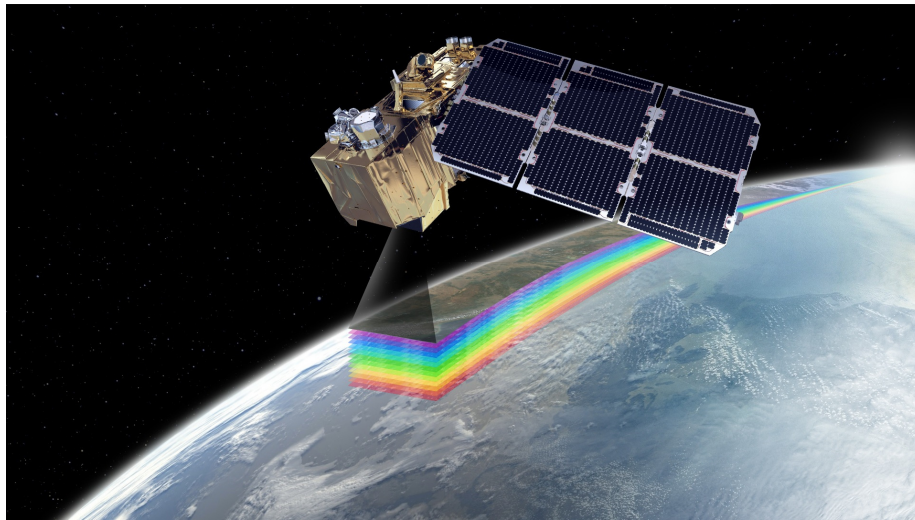


Uudet tekniikat nurmisadon mittauksen apuna

Jere Kaivosoja

Uudet tekniikat

- Kaukokartoitusmenetelmät: satelliitit ja dronet



Satelliitit

- Sentinel-1 ja Sentinel-2 satelliitit
 - Uusi 10m x 10m kuva n. joka toinen päivä

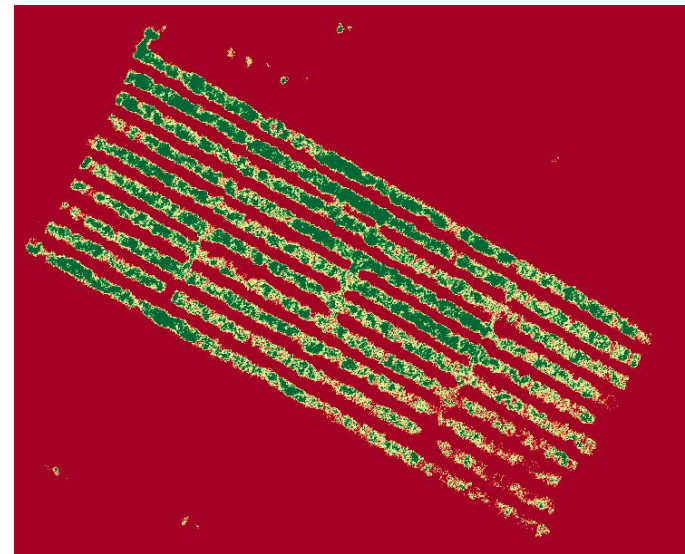
Dronet

- Kuluttajakalusto tonnin hintaluokassa: 20min 20 ha, luokiteltu kartta reaaliajassa.
- Sensorikehitys: hyperspektri +SWIR, + Lidar



Mitä on tarkoitus saada selville

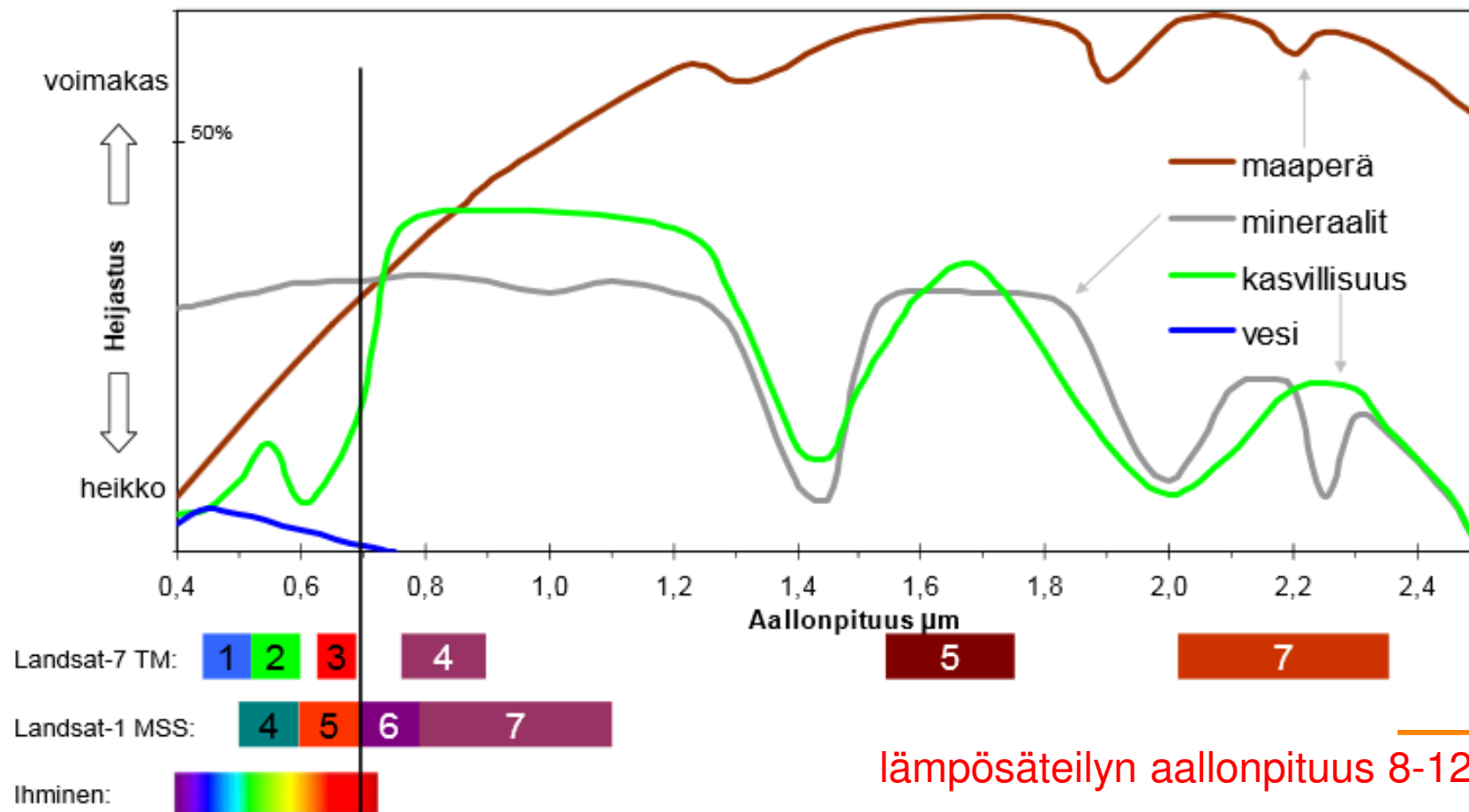
- Paikkakohtainen arvio pellolla olevan nurmen määrästä ja laadusta (sulavuus) täsmäkartta
- Satelliittipohjainen arvio nurmilohkon tilanteesta

