



Growing
ideas
through
networks

HARMONIOUS

uas for environmental monitoring

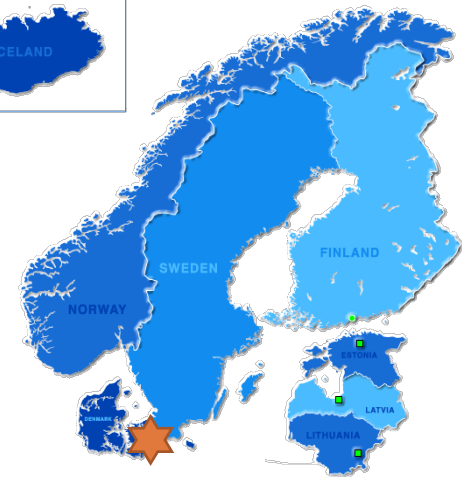


HARMONIOUS

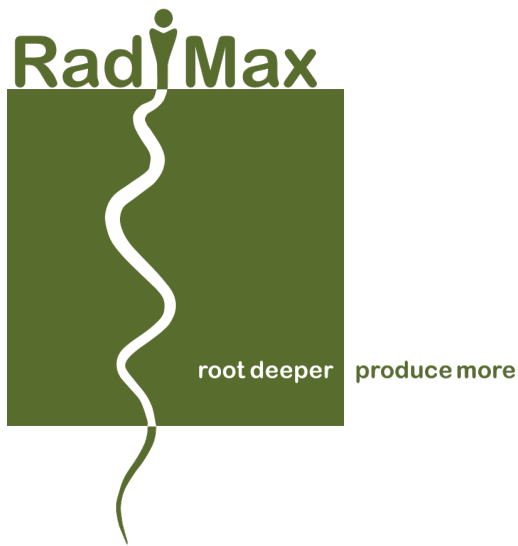
UAS Techniques for Environmental Monitoring

Jesper Svendsgaard (PhD fellow) – University of Copenhagen – 2018-02-15

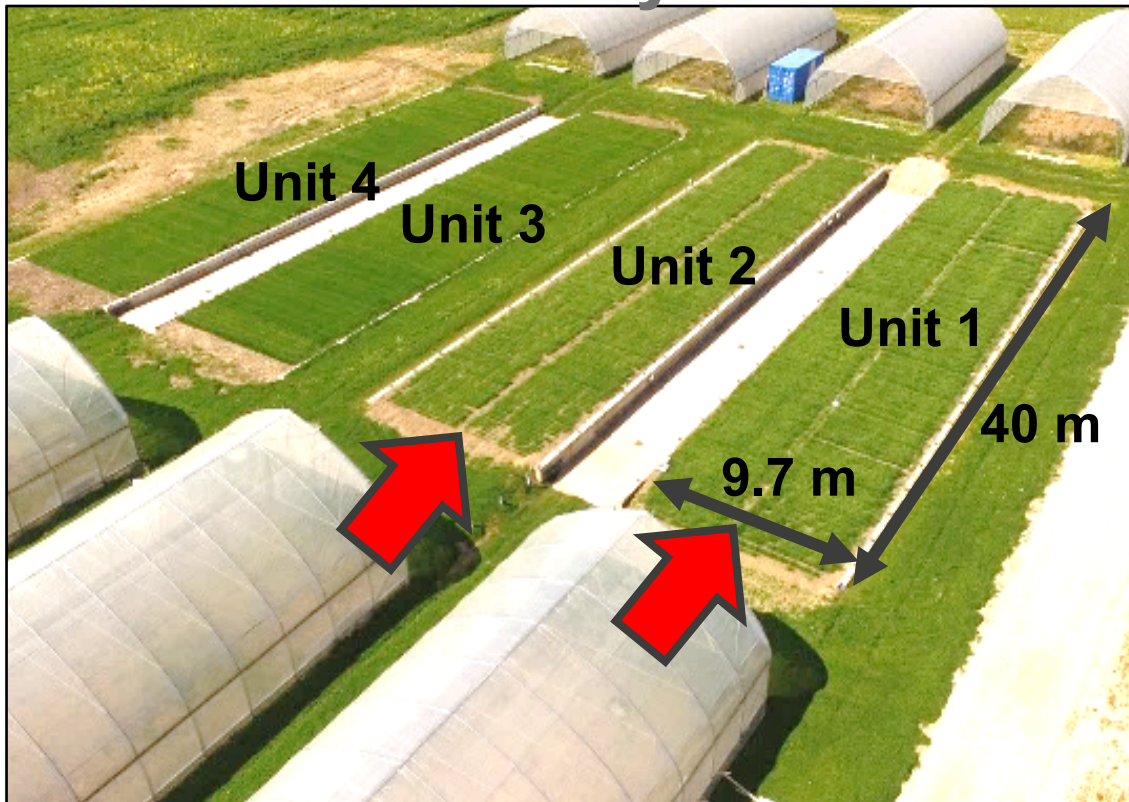
UAS for monitoring in breeding – part of nordic initiatives on phenotyping

