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Framework conditions for innovation

INNO-VEG: Use of crop sensing in field vegetable and potato crops

Thursday 26th January 2023

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Agenda

▪ Introduction to the INNO-VEG project	John Williams, ADAS
▪ Theory and practice: how to make use of crop sensors in field vegetable and potato crops	Lizzie Sagoo, ADAS
▪ Analysis of field scale crop reflectance data using ADAS Agronomics data analysis methods	Susie Roques, ADAS
▪ HMC: Yield mapping & crop sensing	Jack Harris, HMC Peas
▪ INNO-VEG Facts & Figures	James Dowers, ADAS
▪ Close and lunch	

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Introduction to the INNO-VEG project

John Williams, ADAS

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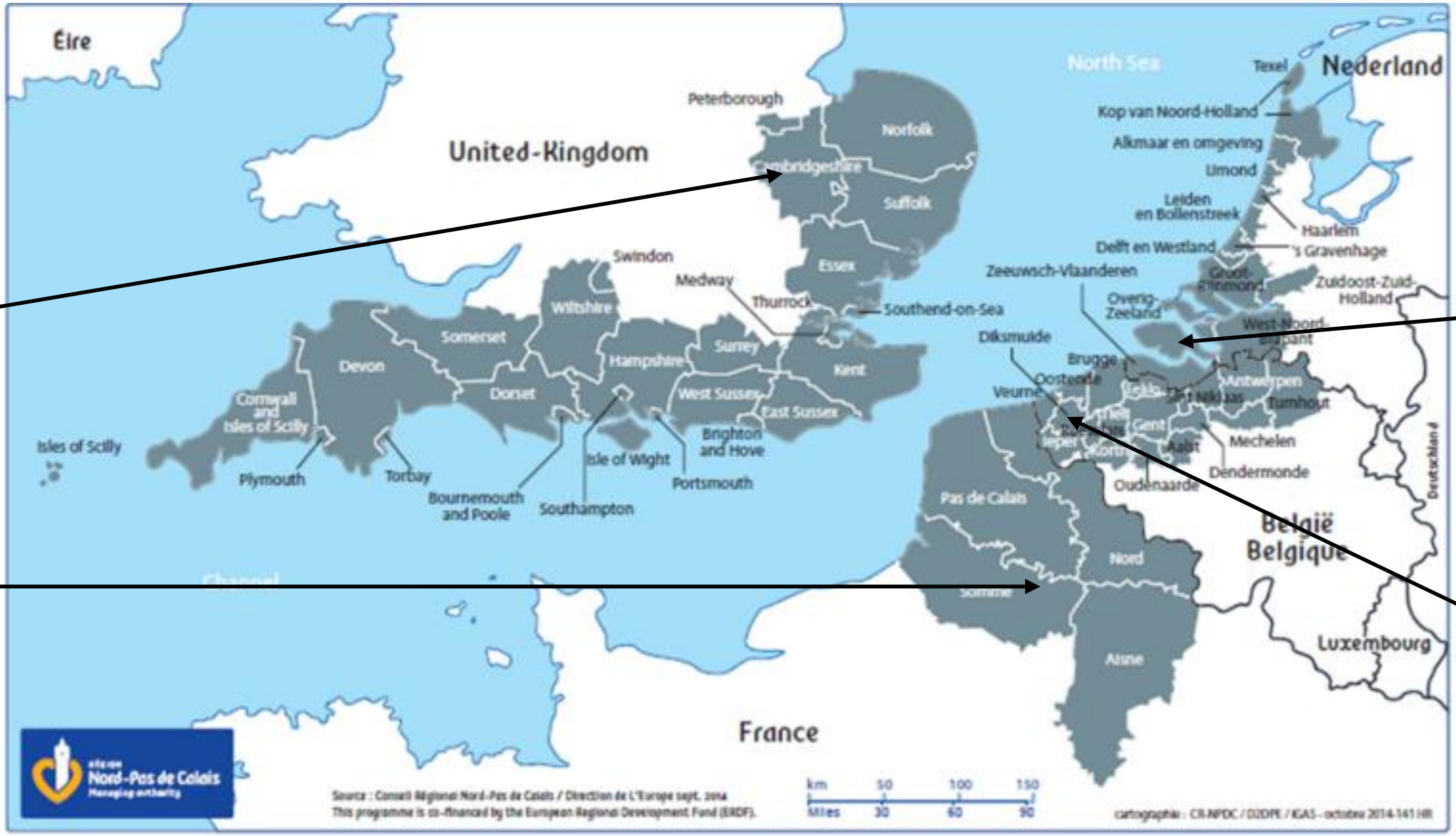
INNO-VEG – Increasing the speed & uptake of innovation in the field vegetable & potato sectors

ADAS

Delphy



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Project objective

- To increase the speed and uptake of innovation in the field vegetable and potato sectors
- Evaluate the suitability of using crop sensing data to carry out measurements in field experiments
- Define a new approach for delivering research in the field vegetable and potato sectors

INNO-VEG – Increasing the speed & uptake of innovation in the field vegetable & potato sectors

- Field experiments focus on:
  - Using crop sensing data to carry out measurements in field experiments
  - Upscaling from small plot to field scale farmer led experiments
  - Field vegetable & potato crops

Crop types

- Alliums (leeks/onions)
- Brassicas (cauliflower/sprouts)
- Leafy salads (lettuce/spinach)
- Vining peas
- Root vegetables (carrots)
- Cucurbits (courgettes)
- Potatoes



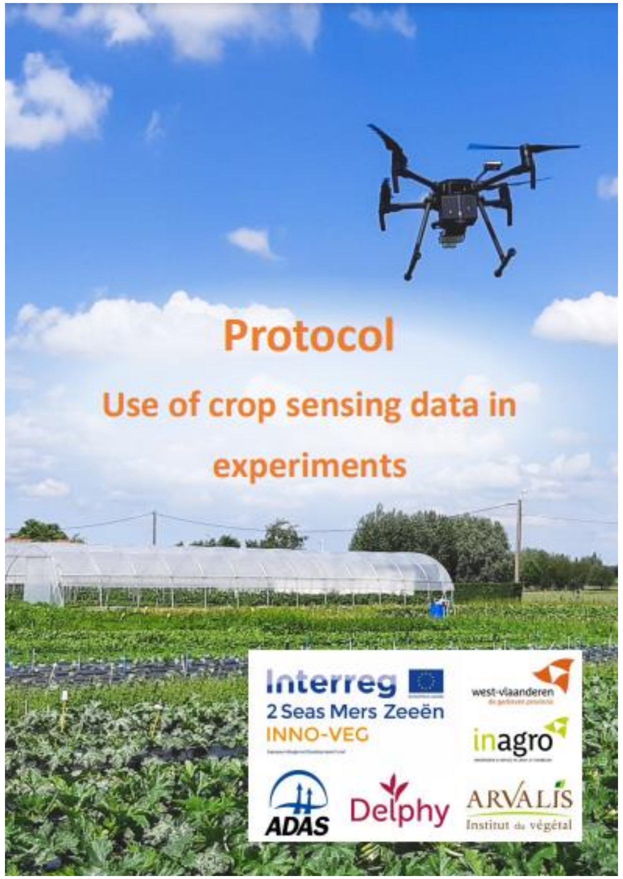






Experimental work

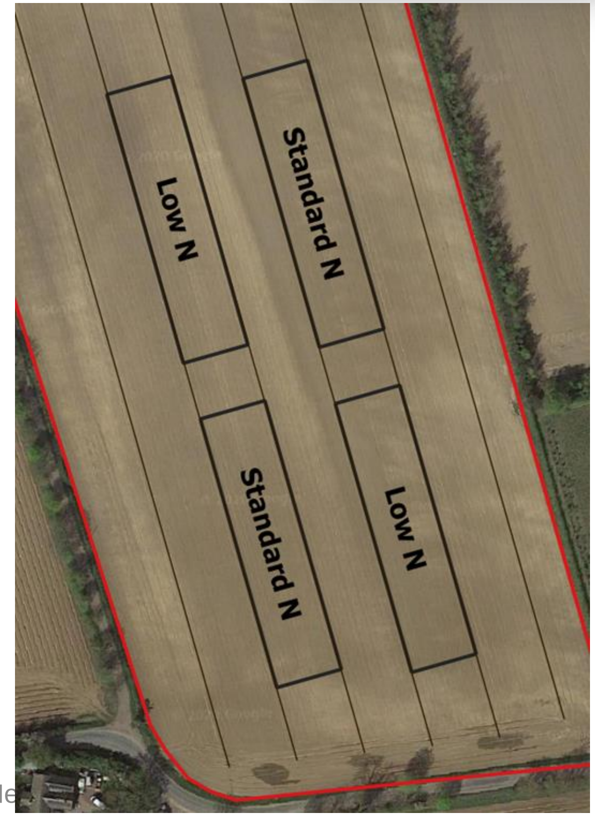
- 2019 - 47 small plot field experiments in UK, FR, BE & NL
  - Range of crops
  - Use crop sensors to measure reflectance
  - Calculate range of vegetation indices & correlate to crop yield

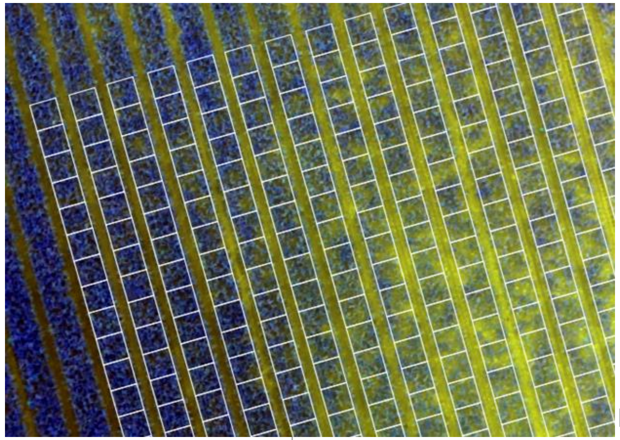


www.inno-veg.org

Field scale field experiments (2020 & 2021)

- Field scale farmer led experiments
- Host farms apply treatments
- Collect crop reflectance data
- Use spatial statistics to analyse data
- ‘Framework for farmer led research’





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INNO-VEG Cross border innovation network

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- Knowledge transfer & networking
- Register on our website for project updates
  - www.inno-veg.org
- Talk to us on social media ☺

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ADAS inagro Delphy ARVALIS Institut du végétal west-vlaanderen de gedreven provincie

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Theory and practice: how to make use of crop sensors in field vegetable and potato crops

Lizzie Sagoo, ADAS

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Outline

- What is crop sensing
- Why use crop sensing
- Vegetation indices
- Types of sensor
- INNO-VEG - lessons learnt

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Why use crop sensing?

- Data can be used to provide an indicator of crop growth/performance
- Non-destructive
- Relatively quick
- Cost effective for measuring from larger areas and for crops where yield mapping is not available

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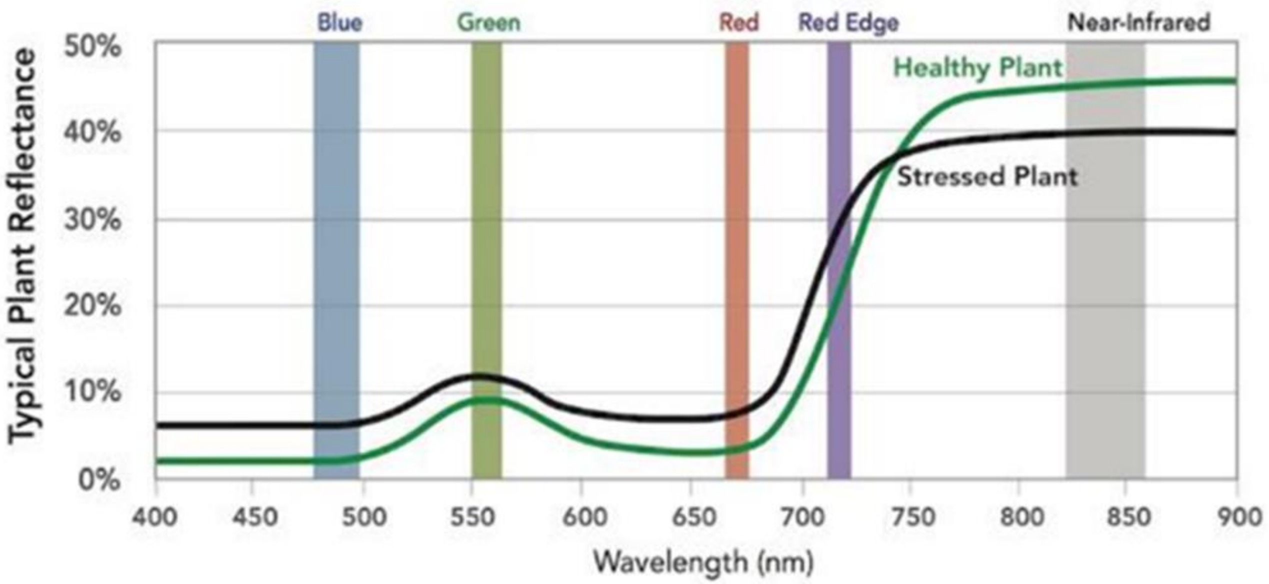
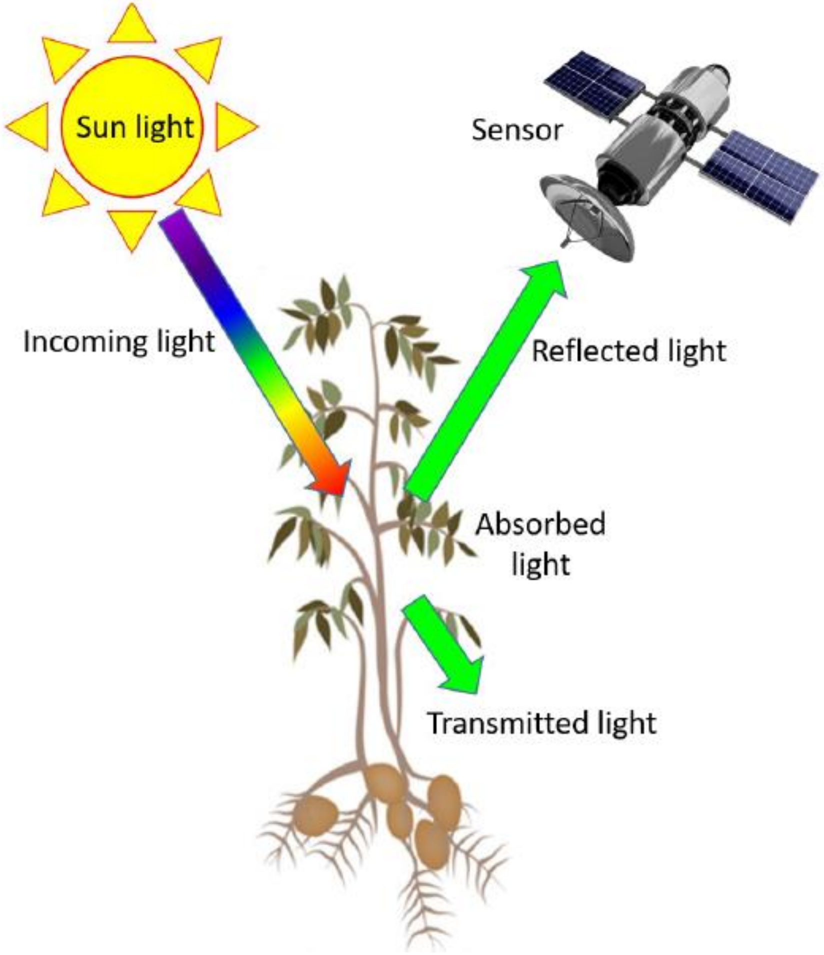
What is crop sensing?

- Capturing reflected light in different wavelengths
- Using this data to provide information on crop growth and vigour





Sensor types

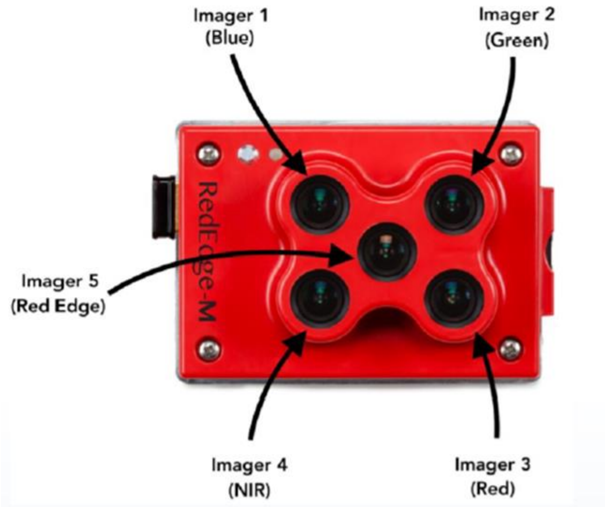
Spectral resolution

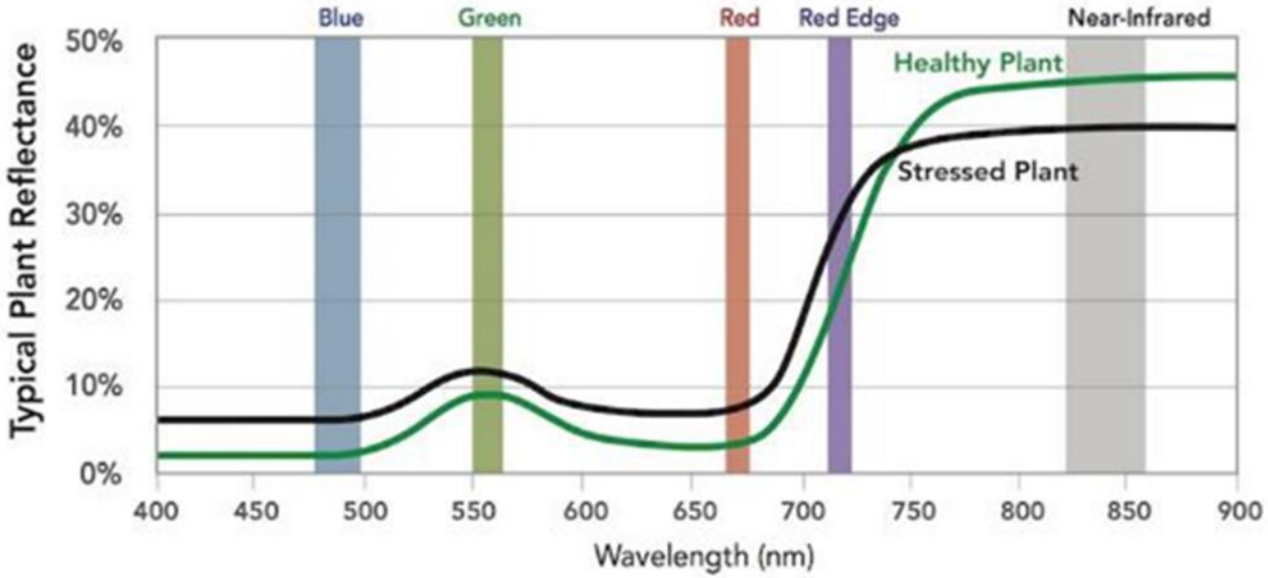
- Multispectral
- Hyperspectral
- RGB

Light source

- Passive
- Active

Platform





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Sensor platform

- Handheld sensors
- Tractor mounted sensors
- Drone mounted sensors
- Satellite images

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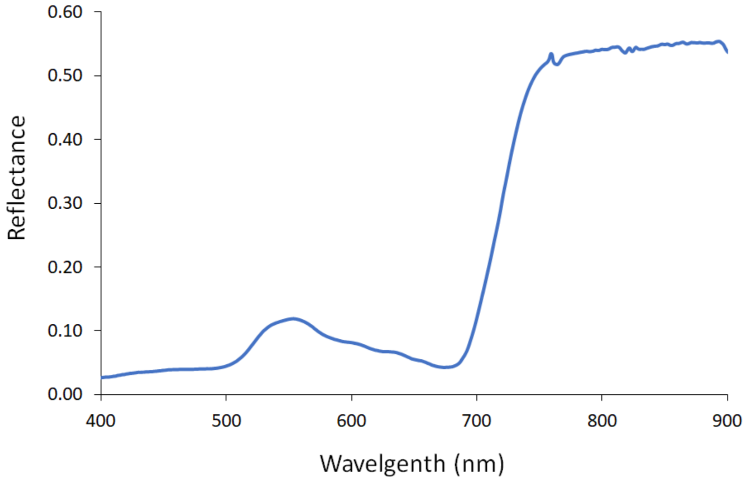
FieldSpec HandHeld 2

- Hand held sensor
- Used in small plot experiments in 2019
- **Hyperspectral** – wavelength range 325-1075 nm
- Records reflectance values every 1nm
- Passive sensor – calibrate in field using a white reference disc