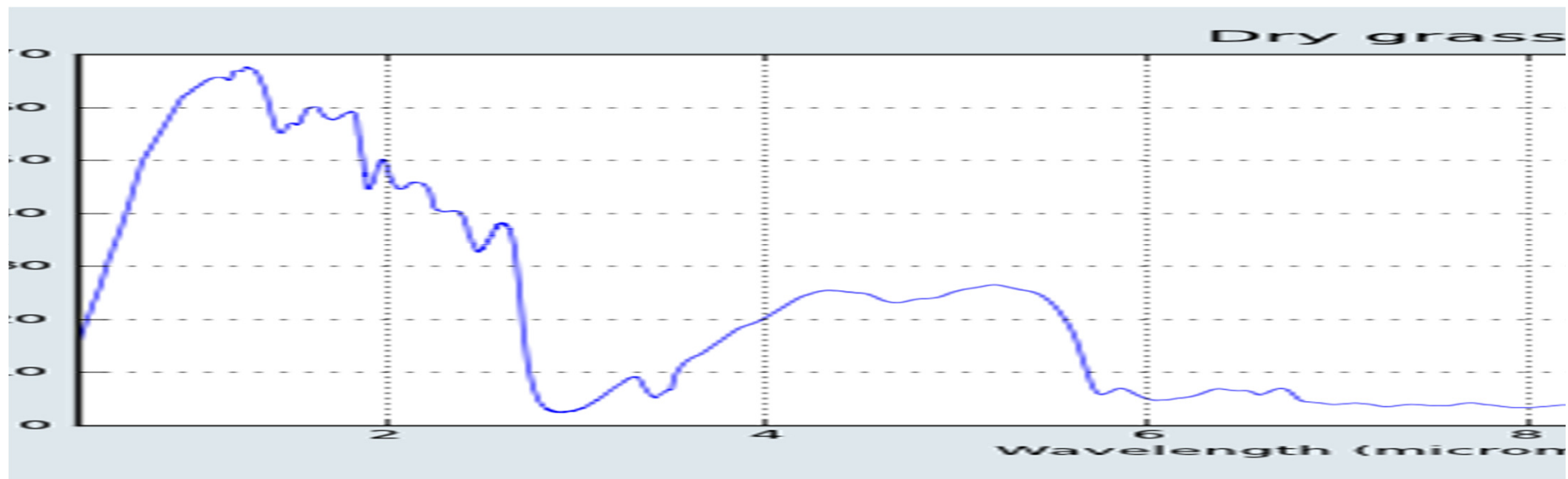
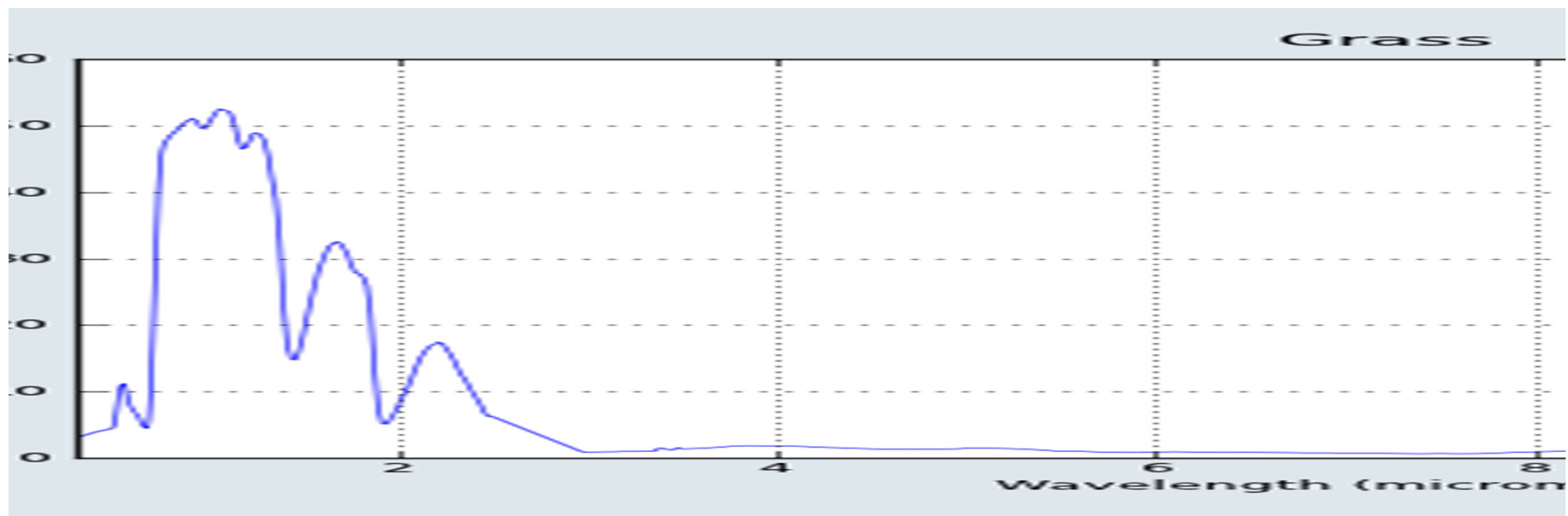


Keskeisessä roolissa optiset menetelmät

- RGB, CIR, NIR, SWIR, Multispektri, Hyperspektri
- Aktiivisena mittauksena laser-mittaus dronesta (lidar)

