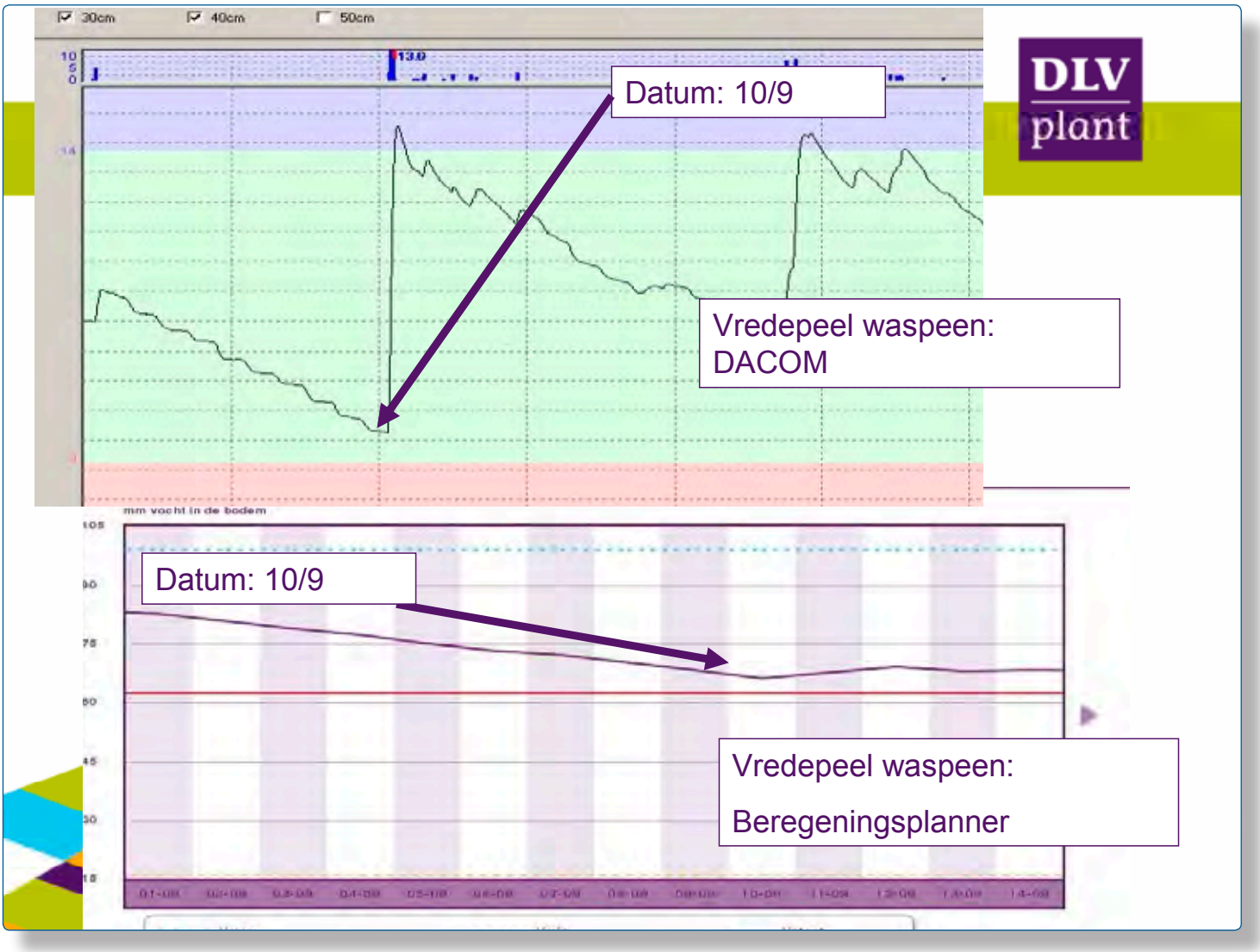

Overzicht week 26
ma 27/06 neerslag 0mm
di 28/06 neerslag 8mm
wo 29/06 neerslag 0mm
grondwater 300cm
do 30/06
vr 01/07 neerslag 1mm
za 02/07 neerslag 0mm
zo 03/07 neerslag 0mm
neerslag 1mm
do 07/07 neerslag 0mm
vr 08/07
za 09/07
zo 10/07
do 14/07
neerslagbeeld > radar detail
overzicht
korte termijn
lange termijn
biadnatdrift
waarnemingen
dagoverzicht
Tijdstip
Kaart
te meten en te
noteren lengte

Step 5: requests for advice




mm vocht in de bodem
mm water in rootzône
Advice: 1 day irrigation
Advice: start irrigation
data
50
40
30
20
10
0
31-05
01-06
02-06
03-06
04-06
05-06
06-06
07-06
08-06
09-06
10-06
11-06
12-06
13-06
Vmax
Vmin
Vstart

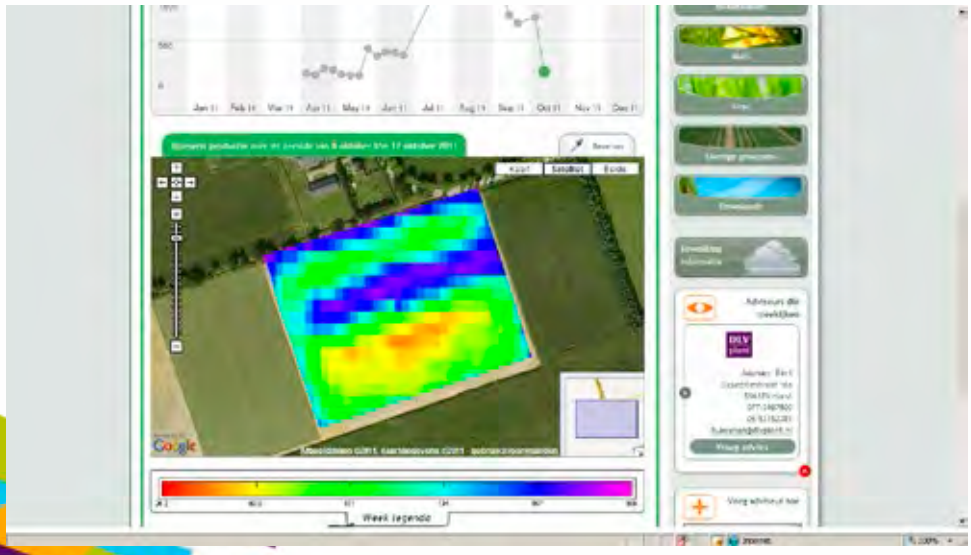

Datum: 16/8
Vredepeel waspeen:
DACOM
Datum: 15/8
Vredepeel waspeen:
Beregeningsplanner


30cm
40cm
50cm
Datum: 10/9
Vredepeel waspeen:
DACOM
mm vocht in de bodem
Datum: 10/9
Vredepeel waspeen:
Beregeningsplanner

Evaporation

Evaporation = crob x stadium x reference evaporation

Measured by satellite and weatherstation



Cloud problems

DEZE MAAND GEEN RUIMTEBLIK, OMDAT BASFOOD AL 2,5 MAAND GEEN BEELDEN KAN LEVEREN.

Bewolking tart MijnAkker

Hardnekkige bewolking speelt MijnAkker.nl van Basfood dit groeiseizoen stevig parten. Nederland is al weken bedekt door een dicht wolkendek. Het gaat vooral om de [illegible]gere [illegible]chtlage[illegible]. S[illegible] [illegible]t de lu[illegible] [illegible] de [illegible] [illegible] wolkt, maar [illegible] satelliet vanui[illegible] ruimte een soort heiigheid waar niet doorheen valt te fotograferen.

Hoewel de satelliet vijf keer per week 'overvliegt', zijn van een groot deel van de percelen in Nederland door de bewolking al sinds 1 juni geen goede opnames verkregen. Basfood stopte daarop met het leveren van biomassabeelden.

Omdat de beelden juist in het groeiseizoen niet zijn ververst, zijn vele telers teleurgesteld in de beeldenservice.

Nu werkt Basfood nog met optische satellietbeelden. Basfoods researchafdeling werkt aan technieken die op termijn ook door de wolk[illegible]n heen ku[illegible] [illegible] z[illegible] [illegible]dar[illegible] te[illegible]nol[illegible]gie.

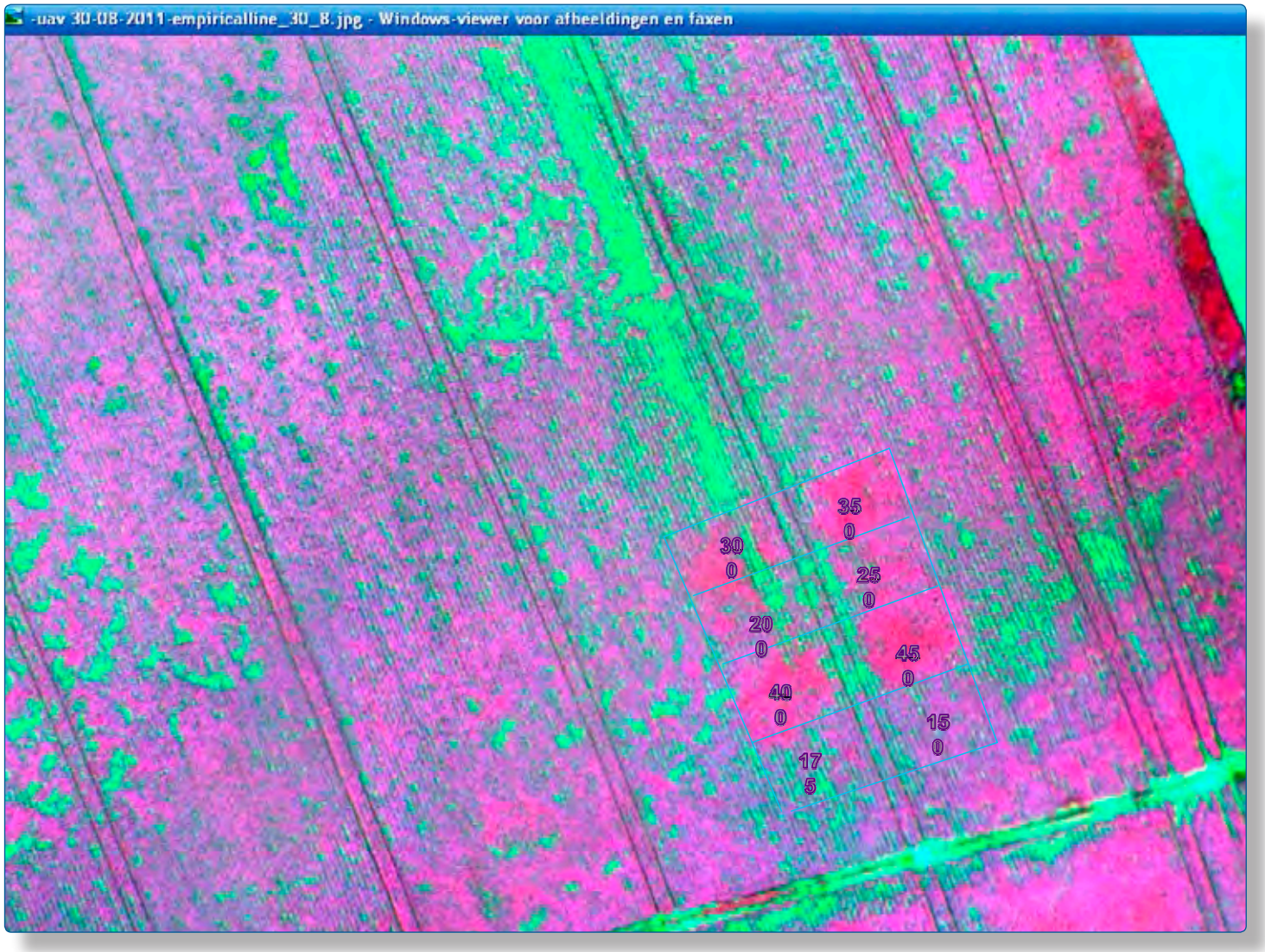
[illegible]asfood [illegible] erg[illegible]ns volgend jaar praktijkrijp te hebben, zodat hardnekkige bewolking minder snel roet in het eten kan gooien. ■

Al sinds juni zorgen wolken ervoor dat er geen satellietbeelden gemaakt zijn.

BOERDERIJ 96 — no. 47 (23 augustus 2011)

New way for solutions

- Airplane and hyperspectral images for precision agriculture.


-uav 30-08-2011-empiricalline_30_8.jpg - Windows-viewer voor afbeeldingen en faxen
35
0
30
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25
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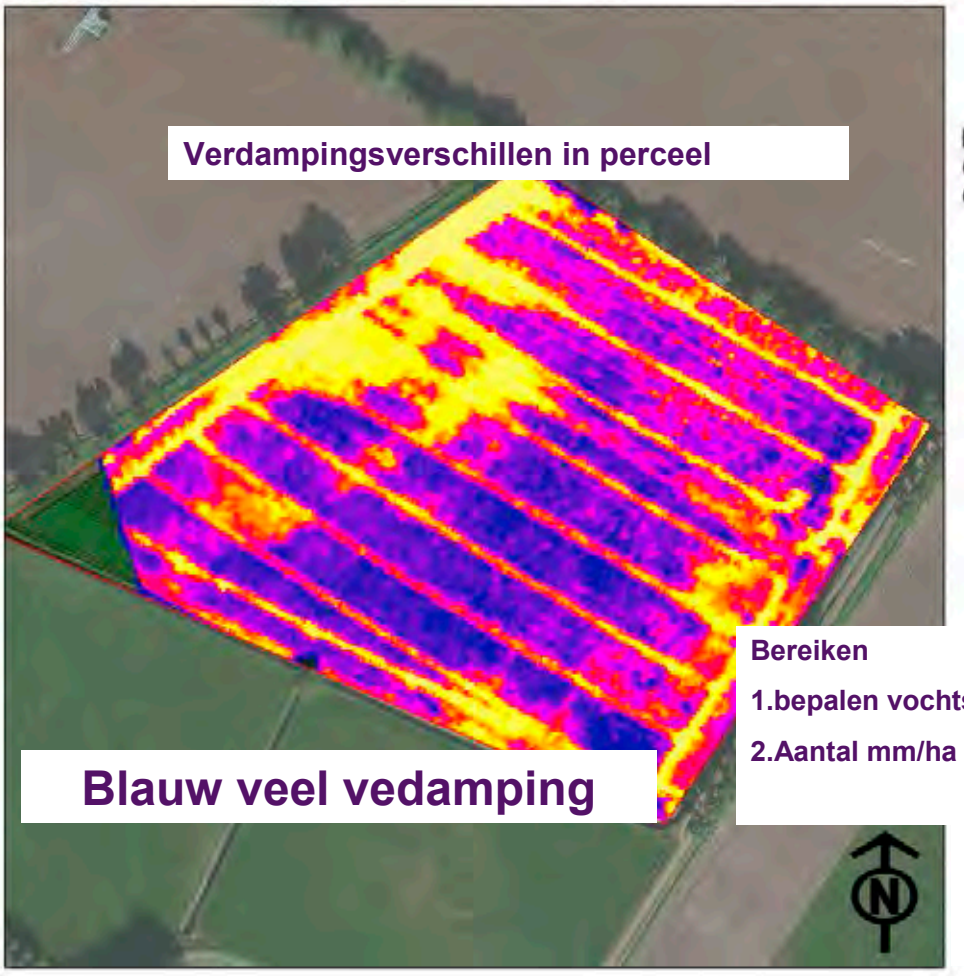
20
0
45
0
40
0
15
0
17
5



MULTISPECTRALE GEWASOPVOLGING
VLUCHT 30-06-2012

Naam perceel:
Gewas: Aardappels
Oppervlakte: 6,57Ha

Temperatuur
Laag Hoog

Opmerkingen:

Hoge temperaturen voor kale grond en laagste voor gewas met hoogste biomasa.
Hogere temperatuur in gewas kan duiden op ziektes

Bereiken

1.bepalen vochtstres Vstart

2.Aantal mm/ha

DLV plant

Situation now june 2014

New irrigation planner by grow curve only grass, potatoes and maize

Testing hyperspectral images

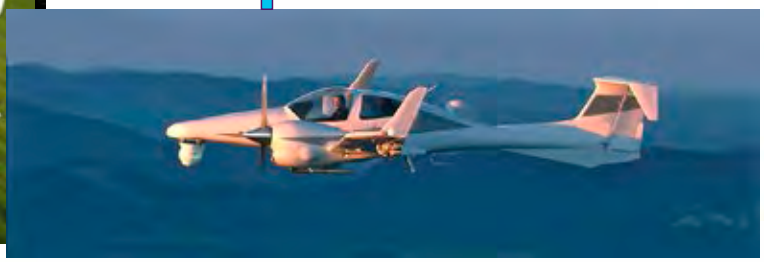
Study to combine data also moisture sensors

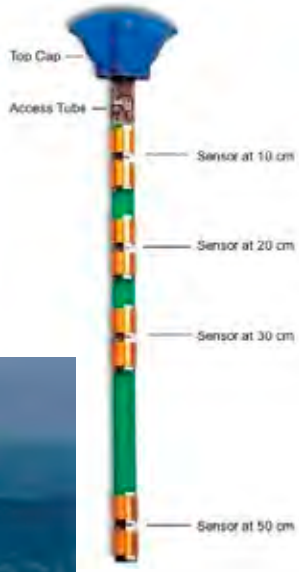
Combining systems and techniques

DLV plant

"Blackbox"

Bechmark / Advisory system





Questions

- Do you have any question?