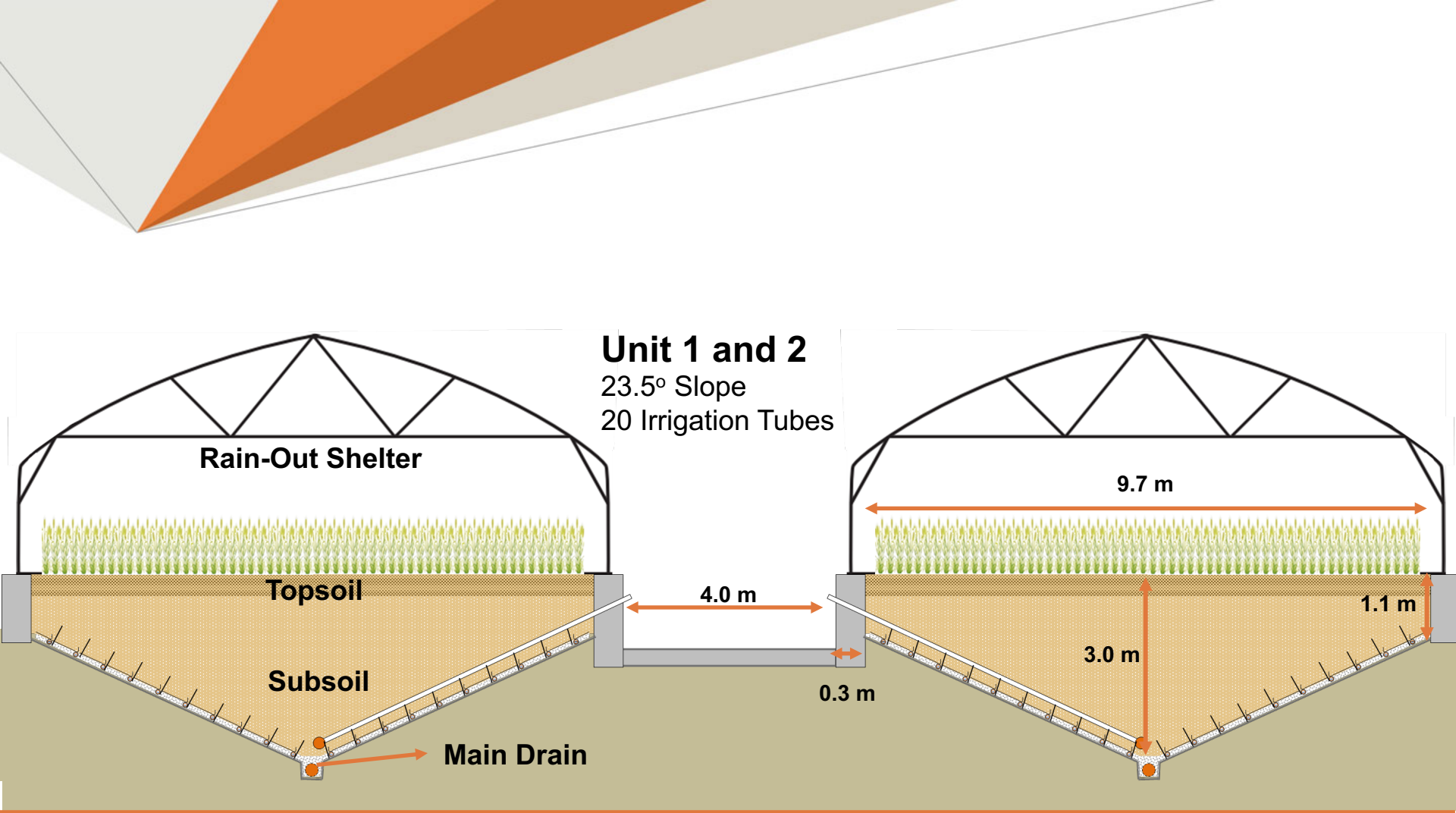


Case: Deeper root, deeper uptake of water and nutrient...



RadiMax – a facility to screen roots and drought





RadiMax – a facility to screen roots and drought



RadiMax – a facility to screen roots and drought