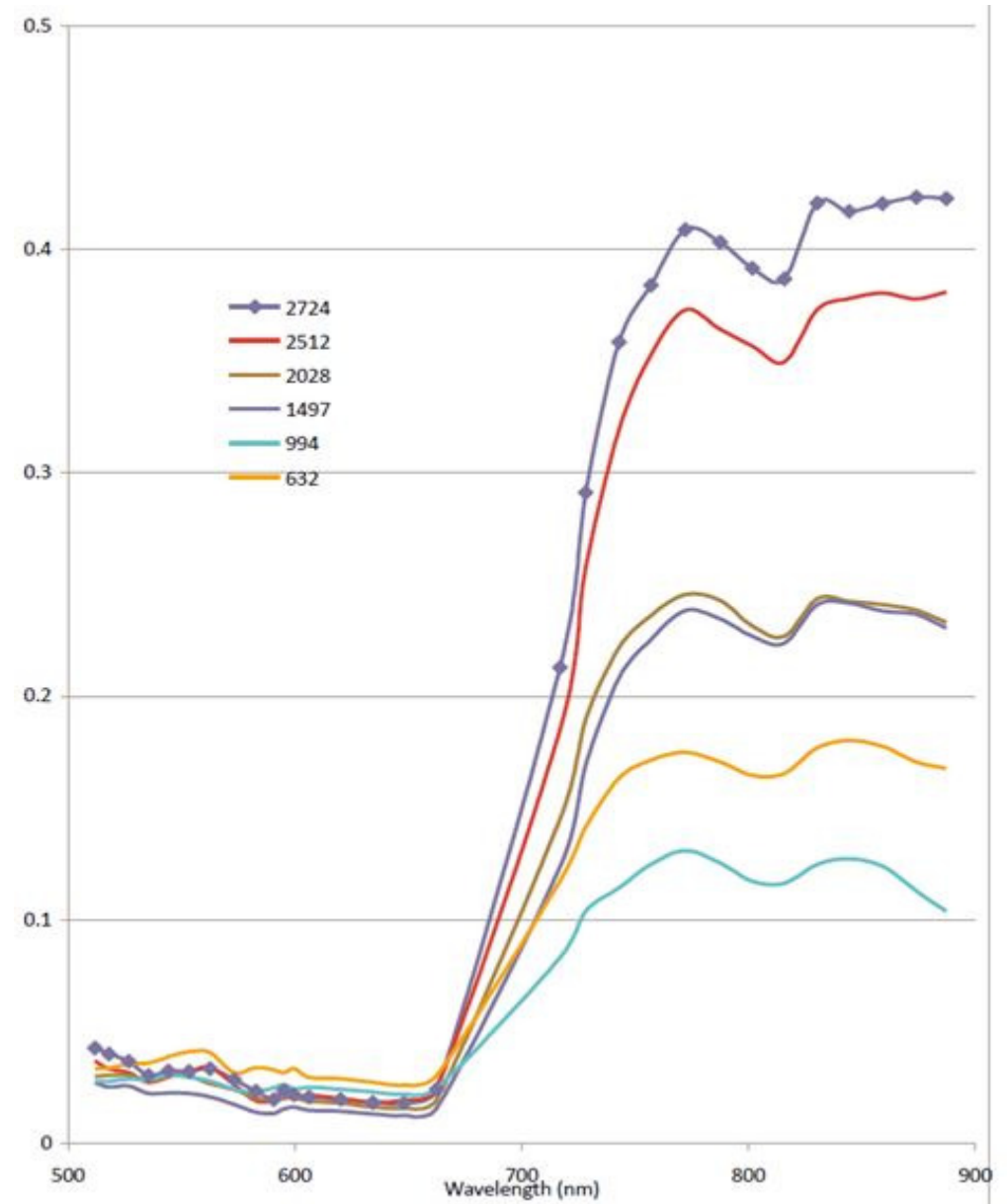
Erilaisten kohteiden heijastuminen



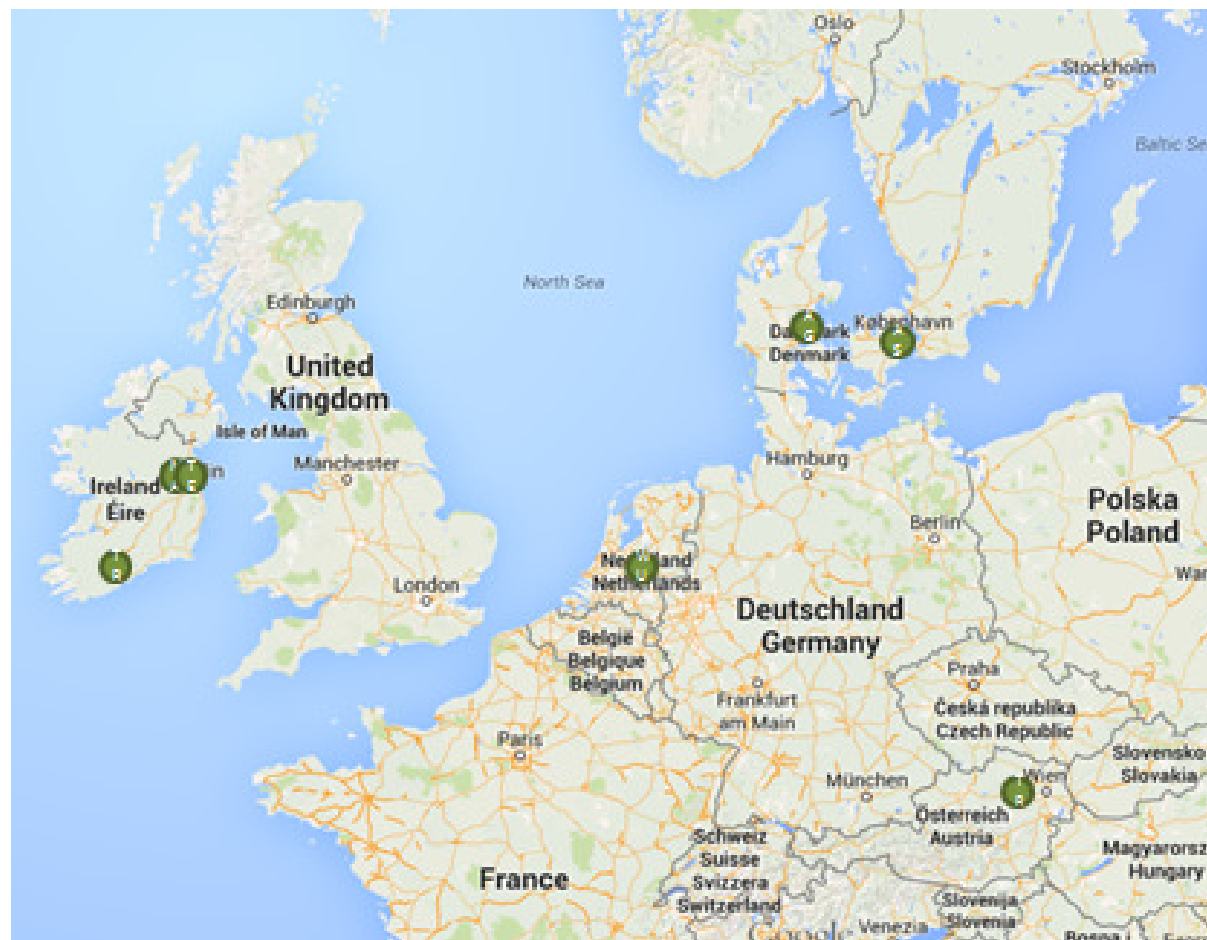
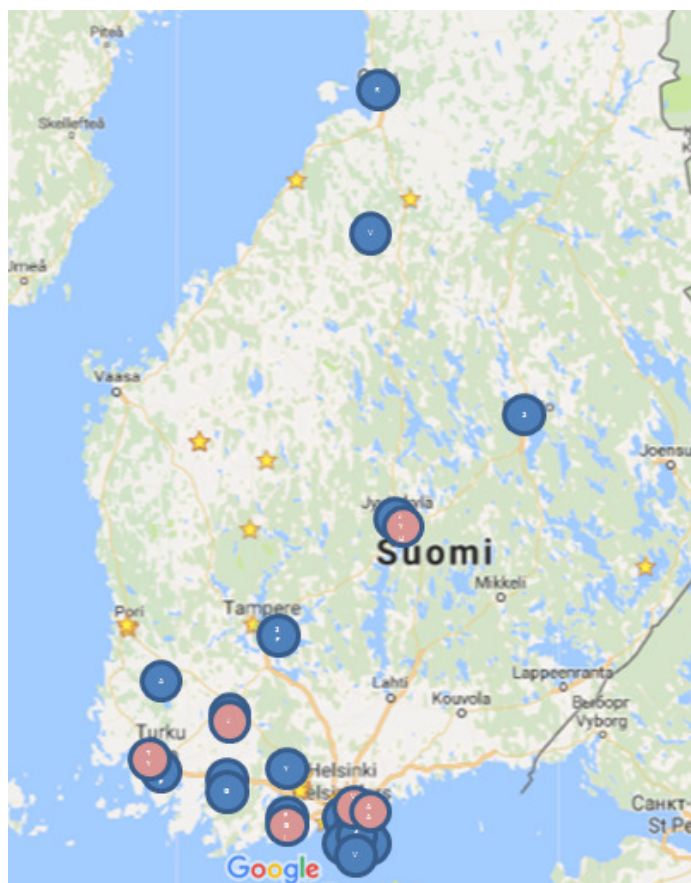


Hyperspektrikamerat

Rikola

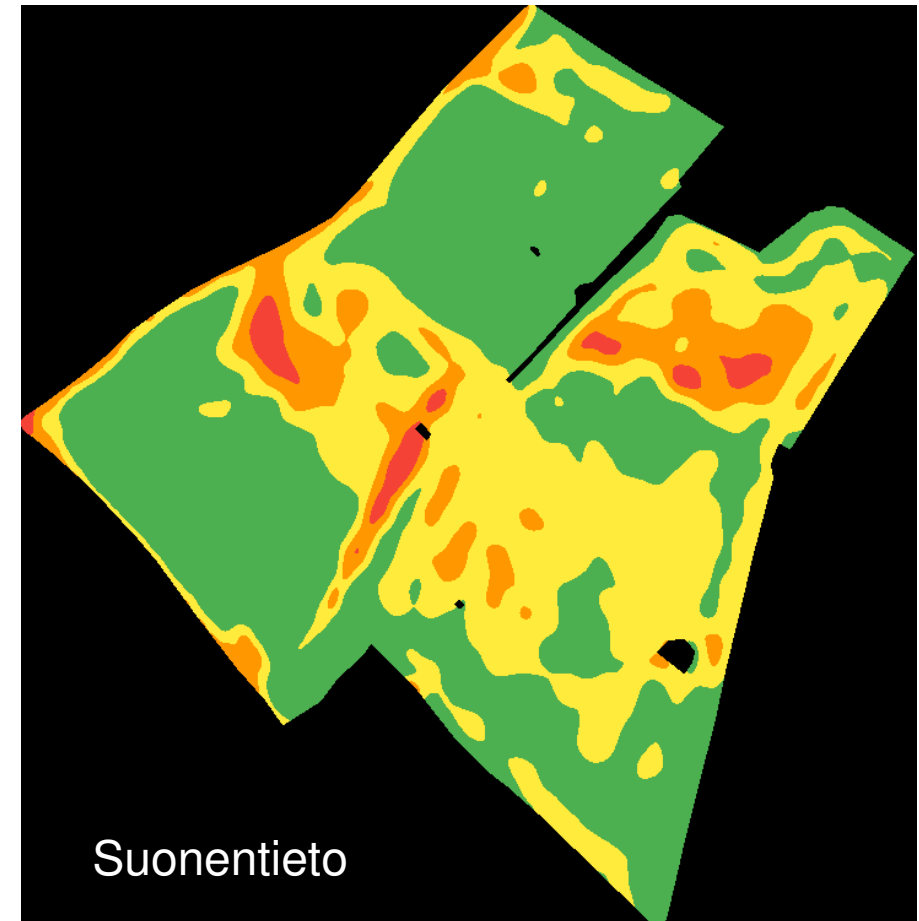
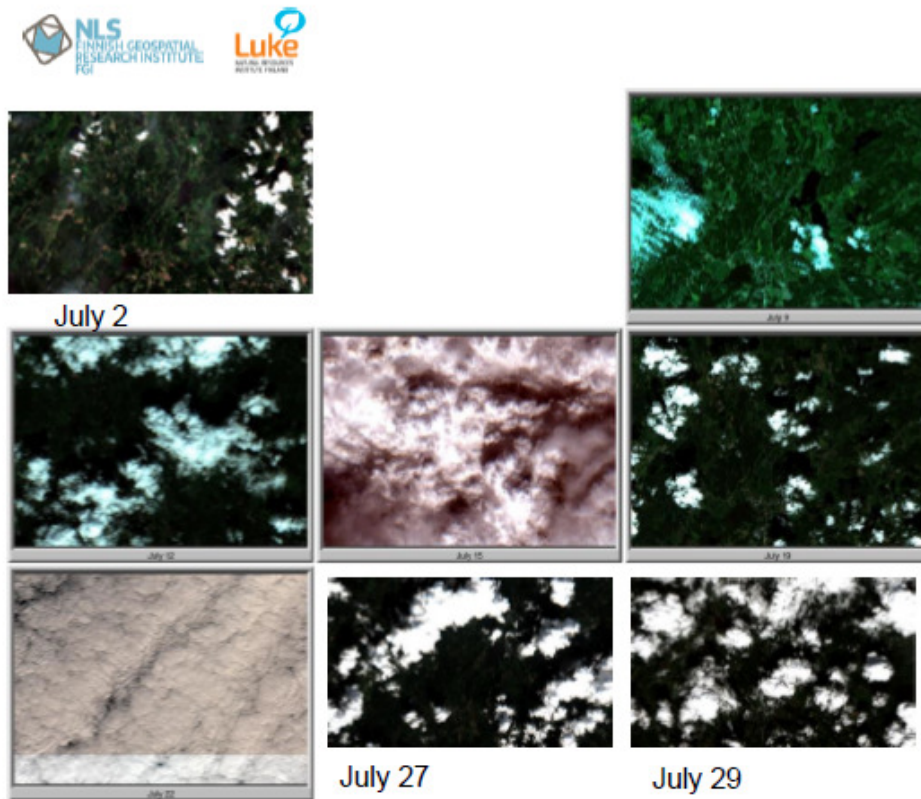