For more information en instructions:

Bert Aasman, manager DLV Plant
Postbus 6207,
5960 AE Horst
Netherlands

E-mail: b.aasman@dlvplant.nl
Telefone: +31653152389

Remote control

- Images and helpdesk

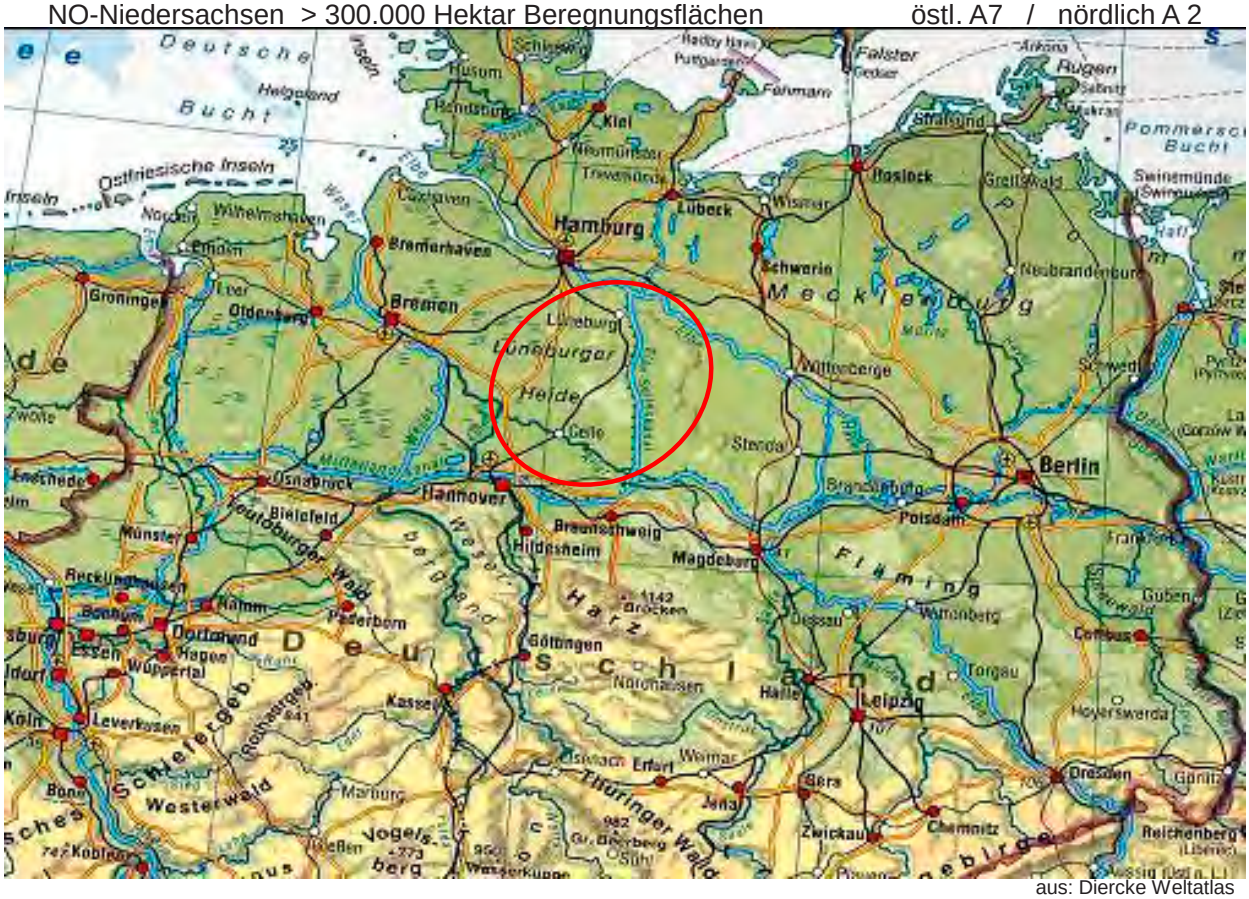
Landwirtschaftskammer Niedersachsen

New developments in Northeastern Lower Saxony in the field of efficient and sustainable water use by farmers

Angela Riedel, Irrigation Unit, Hannover
Elisabeth Schulz, Regional Office Uelzen

Exchange at Provincie Drenthe, Exloo, NL, June 17.-18., 2014

NO-Niedersachsen > 300.000 Hektar Beregnungsflächen östl. A7 / nördlich A 2



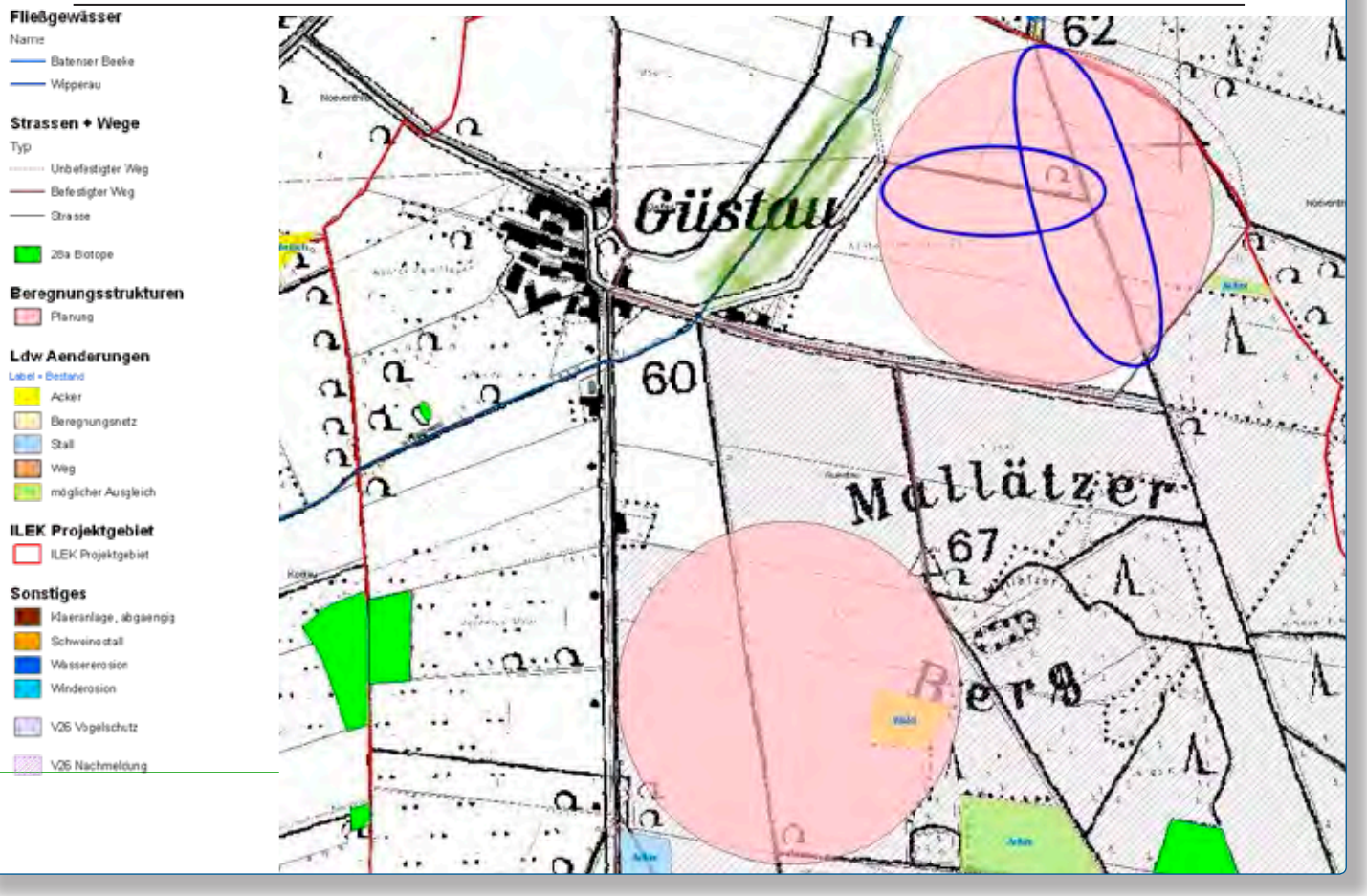
aus: Diercke Weltatlas

- Subkontinentales Klima => Wasserbilanzdefizit während der Vegetationsperiode 100-200 mm …
- leichte Böden => nutzbare Feldkapazität <100 mm

Landwirtschaftskammer Niedersachsen

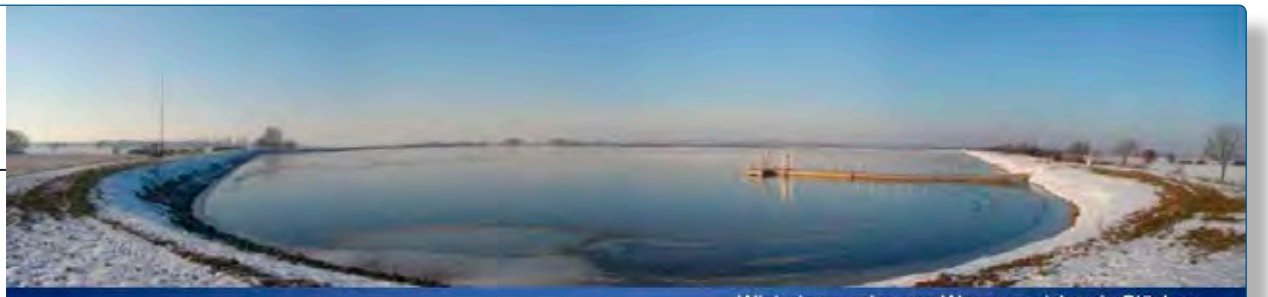
Aim: Tackling WFD

Inprovement of Waterefficiency => Innovations towards smaller pivot irrigation



Storage of sugar beet processing Water

750.000 m³ Speicher Stöcken (First filling 2004)



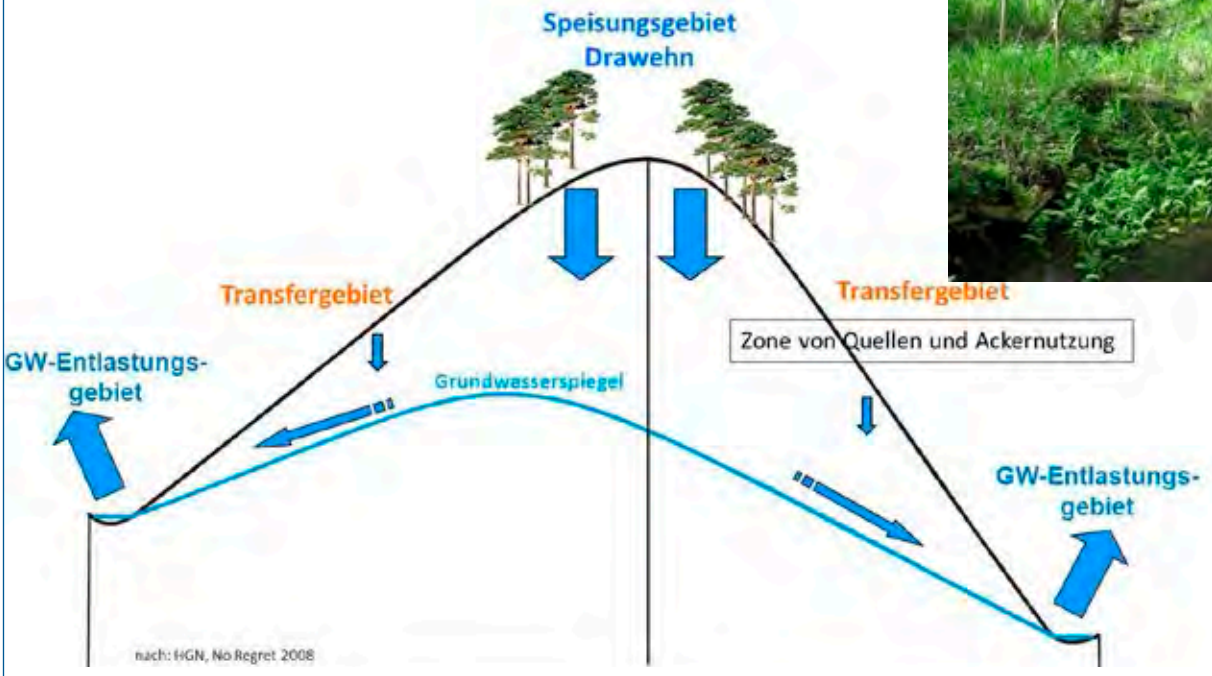
Winterimpression von Wasserspeicher in Stöcken

400.000 m³ Speicher Borg

First filling September 2014

Increase of Groundwater Supply

Landwirtschaftskammer Niedersachsen



Landwirtschaftskammer Niedersachsen

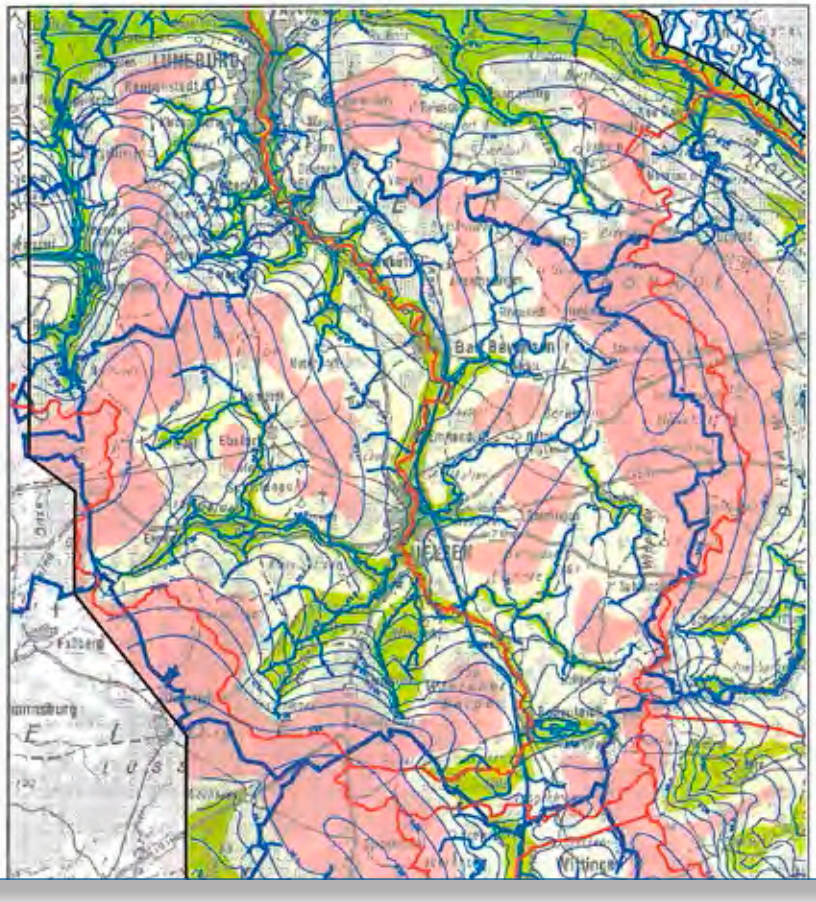
Pink = major recharge areas

=> Best for „active seepage“

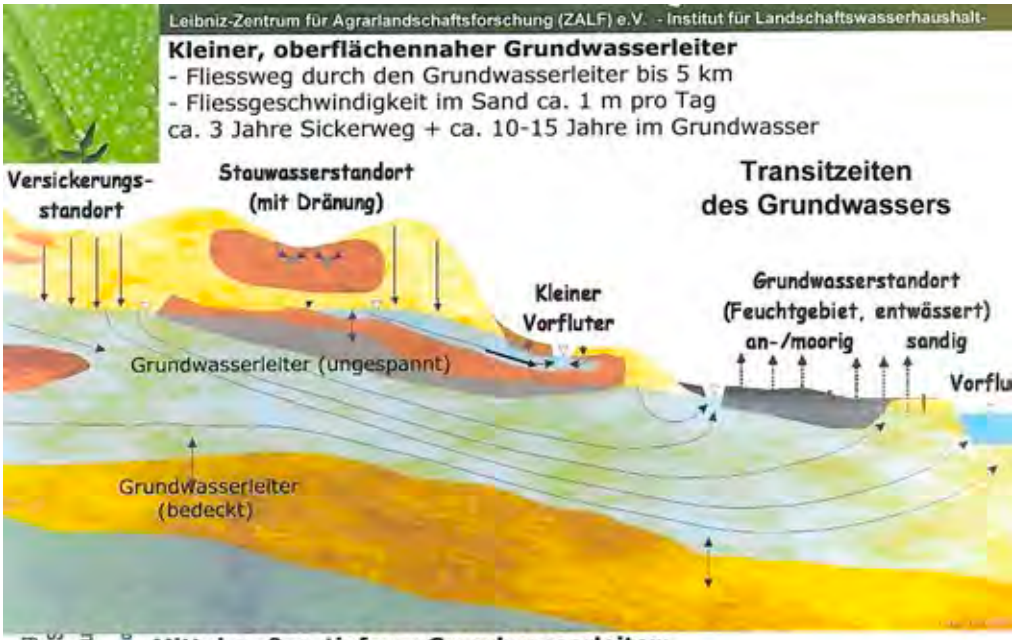
Green = zone of discharge

White = transit zone

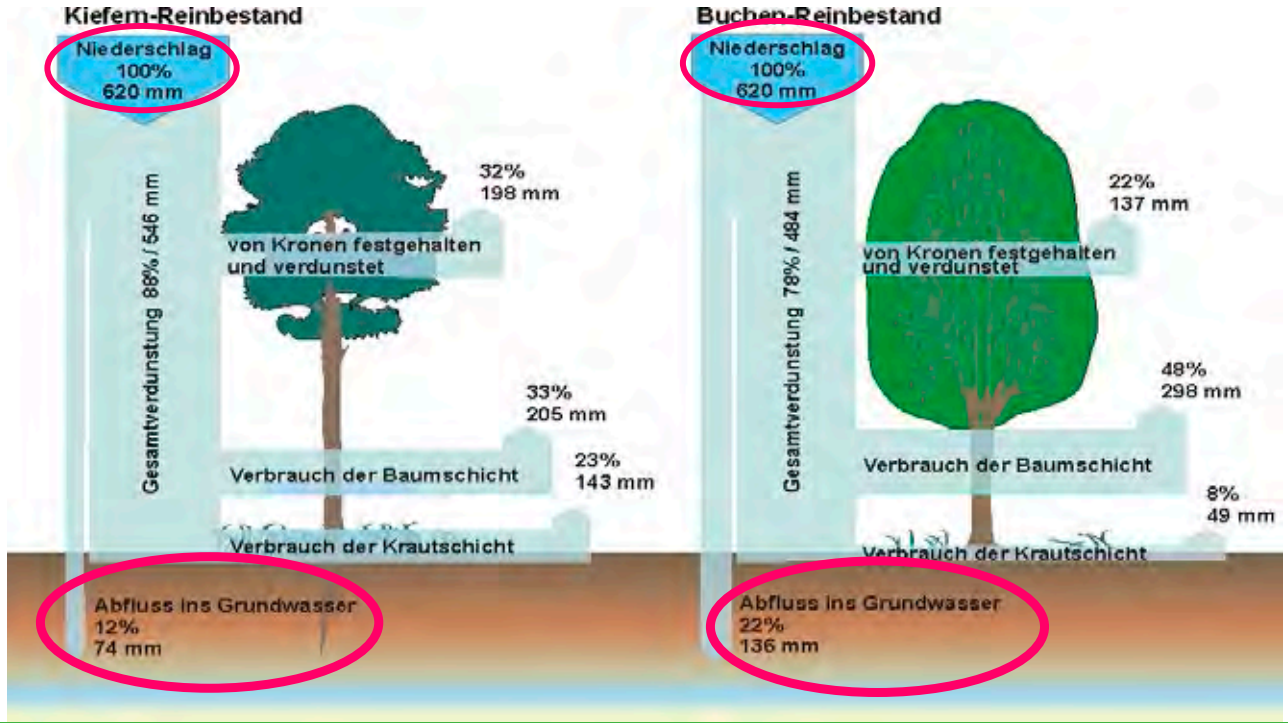
Foundation of new regional **central irrgation boards**
Aim => joint measures



Landwirtschaftskammer Niedersachsen



Reconstsruction of coniferous forest to decidous forest



KLIMZUG-NORD
Strategische Anpassungsansätze
zum Klimawandel in der Metropolregion Hamburg

Gefördert durch das:

Bundesministerium
für Bildung
und Forschung

Rain Harvesting Kettelstorf

Construction of the new seepage pond (2011)

Seepage of cleaned wastewater in forest

Landwirtschaftskammer Niedersachsen

Landwirtschaftskammer Niedersachsen

Landwirtschaftskammer Niedersachsen

Landwirtschaftskammer Niedersachsen

Thank you for your interest!