Use of UAS for drought screening in RadiMax




PIX4D



Thermal (and more) imaging

Parrot Sequoia
- G, R, RE, NIR,
RGB



X5
RGB



XT
Thermal (512*620)
Radiometric



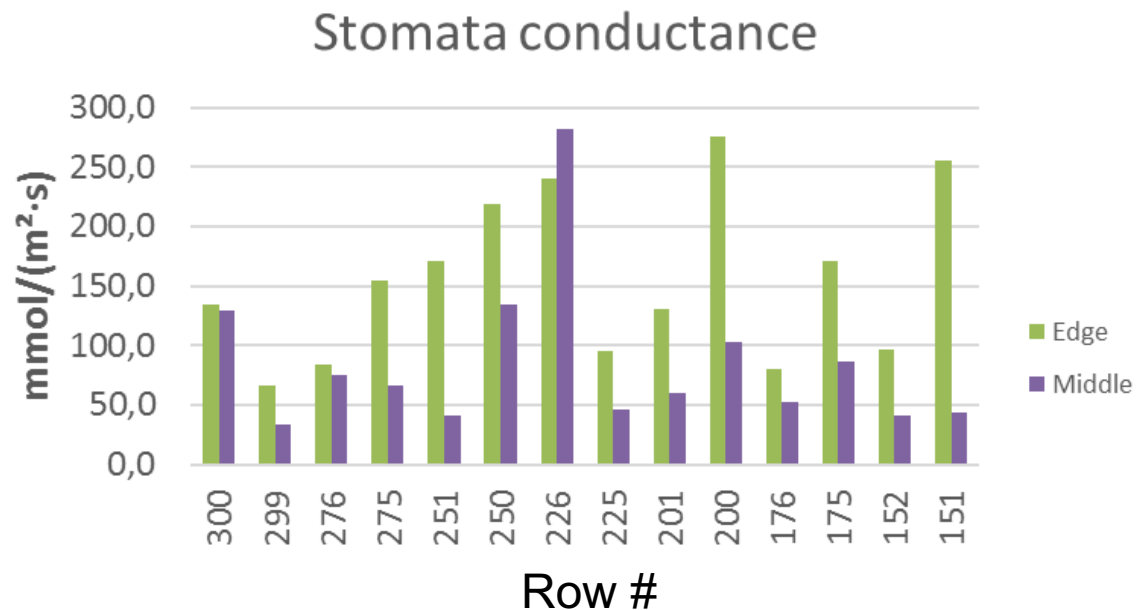
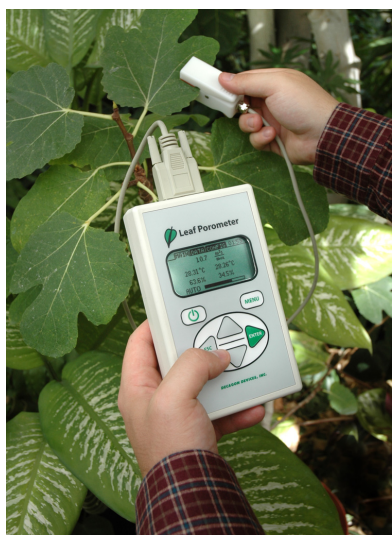
dji