GrassQ, DroneKnowledge ja BoostSat



Valio, Yara, Suonentieto, Bitcomp, Boreal, Appetit

Satelliitit



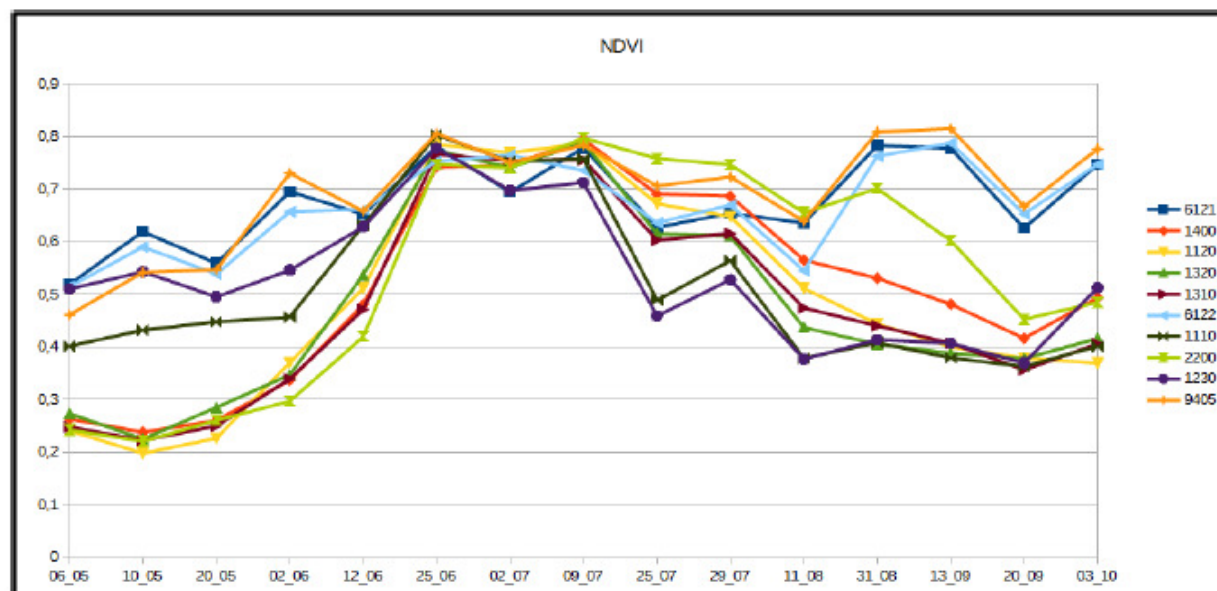


Figure 5. Average statistics of all LPIS vegetation classes.

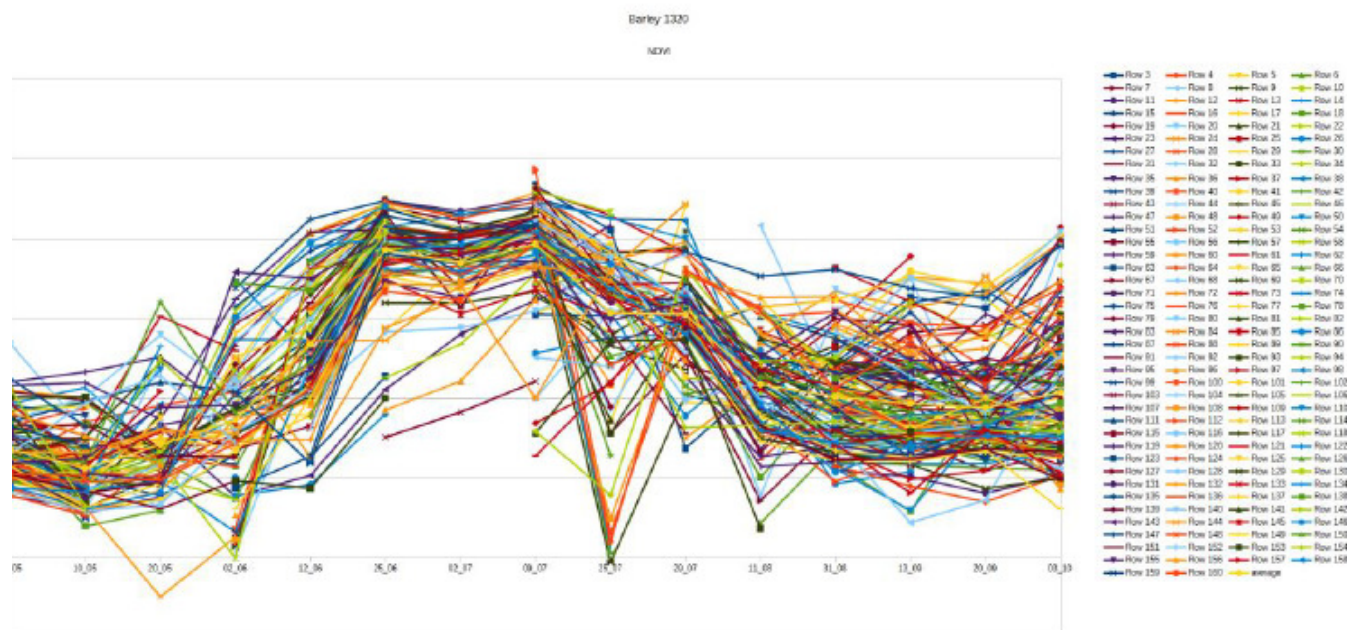
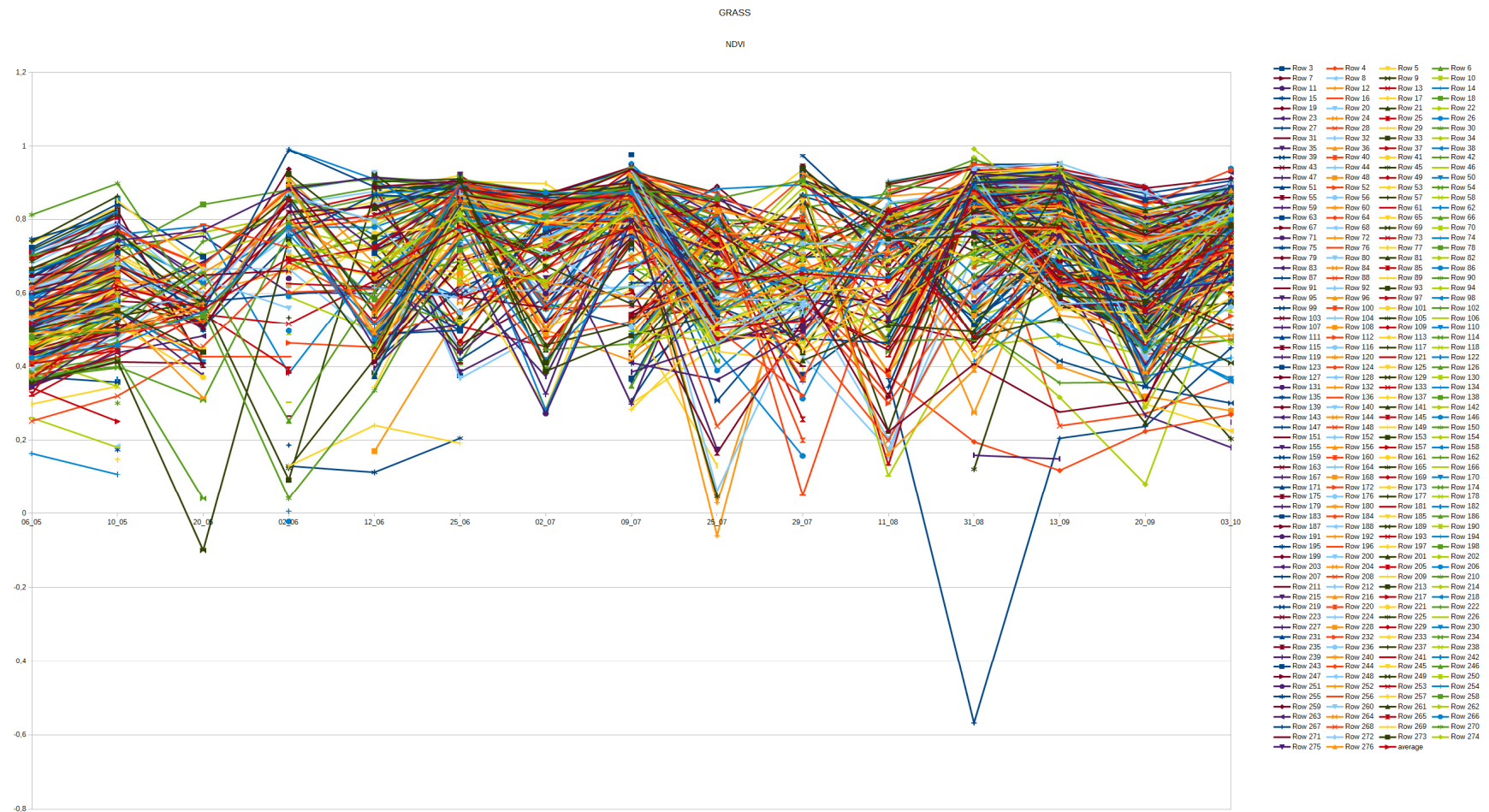