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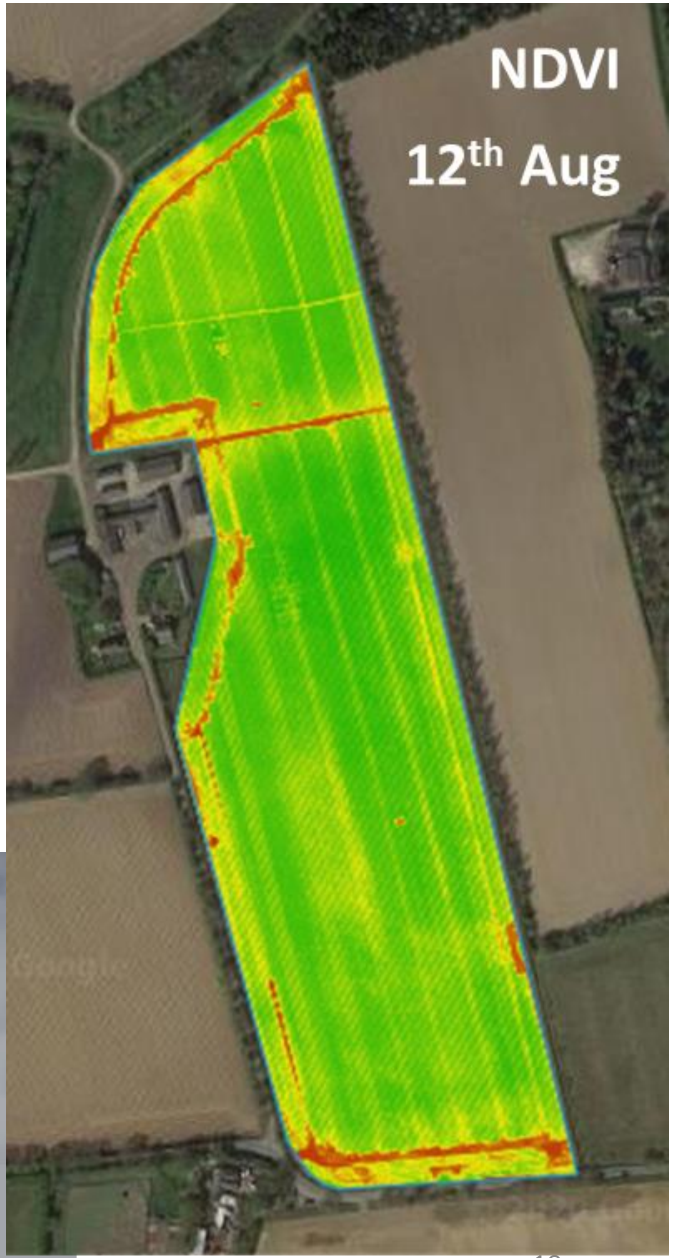
MicaSense Red Edge 3

- Drone mounted
- Used in 2020 & 2021 field scale experiments
- **Multispectral** – 5 bands
  - 475, 560, 668, 717, 840nm



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Other sensors used

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Vegetation Indices

- A vegetation index (VI) is a single number calculated using the reflectance at two or more bands
- There are lots of VIs!
- VIs used in INNO-VEG
  - NDVI
  - MCARI2
  - CI Green
  - CI Red-Edge
  - NDRE
  - REIP
  - MTCI

$$NDVI = \frac{NIR - Red}{NIR + Red}$$

$$NDRE = \frac{790 - 720}{790 + 720}$$

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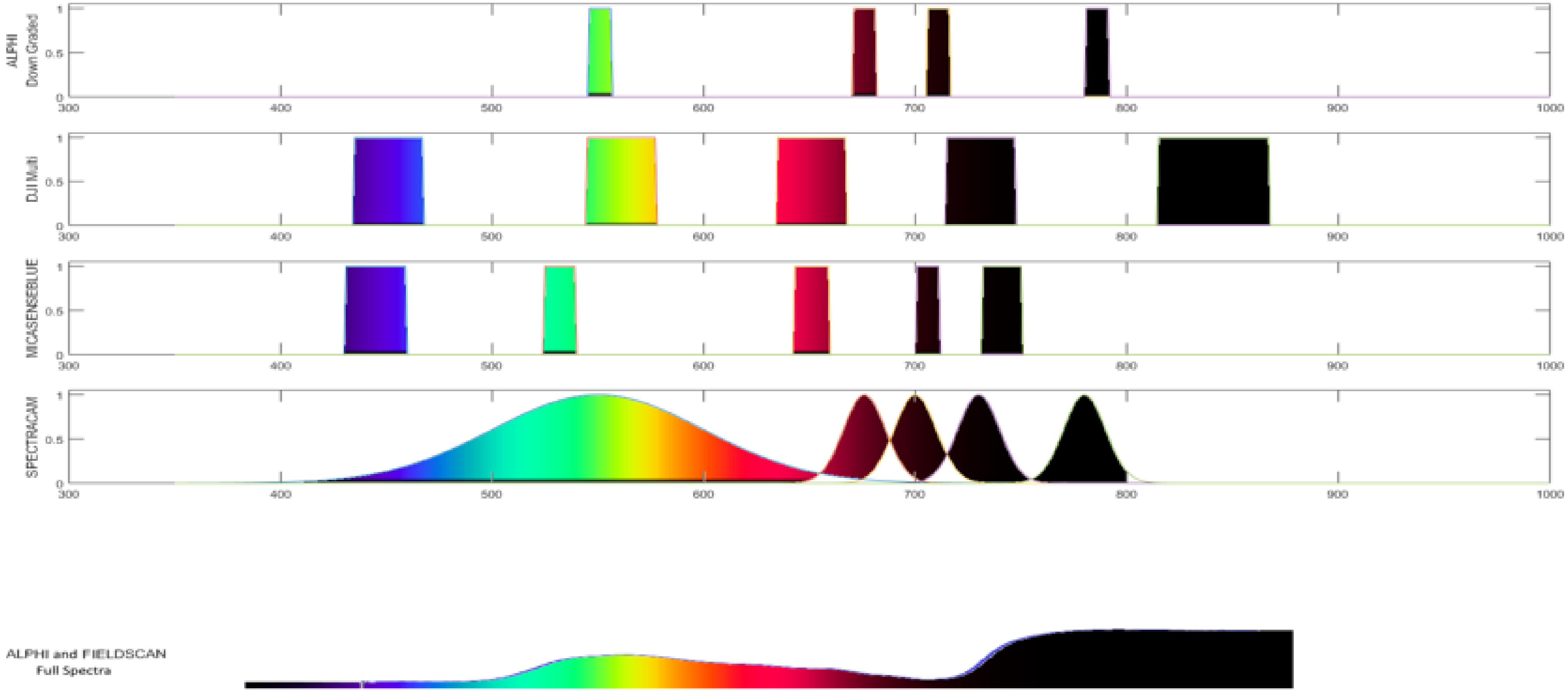
What impact does sensor type have?



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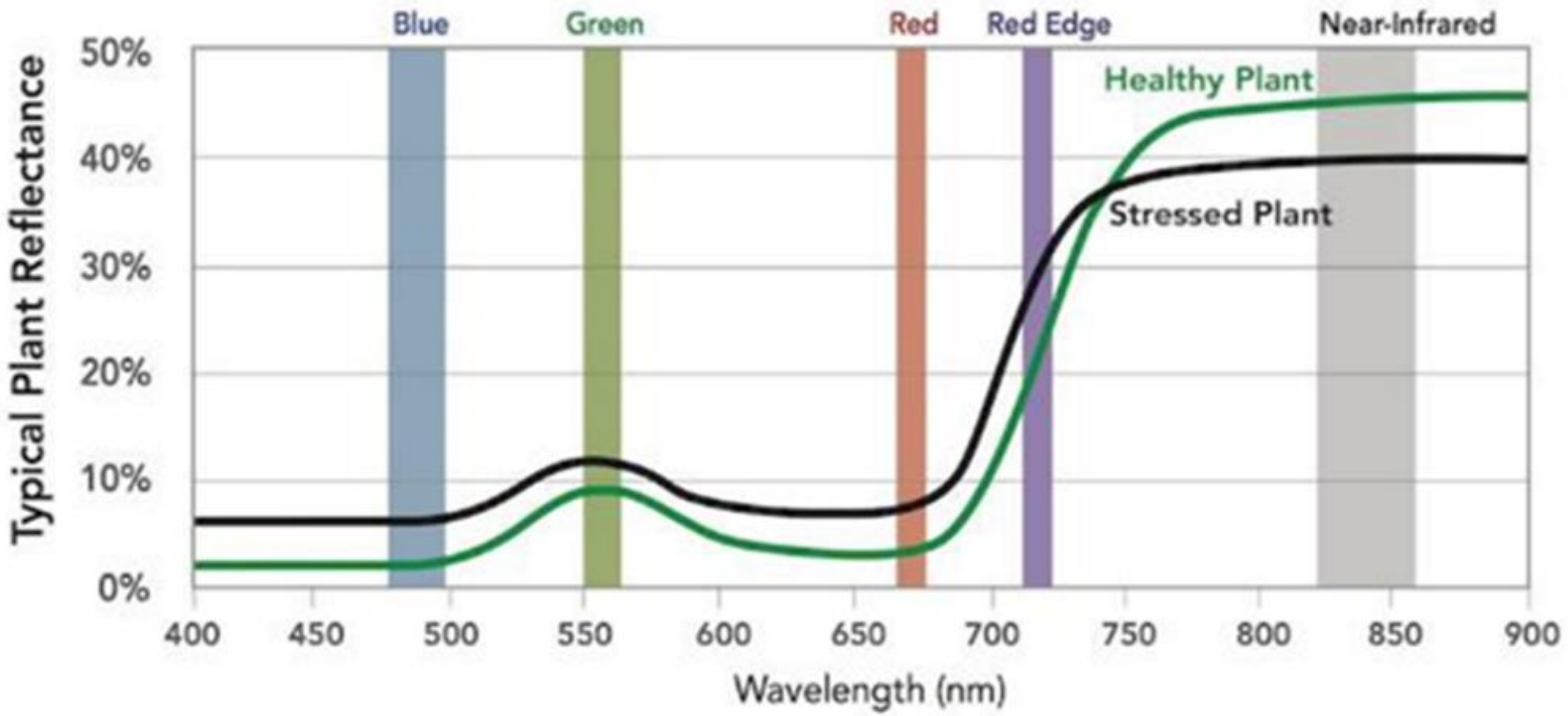
Blue
Green
Red
Red Edge
Near-Infrared
Healthy Plant
Stressed Plant
Typical Plant Reflectance
50%
40%
30%
20%
10%
0%
400
450
500
550
600
650
700
750
800
850
900
Wavelength (nm)

Relationship between Vegetation Indices and yield – what have we learnt?

- Good relationship with marketable yields where there was a significant treatment effect
- Strength of the relationship varied between crops and across experiments
- Beware of other complicating factors – weeds & disease
- Relationship between VIs and yield tended to improve through the season

INNO-VEG Protocol

This Protocol provides guidance on using crop sensing data to assess treatment differences in field experiments. The guide focusses on field vegetable and potato crops and has been produced as part of the INNO-VEG project. The Protocol is aimed at researchers, agronomists and farmers who want to use crop sensing technology to assess their crops and aims to support them to make best use of the technology.
The Protocol includes information on the use of crop sensing technology in the field and on the management and interpretation of the data. The information provided is based on the experience of the authors and the results of the INNO-VEG project.

Downloads

INNO-VEG Protocol (EN)

www.inno-veg.org

Protocol provides advice on

- ‘Best practice’ when collecting crop sensing data
  - Time of day, geolocation, when to collect the data etc
- Advice on commissioning a drone survey
- Management and interpretation of the data
- Information on each crop type

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Questions

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Analysis of field scale crop reflectance data using agronomics data analysis methods

Susie Roques, ADAS

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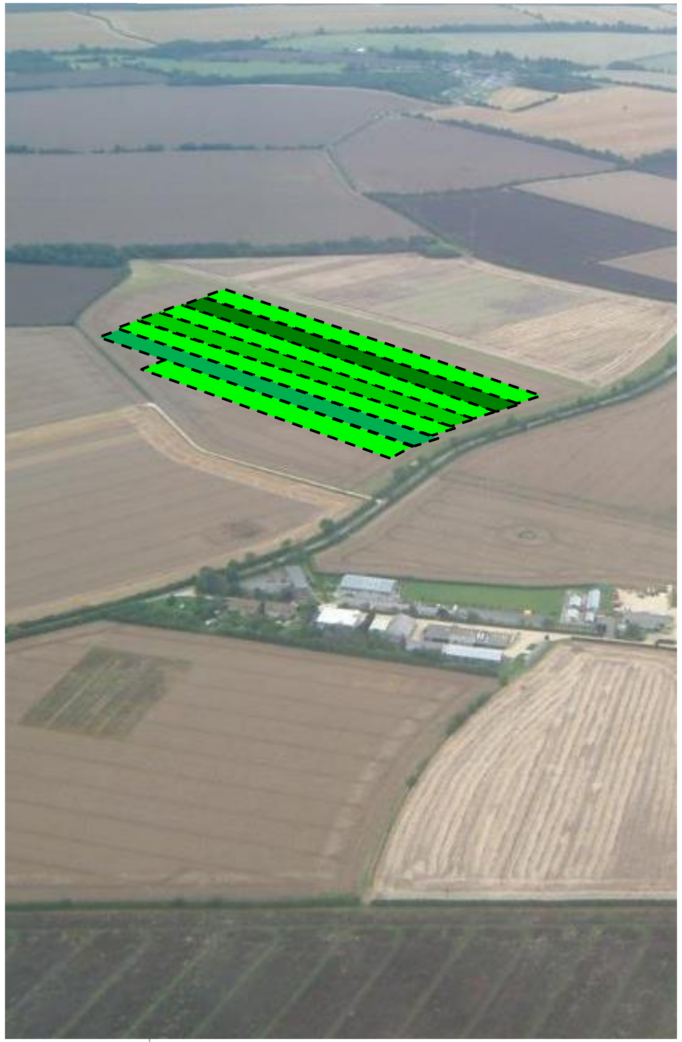
Agronomics spatial data analysis

Agronomics

- Agronomics approach developed 2013-2017 for cereal yield maps
- New statistics to model treatment effects, after accounting for underlying spatial variation
- Statistics and software also work for other spatial data, e.g. drone/satellite crop reflectance



Innovate UK Technology Strategy Board

AG Space

BASF The Chemical Company

BGS 1835

Harvesting the future TRIALS EQUIPMENT

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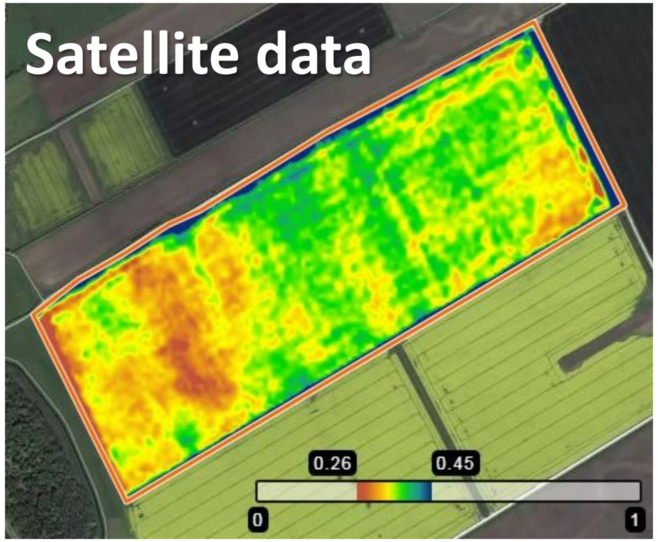
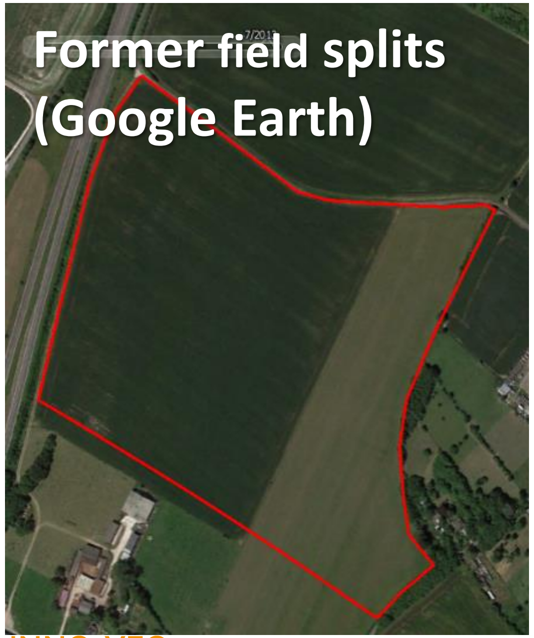
Why carry out field scale trials?

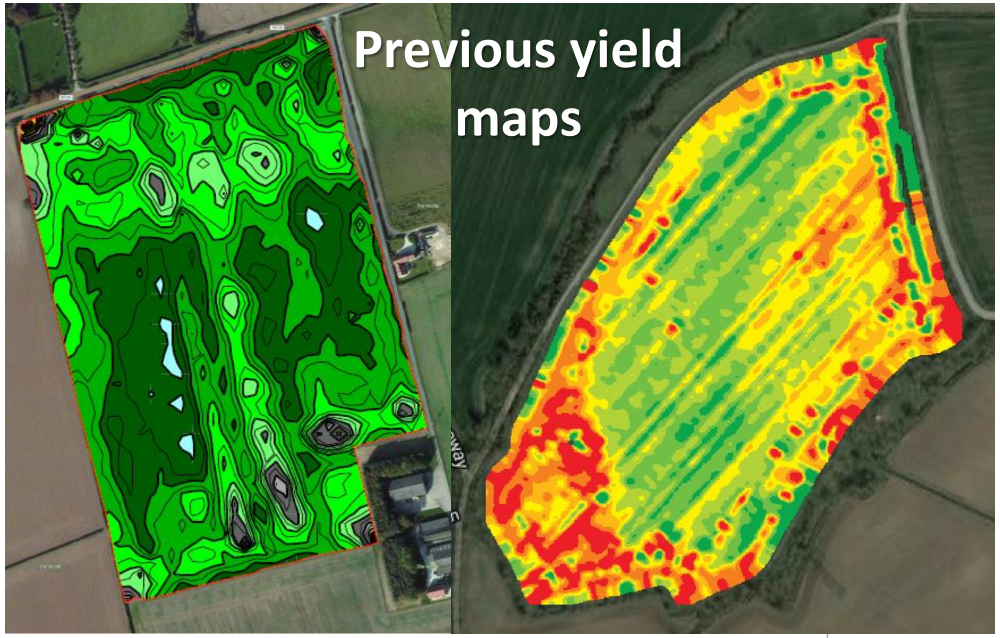
Advantages	Disadvantages
Test treatments over larger areas	Max 4 treatments (ideally 2-3)
Allows treatments not practical at plot scale (e.g. variable rate, cultivations)	Reliance on host farmers – greater risk of error or trial failure
Directly applicable to farm practice	Higher costs of treatment supply & yield compensation
Farmer engagement / involvement	Less suited to assessments other than yield / crop sensing
Low labour costs	

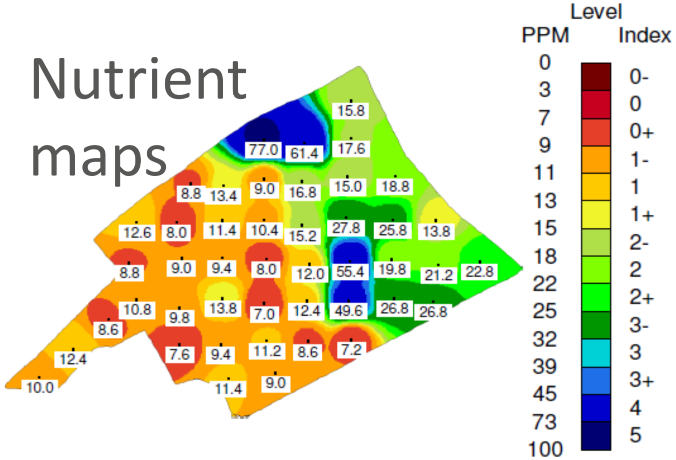
Choose a suitable trial field

- Even fields give more precise results
- Variation across the tramlines is acceptable
- Variation in line with the tramlines is a problem









Trial design

- Avoid confounding treatments with underlying variation
- Best to test fewer treatments
- Replication improves precision / confidence

Two test treatments interspersed with farm standard

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Treatment application

- Accurate application to treatment area
- Need area of overlap if using broadcast spreaders
- Mark treatment locations in field
- Geolocate treatment locations

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Assess the impact of treatment application

Yield map data

- Advantages
  - Actual measure of crop yield
  - Yield monitoring equipment now fitted as standard to most combines
- Disadvantages
  - Not available for all crops
  - Data ‘errors’ & noise – need to clean data