INSPIRE 1



Measurements stomata conductance

Unit 2: 2017-07-04

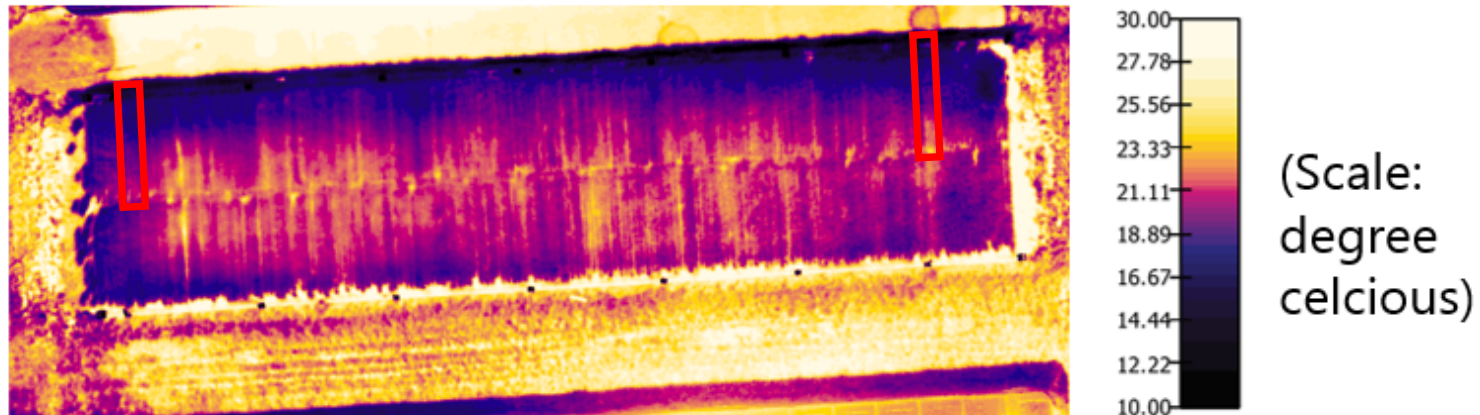


Thermal, multispectral and color imaging from UAS