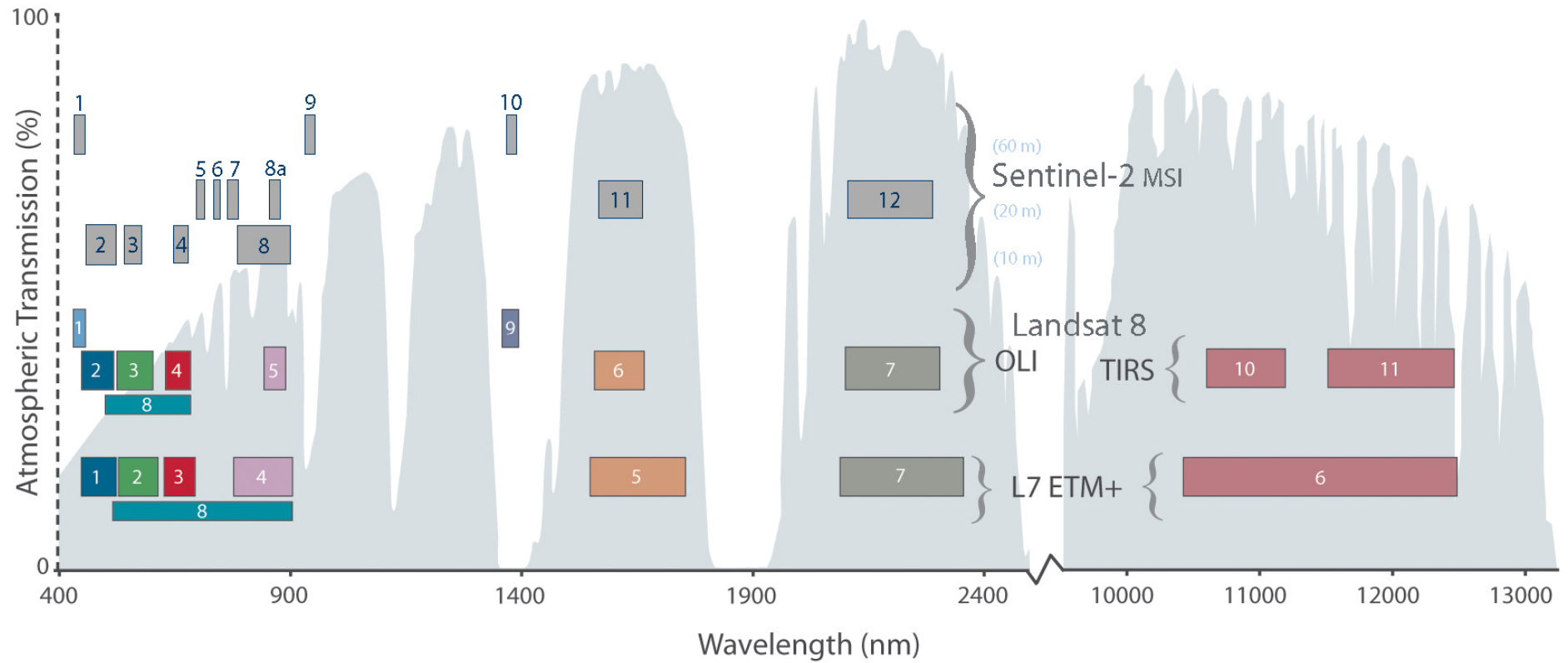
Figure 6. NDVIs of all Barley parcels in the area during the entire summer.

and

10km x 10km alueen eri nurmilohkot kasvukauden aikana, NDVI



Comparison of Landsat 7 and 8 bands with Sentinel-2



RESEARCH CO-OPERATION, 2009->

VTT Technical Research
Center Finland, Optics
team



Sensor development

FGI Finnish Geospatial
Research Institute



Data production,
integration

JYU University of
Jyväskylä, Department of
Mathematical Information
Technology



Information development

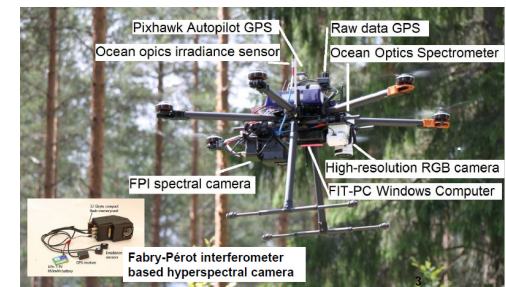
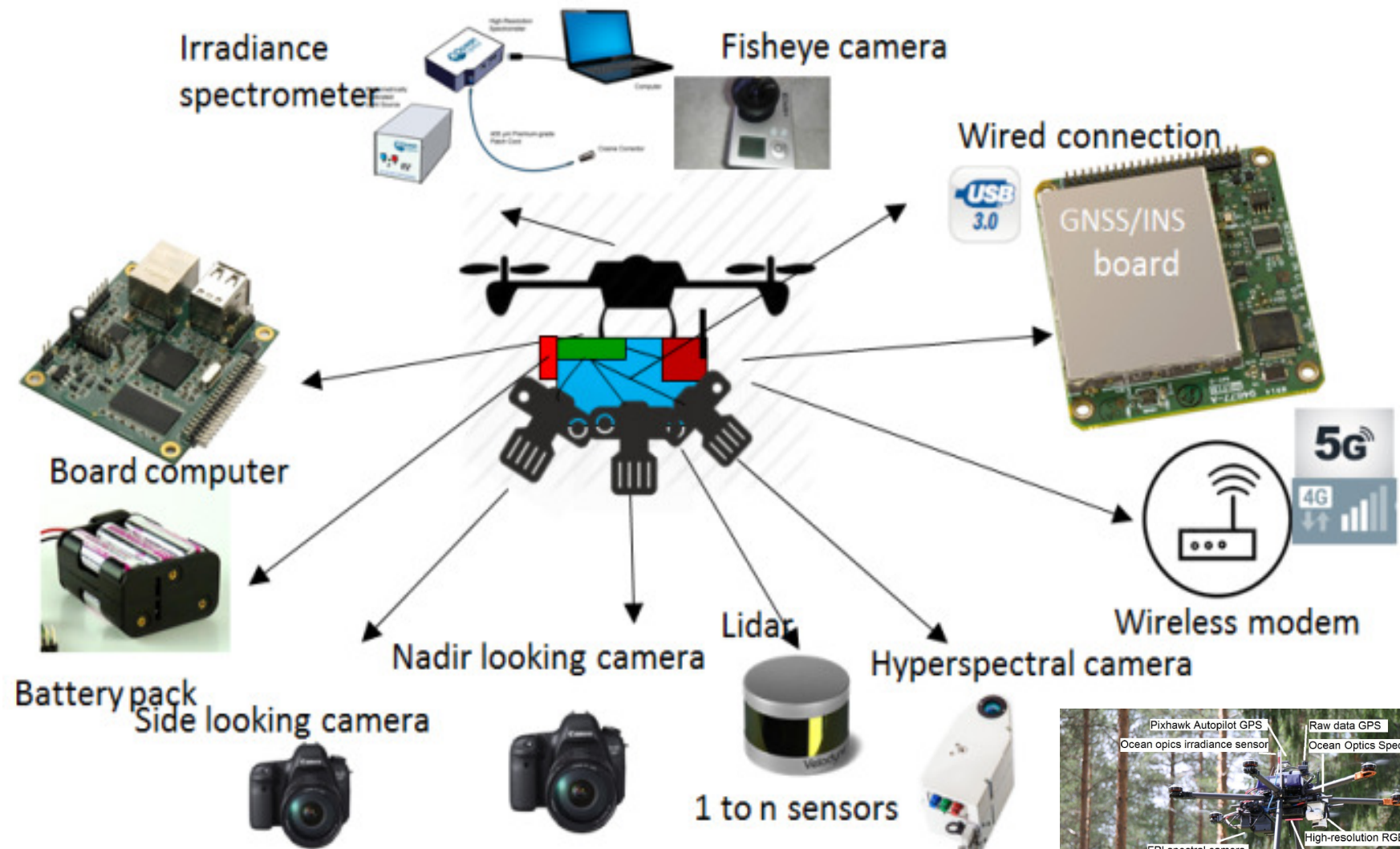
LUKE, Green technology
unit