KNOWLEDGE CENTRE FOR AGRICULTURE

Irrigation and WFD in Denmark

Knowledge Centre
for Agriculture

PARTNER IN
DLBR
DANISH AGRICULTURAL ADVISORY SERVICE

KNOWLEDGE CENTRE FOR AGRICULTURE

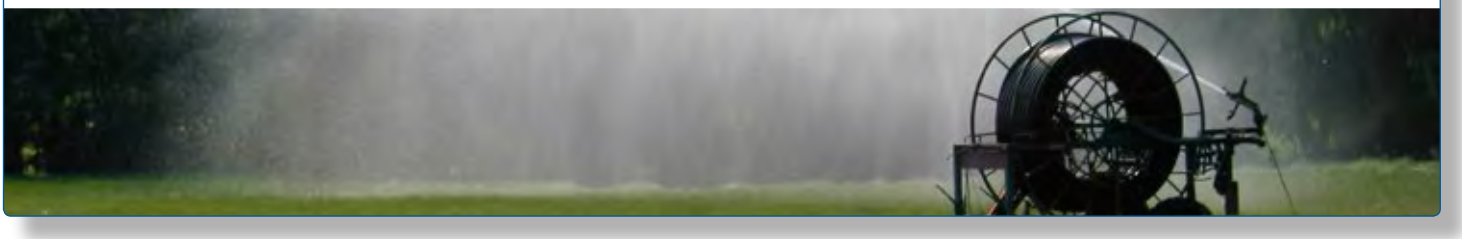
Danish Agricultural Advisory Service

- 31 regional advisory companies (3,200 employees)
- Knowledge Centre for Agriculture in Skejby - VFL (500 employees)
  - Communication of knowledge to the agricultural sector
  - Development projects
  - Management programs
  - Owned by the organisation 'Danish Agriculture'
  - Non-profit

KNOWLEDGE CENTRE FOR AGRICULTURE

Irrigation in Denmark

- Irrigation on 17 % of the agricultural area in DK
- Irrigation is most important in the western part of DK
  – up to 50 % of the cultivated area has irrigation
  - available water at field capacity is only 60-70 mm on typical soils in this region
- Irrigation is common on farms growing potatoes and on many dairy farms – but also on farms with pig production
- Mainly sprinkler gun irrigation.
- 96 % of all water for irrigation is ground water.

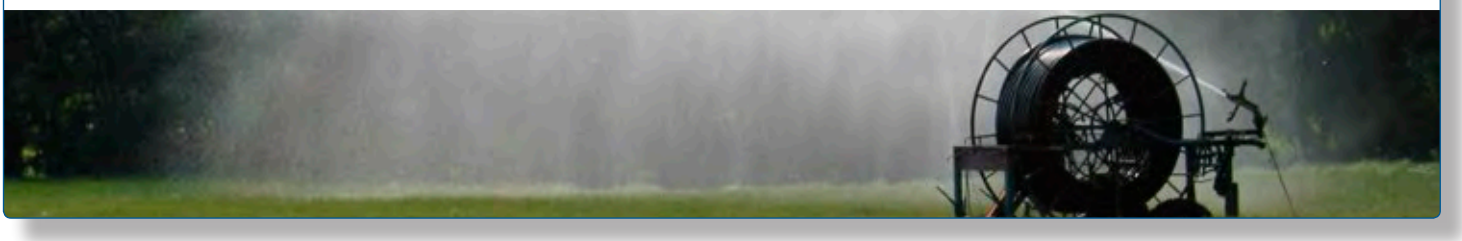


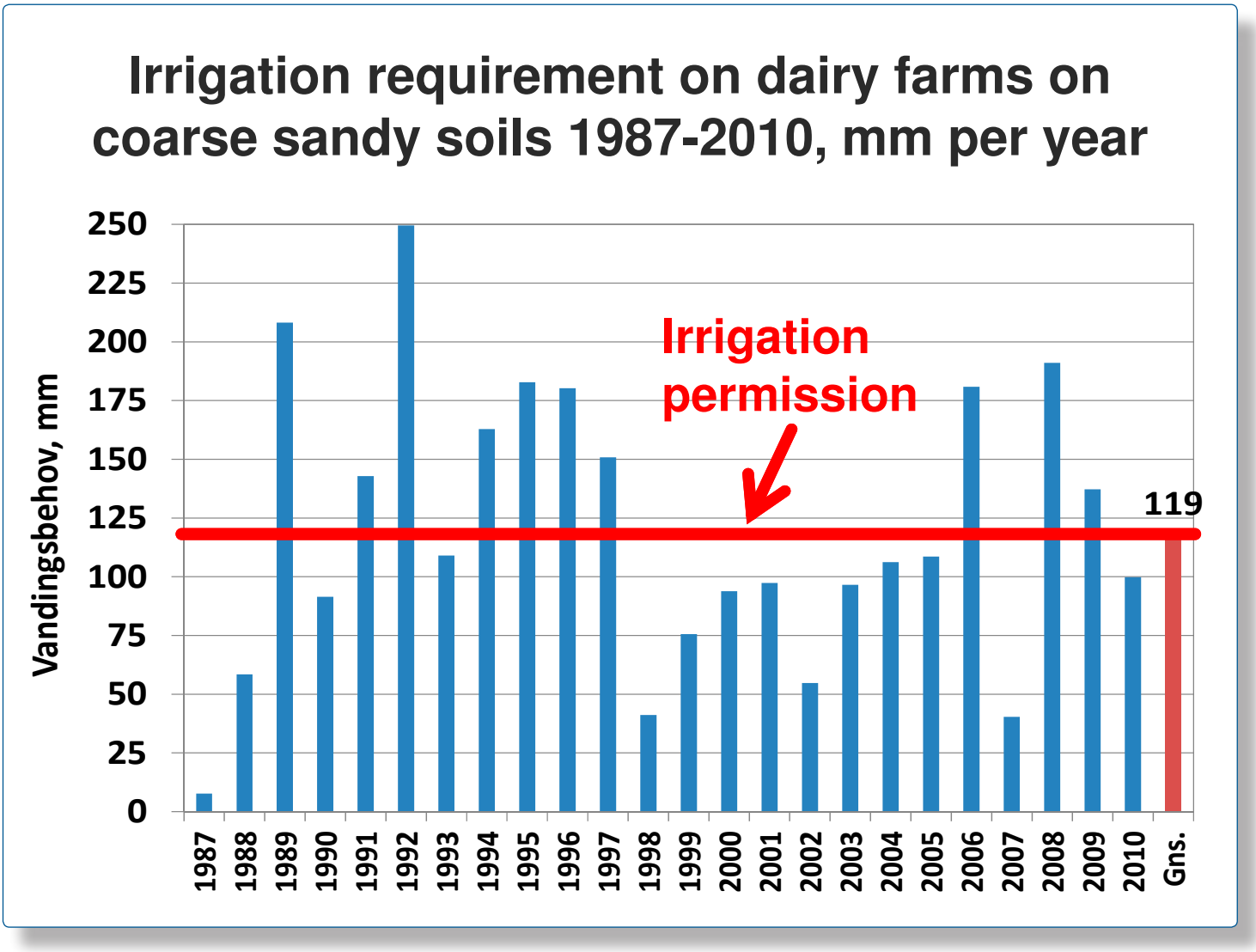
Irrigation permissions

	Per year	
Ringkøbing county	120 mm	1.200 m^3/ha
Other counties – JB 1	100 mm	1.000 m^3/ha
Other counties – JB 3	75 mm	750 m^3/ha

Irrigation permissions are issued for 15 years
Permissions depends on soil type: 750-1200 m^3/ha/year

The permissions corresponds to the <u>average</u> irrigation requirement over a long period of years




Irrigation requirement on dairy farms on coarse sandy soils 1987-2010, mm per year
Vandingsbehov, mm
250
225
200
175
150
125
100
75
50
25
0
Irrigation permission
119
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Gns.

KNOWLEDGE CENTRE FOR AGRICULTURE

Irrigation management

- Irrigation decision support tool: Calculation of water deficit and calculation of yield loss if no irrigation water is applied
- Vandregnskab Online is used by advisers and 500 farmers.

Mark	JB	Afgrøde	0 50 100 150 mm	Vandet mm	Balance mm
4-0	1	Vinterhvede		0	-32

	27/5	28/5	29/5	30/5	31/5	1/6	I alt periode
Vandbalancen uden markvanding, mm	-32	-35	-38	-41	-44	-45	
Udbyttetab uden markvanding pr. døgn (pct)	0,4	0,4	0,8	1,2	0,8	0,1	3,7
Tab uden markvanding pr. døgn (kr. pr. ha)	15	19	54	86	57	0	231

Tab uden markvanding er beregnet ved et udbytte på 75 hkg pr. ha og en afgrødepris på 130 kr. pr. hkg.

KNOWLEDGE CENTRE FOR AGRICULTURE

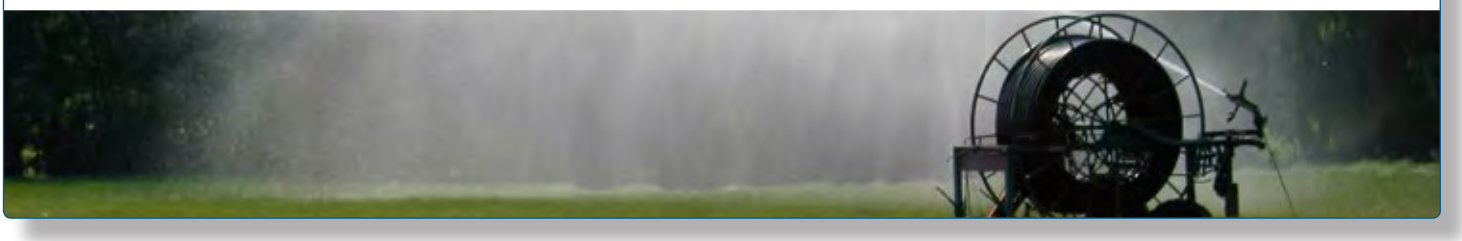
Administration of permissions for groundwater abstraction for irrigation

- Abstraction of water for irrigation has a lower priority than abstraction of water for other purposes
- Abstraction of water for irrigation is already limited in many areas due to exceeded impact on stream flow
  - No new permissions are issued
- Implementation of the Water Framework Directive may result in further restrictions on irrigation
  - Maybe less water can be used for irrigation in some areas in the future

KNOWLEDGE CENTRE FOR AGRICULTURE

Less water for irrigation?

- In the western part of DK ground water resources are sufficient (Precipitation per year: 800-1100 mm)
- Too big reductions in stream flow are critical for ecosystems in streams and rivers
- Permissions for irrigation are limited by a requirement related to a maximum reduction of low flows in streams (typical 10 % of median minimum flow)
- Lowering of the ground water table may be critical for some wet terrestrial ecosystems.

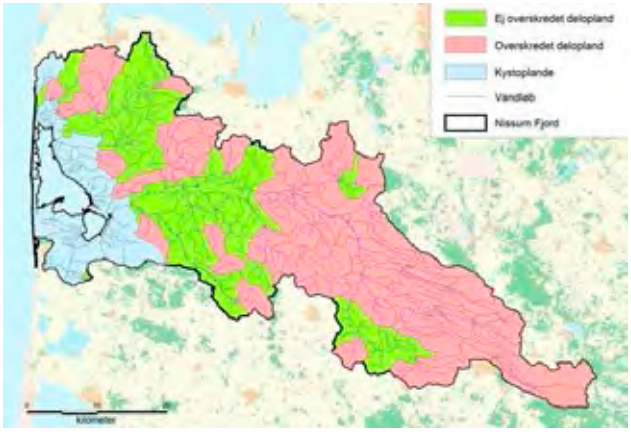


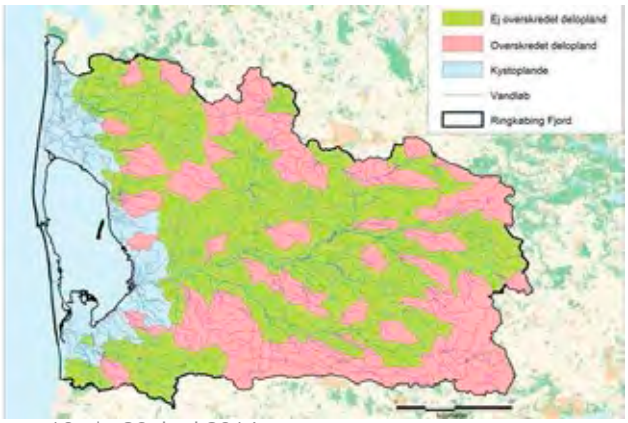
Requirement values for maximum effect of the water flow in streams

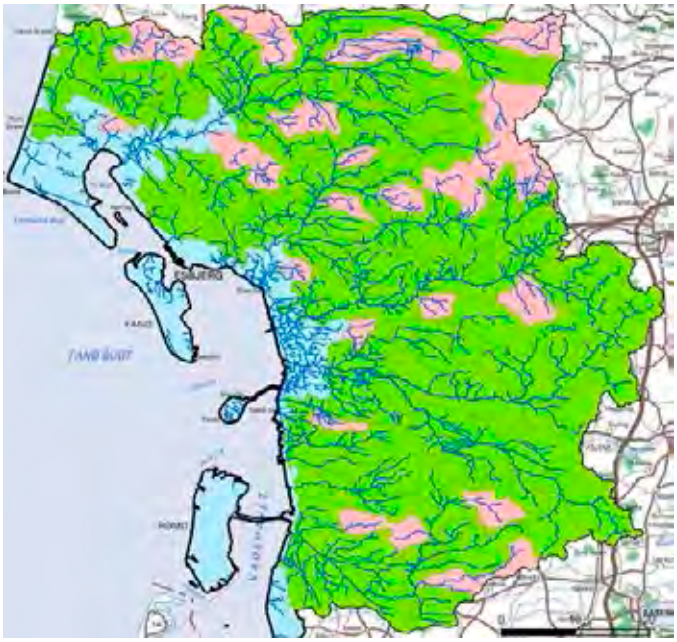
High ecological status		**5 %**
Good ecological status	**Small streams < 2 m width**	**10 %**
	Streams > 2 m (spawning and juvenile growth of water salmonids or protected species/nature)	**10 %**
	Other streams > 2 m width	**15 - 25 %**

- Requirement values are from 1979 (MST Water supply Instructions1979).
  Scientific basis missing.
- The same for all streams. Automatic linkage to stream objectives.

Red areas: Reduction of irrigation?



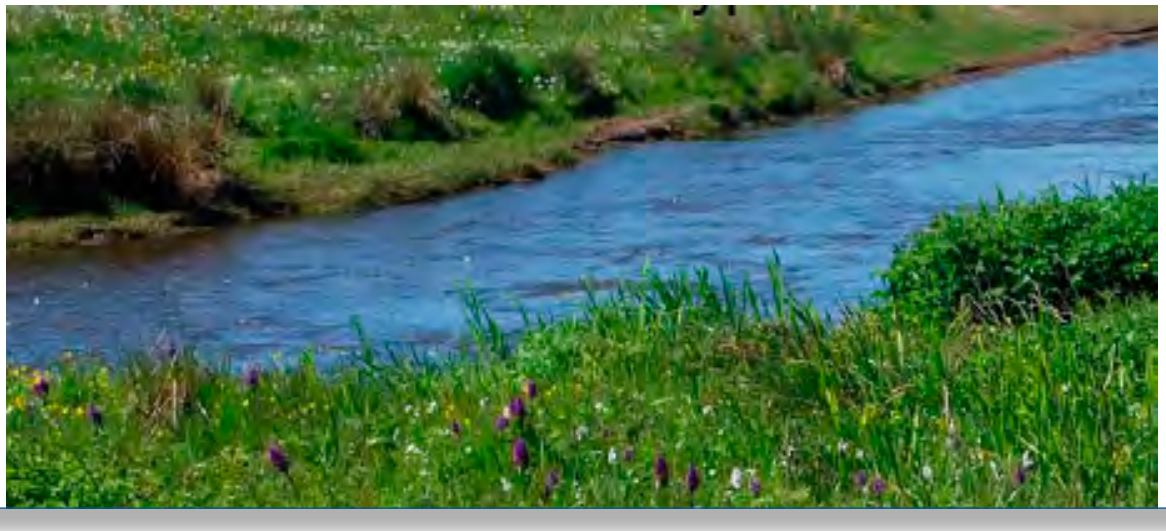




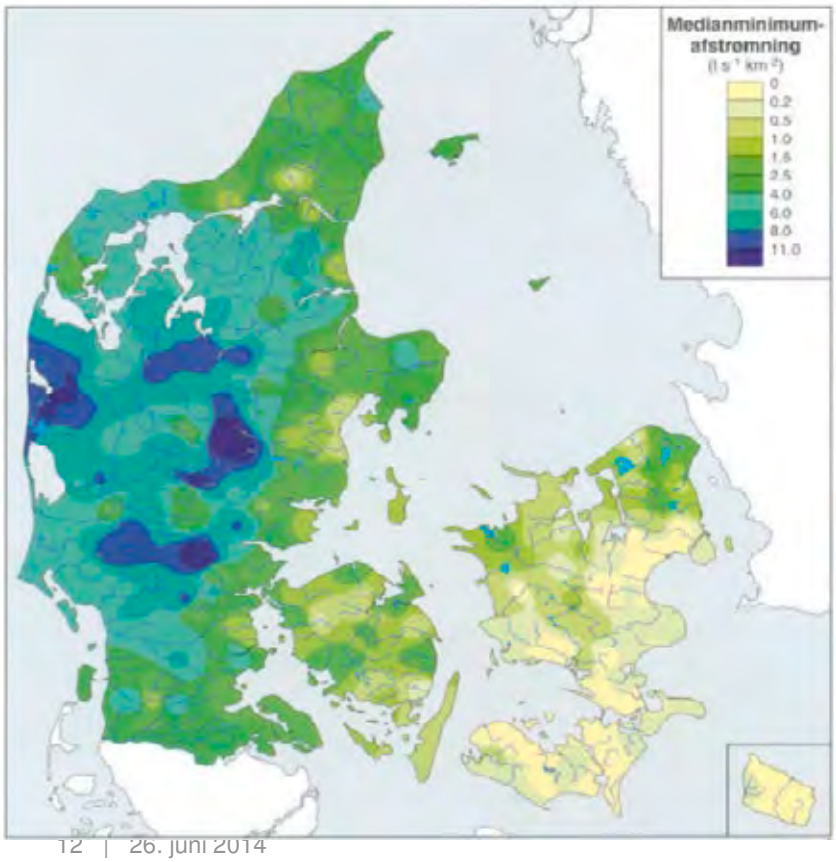
From draft versions of water plans for 2009-2015

”Irrigation” has been postponed to the next generation of WFD plans (2016)

- New calculations (new method) of the impact on stream flow from abstraction of ground water are prepared in 2014 (next generation of WFD plans)
- New limits for maximum reduction of stream flow are also under preparation



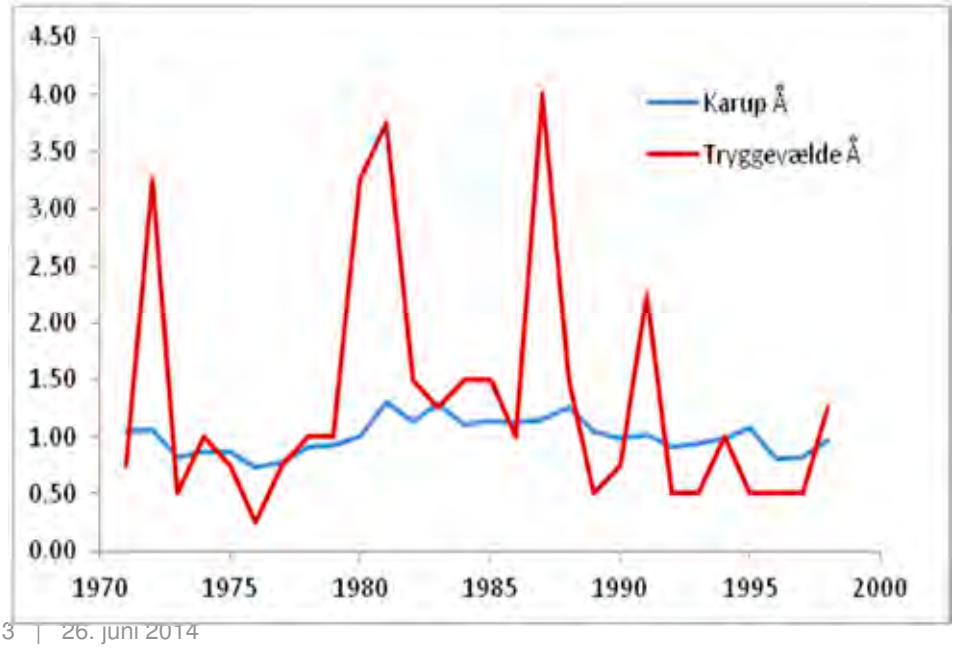
Very water rich streams in Western Jutland in the summer



Water flow (medianmin.) is 5-20 times larger per unit of area in Western Jutland than in the eastern part of Denmark, l/s per km^2.