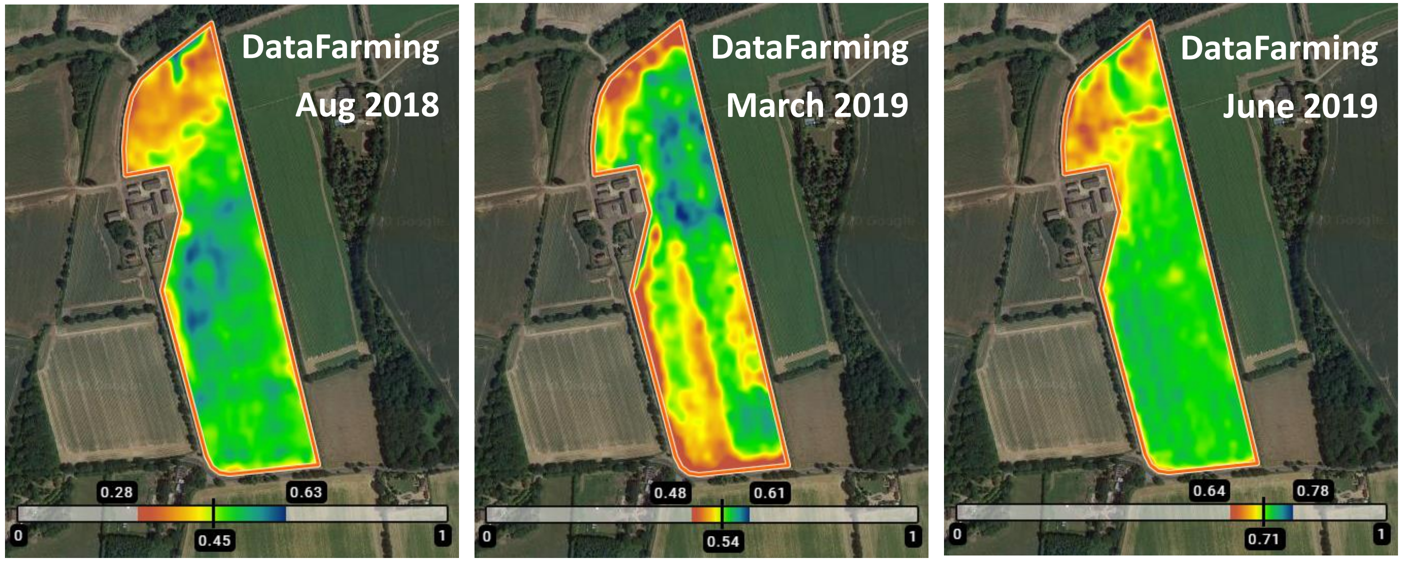
Crop sensing data

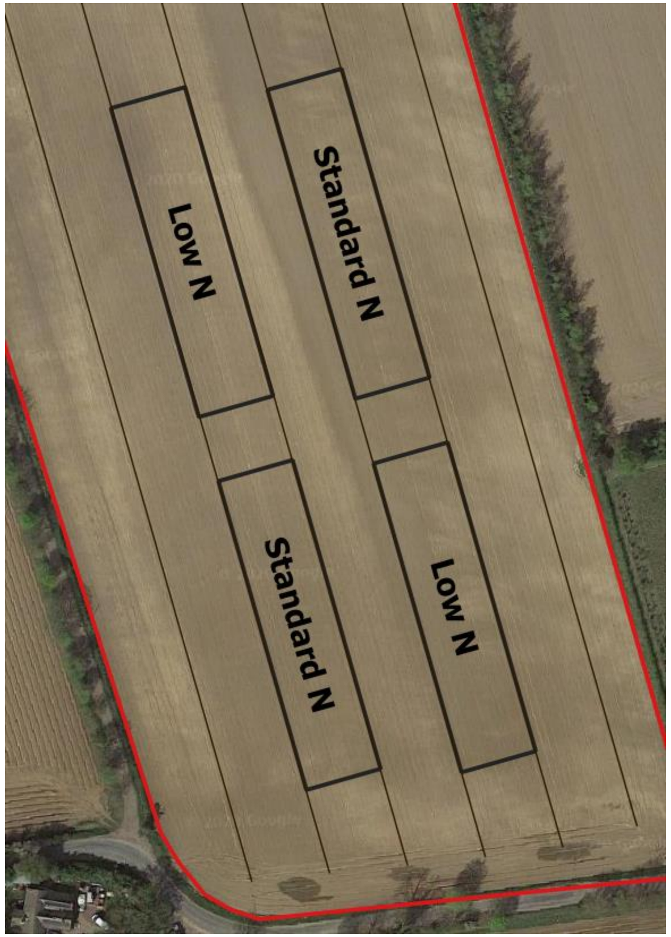
- Advantages
  - High resolution data
  - More ‘precise’ data
  - Can be correlated to yield
- Disadvantages
  - Proxy for yield
  - Cost for acquiring data

Case study 1: onions

P.G.RIX (FARMS) LTD

- Two replicated N rate treatments, applied to pairs of 24m tramlines
- Trial focused in south end of field as more even





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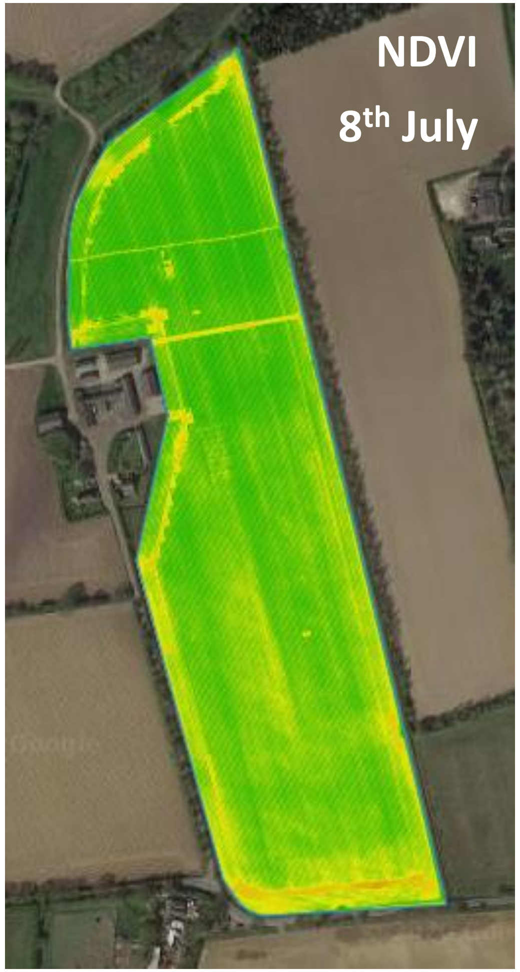
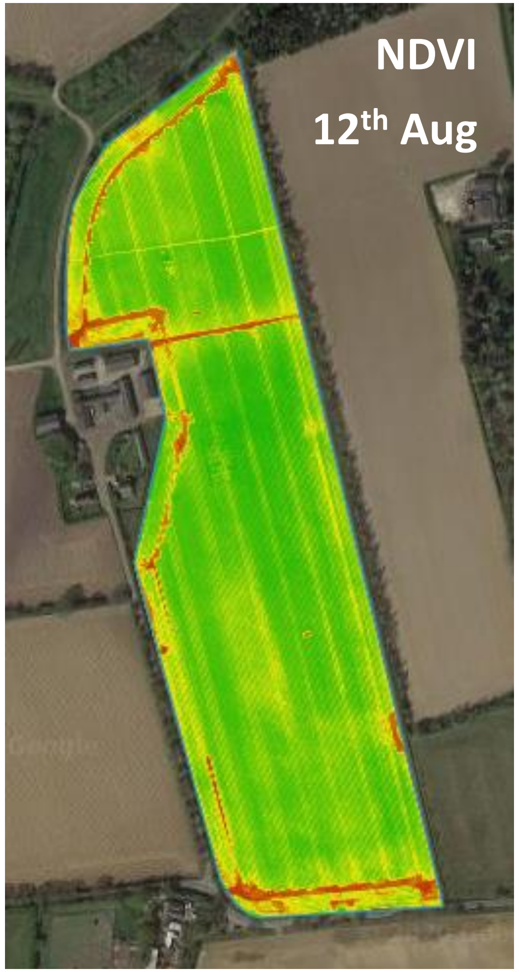
Onions – new drone imagery

- Multispectral images supplied for 8th July and 12th August
  - (5 wavelengths from MicaSense Red Edge drone mounted sensor)
- Low N areas visible as lower NDVI

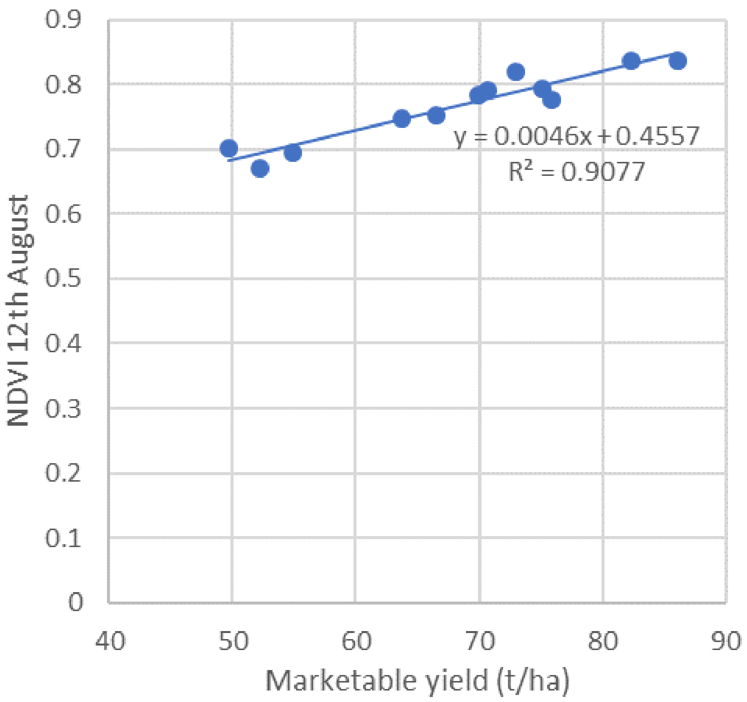


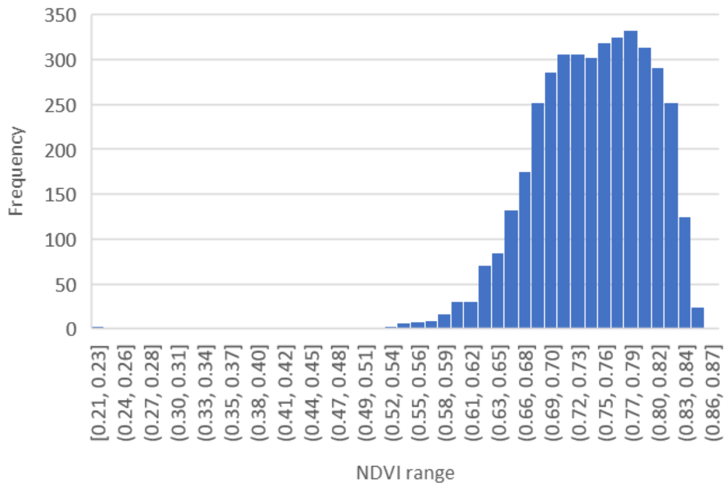


Onions – ground truthing

- 12 yield validation plots (3 per plot); 1 bed x 8m
- Sampled mean MS bands for each sample plot
- Calculated 7 VIs from averaged MS bands
- Correlated VIs with marketable yield

	1st flight (8 July)	2nd flight (12 Aug)
NDVI	0.89	0.91
MCARI2	0.75	0.82
Clgreen	0.90	0.87
Clrededge	0.87	0.84
MTCI	0.84	0.50
NDRE	0.89	0.86
REIP	0.89	0.48





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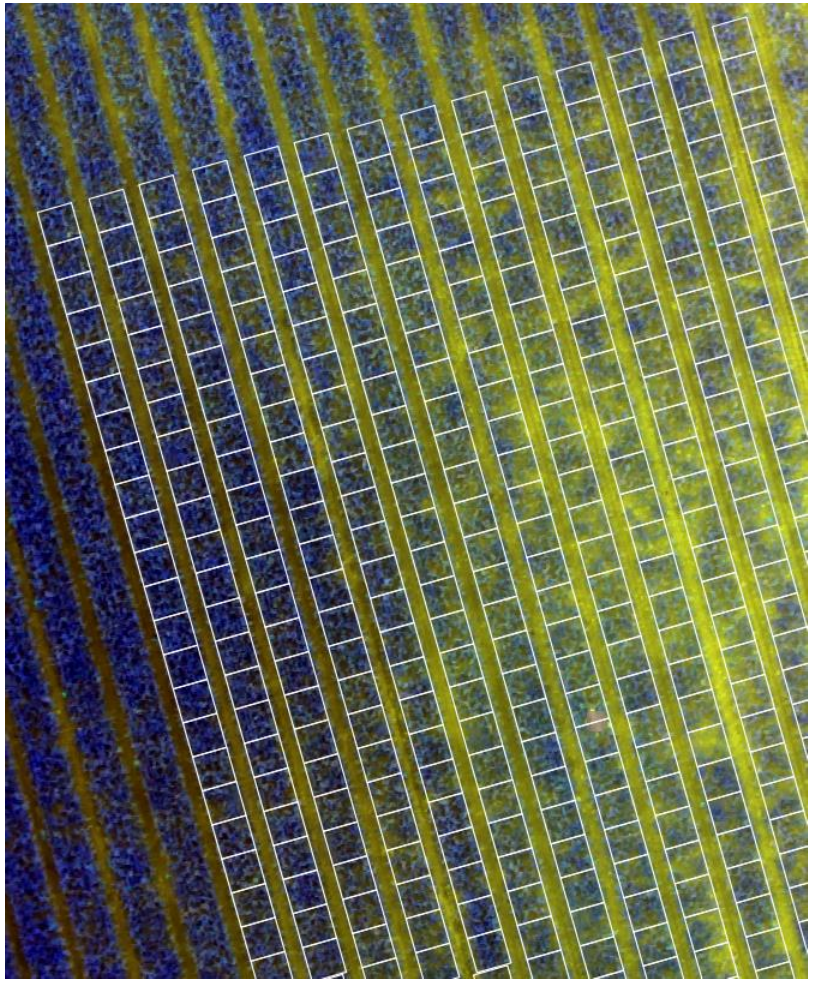
Onions – data processing

Agronomics analysis requires point data

Crop grown in beds 1.5m wide with 0.5m gaps

1. Created grid of cells 1.3m wide x 1.3m long
2. Placed cells along beds, avoiding bare soil
3. Mean values for each wavelength calculated for each cell, then converted to points
4. Vegetation indices calculated from averaged data



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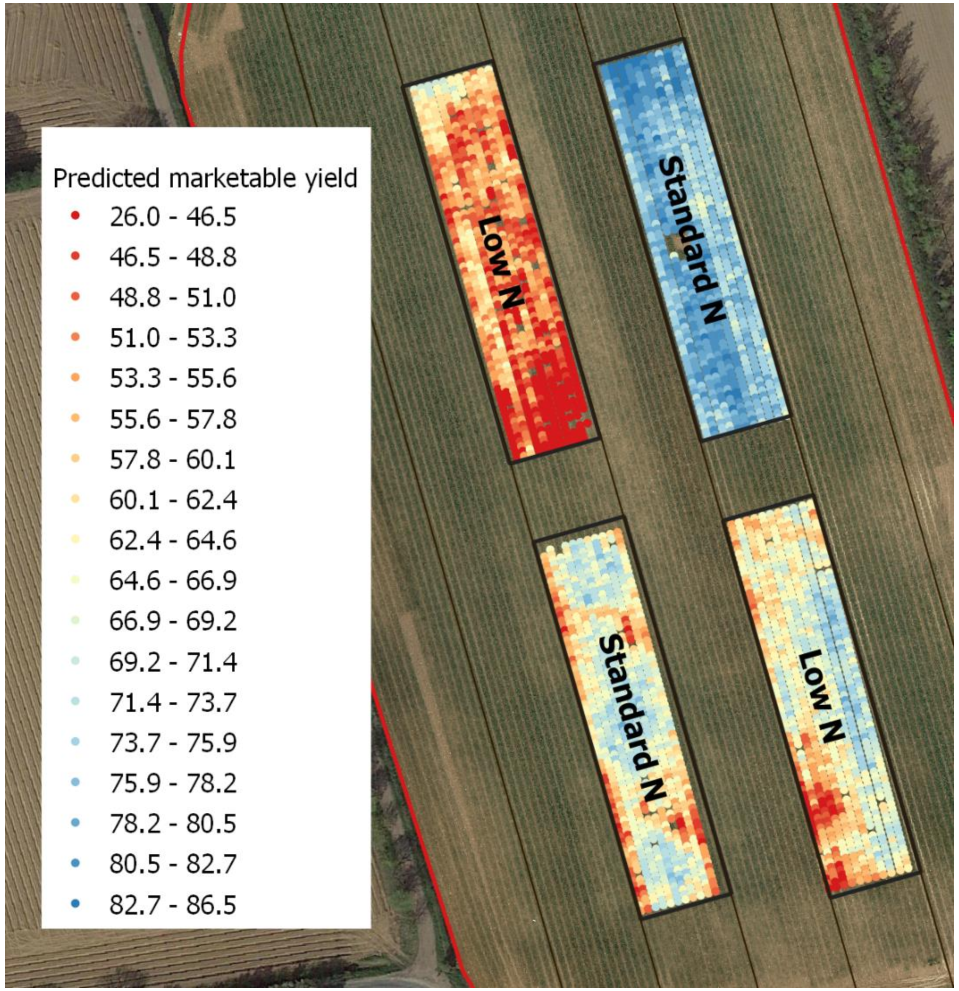
Onions – trial results

- Predicted yield map created from NDVI (second drone flight), according to correlation with sample plot yields.
  - Average yield at standard N: 71.2 t.ha
  - Yield benefit of standard N rate over low rate: 12.9 t/ha ± 1.4 (95% confidence interval)
- Vegetation indices also analysed directly
  - All VIs from both flights significantly higher for standard N rate than low rate



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Case study 2: Vining peas

HMC

- HMC Peas are a co-operative of 43 vining pea growers in the UK
- Grow green peas for processing
- Growers want to maximise yields through good crop nutrition
- Research question: can the growers increase yields with starter fertiliser
- Set up field scale trials to test products in 2020 & 2021

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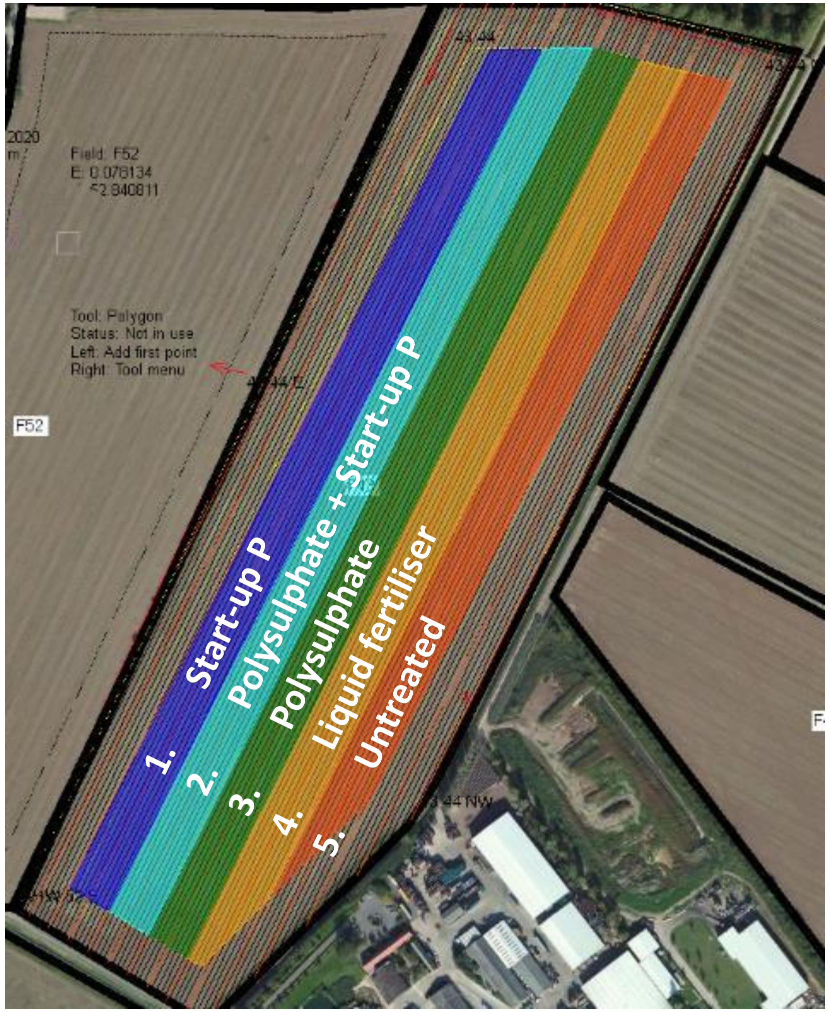
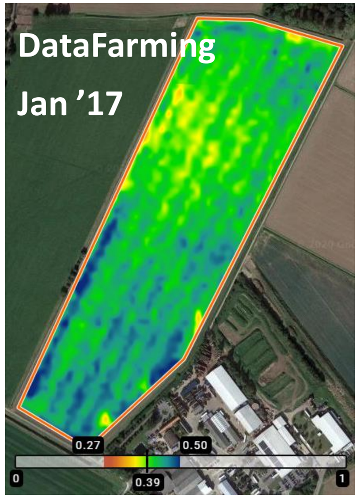
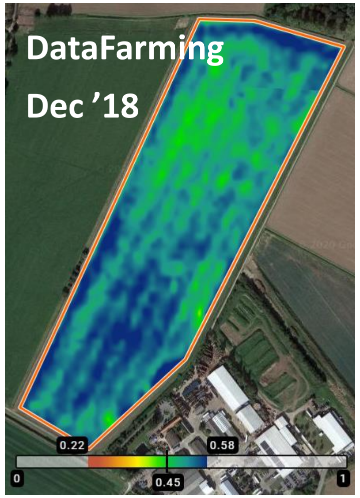
Vining peas 2020 trial