Knowledge
and decision support systems



END USERS

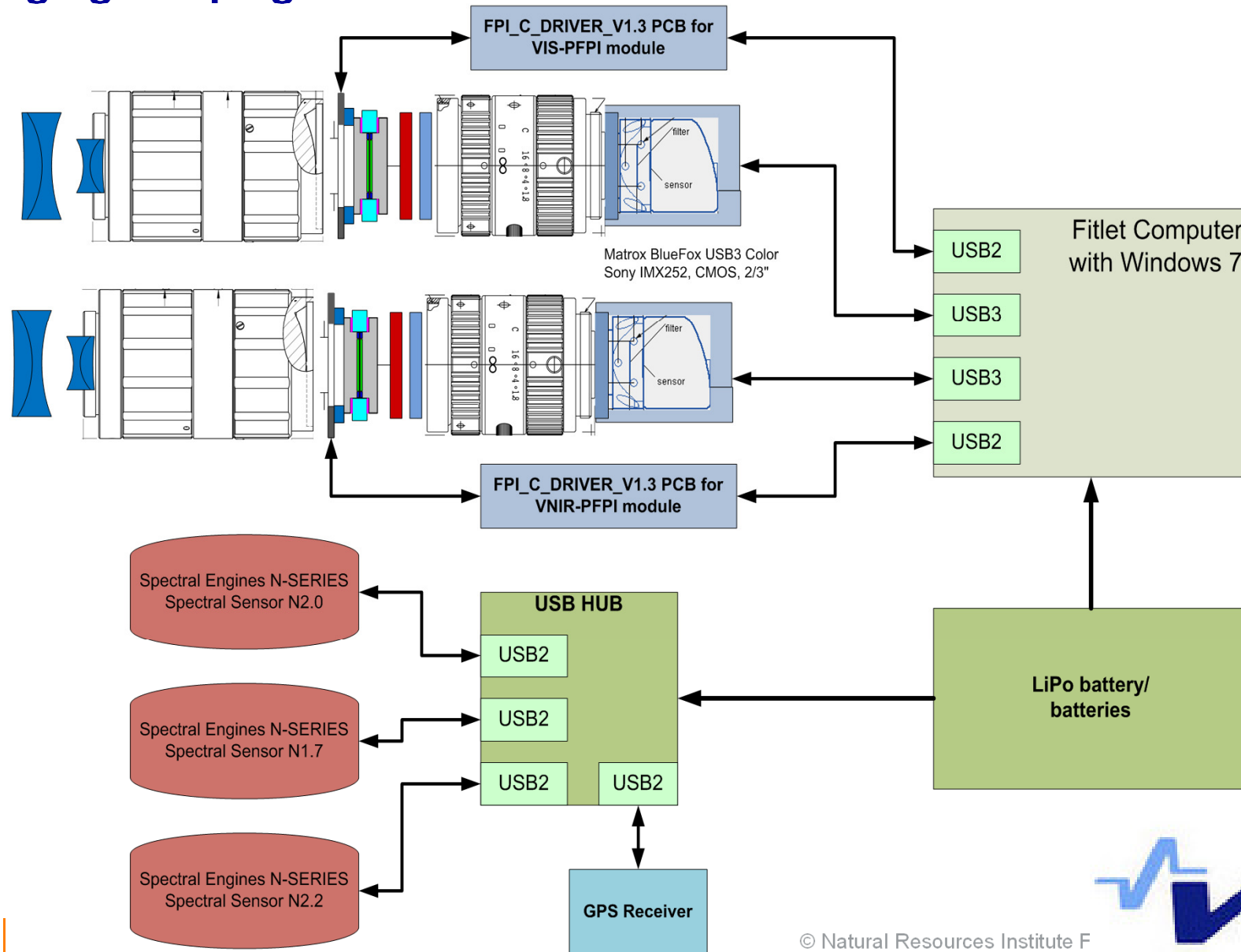


• 3D hyperspektrikartoitus

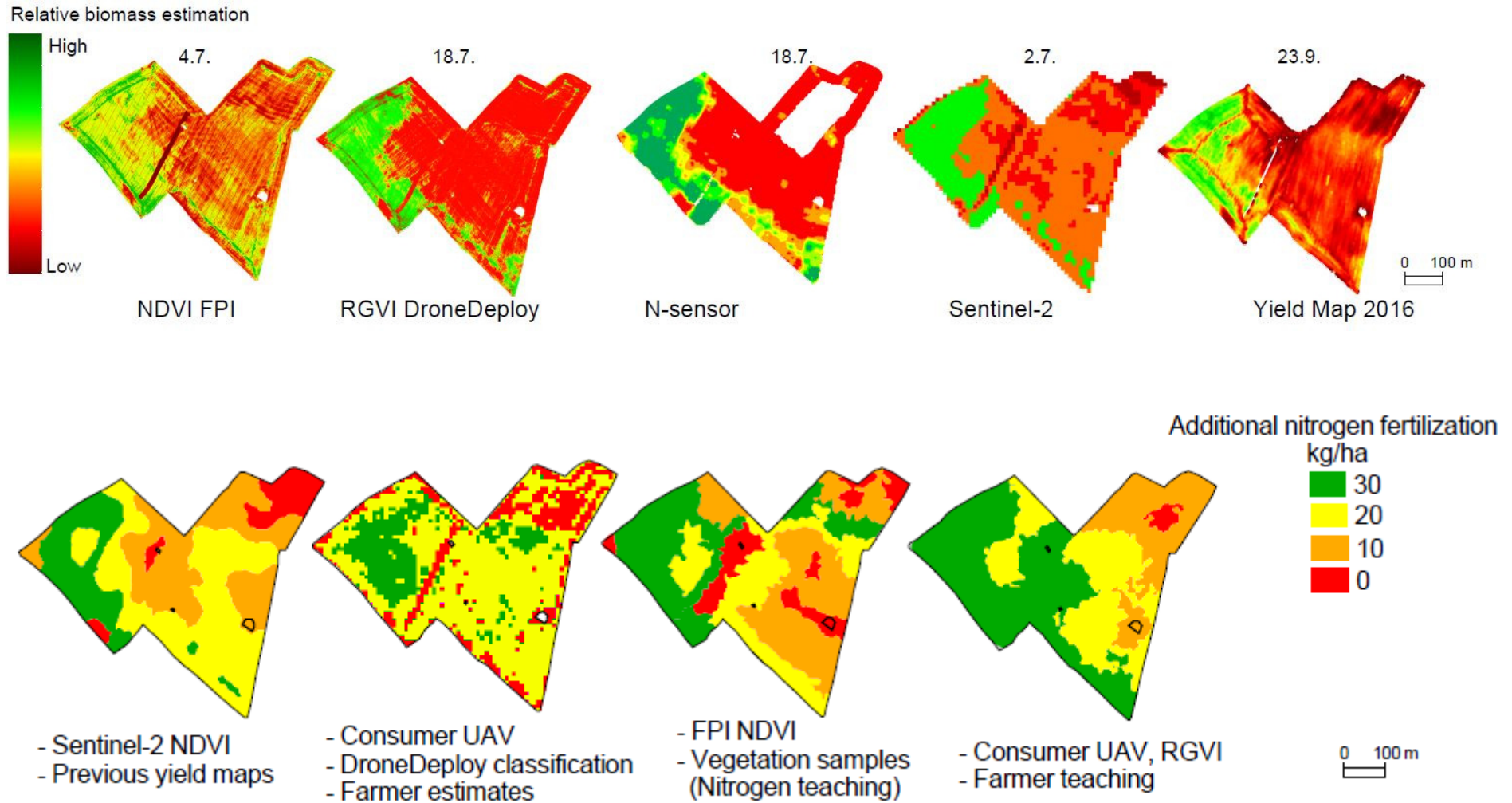


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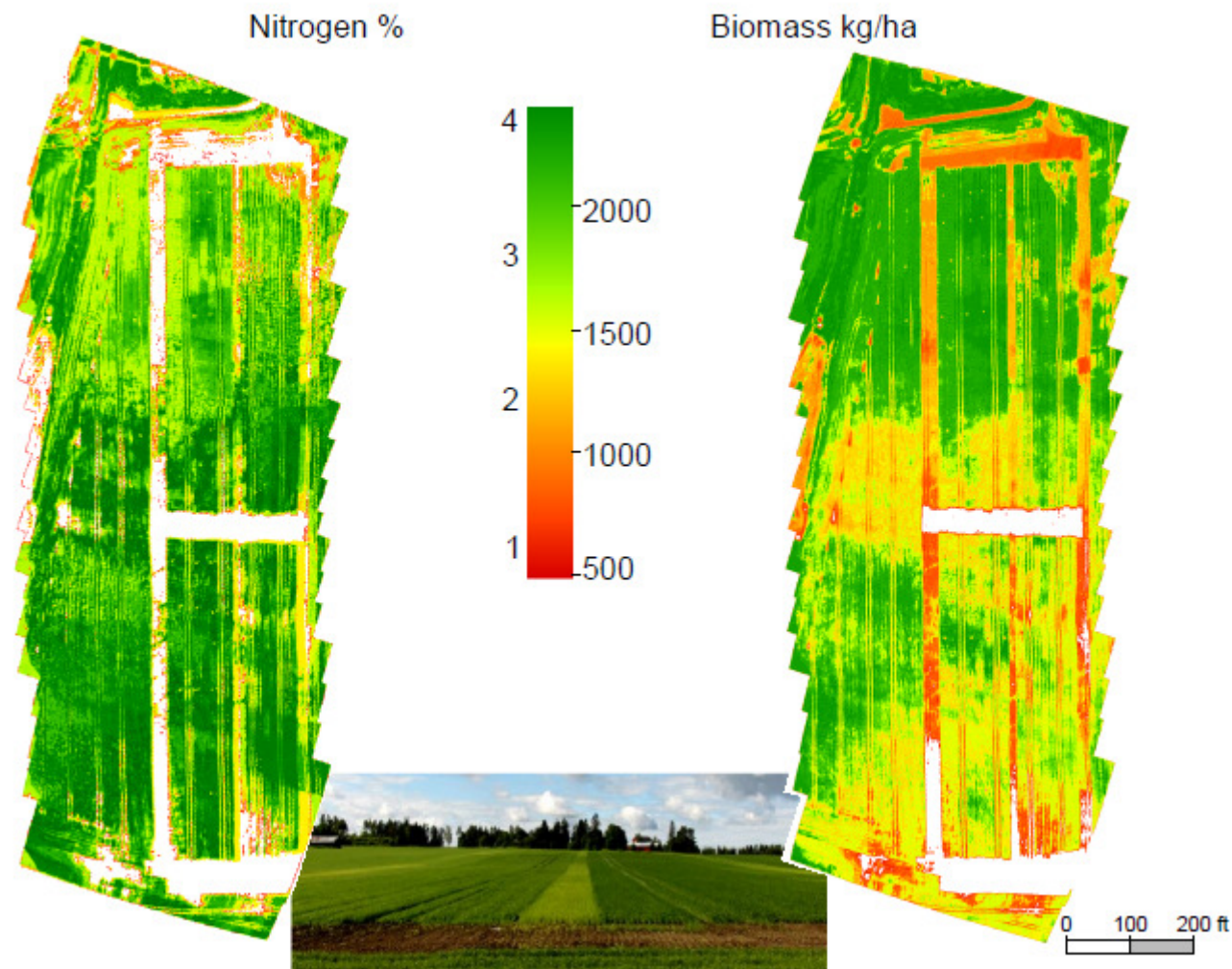