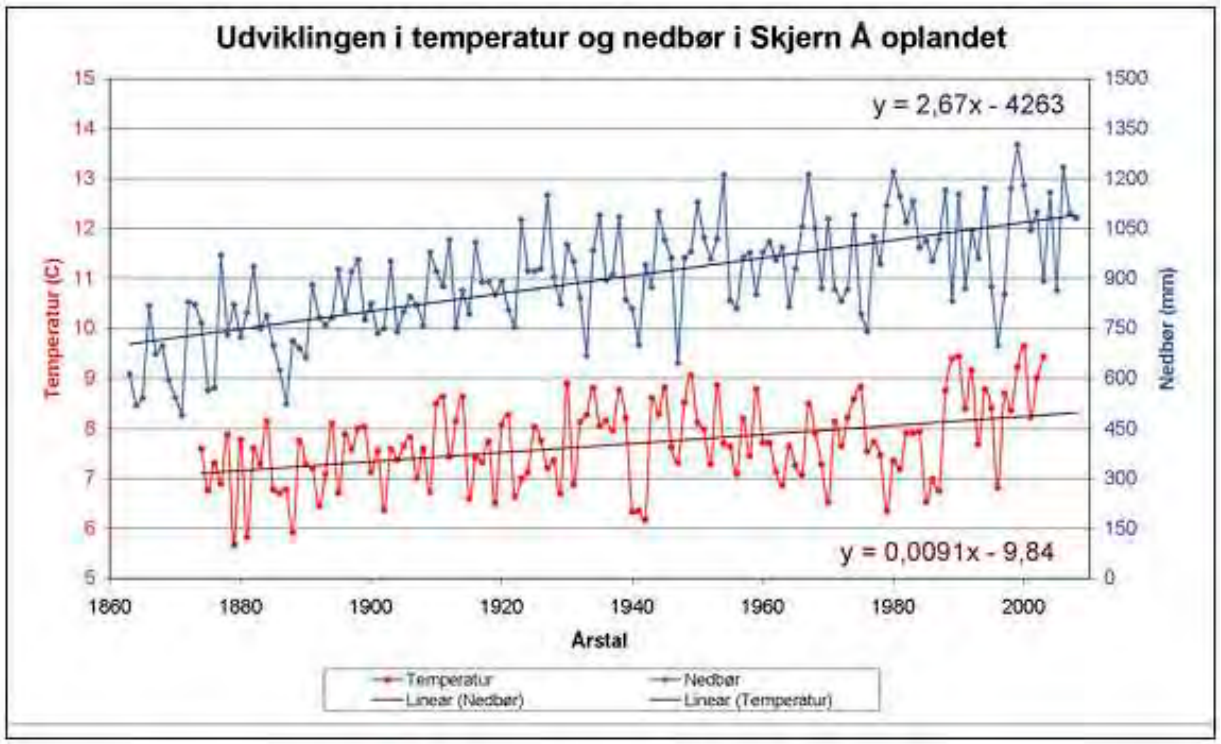
Stable water flow in the summer in streams of western Jutland

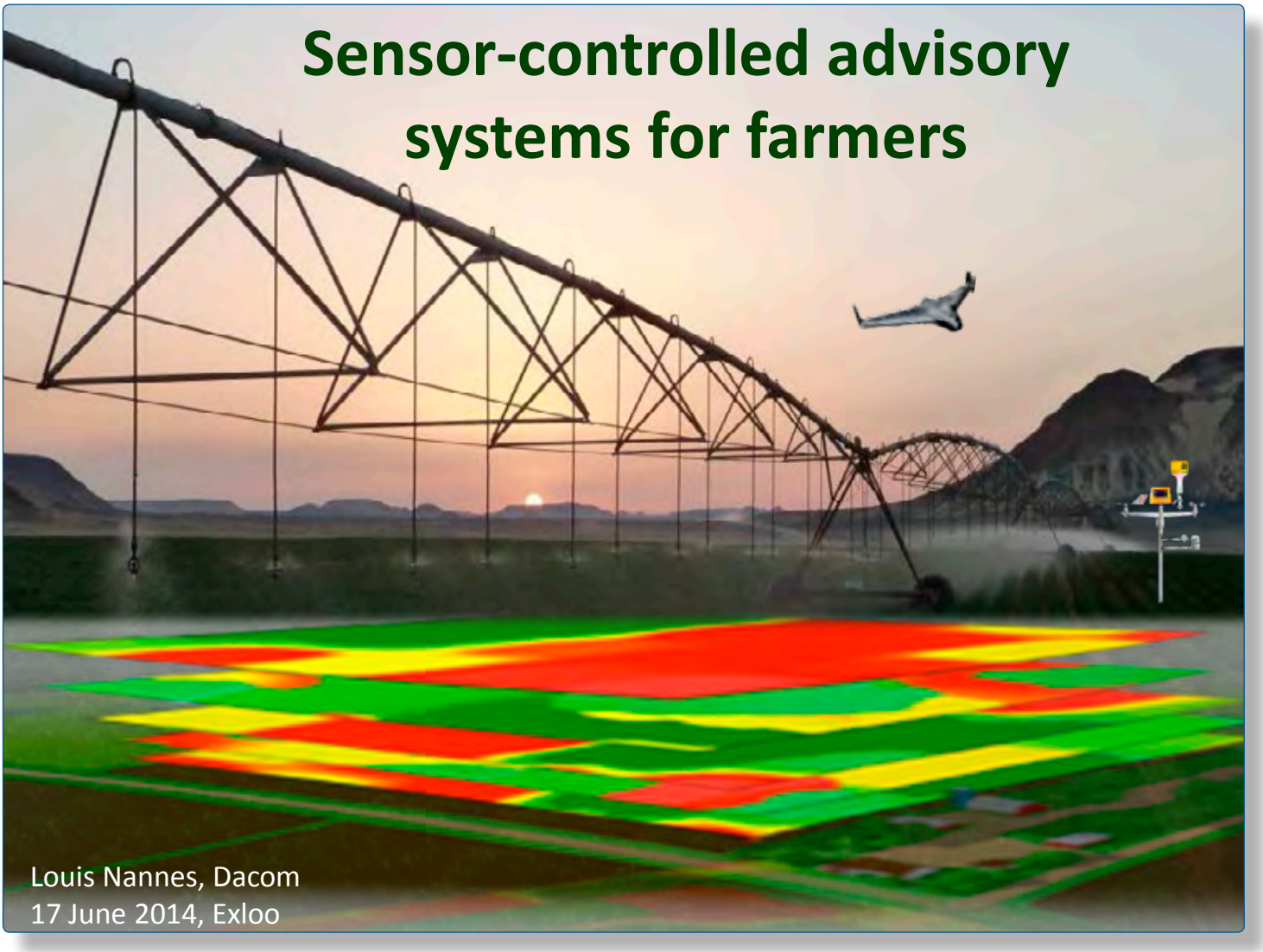
- Karup å: 8,0 l/s per km^2 = 66 % of average run-off
- Tryggevælde å: 0,4 l/s per km^2 = 6 % of average run-off



The annual rainfall has increased in Western Jutland

The annual rainfall has increased by 266 mm in 100 years!




Sensor-controlled advisory systems for farmers
Louis Nannes, Dacom
17 June 2014, Exloo

Sensor-controlled advisory systems for farmers

- WaterSense history
- Effects of climate changes
- Yield optimization
- Sensing technology

WaterSense


• Advanced sensor systems technology in the agri and water sectors
• Development of an integral Decision Support System (DSS)

Goals

watersense

DECISION SUPPORT SYSTEM

Level management | Spatial planning | Irrigation advice | Fertilizing advice | Crop protection advice | Surfacewater quality | Groundwater quality

SUBJECTIVE

© WaterSense

Waterboard | Agriculture | Drinkwater Company

DACOM

AGRI YIELD MANAGEMENT

Goals

watersense

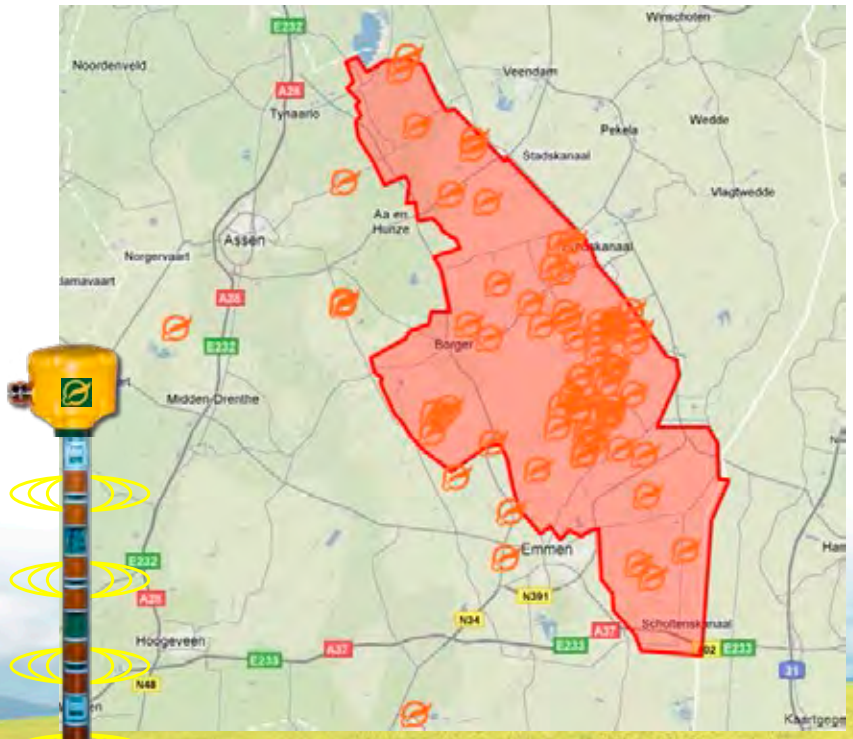
- Agriculture
  - Optimizing crop yields
  - Saving fertilizer, irrigation and pesticides
- Drinking water production
  - Preventing contamination
- Operational water management
  - Level-management
  - Water quality monitoring

DACOM

AGRI YIELD MANAGEMENT.

100 sensors in 20.000 ha

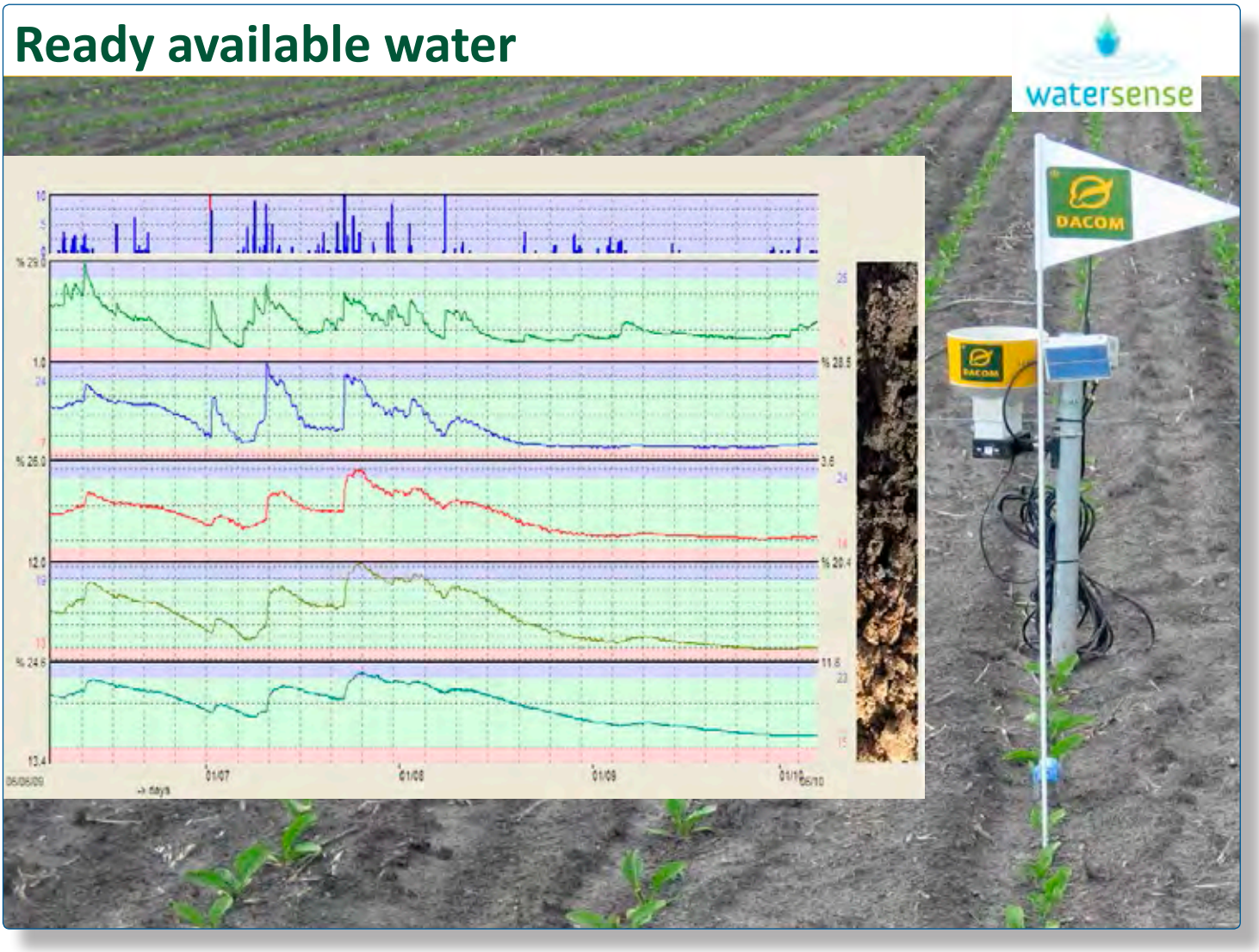
watersense



DACOM

AGRI YIELD MANAGEMENT

Ready available water



Results

watersense

- Soil moisture sensors can optimize the use of fertilizers and pesticides
- But use of sensors in the unsaturated zone is less promising than initially thought, because expectations were too high
- More time needed for modelling the collected data
- Make knowledge more shareable to other regions

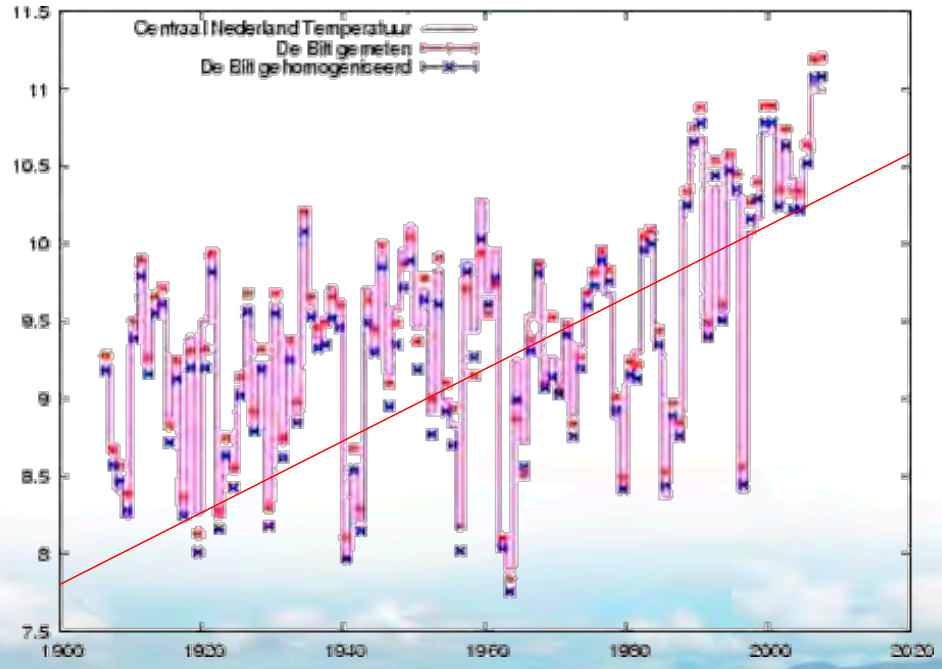
DACOM

AGRI YIELD MANAGEMENT

Effects of climate change

- **Global warming** since 1970 with an **average of 0.6 ° C**
- By higher temperatures more violent storms and **crop failure due to drought**
- **Prediction** of the Intergovernmental Panel on Climate Change **(IPCC):** this century an **average temperature rise of 1.1 - 6.4 ° C**

Also global warming in the Netherlands

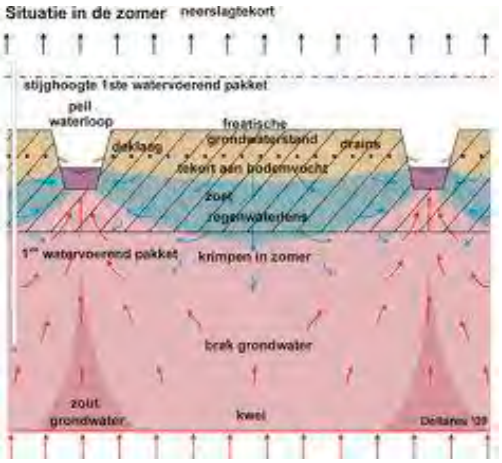


Source: KNMI

DACOM

AGRI YIELD MANAGEMENT

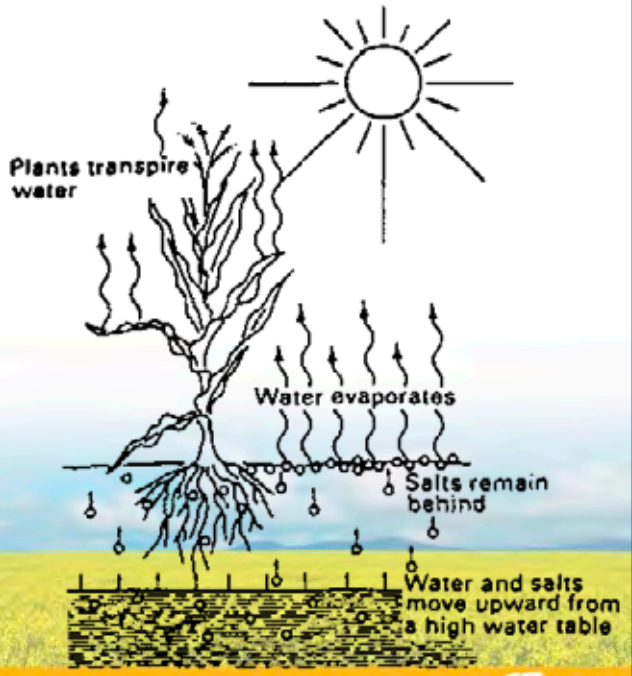
Effects of climate change



- **Global warming** is making the sea **more salty**, according to new research that demonstrates the massive shifts in natural systems triggered by climate change.
- Can we store enough and can we distribute our water efficiently?