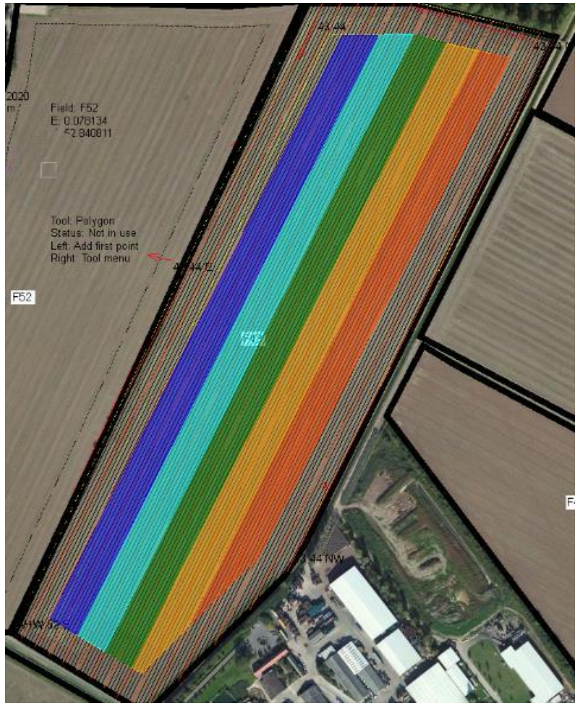
- HMC trial site - five unreplicated treatments
- Plots one tramline (36m) wide
- Two drone flights with multispectral camera
- Seven vegetation indices
  - NDVI, MCARI2, MTCI, CI Green, CI Red Edge, NDRE & REIP
- 20 yield validation plots
- Plus yield map data from farm



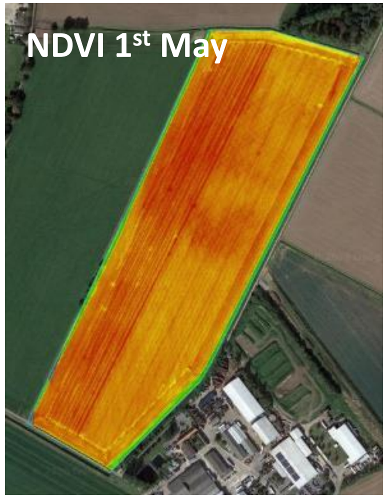
Vining peas 2020: underlying variation

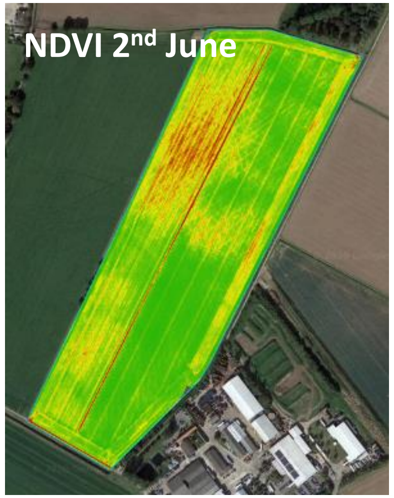


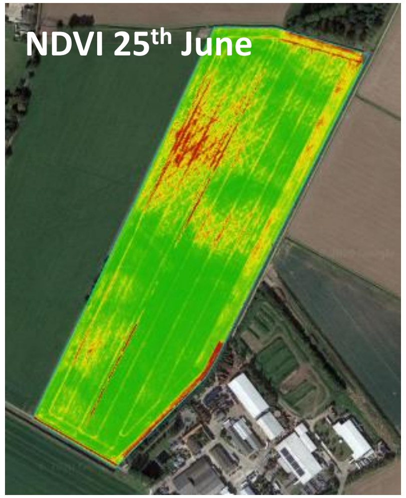




- Previous crops show poor patch in NW corner
- Treatments 1 and 2 stood out as worse in 2020







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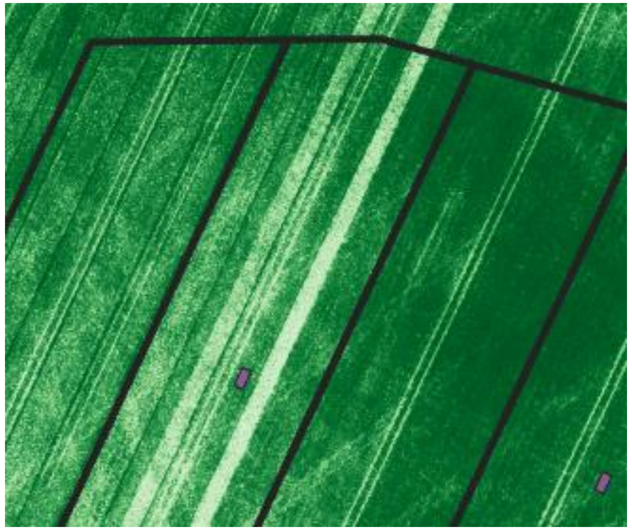
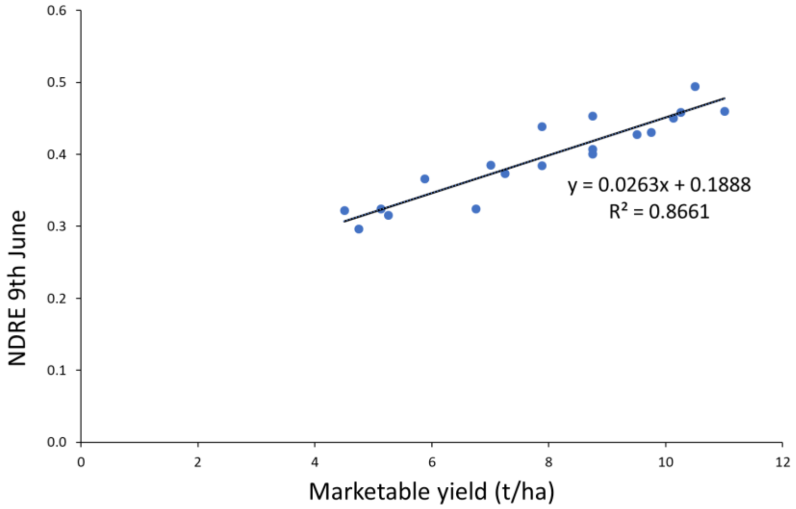
Vining peas 2020 – ground truthing

- 20 yield validation plots (4 per treatment); 2m x 4m
- Sampled mean MS bands for each sample plot
- Calculated VIs from averaged MS bands
- Correlated VIs with sample plot marketable yields



	1st flight (9 June)	2nd flight (25 June)
NDVI	0.86	0.70
MCARI2	0.83	0.77
Clgreen	0.85	0.71
Clrededge	0.85	0.71
MTCI	0.81	0.67
NDRE	0.87	0.70
REIP	0.85	0.62



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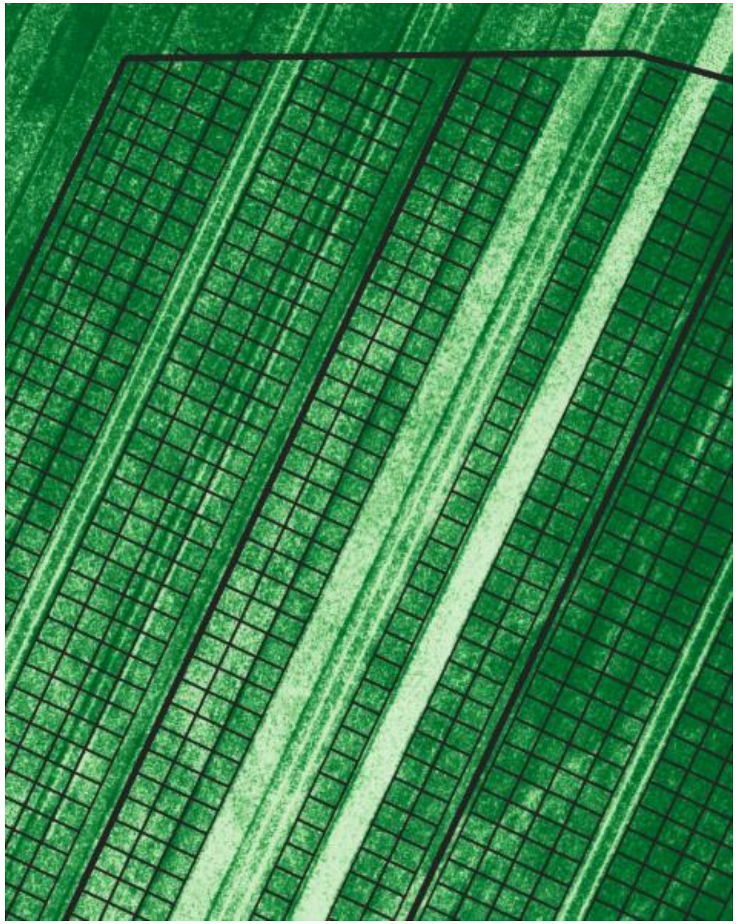
Vining peas 2020 – data processing

Drone image converted to point data as for onions

Grid cells 3.5m wide x 3m long

Four rows of cell in each half tramline, avoiding wheelings, drill misses and treatment boundaries



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Vining peas – trial results

- Predicted yield maps created from NDRE and NDVI (first drone flight), according to correlations with sample plot yields.
- Results very similar to actual yield map, but far more precise

	Yield from yield map	
Treatment	Mean	Modelled difference from trt 3, with 95% confidence interval
1		-3.29 ± 1.44
2		-1.25 ± 1.35
3	9.76	
4		0.41 ± 1.31
5		0.03 ± 1.39

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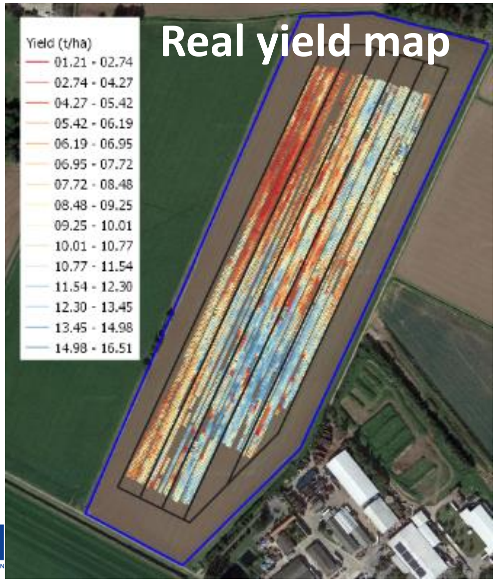
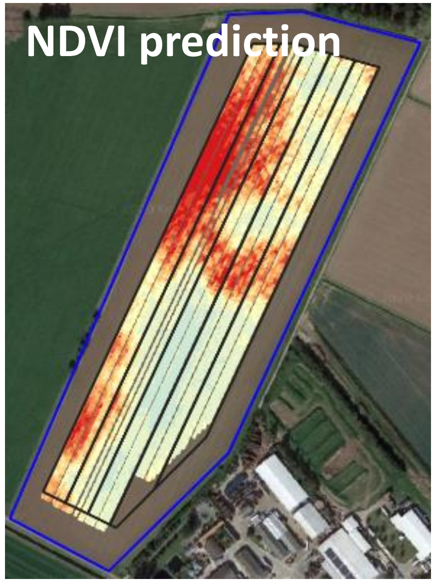
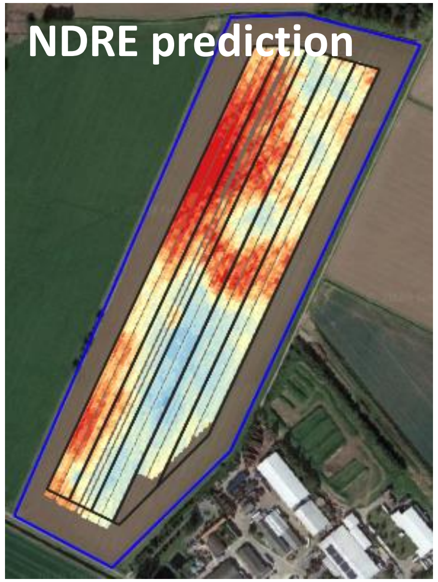
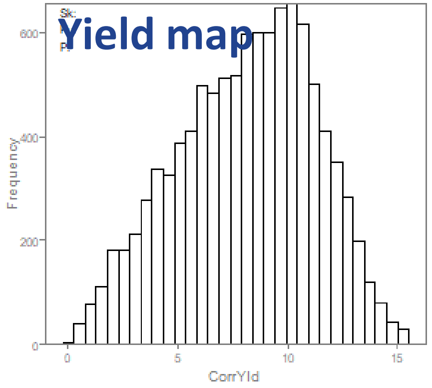
Vining peas – real vs predicted yield maps

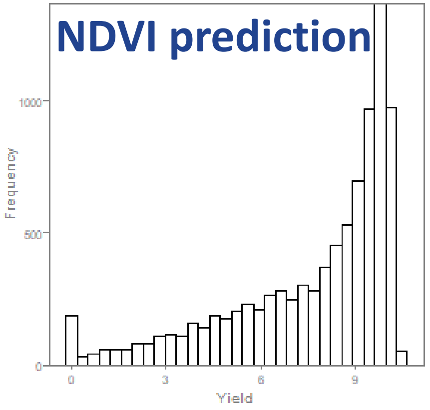
- Real yield map noisy and may overestimate field average, as data cleaning removes wheelings, poor patches, etc.
- NDVI prediction underestimates high yields due to saturation.
- NDRE prediction appears closest to real yield map.

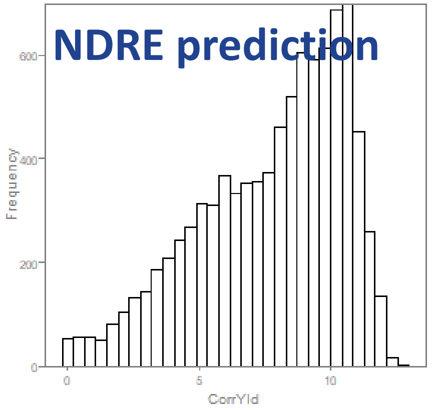








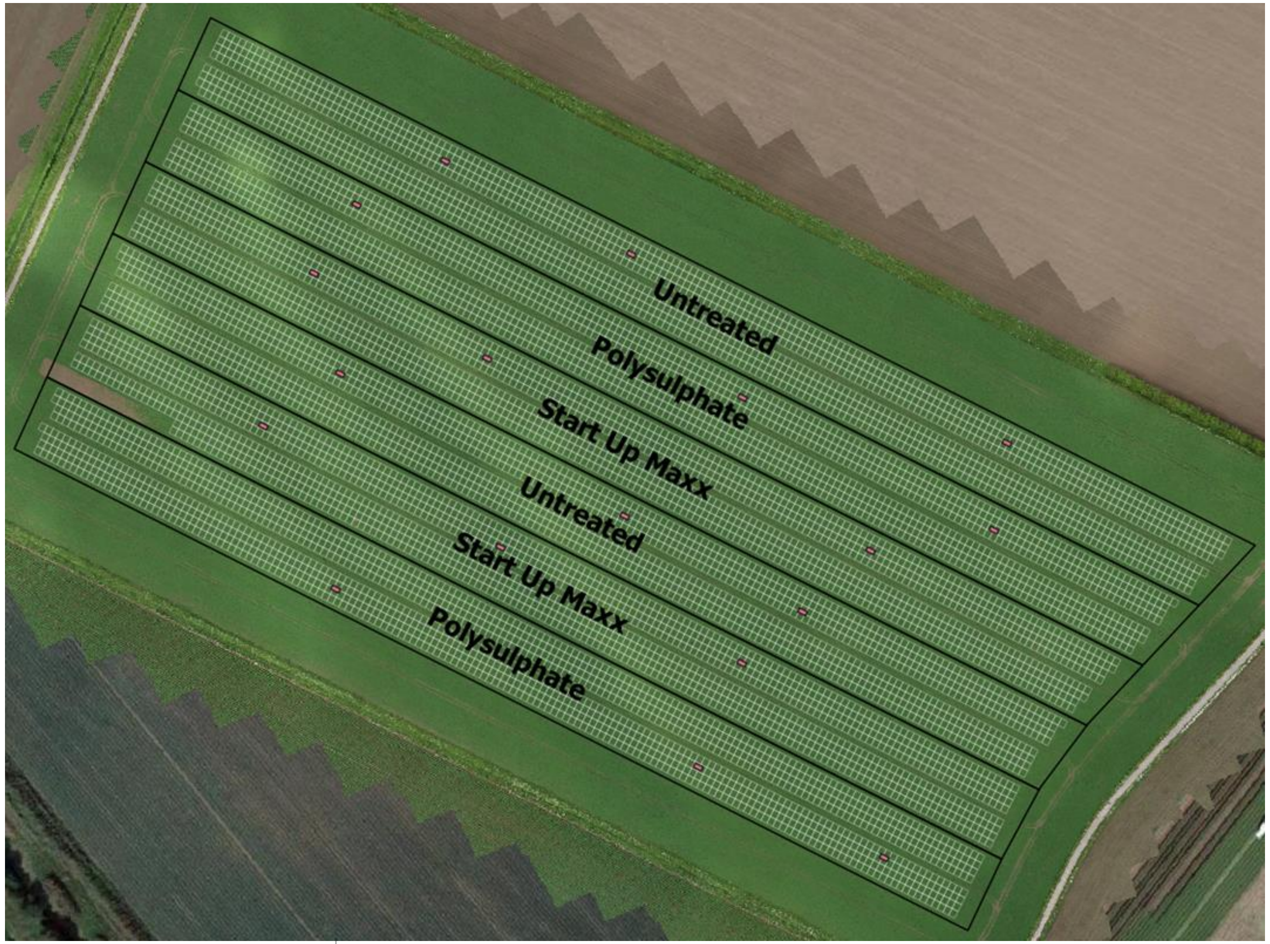




Interreg
EUROPEAN UNION
2 Seas Mers Zeeën
INNO-VEG
European Regional Development Fund

Vining peas 2021 trial

- HMC trial site – 3 treatments x 2 replicates
- Plots one tramline (36m) wide
- Ideal trial design
- Two drone flights
- 18 yield validation plots
- Plus yield map data from farm



Interreg
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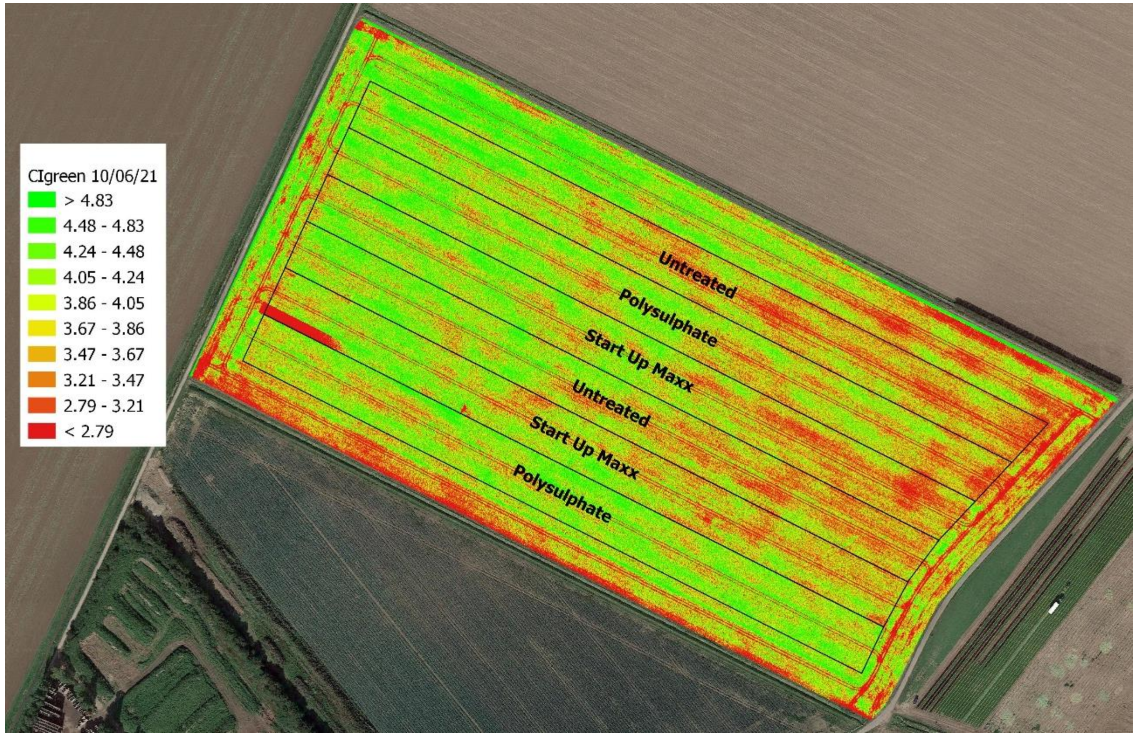
INNO-VEG
European Regional Development Fund