Preliminary concept of the DroneKnowledge VIS-VNIR-SWIR HSI prototype for the growing Season 2017 drone imaging campaigns



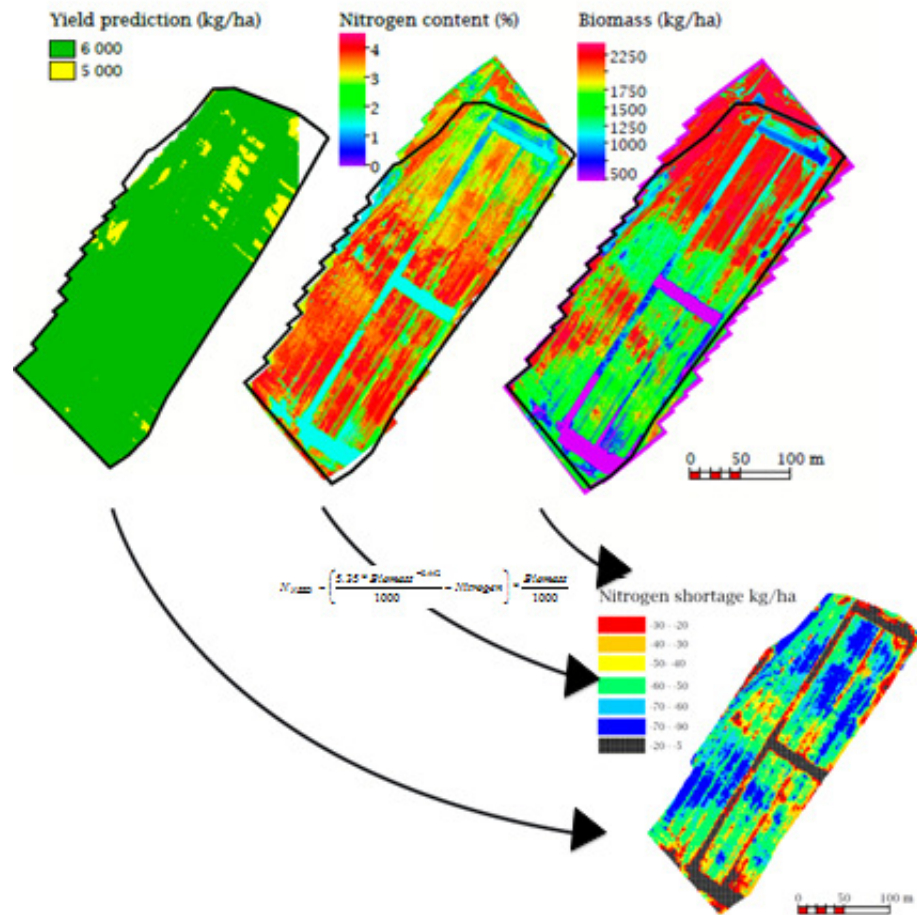
Biomassat ja lisälannoitukset



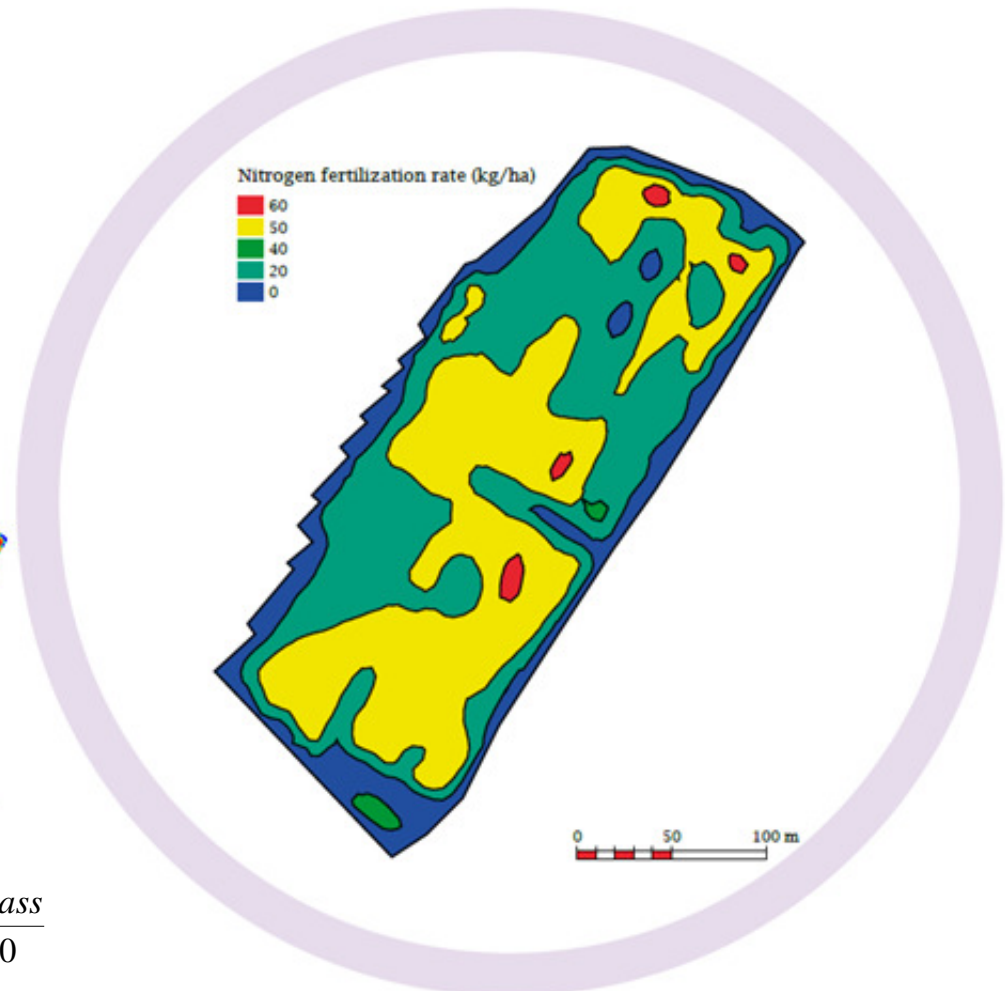
Hyperspectral UAV for precision agriculture