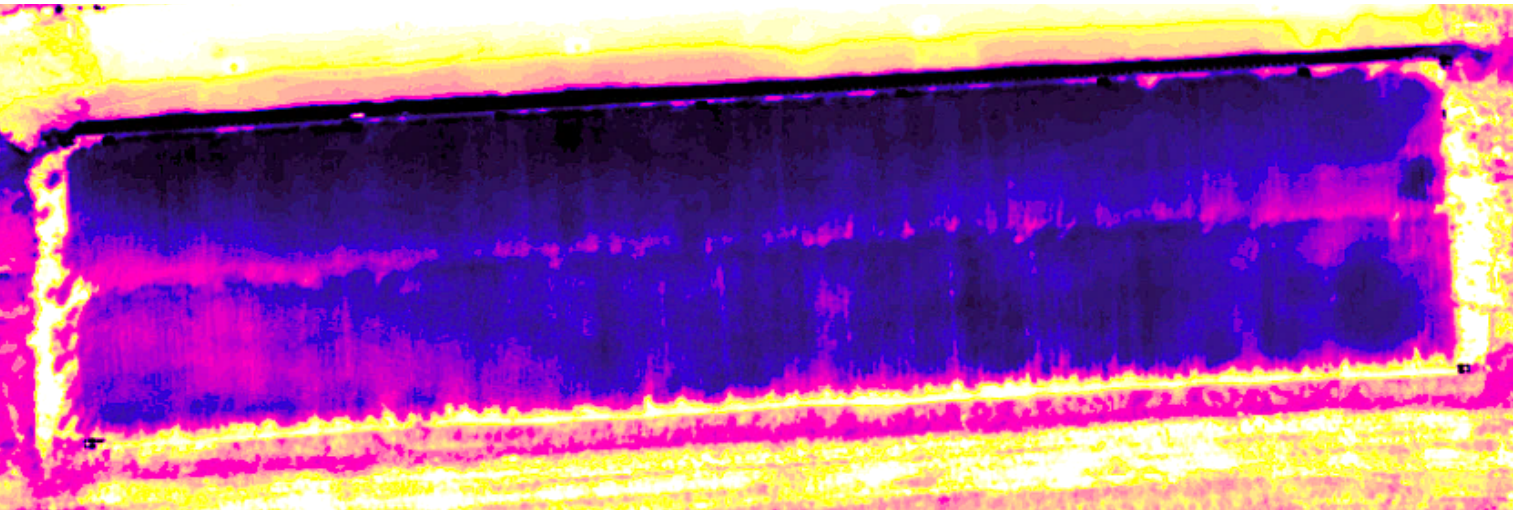
NDVI map
4. July 2017
Altitude 15 m
Barley, anthesis



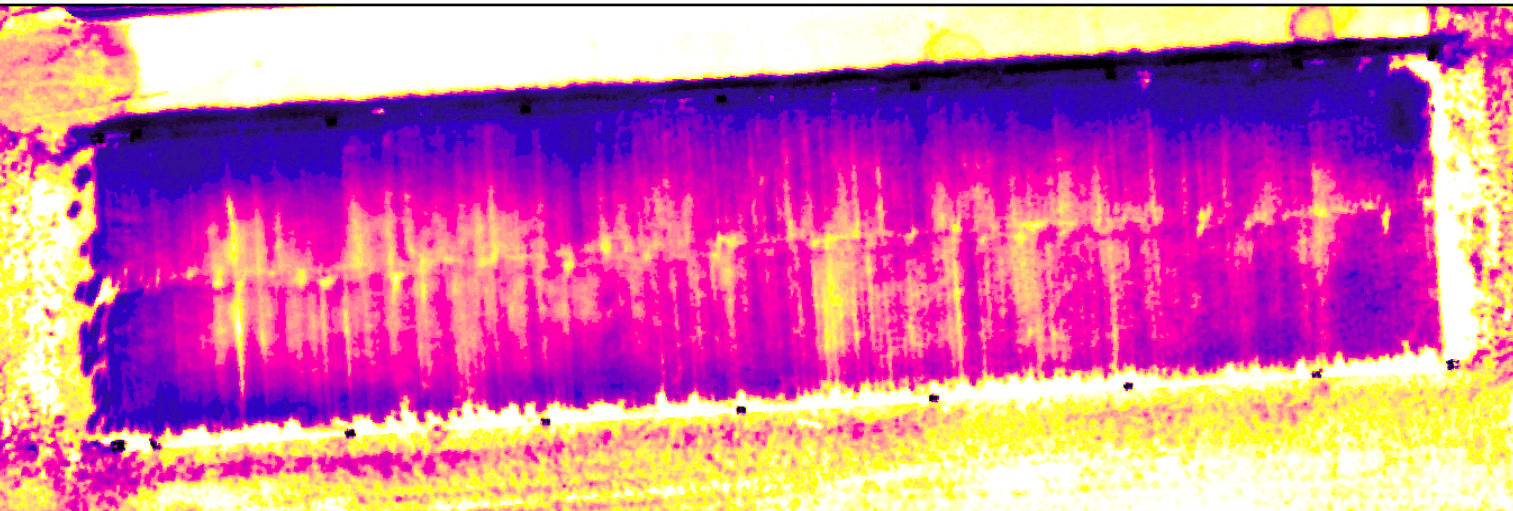
Thermal map
7. July 2017
Altitude 30 m
Barley, anthesis