Agronomics analysis – NDVI data

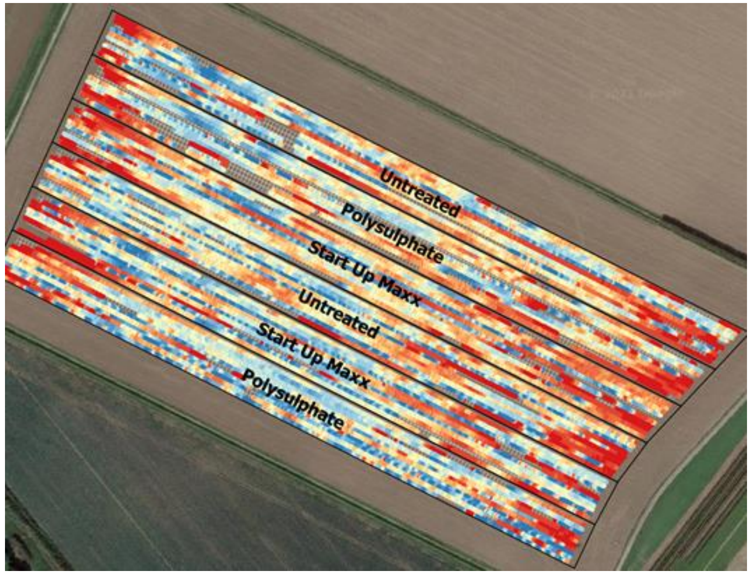
- Weaker correlations between yield and vegetation indices than in 2020
- Polysulphate significantly increased most vegetation indices

	Total fresh weight biomass (t/ha)		Marketable pea yield (t/ha)	
	Scan 1 10/06/21	Scan 2 19/06/21	Scan 1 10/06/21	Scan 2 19/06/21
NDVI	0.55	0.63	0.17	0.25
MCARI2	0.30	0.25	0.18	0.11
MTCI	0.35	0.35	0.06	0.24
CI Green	0.44	0.62	0.09	0.27
CI RedEdge	0.40	0.41	0.08	0.25
NDRE	0.43	0.42	0.09	0.26
REIP	0.41	0.38	0.08	0.25



Agronomics analysis – yield map data

- HMC supplied yield map with 62,000 points (high due to small harvest width)
- Cleaned data by removing headlands, harvest runs on wheelings etc
- Predicted yield lower, because validation plot yields were low



	Yield from yield map		Predicted from 19/06 NDVI	
Treatment	Mean	Modelled difference from trt 1, with 95% confidence interval	Mean	Modelled difference from trt 1, with 95% confidence interval
1 Untreated	10.19		6.00	
2 Start-up Maxx		-0.09 ± 0.61		0.01 ± 0.16
3 Polysulphate		0.49 ± 0.64		0.17 ± 0.16

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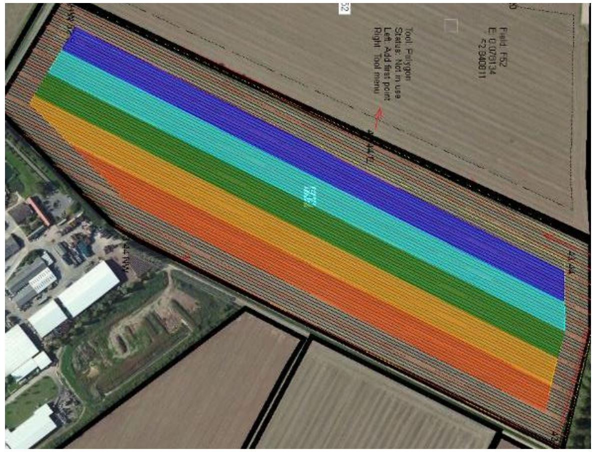
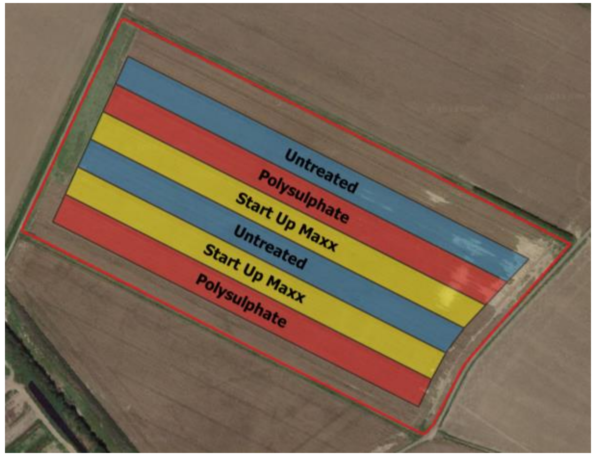
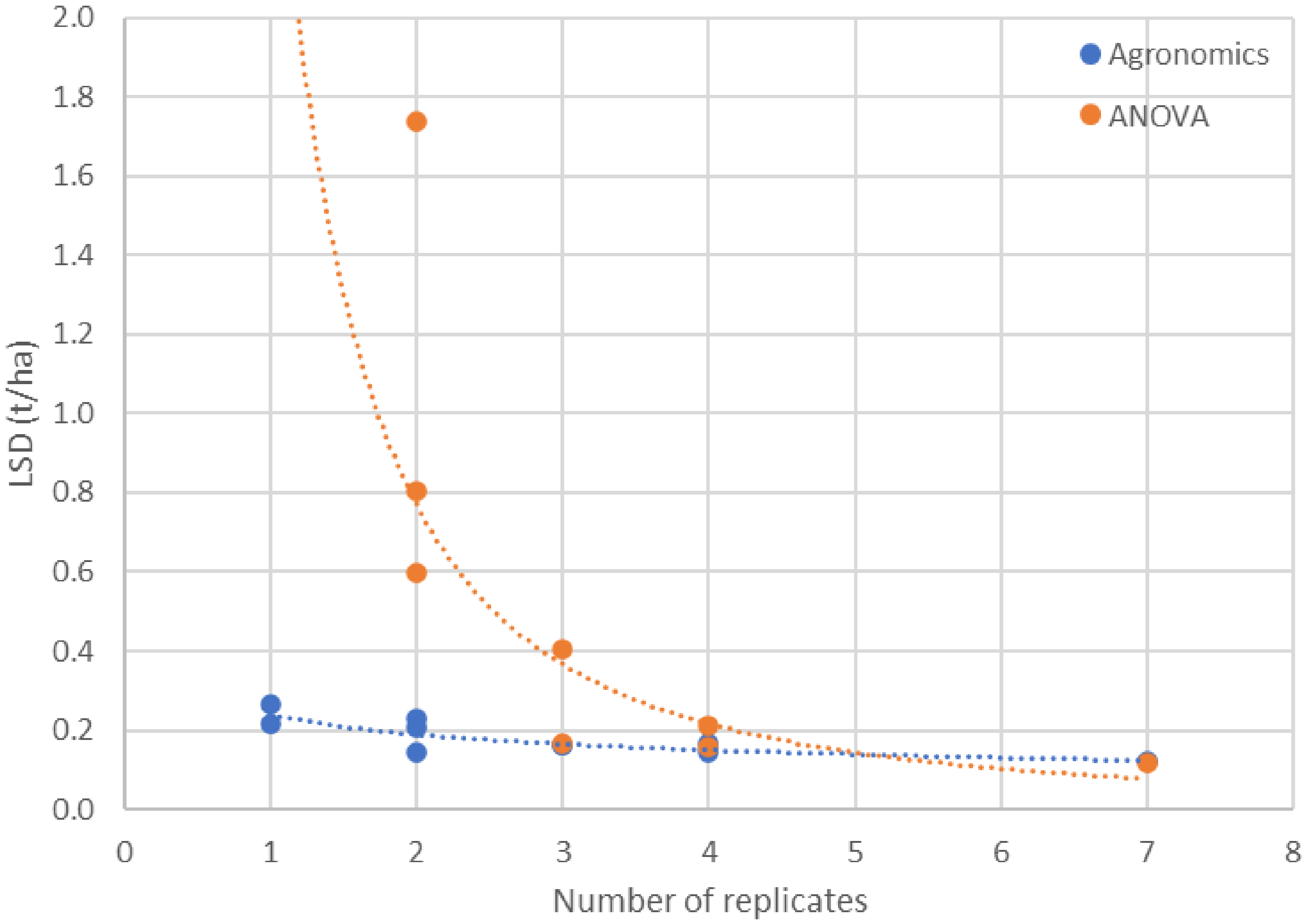
Vining peas 2020 vs 2021

	2020	2021
Trial design	5 treatments x 1 rep	3 treatments x 2 reps
LSD: yield map	1.4 t/ha	0.6 t/ha
LSD: predicted yield map	0.31 t/ha	0.16 t/ha
LSD: NDVI	0.013	0.009





Agronomics vs conventional statistics



Conclusions

- Crop reflectance data can correlate well with marketable yield
- Field scale experiments can be assessed accurately and efficiently using remote sensing data and Agronomics statistics
- Trials should be laid out with reference to underlying soil variation
- Treatments should be replicated where possible
- Guidance published in '*Framework for farmer led research*'

Interreg 2 Seas Mers Zeeën
INNO-VEG
European Regional Development Fund

Framework conditions for innovation

Questions

Susie.Roques@adas.co.uk

HMC

YIELD MAPPING AND CROP SENSING

CONTENTS

- Jack Harris – Introduction to HMC
- Yield Mapping and Autosteer
- Crop Sensing technology
- On Farm Trials
- Yield Predictions

Introduction to HMC

Introduction to HMC

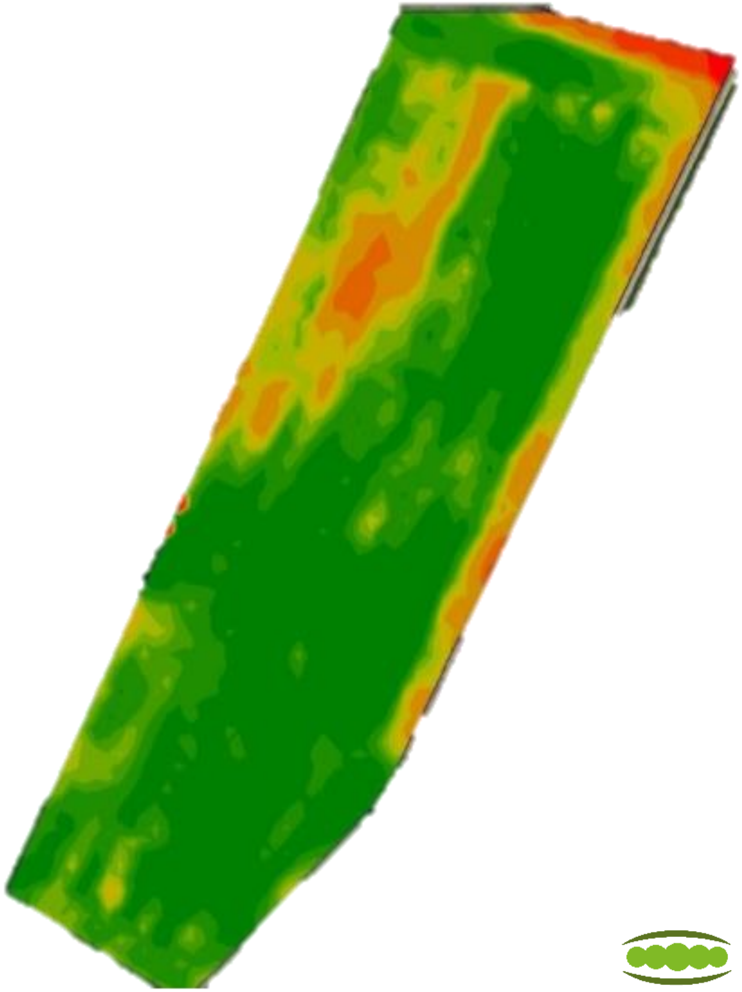
Introduction to HMC

Yield Mapping & Autosteer

- Yield Mapping involves weigh cells taking a reading every few seconds with a GPS position being logged against it
- It allows us to see how many peas we are getting in a specific area
- Data is given back by each viner and is cleaned and merged to make maps which show good and poor areas of the field
- Autosteer uses the same GPS technology and will steer the viner in a dead straight line with 1cm accuracy
- Each viner shares data with the others
- HMC were the first pea group to adopt Autosteer and Yield Mapping in the UK

Yield Mapping & Autosteer

Yield Mapping & Autosteer



Crop Sensing Technology

- Yield is the base of the data as we can use it to corroborate other data we have

- We started 6 years ago with drone technology using RGB cameras to fly fields and compare against yield data

- After a year of doing this, we moved to a tractor mounted sensor called the Fritzmeir Isaria which utilises 4 different wavelengths and is an active sensor (not passive like RGB). This means the data isn’t affected by changes in light or conditions of the crop.

- Using the Isaria we were able to start making predictions for yield. At that time satellite data was hit and miss and the data wasn’t readily available to use and process.

- About 2 years ago we made the switch to satellite data to allow us to collect more field data and for a reduced cost. We use NDRE index in satellite data as the work ADAS have done with us suggests a good correlation to yield using that index.

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Crop Sensing Technology

HMC

2020 Trials

- Amalfi
- Drilled 30th March
- Harvested 28th June
- Rainfall during grow period 70mm

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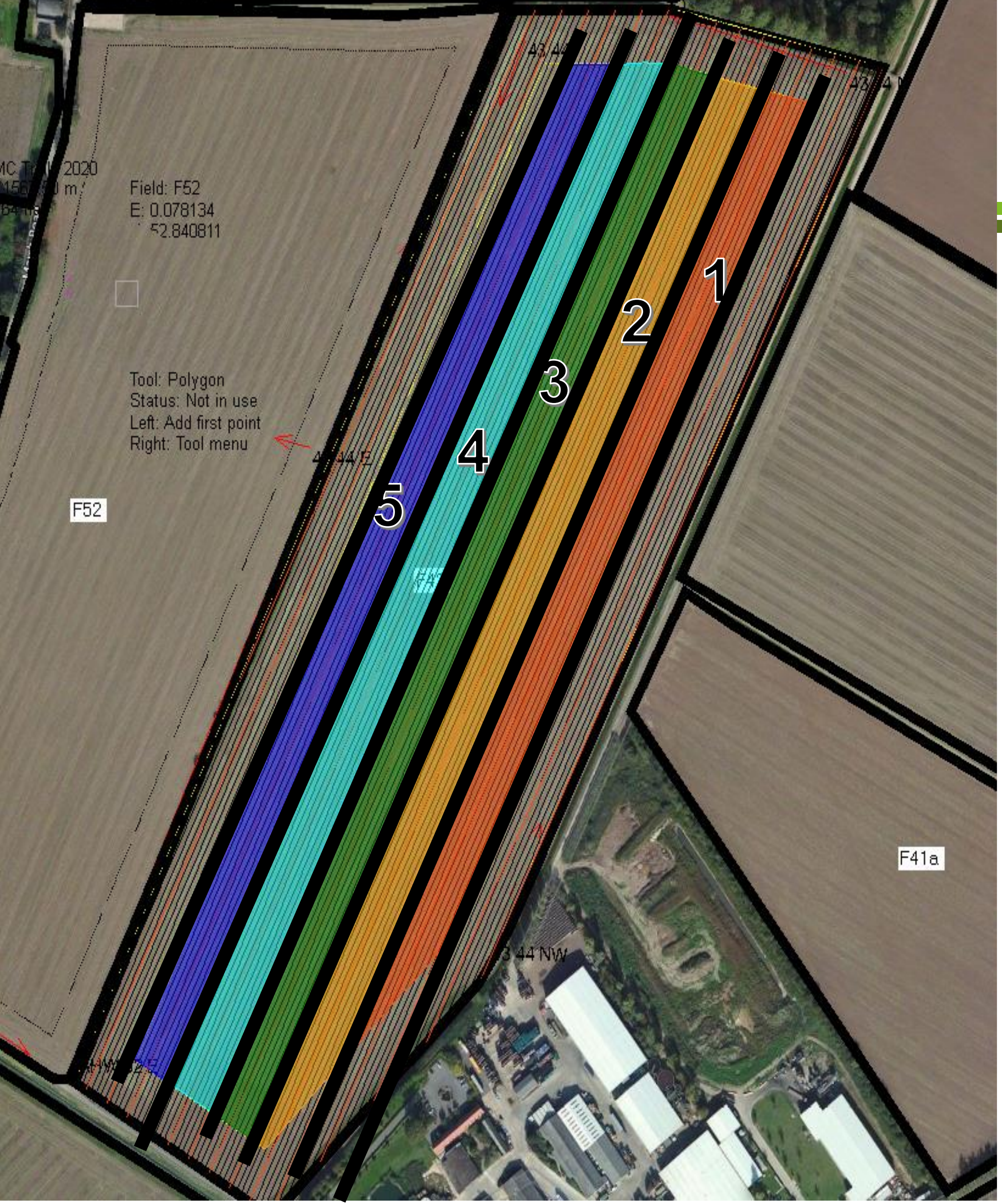
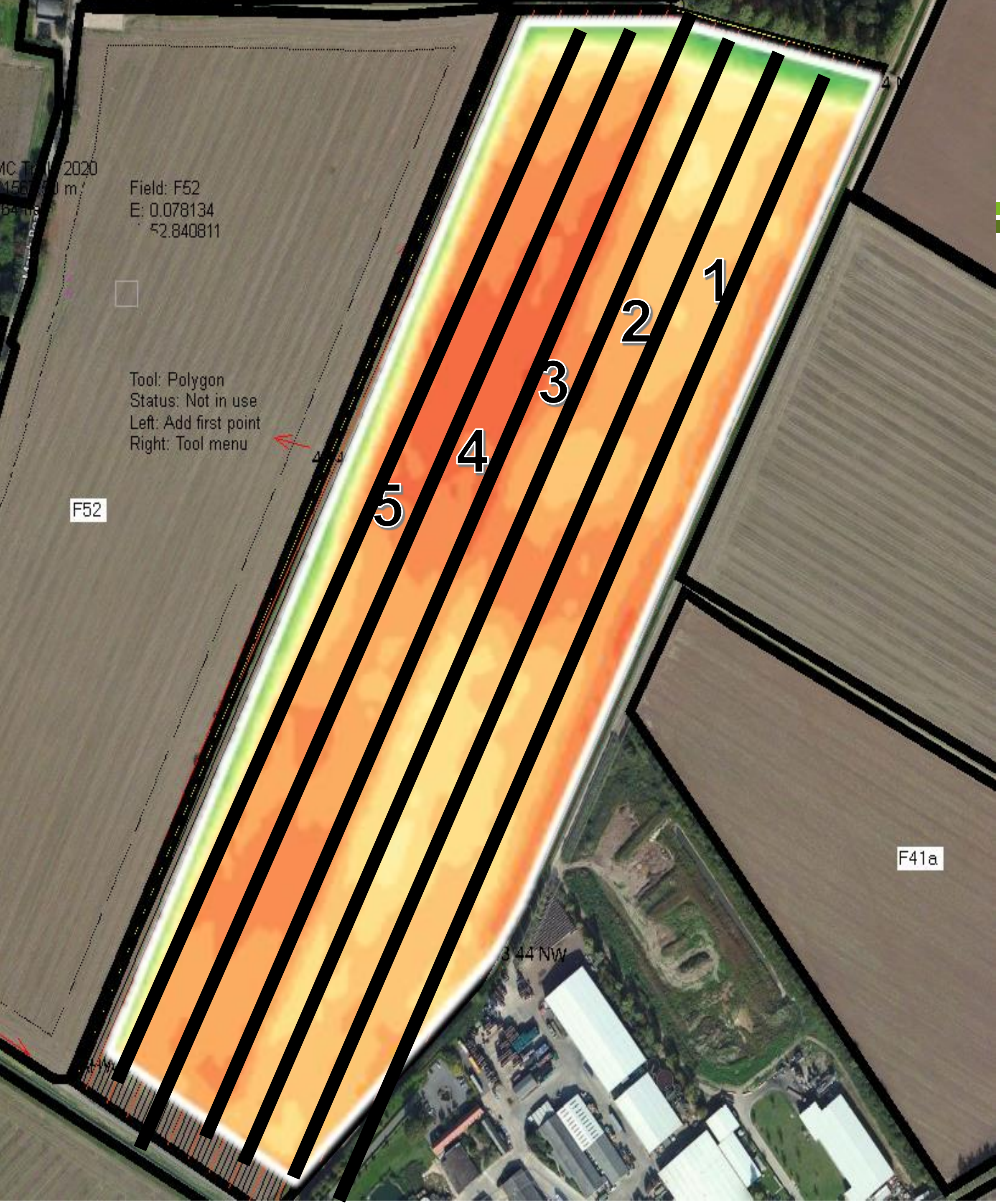