Salinization

- Most irrigation waters contain salts
- After irrigation, the water is used by the crop or evaporated
- The salt that is left accumulates
- This process is called salinization
- Leeching saline soils can result in sodic soils



DACOM

AGRI YIELD MANAGEMENT

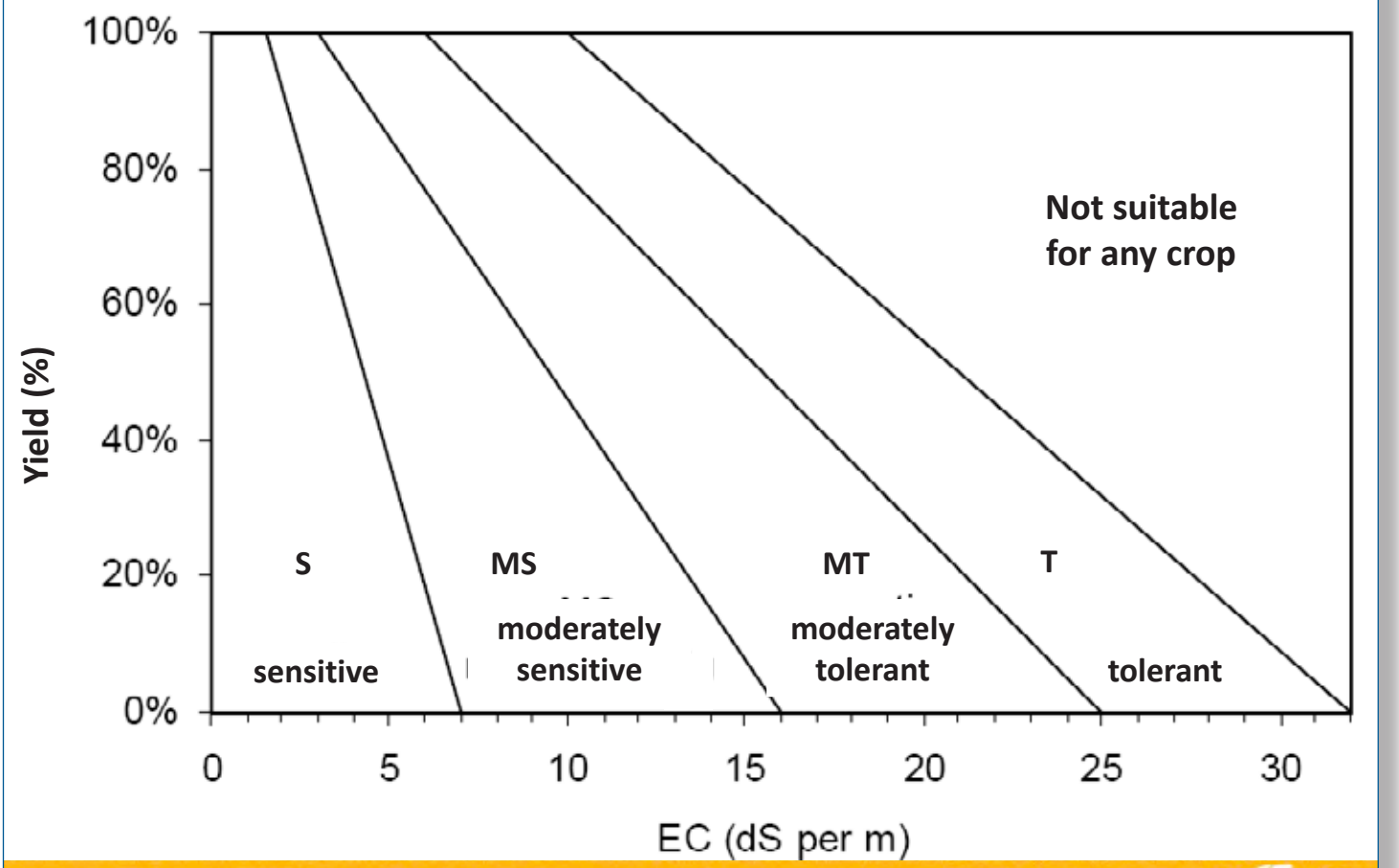
EC: Crop tolerance and Yield potential

$EC_{e:}$ soil

$EC_{w:}$ irrigation water

Crop	EC_e threshold for yield reduction	EC_w crops growing in		
		sand	loam	clay
Onion	*1.2*	*2.3*	*1.3*	*0.8*
Grape	*1.5*	*3.3*	*1.9*	*1.1*
Potato	*1.7*	*3.2*	*1.8*	*1.1*
Tomato	*2.3*	*3.5*	*2.0*	*1.2*
Date	*4.0*	*8.7*	*5.0*	*2.9*
Wheat	*6.0*	*9.4*	*5.3*	*3.1*

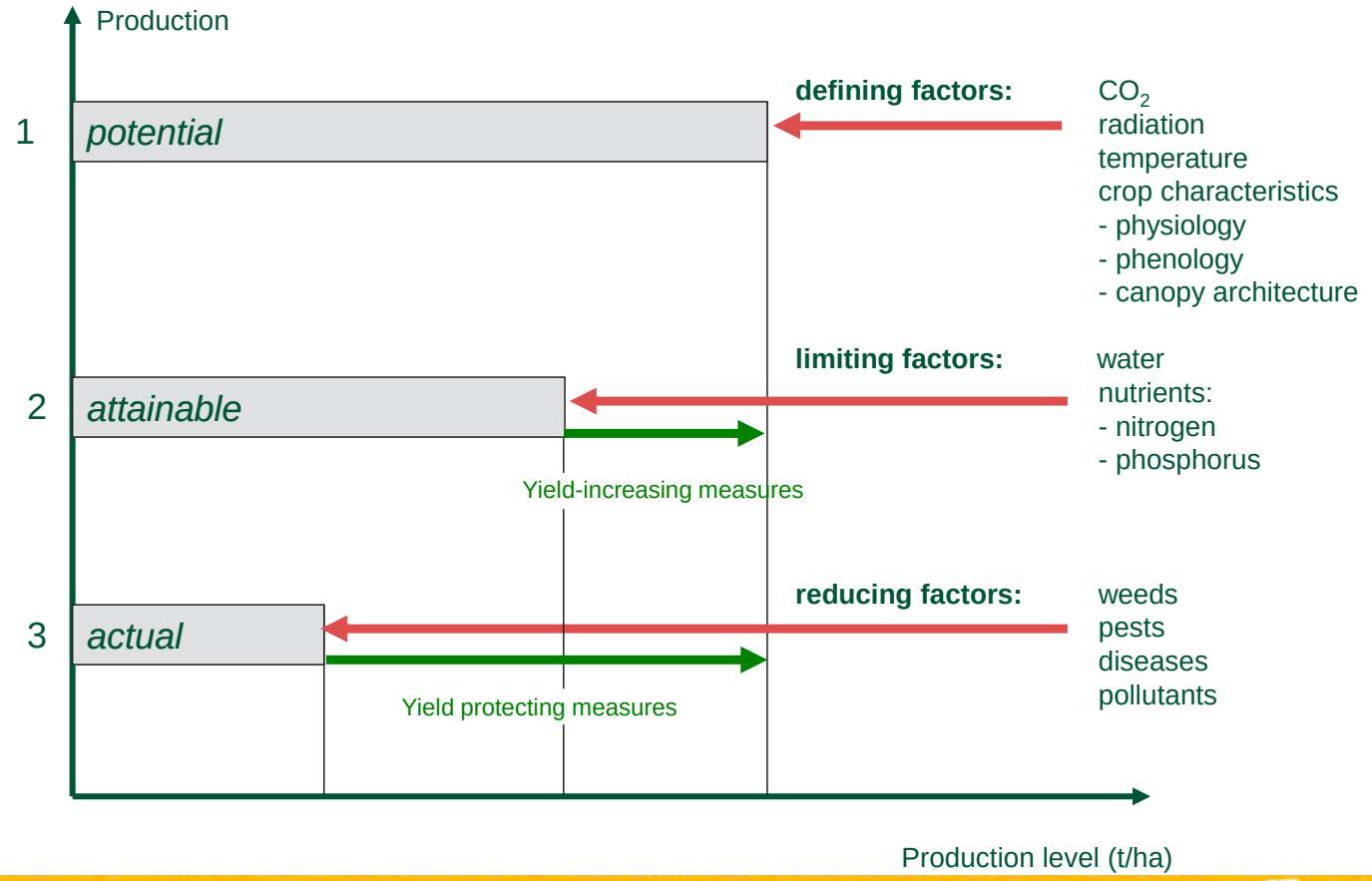
EC_{water} versus yield



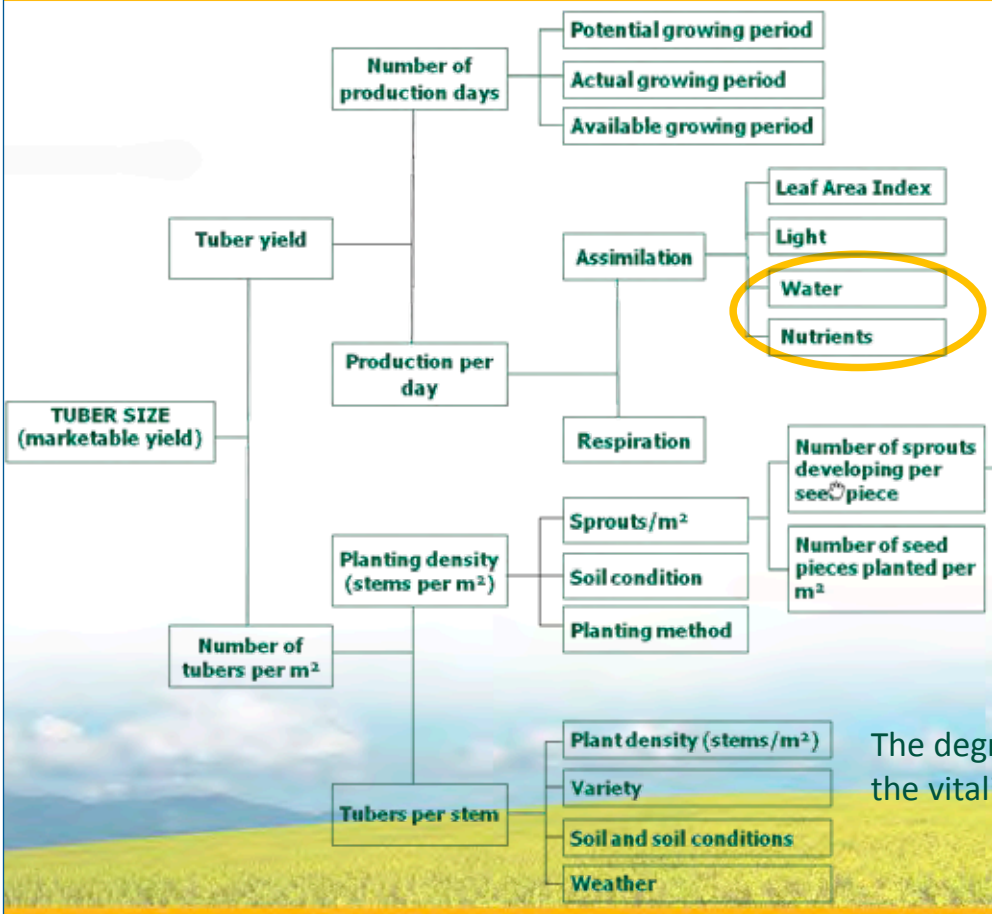
DACOM

AGRI YIELD MANAGEMENT

Optimization



Influences on marketable yield



During the season only fertilization and irrigation influence the outcome!

The degree of influence depends on the vitality of the crop AND soil

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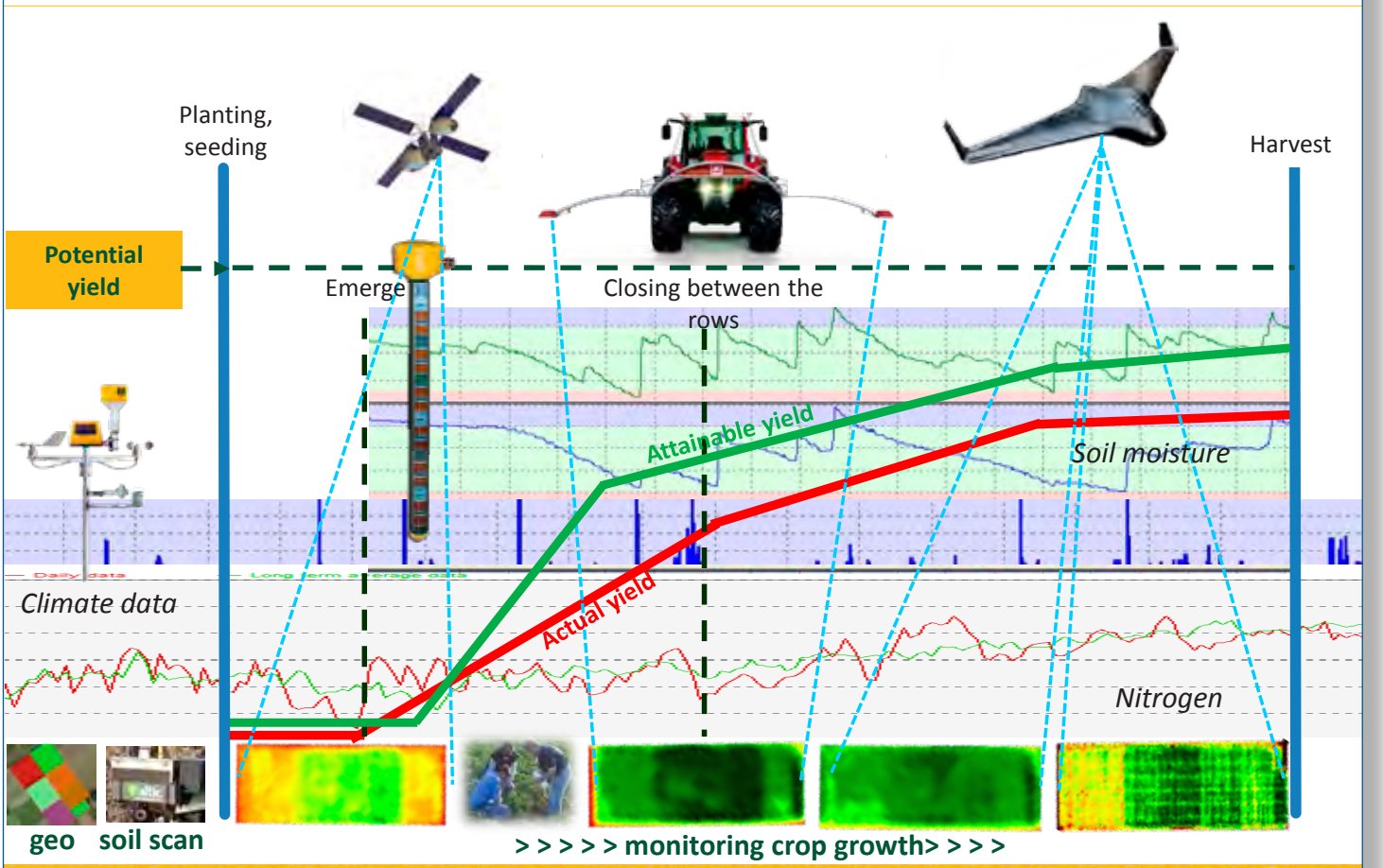
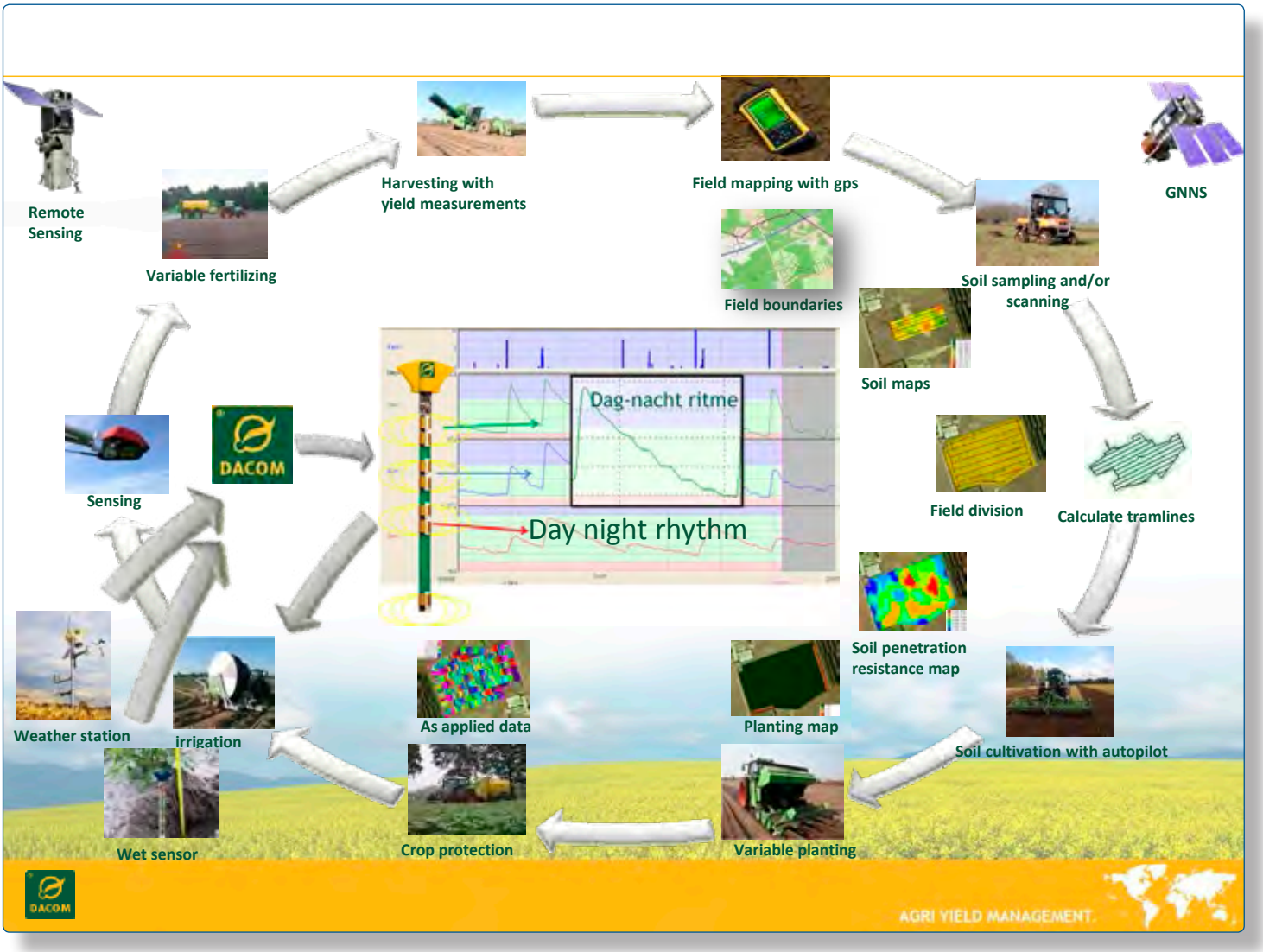
Optimization using crop growth model