Precision fertilization task

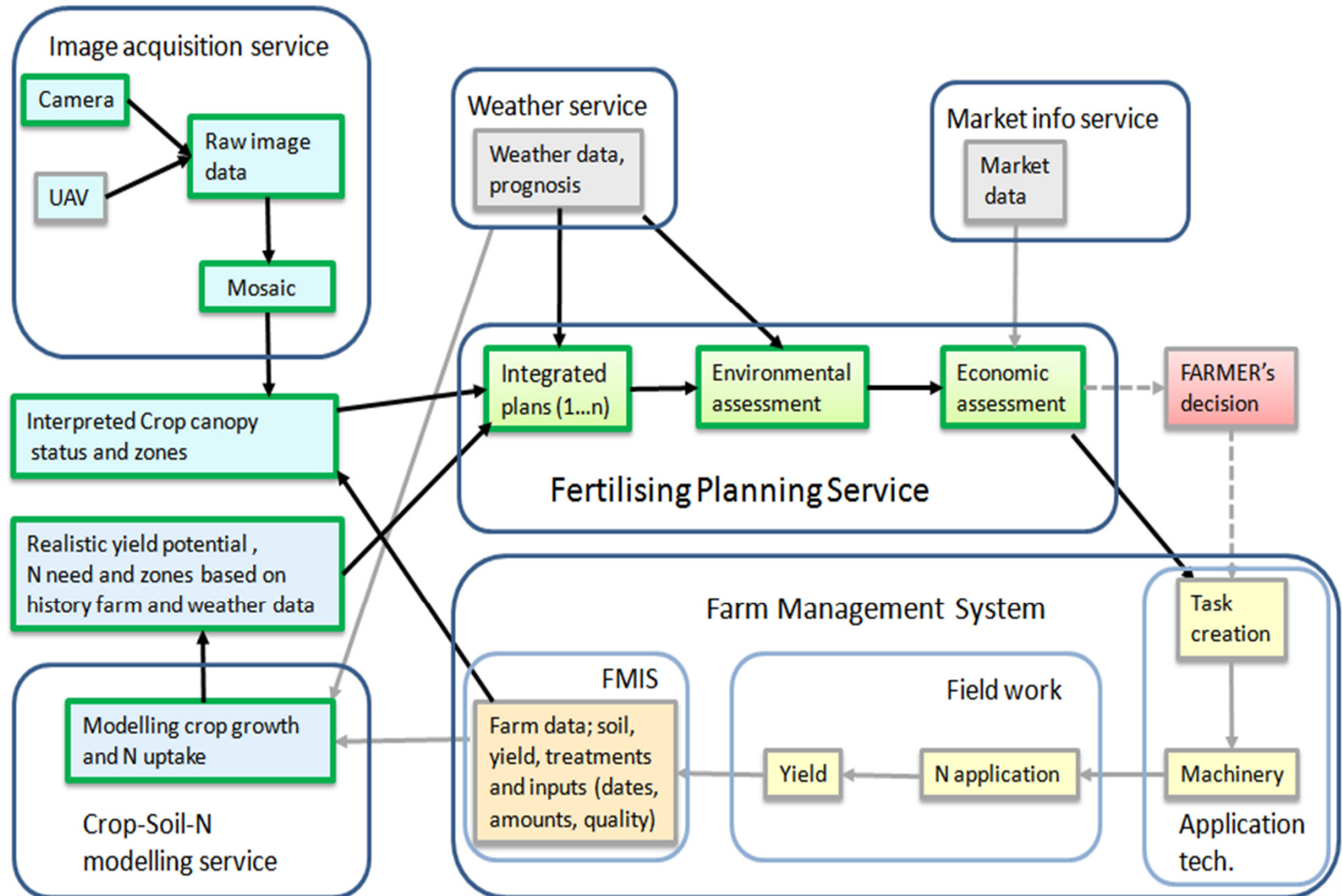


Precision fertilization task generation

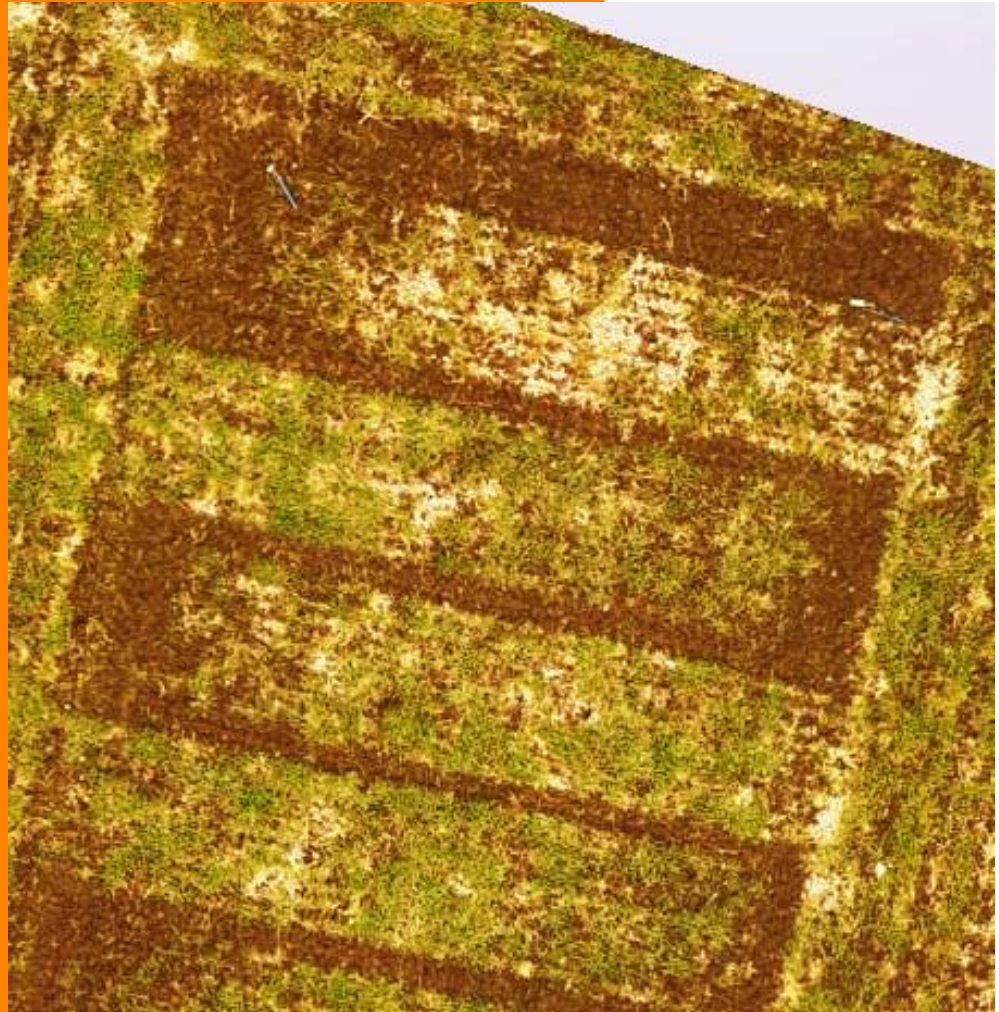


$$N_{NEED} = \left(\frac{5.35 * Biomass^{-0.442}}{1000} - Nitrogen \right) * \frac{Biomass}{1000}$$

Koko systeemi loppukäyttöön ja arviointiin asti



Thank you!



Jere.kaivosoja@luke.fi