2020 Trials

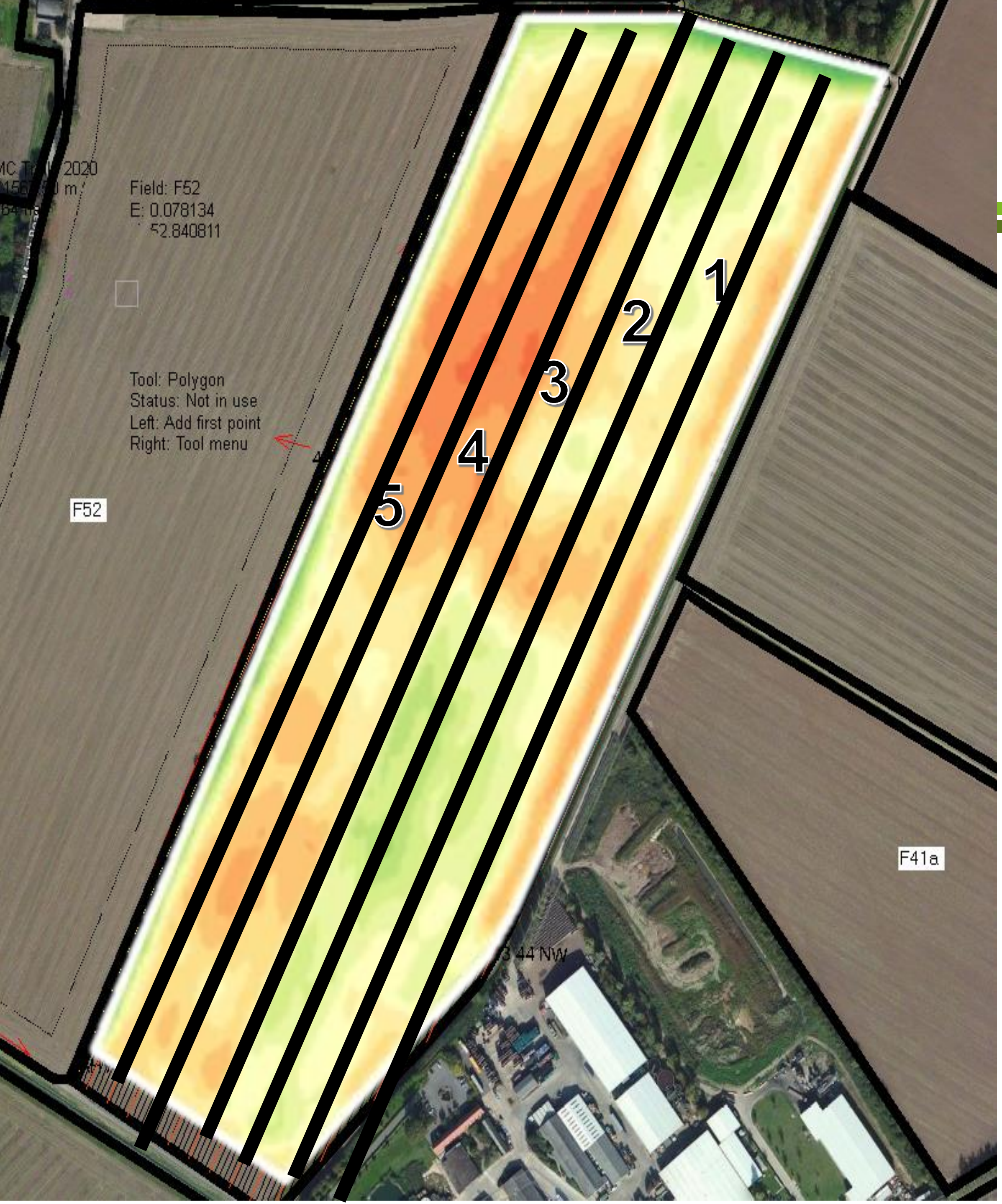
1. Untreated
2. Liquid Fert
3. Poly Sulphate
4. Poly Sulphate and Start Up
5. Start Up



11th May

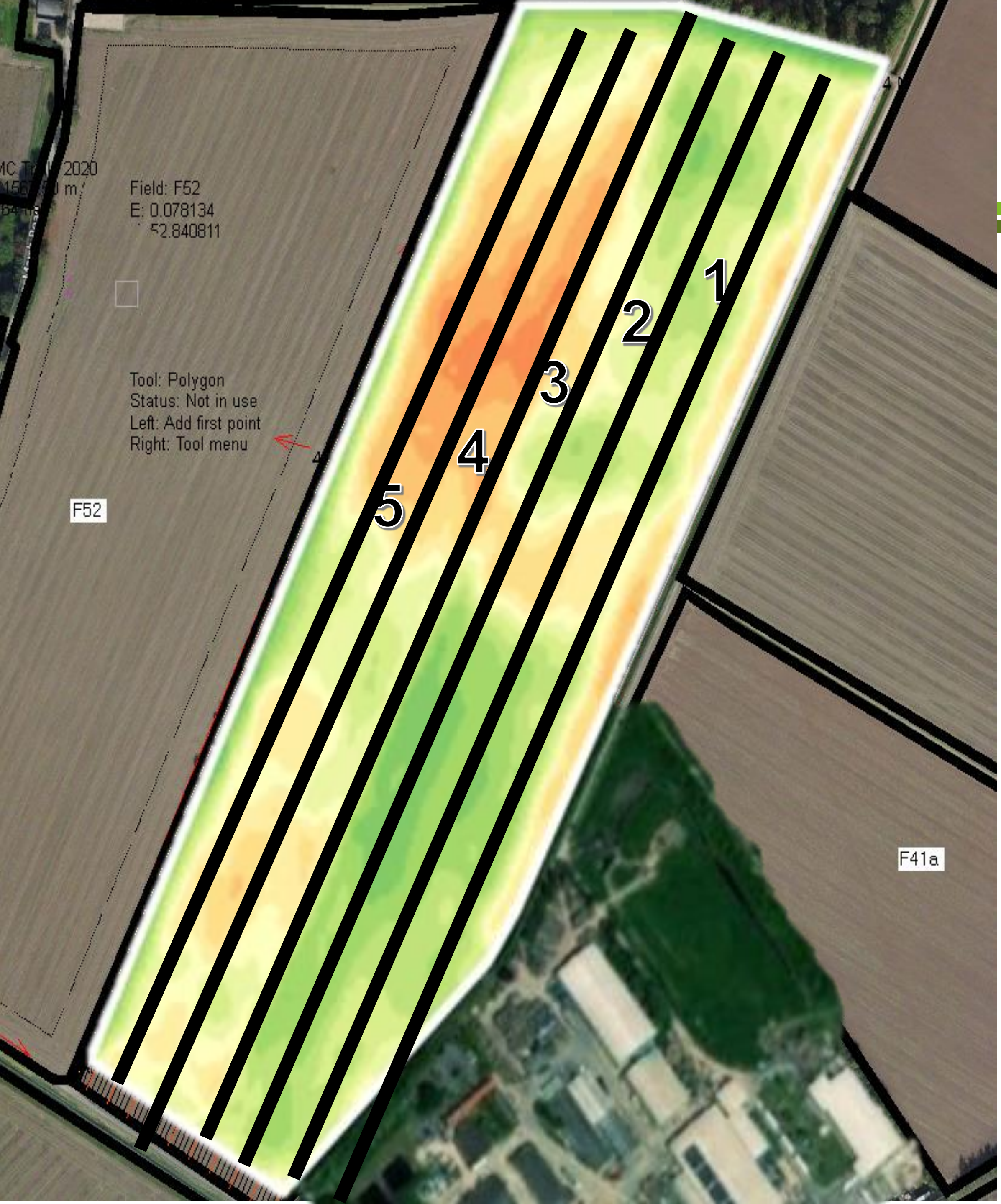
1. Untreated
2. Liquid Fert
3. Poly Sulphate
4. Poly Sulphate and Start Up
5. Start Up

HMC



21st May

1. Untreated
2. Liquid Fert
3. Poly Sulphate
4. Poly Sulphate and Start Up
5. Start Up



28th May

1. Untreated
2. Liquid Fert
3. Poly Sulphate
4. Poly Sulphate and Start Up
5. Start Up

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31st May

1. Untreated
2. Liquid Fert
3. Poly Sulphate
4. Poly Sulphate and Start Up
5. Start Up

21st June

1. Untreated
2. Liquid Fert
3. Poly Sulphate
4. Poly Sulphate and Start Up
5. Start Up

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20th June

1. Untreated
2. Liquid Fert
3. Poly Sulphate
4. Poly Sulphate and Start Up
5. Start Up

25th June

1. Untreated
2. Liquid Fert
3. Poly Sulphate
4. Poly Sulphate and Start Up
5. Start Up

Yield

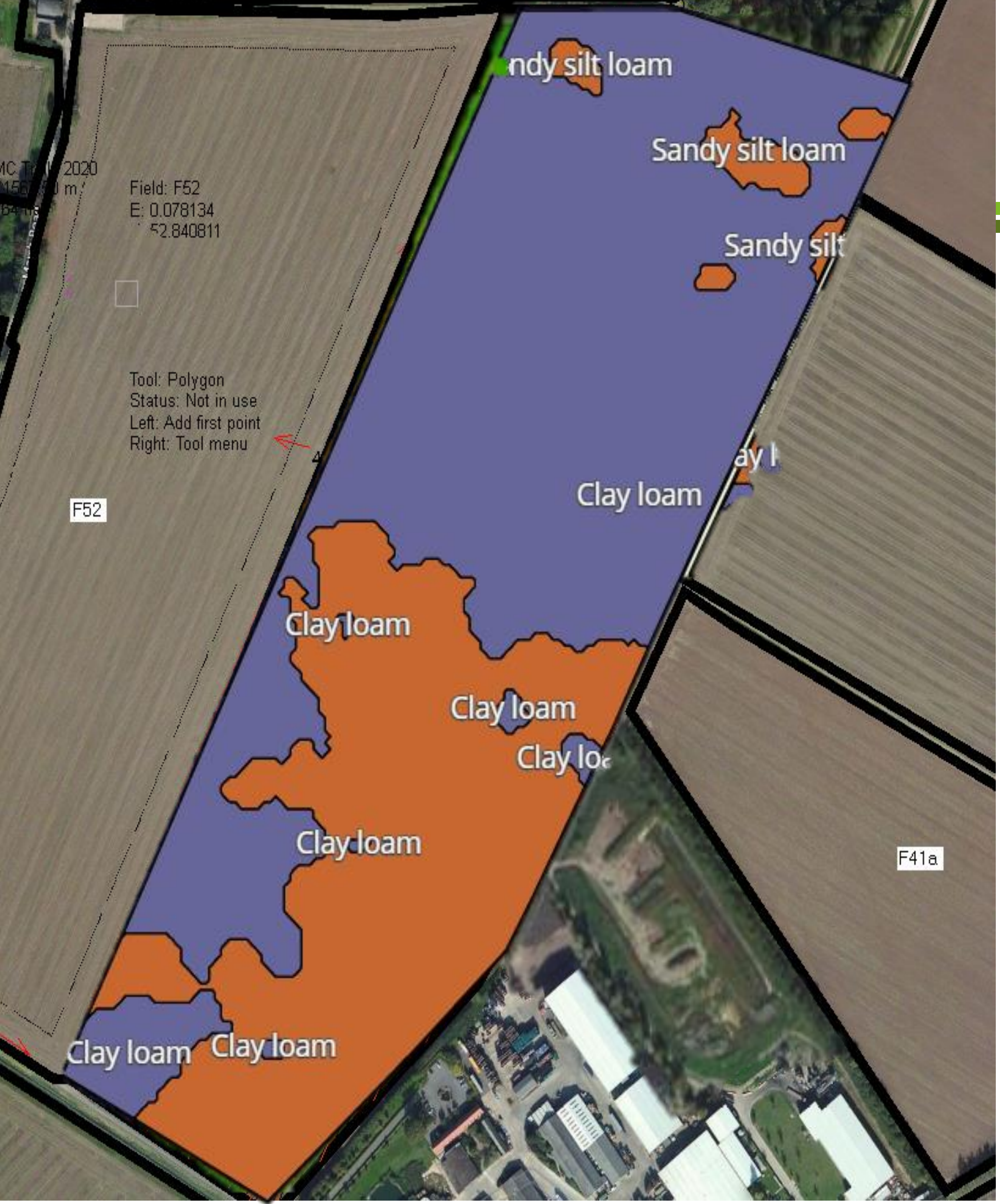
1. Untreated 9.56T/ha
2. Liquid Fert 10.12T/ha
3. Poly Sulphate 9.56T/ha
4. Poly Sulphate and Start Up 8.75T/ha
5. Start Up 6.45T/ha

Lessons Learnt

- Field Choice needs to be better
- Scan and look at Satellite History
- Repeat Plots if possible
- We are on right track to yield prediction and data collected by Innoveg helping
- Scanned with Soil Optix after harvest to show field zones and correlation to yield