Thermal imaging – mosaic of two timepoints

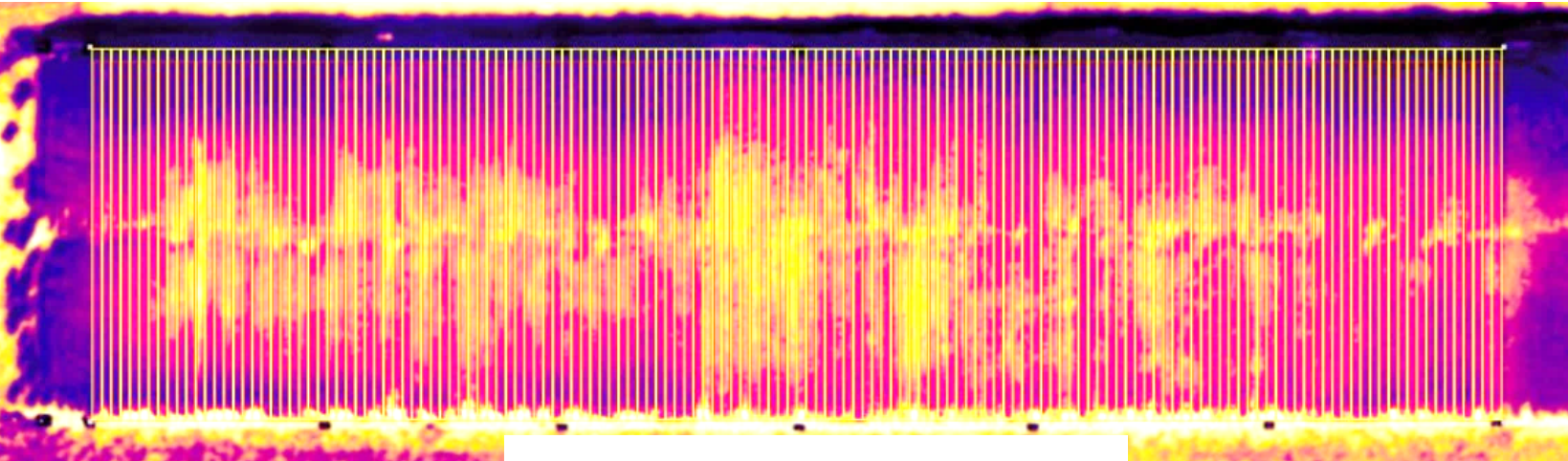


Thermal map
19. June 2017
Altitude 30 m
Barley, flag leaf



Thermal map
7. July 2017
Altitude 30 m
Barley, anthesis

Row-extraction and image analysis with *PlotCut* and *R*





2018 work – 3 Core-groups do research

- Winter wheat (Unit 1 and Unit 2) *AND* Potatoes (Unit 3 and unit 4)
- Measure root depth
- Measure stomata conductance, Carbon Isotope, N15
- Frequent UAS imaging morning and noon over a longer period
- Combine Root, Canopy and Thermography/Multispectral/RGB
- Challenges:
 - Surface roughness (different cultivars, different height)
 - Wind (rainout shelters may create unwanted turbulence/shelter wind)
 - Sun and RH% (often clouds and high humidity, bidirectional reflectance)
 - Temperature effects from concrete walls and passages
 - Background temperature (soil)
 - Stress indices (e.g. CWSI, VIT) or merely canopy temperature ($T_c - T_a$)
 - Image analysis, photogrammetry, radiometric correction, resolution, altitude...

Thank you

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FACULTY OF SCIENCE



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- Jesper Rasmussen (Assoc. professor)

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- Christian S. Jensen (Scientist at DLF)

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- Sejet
- Nordic Seed
- Danespo