Remote Sensing
Variable fertilizing
Harvesting with yield measurements
Field mapping with gps
GNNS
Field boundaries
Soil sampling and/or scanning
Soil maps
Sensing
DACOM
Dag-nacht ritme
Day night rhythm
Field division
Calculate tramlines
Soil penetration resistance map
Weather station
irrigation
As applied data
Planting map
Soil cultivation with autopilot
Wet sensor
Crop protection
Variable planting
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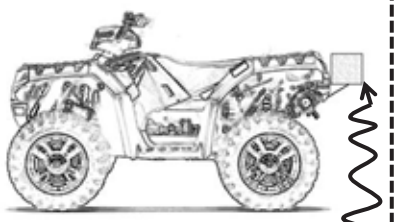
Know soil fertility for determining water retention

From gamma radiation to soil maps & task maps

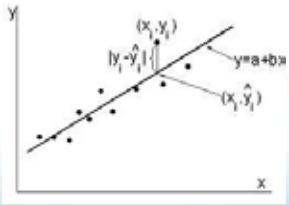
Input



Gamma radiation

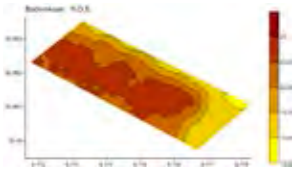
^{40}K, ^{238}U, ^{232}Th, ^{137}Cs

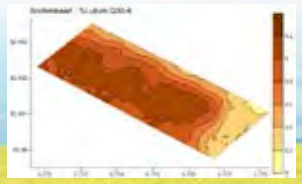
Grain analysis



Output

Soil maps

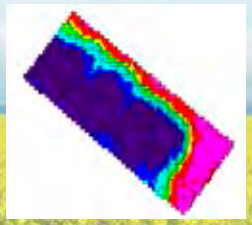




- **Lutum**
- **Org. matter**
- **Grain size**
- **Median**
- **Height**

> Water retention maps

Task maps



Gamma reflection soil scanner

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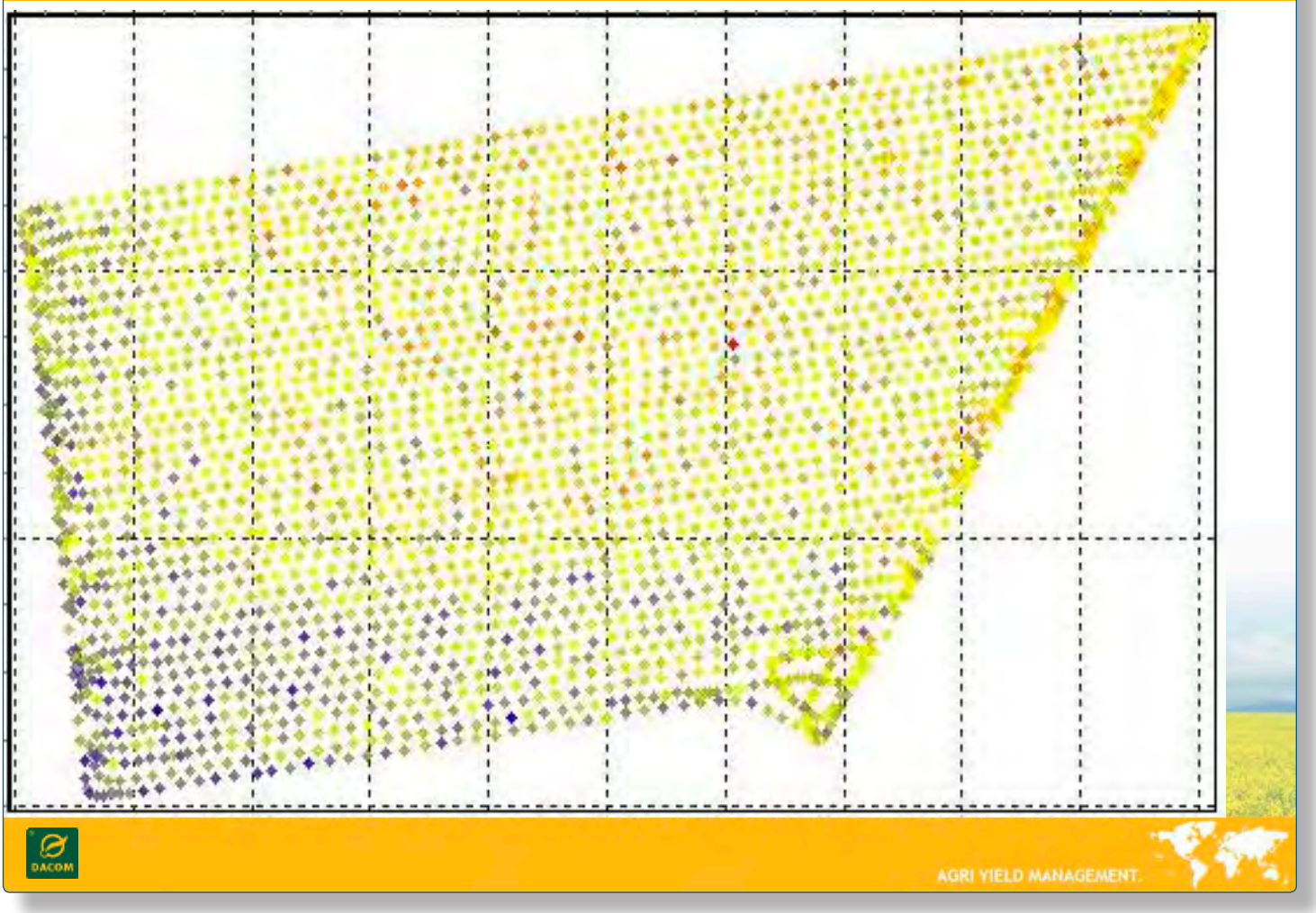
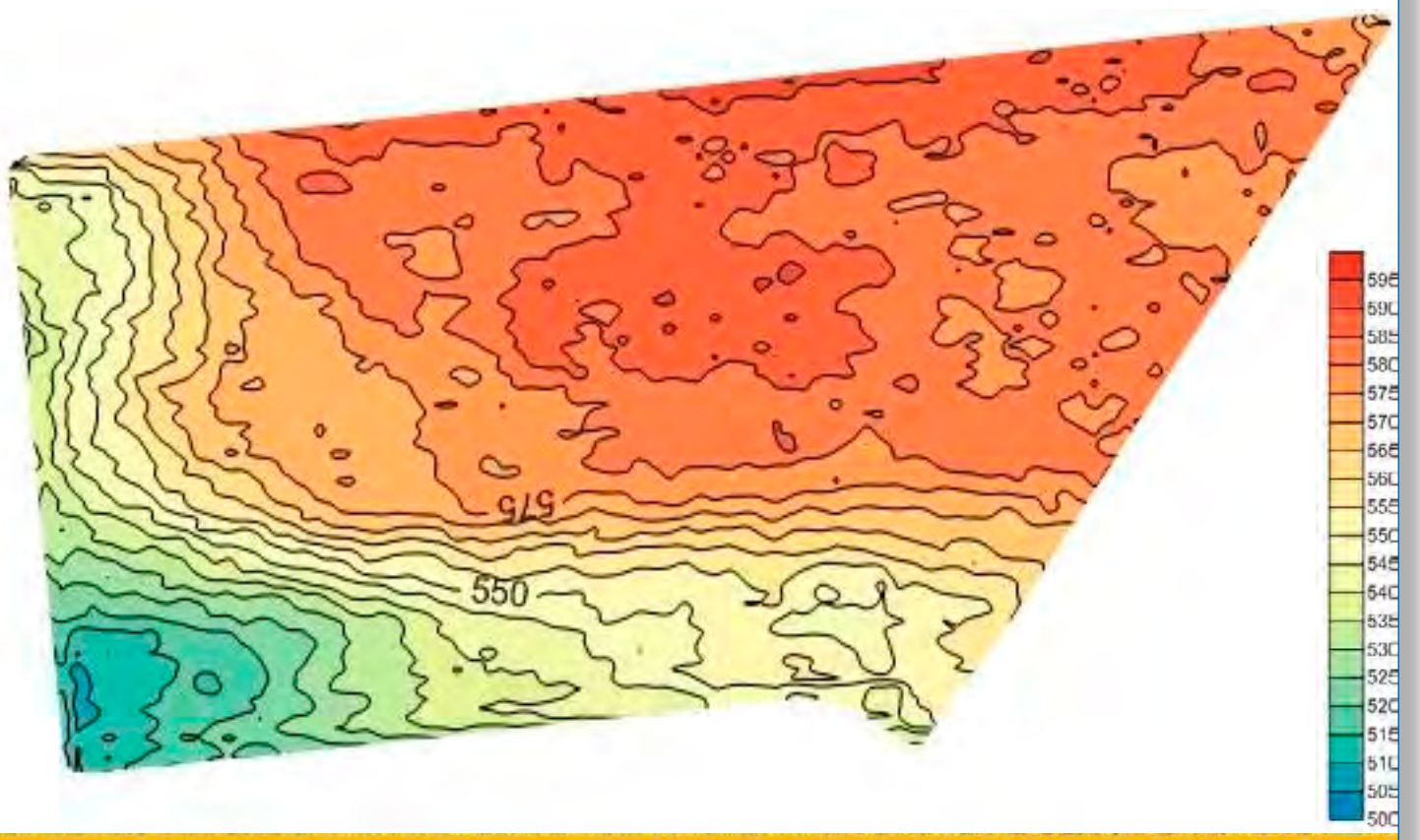
Measurement of natural background radiation



Calibration with soil grain analyses



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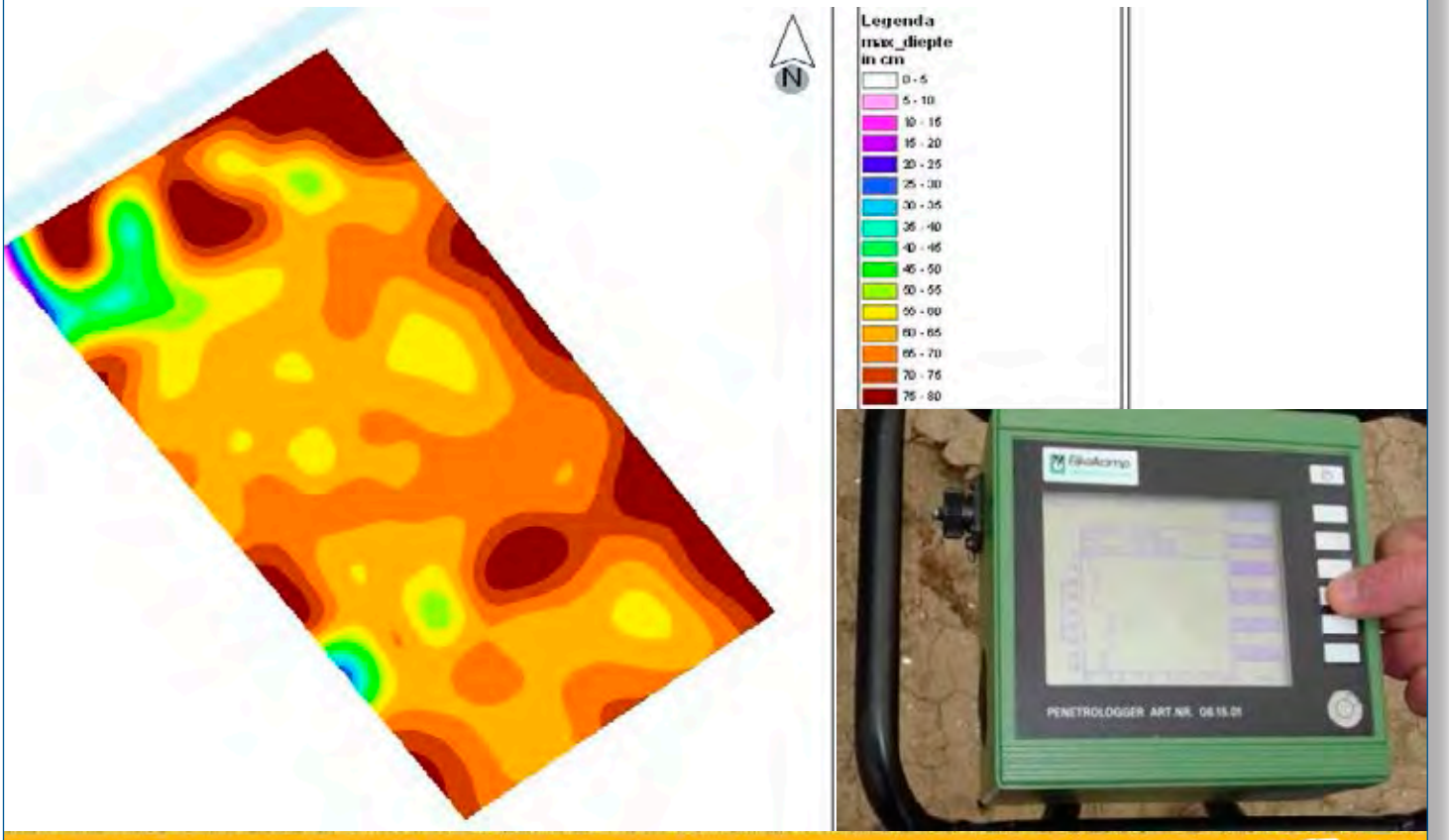
Precision Agriculture: soil sensing

Map showing maximum rootdepth vs compaction



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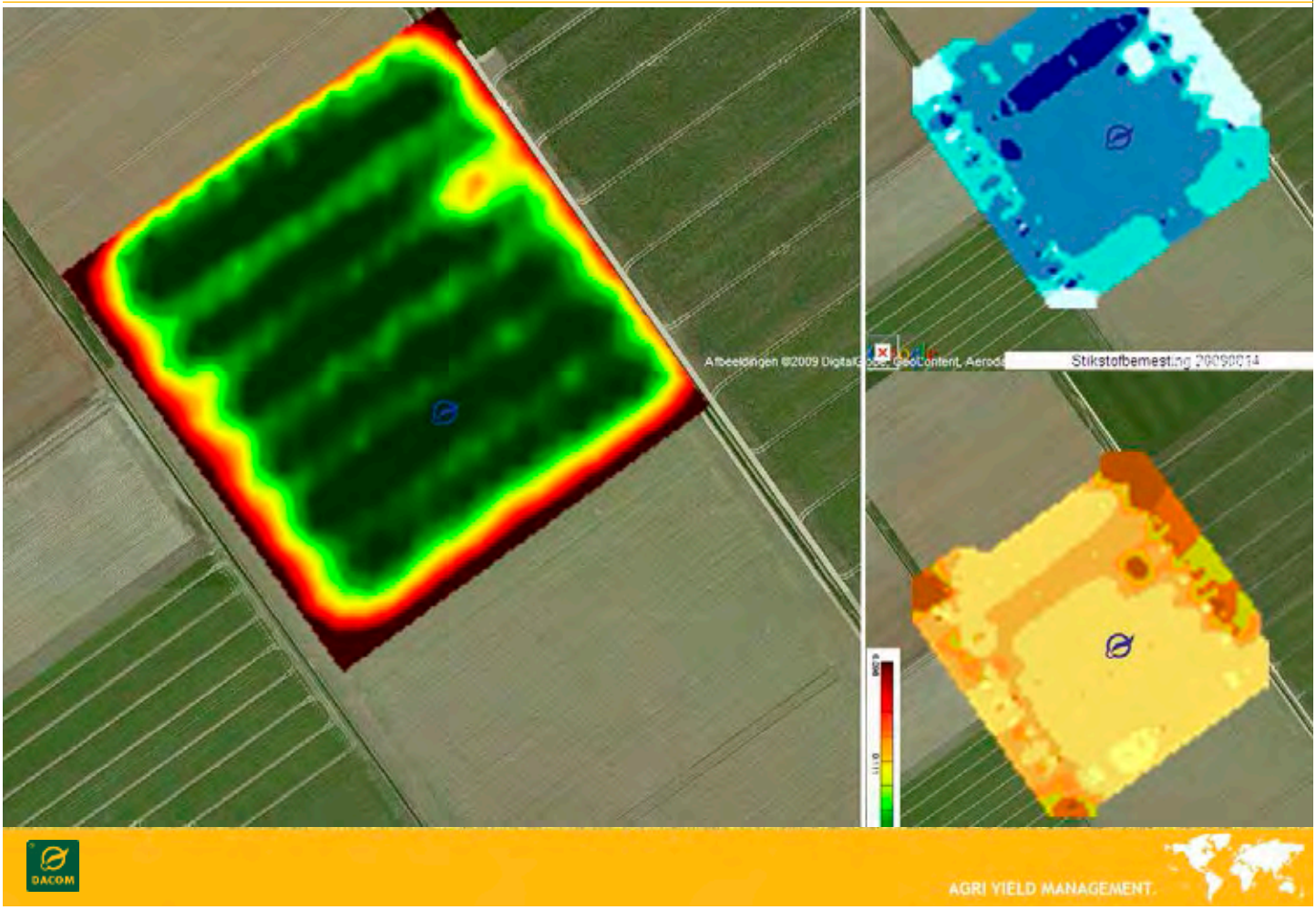
Historical data is also usable



Precision Agriculture: soil sensing

Example irrigation:

Farmer has TerraSen soilmoisture sensor:

- Decision on timing and amount of water

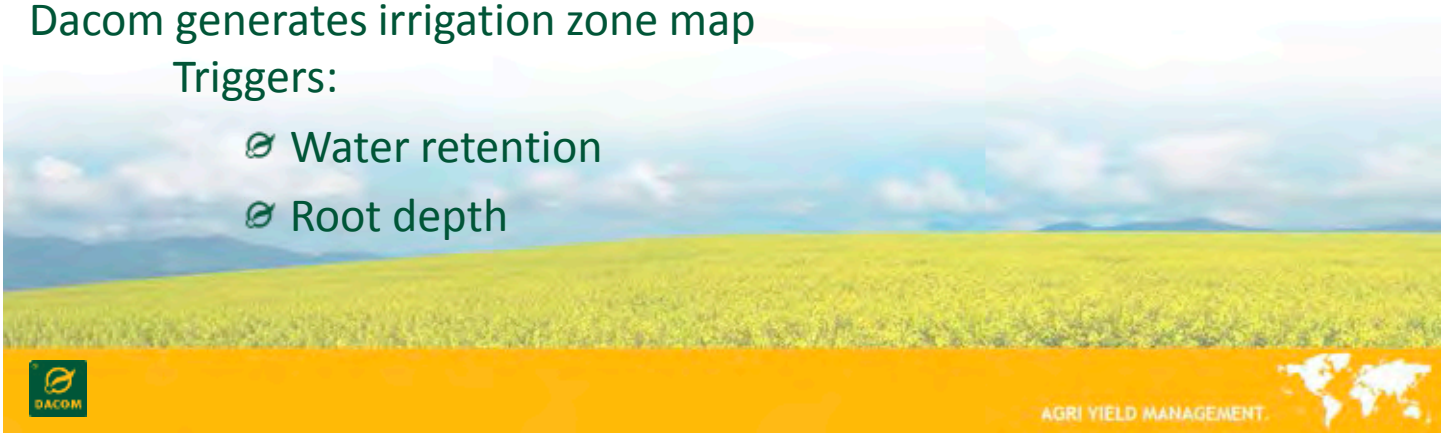
Combine the above with gamma reflection scan soil map:

- Add location to the decision on timing and amount of water

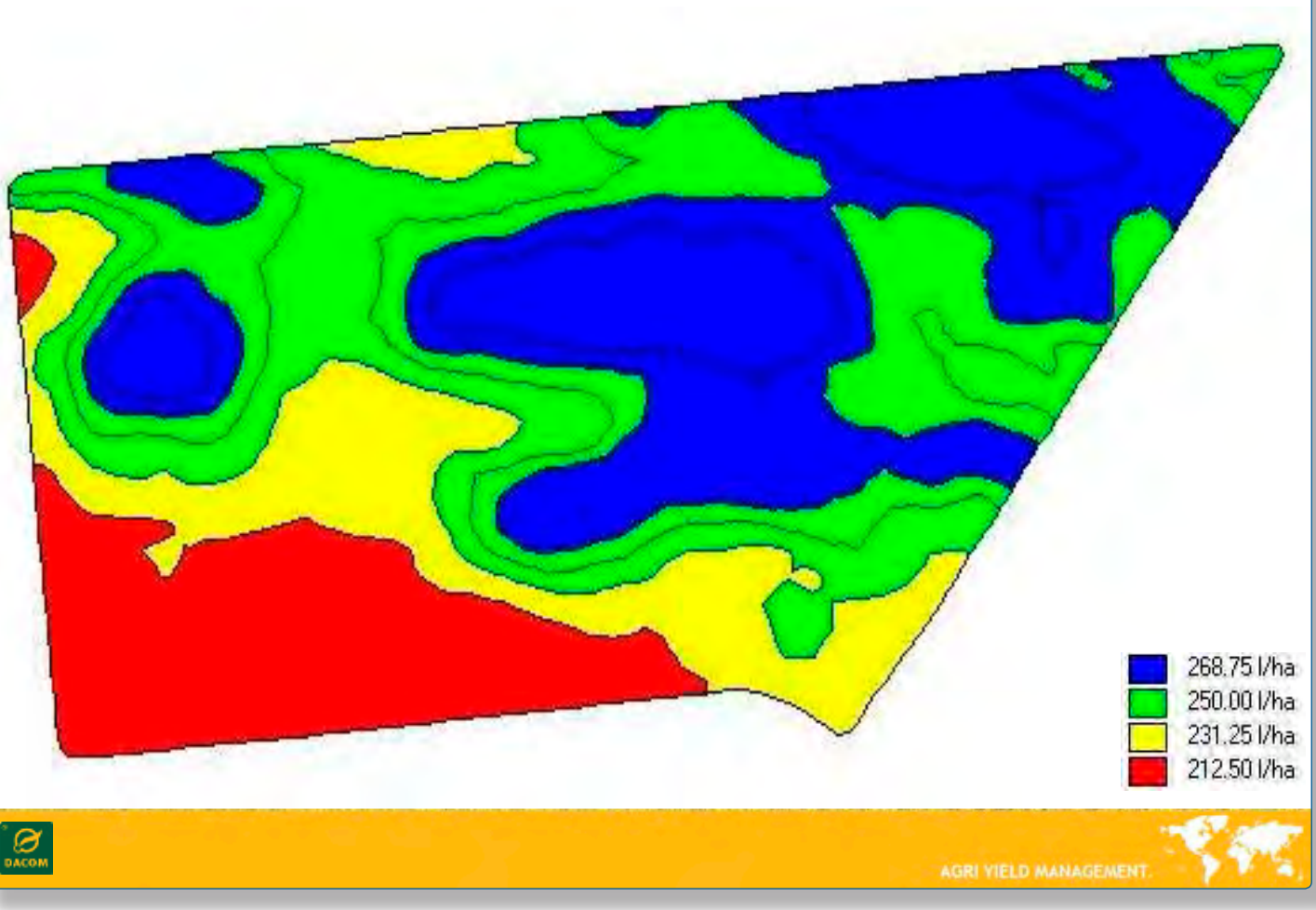
Dacom generates irrigation zone map

Triggers:

- Water retention
- Root depth



Example task map



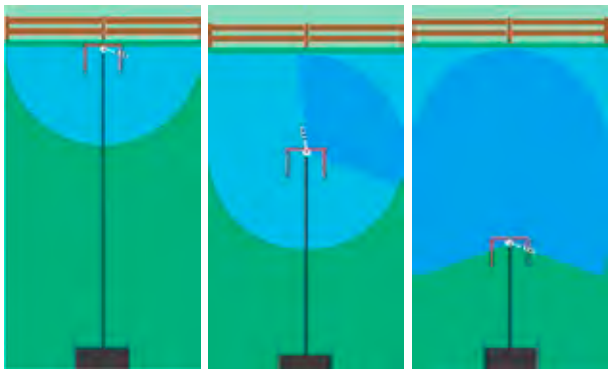
GPS irrigation

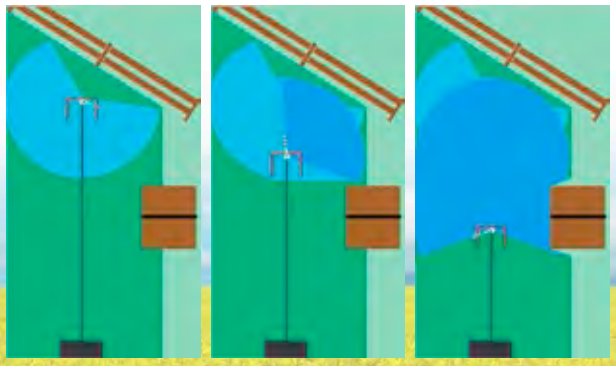
Aqua logger

• Module on the irrigation pump that logs automatically water use, pressure and motor parameters from use of each well/source

Overlap and field boundaries control

• feed field boundary data into web application (only once)
• control irrigation unit by universal ad on tool with electromotor and battery.
• map with water output available
• Overlap between parallel runs adjustable





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As applied map

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Close Sensing with crop sensors

Greenseeker

Yara N sensor

Fritzmeier Isaria sensor

OptRx crop sensor

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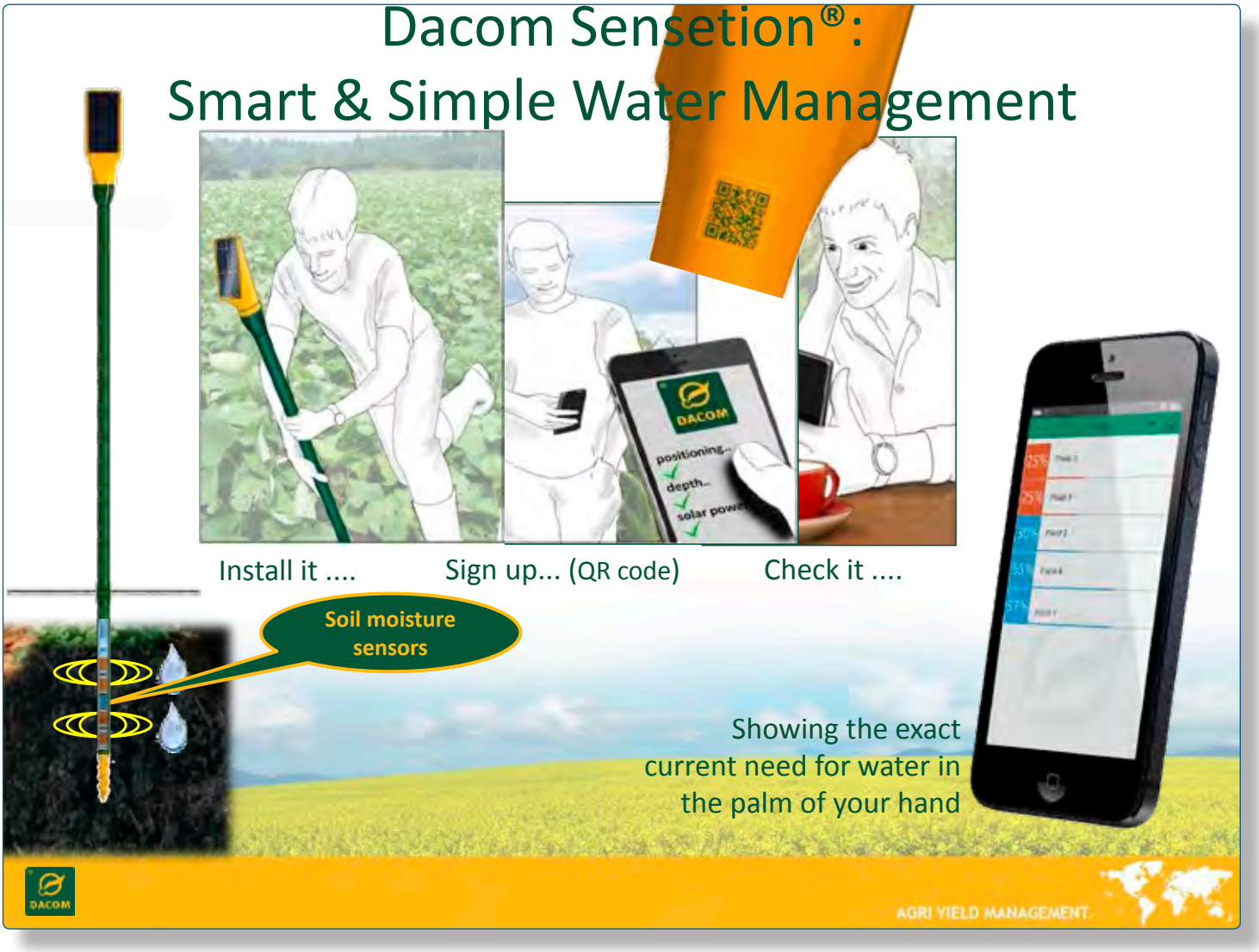
Dacom Sensetion®:
Smart & Simple Water Management
Install it ....
Sign up... (QR code)
Check it ....
DACOM
positioning..
depth..
solar power
Soil moisture sensors
Showing the exact current need for water in the palm of your hand
DACOM
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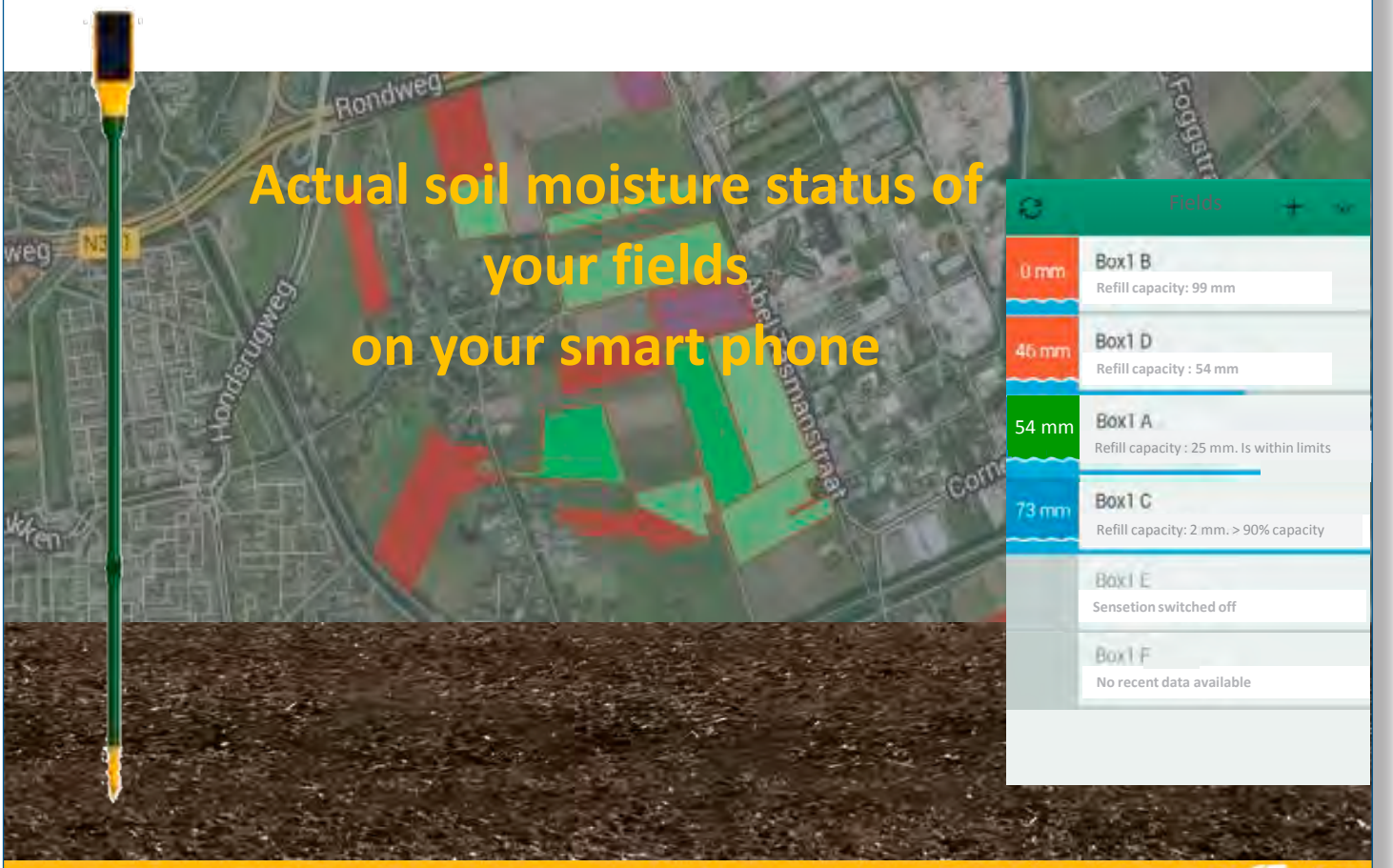
Sensetion


Actual soil moisture status of your fields
on your smart phone
Rondweg
Hondsrugweg
Fields
0 mm
Box1 B
Refill capacity: 99 mm
46 mm
Box1 D
Refill capacity : 54 mm
54 mm
Box1 A
Refill capacity : 25 mm. Is within limits
73 mm
Box1 C
Refill capacity: 2 mm. > 90% capacity
Box1 E
Sensetion switched off
Box1 F
No recent data available
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Results Dacom Water Management

Kenana KSC كنانة

Sugar cane in Sudan 1st year

System in 2011:
12 litres / sugar cube

Water savings 39 %

Dacom system 2012:
7,3 litres / sugar cube

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Some results in irrigation management

- **PepsiCo, UK , potato** **Objective: “50 in 5”:**

  50 % reduction Water footprint and Carbon footprint in 5 years

  www.pepsico.co.uk - iCrop : Dacom inside

- **Min. of Agri. Saudi Arabia** **All crops (date palm trees etc.)**

  2010 - 2015 current: **25-75% less water use**

water reduction

Pico, Egypt,	48%
MAFA, Egypt	30%
Loukil, Tunisia,	50%

yield and quality

Chipsy, Egypt	8%	yield
	50%	quality
SLU, Sweden	15 - 30%	yield

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Earn more euros wit a good irrigation advice

- Start and stop earlier
- Determine optimal irrigation moment
- Improved yield

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Earn more euros wit a good irrigation advice

Thanks for your attention!