HMC

Soil Scans



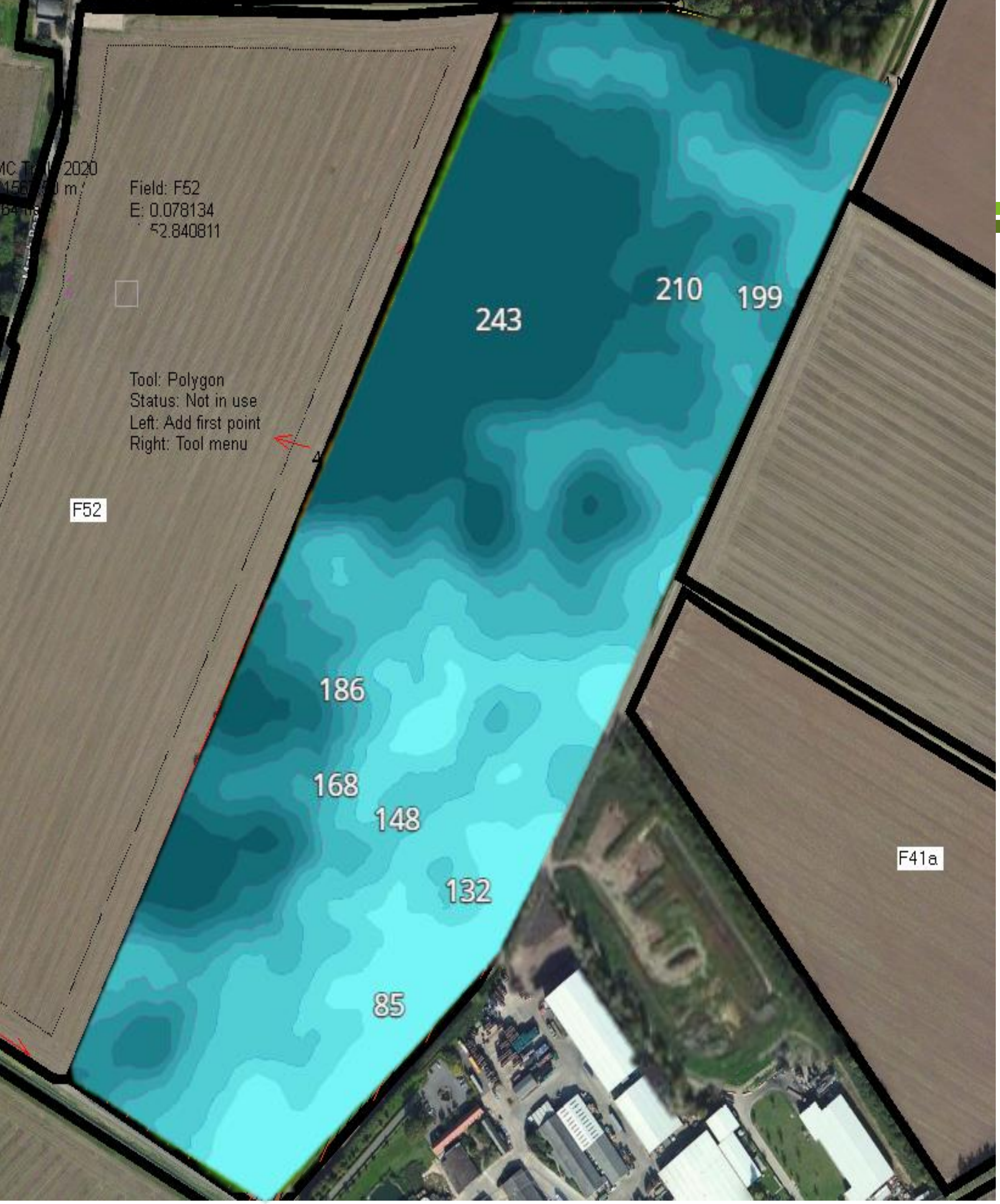
Soil Texture

Soil Scans

P Index 2-3

Soil Scans

K Index 3-4



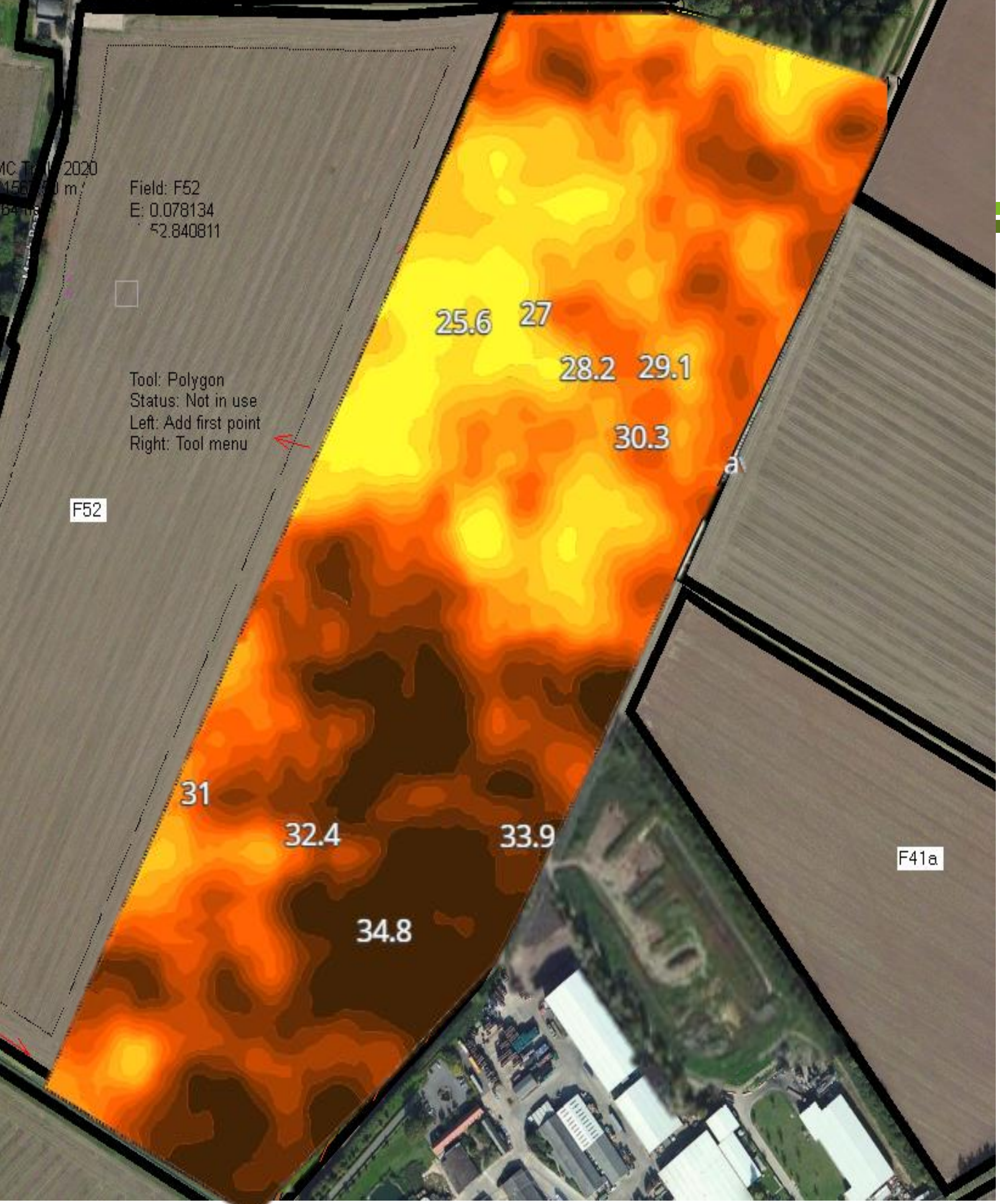
Soil Scans

Mg Index 2-4

Soil Scans

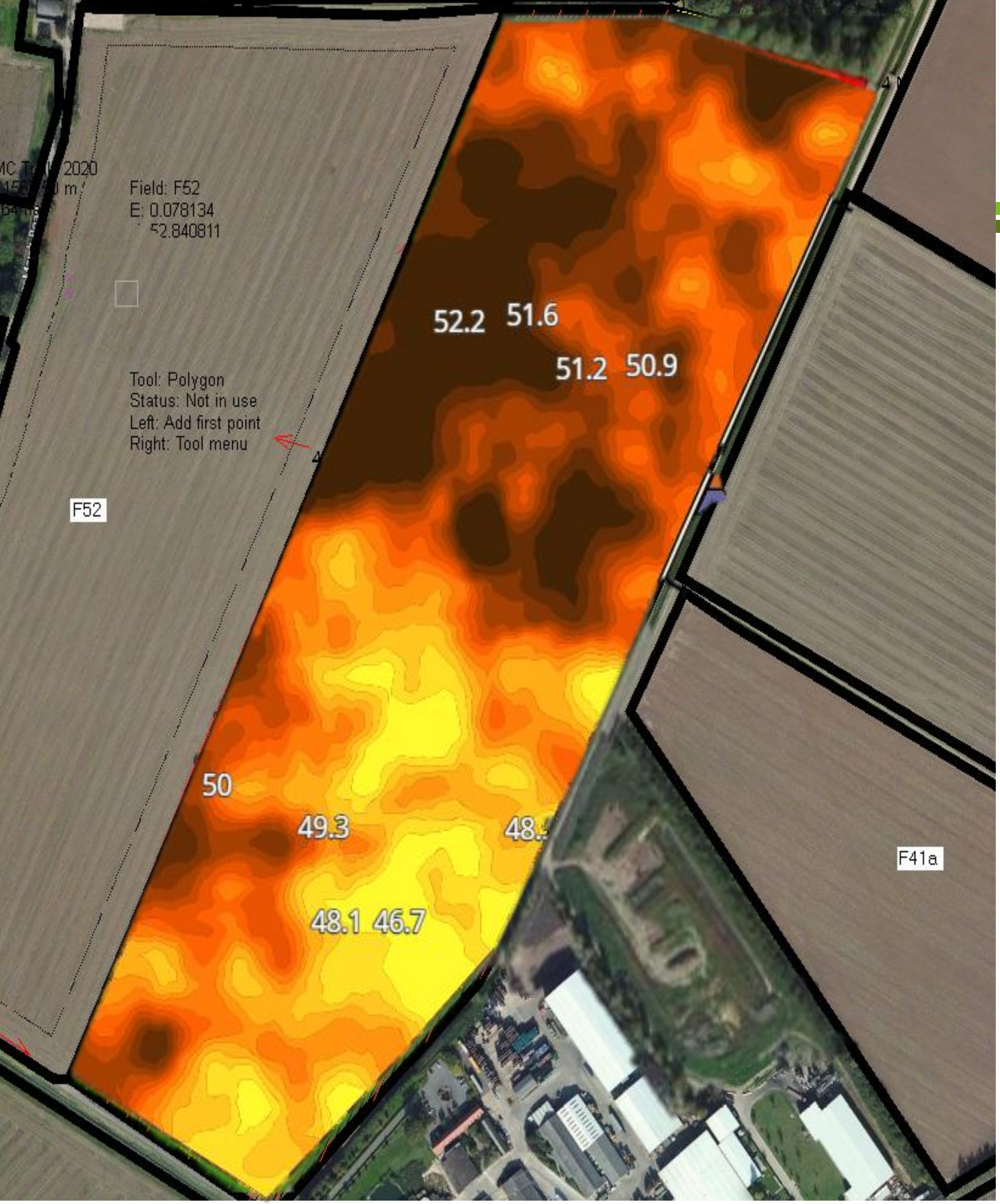
p.H

Soil Scans



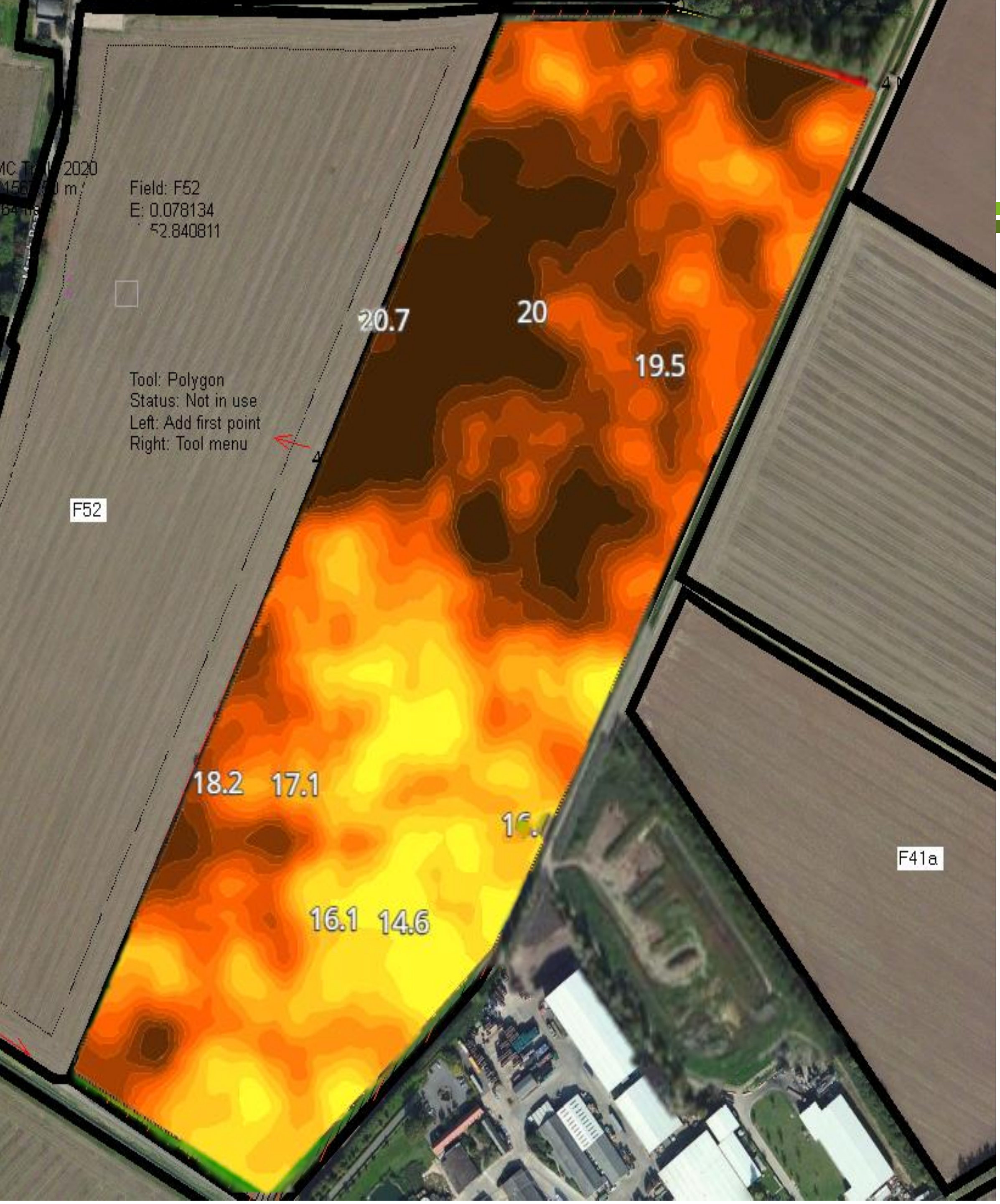
SAND %

Soil Scans



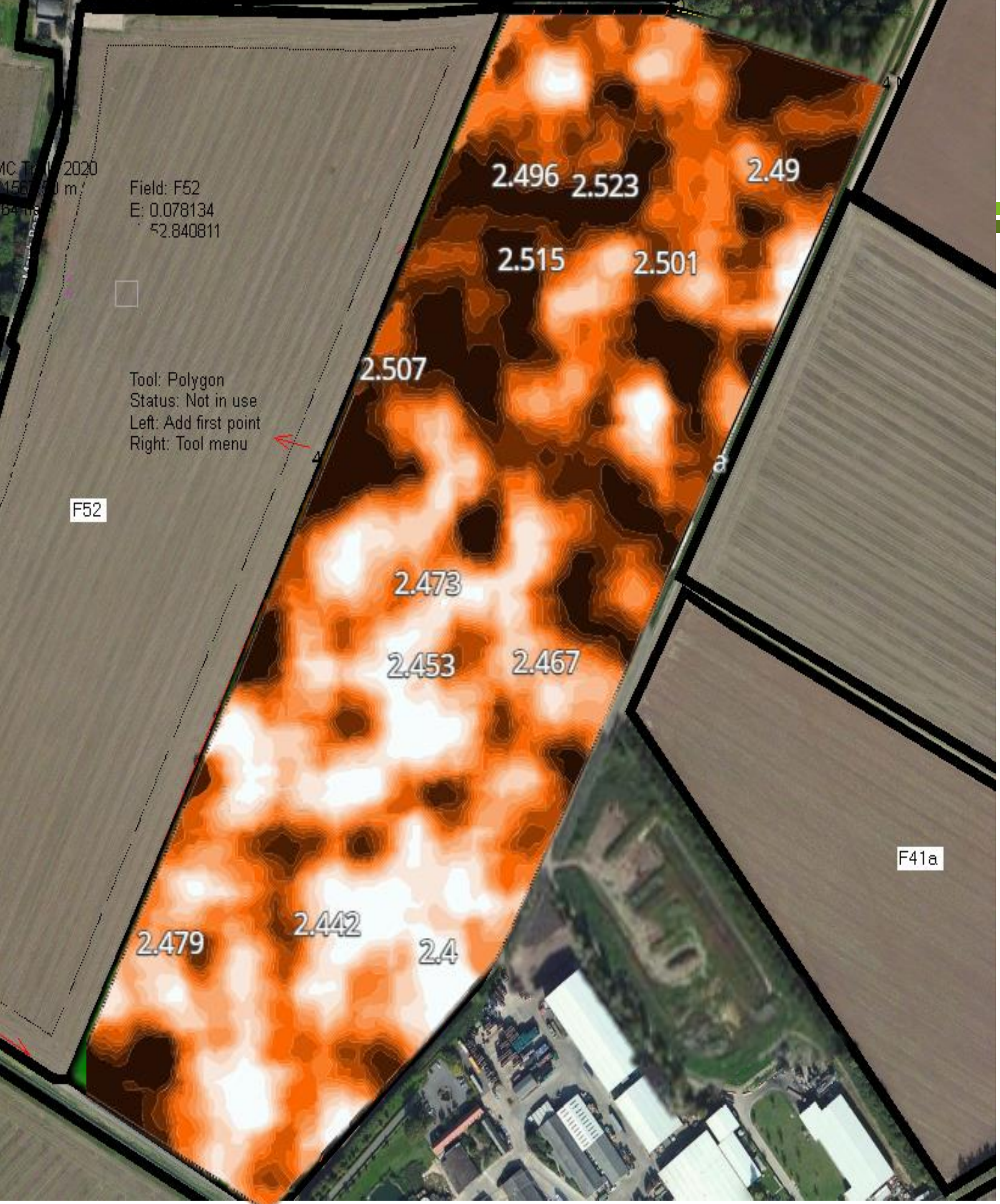
SILT %

Soil Scans

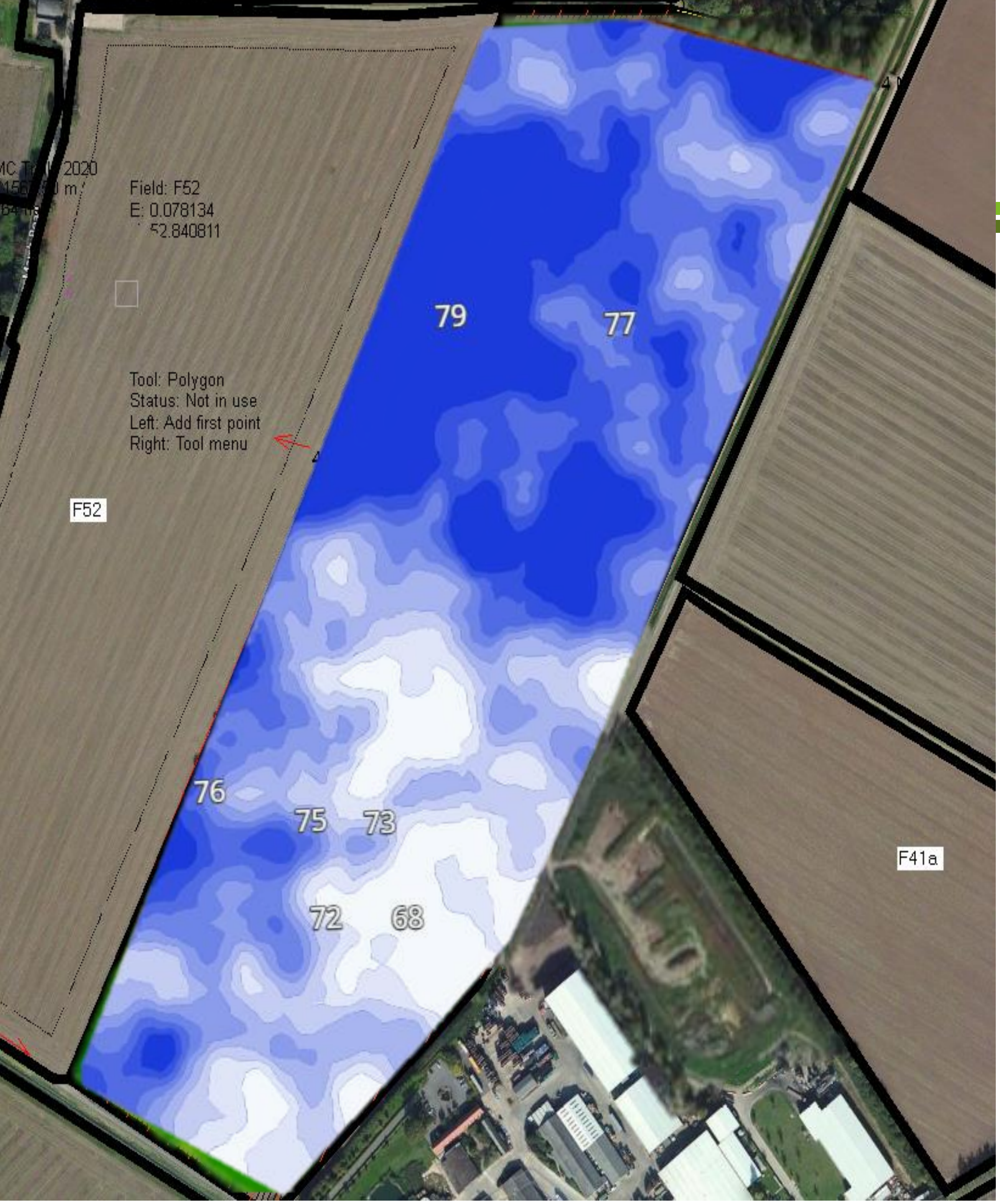


CLAY %

Soil Scans



OM %

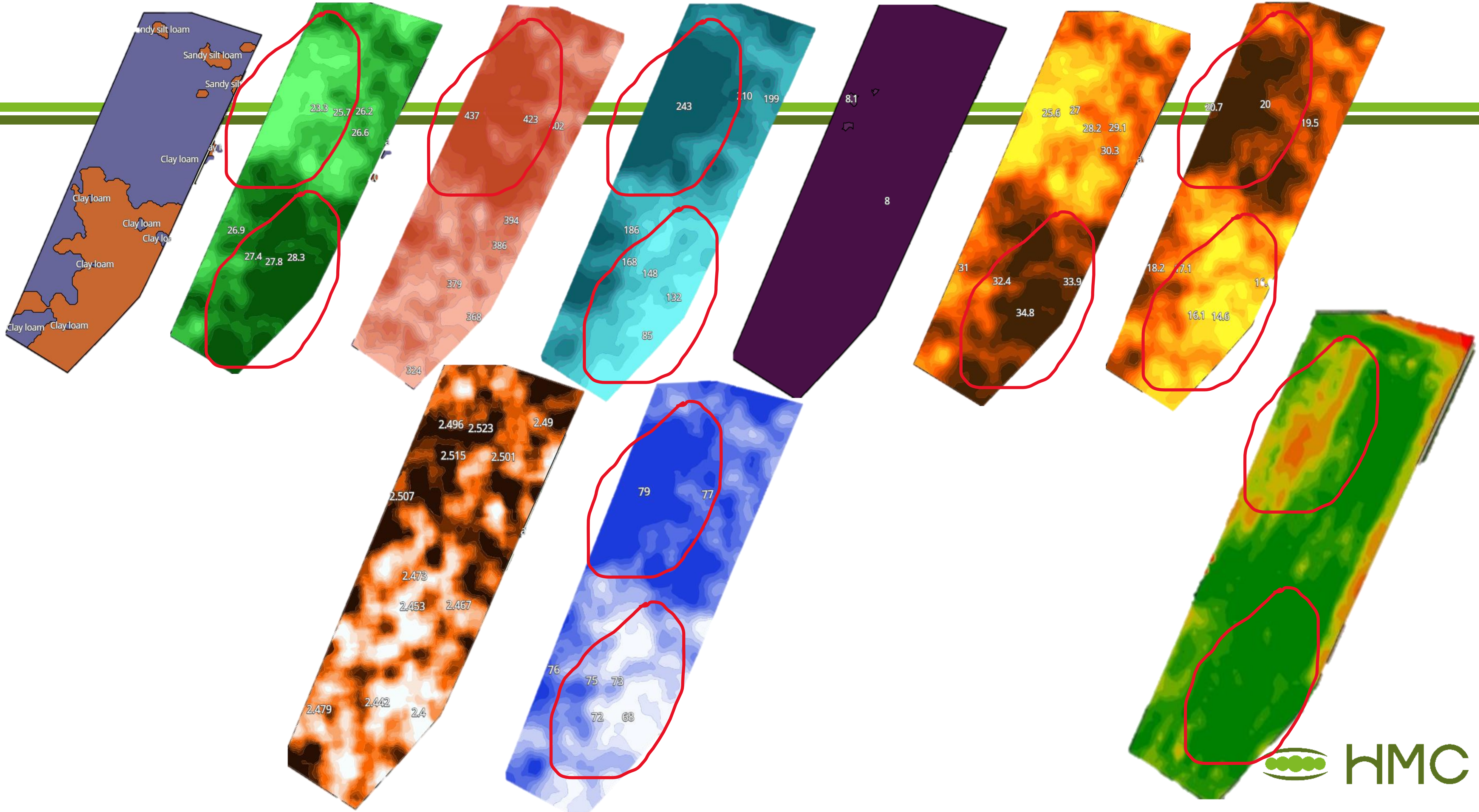


Soil Scans

WATER AVILABLE INDEX

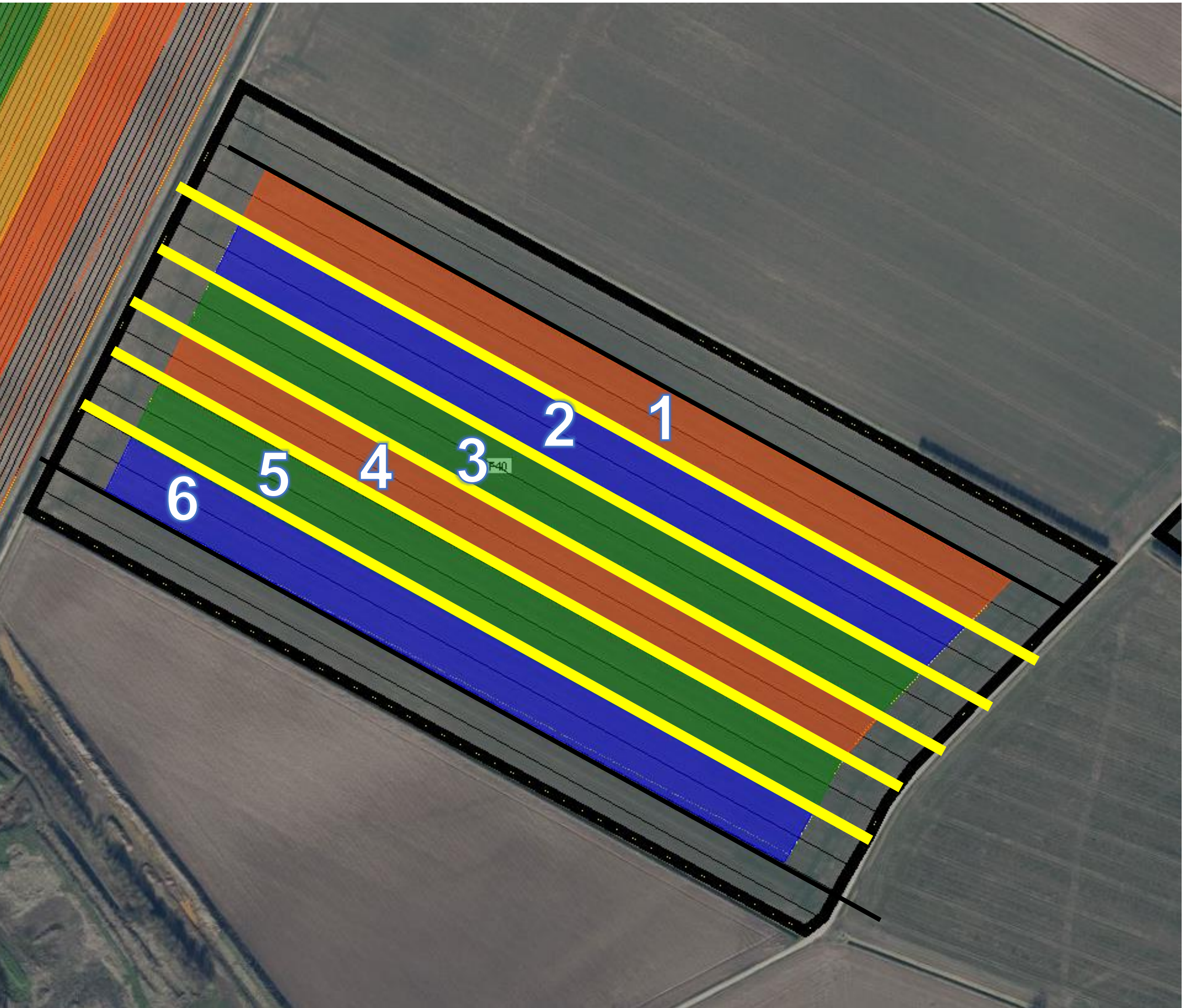
1-100

Combination of Sand, Silt and Clay to give water holding value.
Higher the number the higher the ability to hold water.