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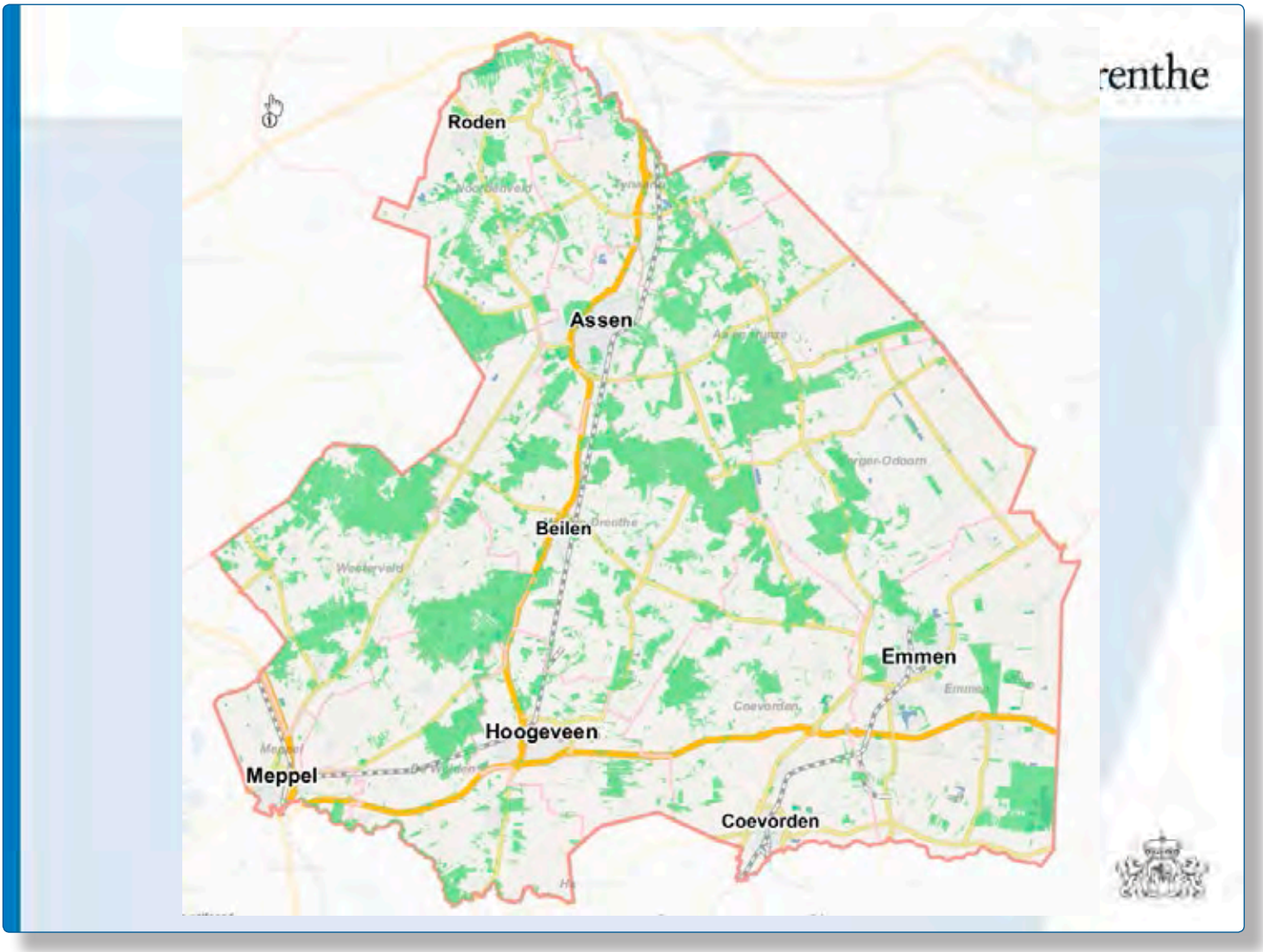
MTTF Meeting Drenthe

New developments in the field of efficient and sustainable water use by farmers

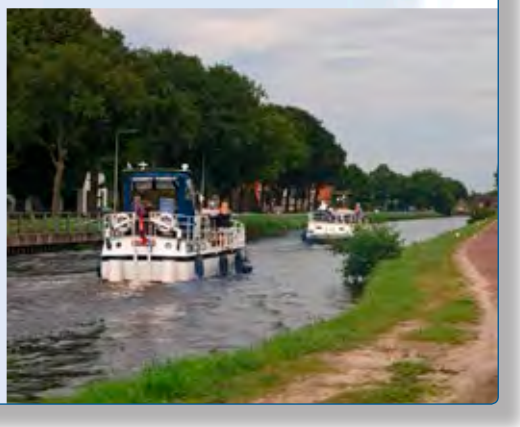
(Rinke van Veen, Provincie Drenthe)

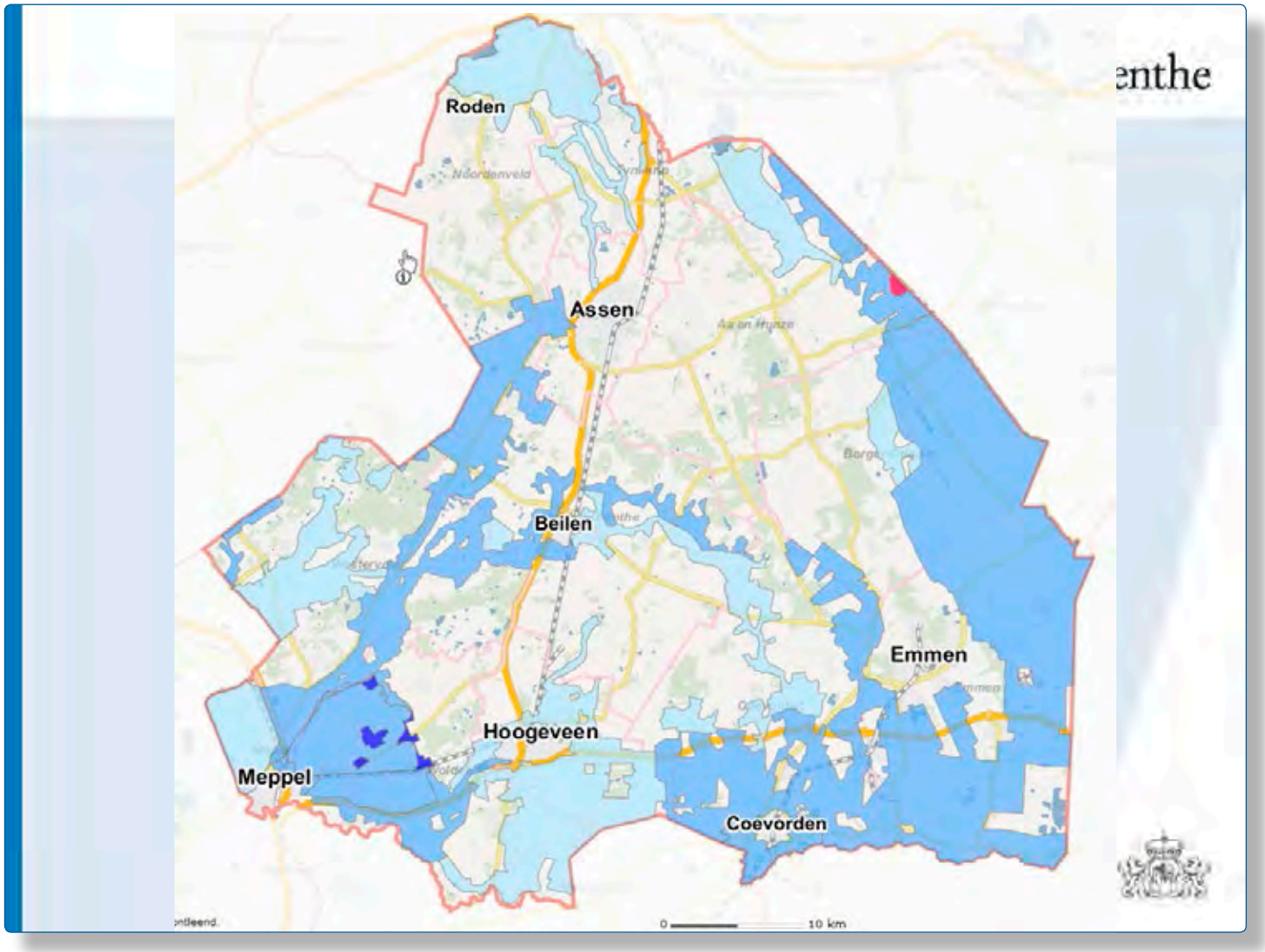
provincie Drenthe

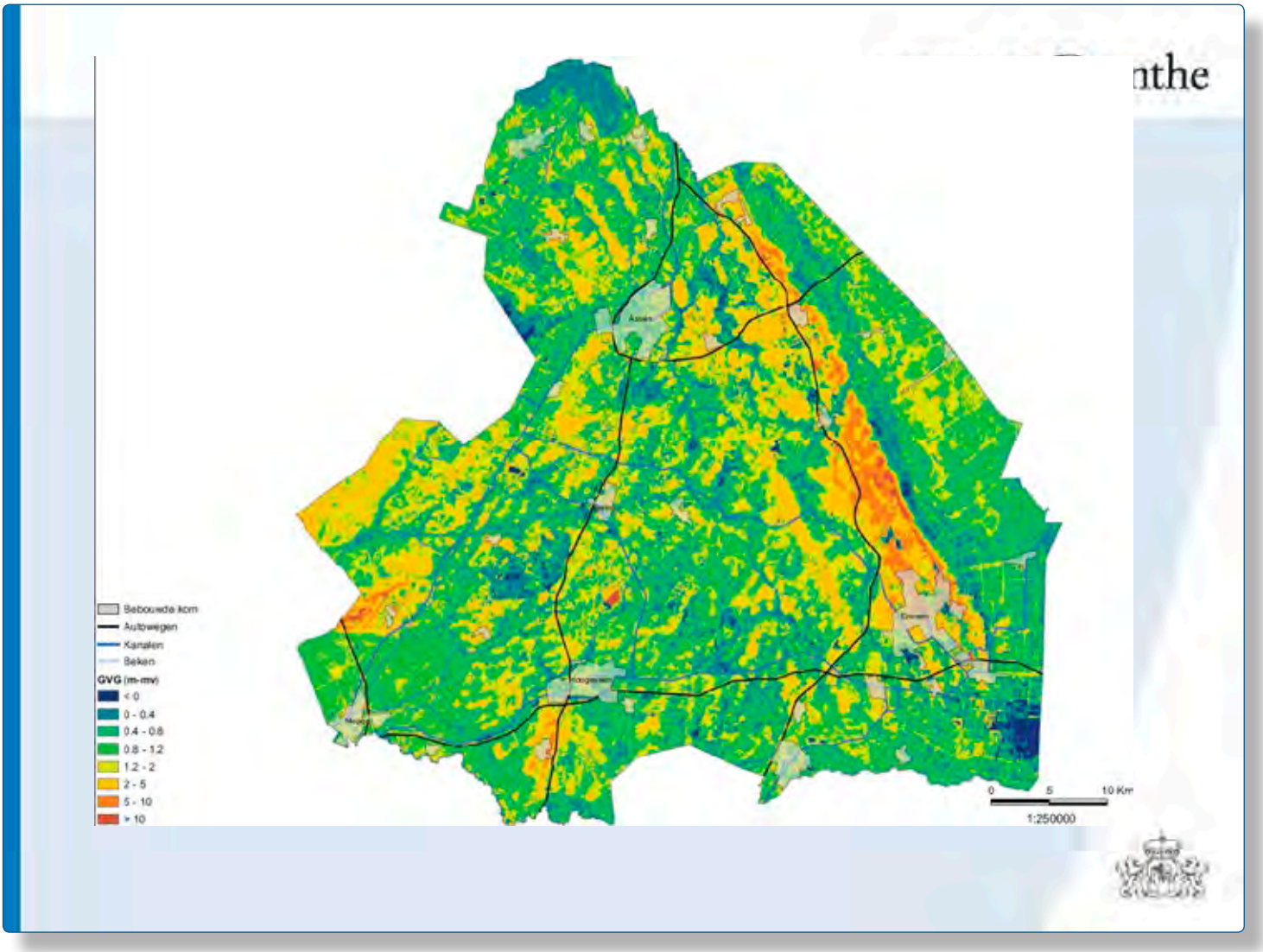
Drenthe

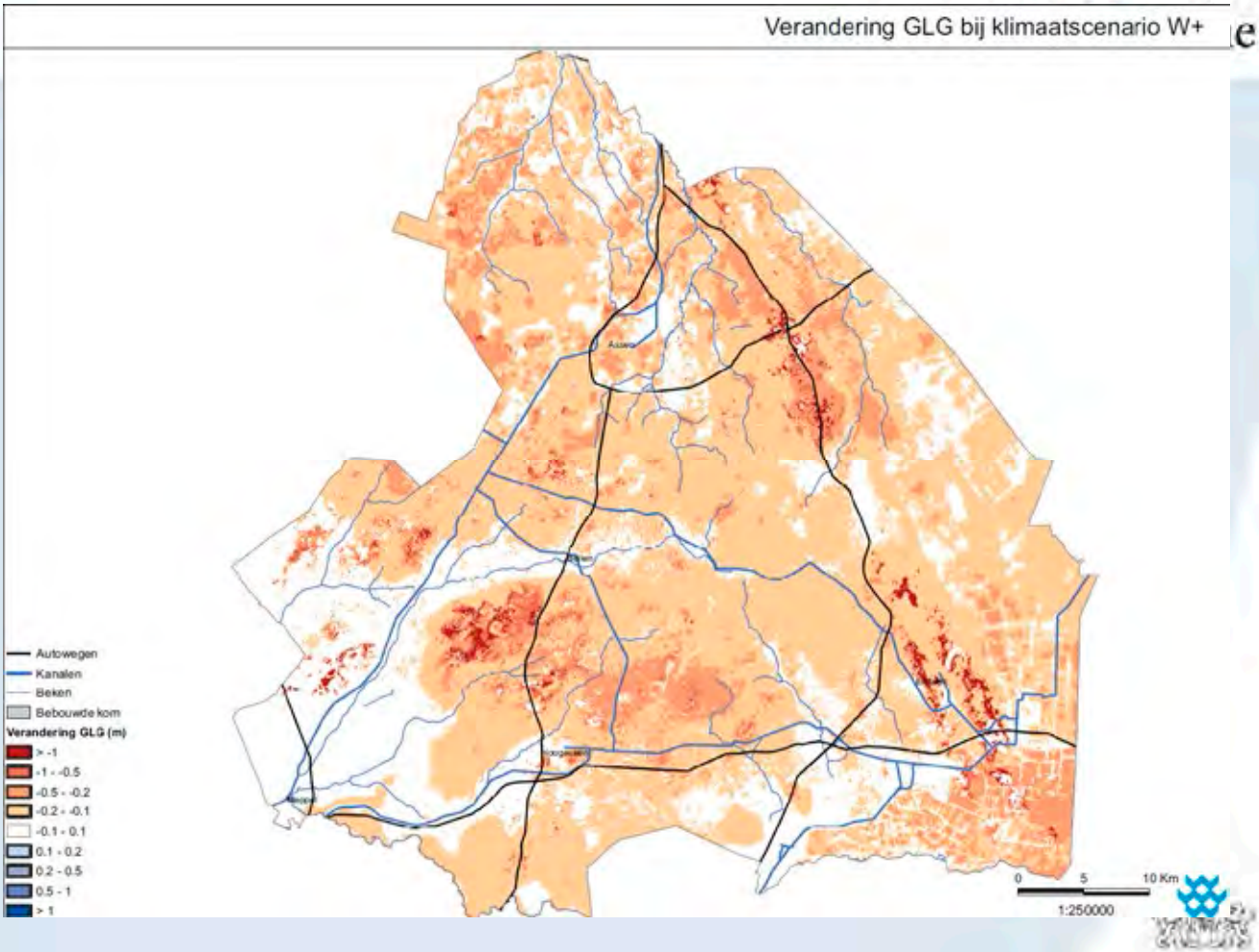

renthe
Roden
Assen
Beilen
Emmen
Hoogeveen
Meppel
Coevorden

provincie Drenthe




Roden
Assen
Beilen
Emmen
Hoogeveen
Meppel
Coevorden
0
10 km


Bebouwde kom
Autowegen
Kanalen
Beken
GVG (m-mv)
< 0
0 - 0.4
0.4 - 0.8
0.8 - 1.2
1.2 - 2
2 - 5
5 - 10
> 10
0
5
10 Km
1:250000


Verandering GLG bij klimaatscenario W+
Autowegen
Kanalen
Beken
Bebouwde kom
Verandering GLG (m)
> -1
-1 - -0.5
-0.5 - -0.2
-0.2 - -0.1
-0.1 - 0.1
0.1 - 0.2
0.2 - 0.5
0.5 - 1
> 1
0
5
10 Km
1:250000

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- Increase amount of groundwater
  - Keep more water in nature area's
  - Higher water levels in small rivers
  - Meandering small rivers
  - Change coniferous forest into deciduous forest

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- By farmers:
  - Efficient water use
  - Irrigation with ground water
  - Sustainable soil management

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New developments

- Implementing en testing “new” techniques in project with 15 farmers

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New developments

- Water management with ‘Farmer’s Weirs’

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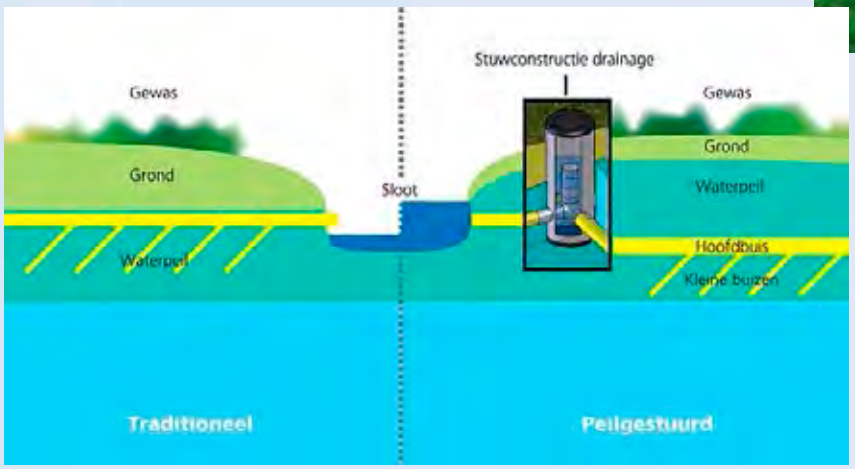
New developments

- Steered drainage



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New developments

- Infiltrate water with the drainage system

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New developments

- Water storage

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New developments

- Water conservation with weirs on remote control

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New developments

- Other crops

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New developments

- Sprinkling
  - use groundwater
  - sensors
  - pivots
  - Drip irrigation

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New developments

- Sustainable soil management
  - Less soil cultivation
  - Disturbing layers
  - Improve soilstructure
  - Improve soil biology
  - Raise organic matter content
  - Green manure

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- Agriculture, as one of the major users and polluters of water, has a key role to improve water management.

- Encourage the most effective and efficient use of water by farmers.

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Its time for action

Thank you for your attention

Field trip
June 18th

During the field trip three sites were visited:

- Applied Plant Research field-test locations Valthermond
- Field location with steered drainage
- Drip irrigation plot in 1e Exloermond

Applied Plant Research field-test locations Valthermond

The excursion started at PPO in Valthermond.
http://www.wageningenur.nl/en/show/PPO-Valthermond-1.htm

PPO Valthermond is one of Applied Plant Research's field-test locations. PPO Valthermond is used to conduct research into arable farming, multifunctional agriculture and field production of vegetables.
Janjo de Haan and Gerard Hoekzema gave us an introduction on the field experiments. The farm has is about 100 ha and research themes include, for example, reduction of pesticide use, nutrition management, water and nutrient management, precision farming and soil management. Within the previous Interreg project (Aquarius) soil sensors were used at this farm and calculations have been made to determine the effects of irrigation on potatoes in combination with the soil sensors.

Field location with steered drainage

The second location we visited was a plot in Exloo with steered drainage.
http://www.hunzeenaas.nl/werk-in-uitvoering/Paginas/regelbare-drainage.aspx

Henk van Norel from Water Board Hunze and Aa's explained why this experiment was started last year. The main goal is to keep more water in the field during the dry season so there is water available for the crops in summer. Supply of surface water is not possible. Because of the seepage in the area it is possible to keep water in the ditch and also in the drains for a longer period.
Second reason is the impact on the water quality. Because of higher water tables the oxidation of peat will probably be less. On the other hand the flushing of nutrients from the subsoil could be higher because of the higher groundwater table. Final results are not yet available.

Drip irrigation plot in 1e Exloermond

The third plot visited was a location in 1e Exloermond with drip irrigation in potato fields. Sigrid Arends from DHV and farmer Speelman explained more about the experiment on drip irrigation to us. The system is a combination of water supply and fertigation. The goal is to optimize crop growth under dry conditions also. One other question is how long the tubes will last and how much work it is to install and at the end of the season to remove the tubes.

The Interreg IVB North Sea Region Programme

Investing in the future by working together for a sustainable and competitive region

WaterCAP Taskforce

Publisher:	Province Drenthe. Postbus 122 NL- 8400 AC Assen
Title:	Report of WaterCap Task Force Meeting June 17th 2014
Author:	Rienk Schaafsma – Waaloord VOF (June 17th)
Photos:	WaterCap website, Speakers and Rienk Schaafsma
Publication:	July 9th 2014