Sandy silt loam
Clay loam
Clay loam
Clay loam
Clay loam
Clay loam
Clay loam
23.3
25.7
26.2
26.6
26.9
27.4
27.8
28.3
437
423
394
386
379
368
324
243
199
186
168
148
132
85
8.1
8
25.6
27
28.2
29.1
30.3
31
32.4
33.9
34.8
20.7
20
19.5
18.2
16.1
14.6
2.496
2.523
2.49
2.515
2.501
2.507
2.473
2.453
2.467
2.479
2.442
2.4
79
77
76
75
73
72
68

HMC

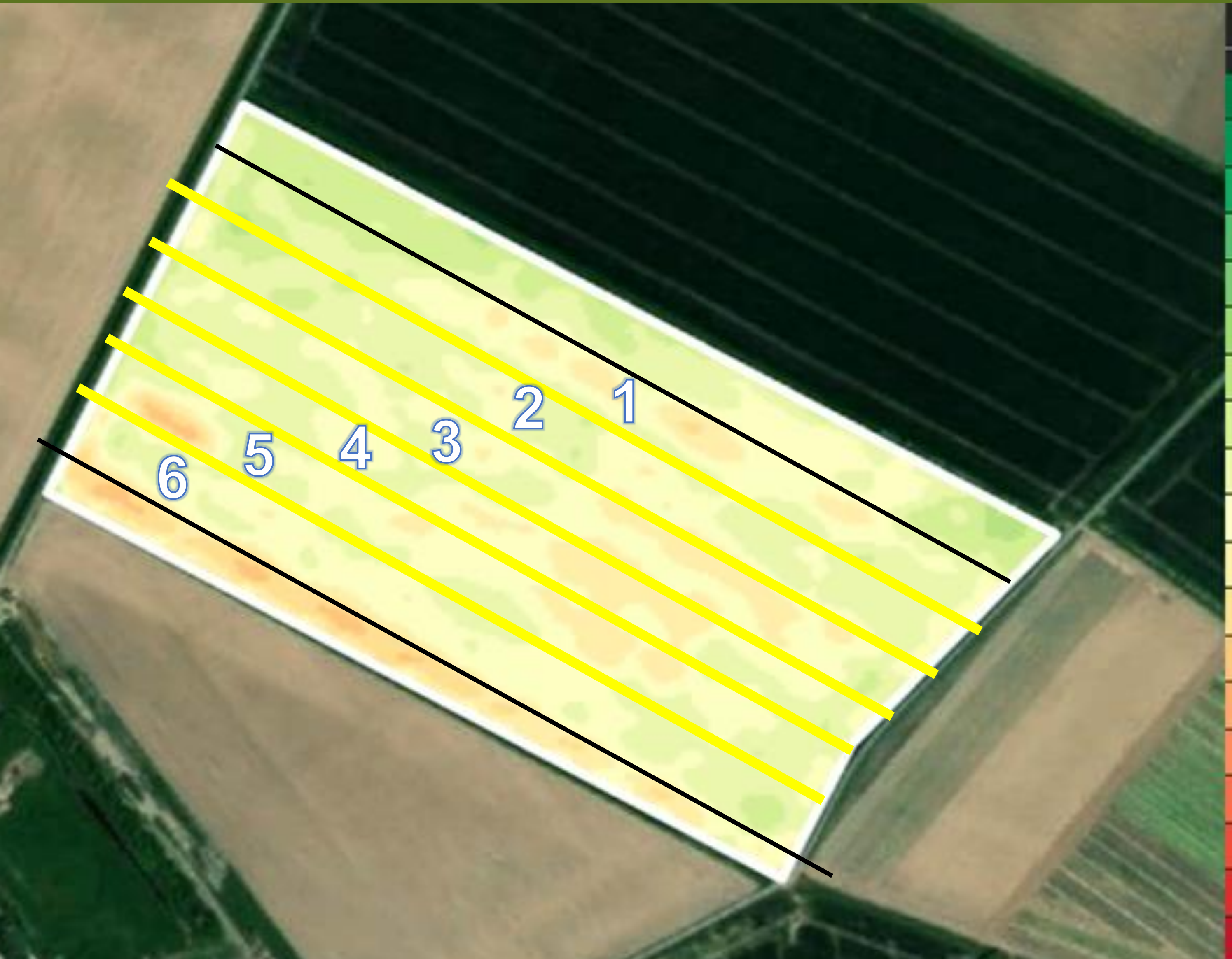
2021 Trials



1. Untreated
2. StartUp Maxx
3. Poly Sulphate
4. Untreated
5. Poly Sulphate
6. StarUp Maxx

HMC

2021 Trials

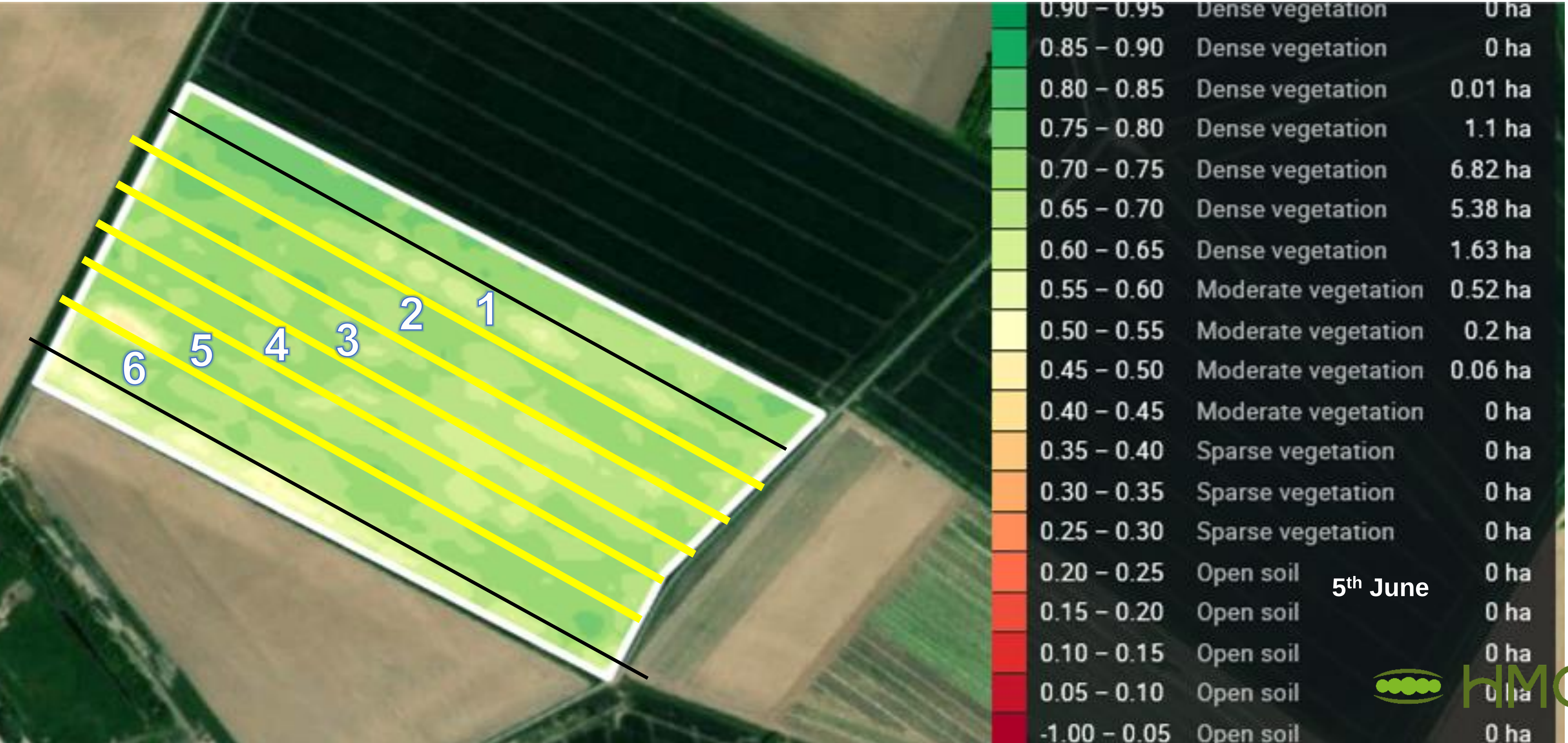


0.95 – 1.00	Dense vegetation	0 ha
0.90 – 0.95	Dense vegetation	0 ha
0.85 – 0.90	Dense vegetation	0 ha
0.80 – 0.85	Dense vegetation	0 ha
0.75 – 0.80	Dense vegetation	0 ha
0.70 – 0.75	Dense vegetation	0 ha
0.65 – 0.70	Dense vegetation	0.13 ha
0.60 – 0.65	Dense vegetation	1.52 ha
0.55 – 0.60	Moderate vegetation	5.62 ha
0.50 – 0.55	Moderate vegetation	5.92 ha
0.45 – 0.50	Moderate vegetation	1.87 ha
0.40 – 0.45	Moderate vegetation	0.49 ha
0.35 – 0.40	Sparse vegetation	0.15 ha
0.30 – 0.35	Sparse vegetation	0 ha
0.25 – 0.30	Sparse vegetation	0 ha
0.20 – 0.25	Open soil	0 ha
0.15 – 0.20	Open soil	0 ha
0.10 – 0.15	Open soil	0 ha
0.05 – 0.10	Open soil	0 ha

2nd June

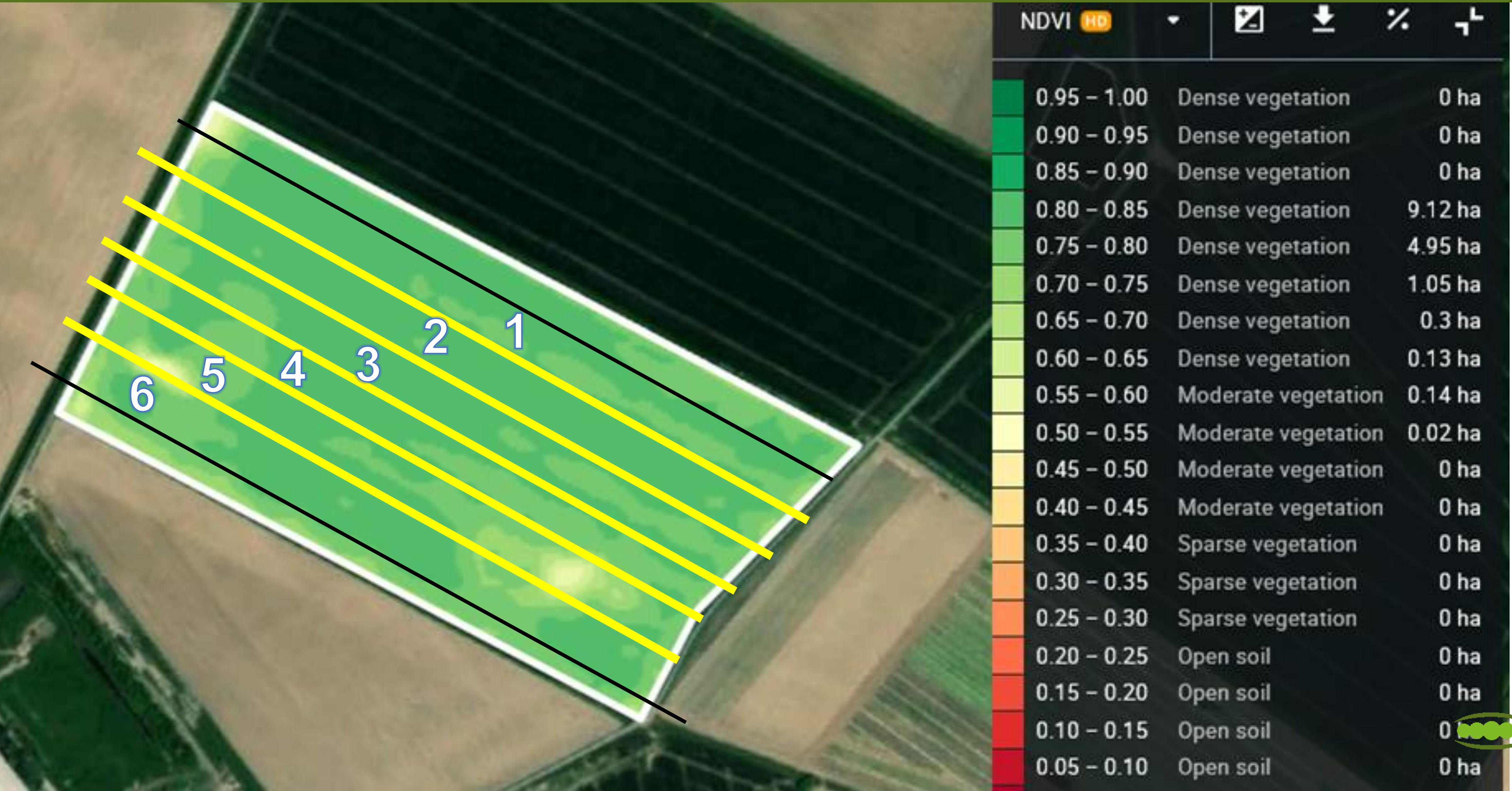
HMC

2021 Trials



1
2
3
4
5
6
0.90 – 0.95 Dense vegetation 0 ha
0.85 – 0.90 Dense vegetation 0 ha
0.80 – 0.85 Dense vegetation 0.01 ha
0.75 – 0.80 Dense vegetation 1.1 ha
0.70 – 0.75 Dense vegetation 6.82 ha
0.65 – 0.70 Dense vegetation 5.38 ha
0.60 – 0.65 Dense vegetation 1.63 ha
0.55 – 0.60 Moderate vegetation 0.52 ha
0.50 – 0.55 Moderate vegetation 0.2 ha
0.45 – 0.50 Moderate vegetation 0.06 ha
0.40 – 0.45 Moderate vegetation 0 ha
0.35 – 0.40 Sparse vegetation 0 ha
0.30 – 0.35 Sparse vegetation 0 ha
0.25 – 0.30 Sparse vegetation 0 ha
0.20 – 0.25 Open soil 0 ha
0.15 – 0.20 Open soil 0 ha
0.10 – 0.15 Open soil 0 ha
0.05 – 0.10 Open soil 0 ha
-1.00 – 0.05 Open soil 0 ha
5th June

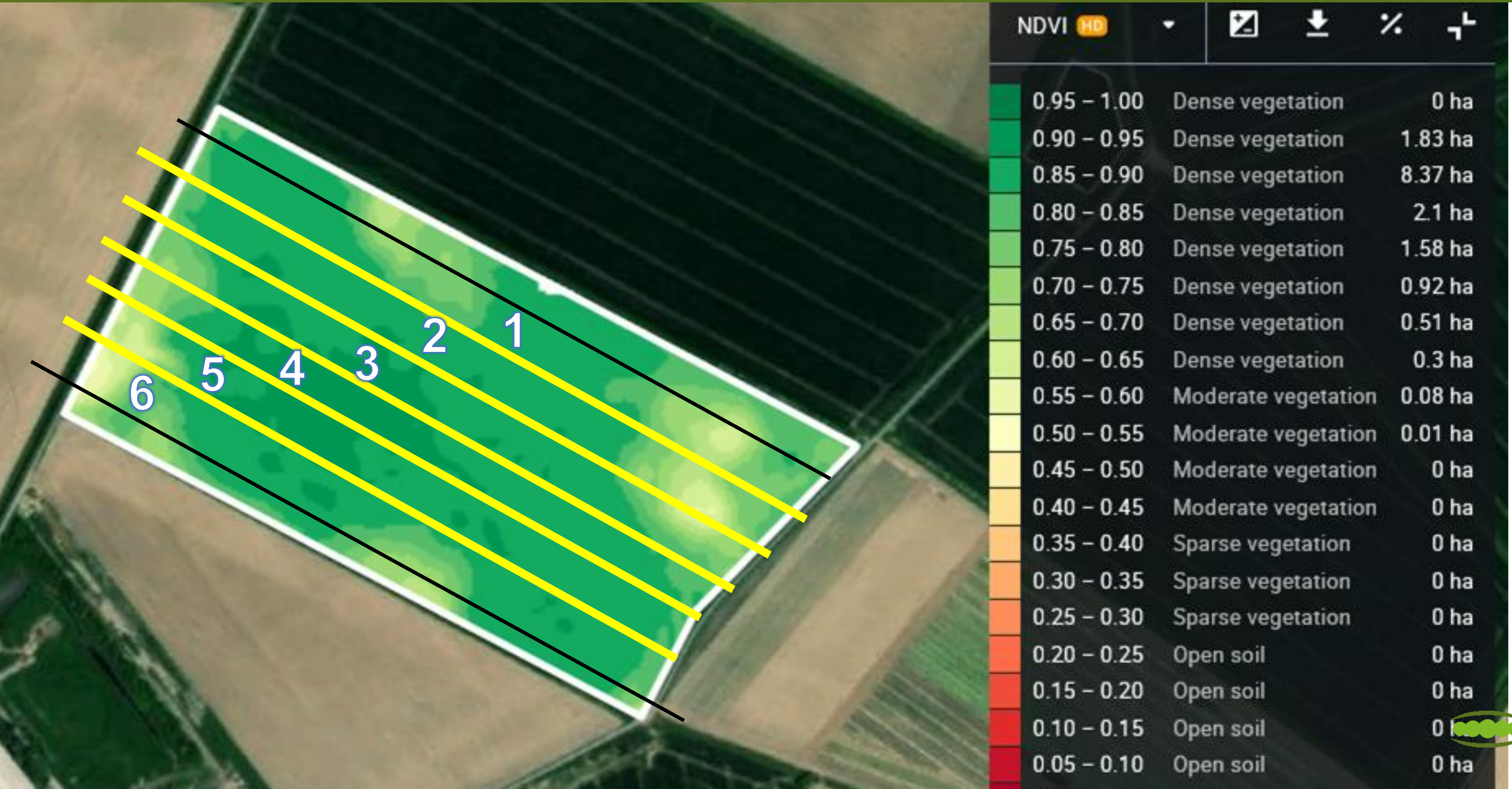
2021 Trials



12th June

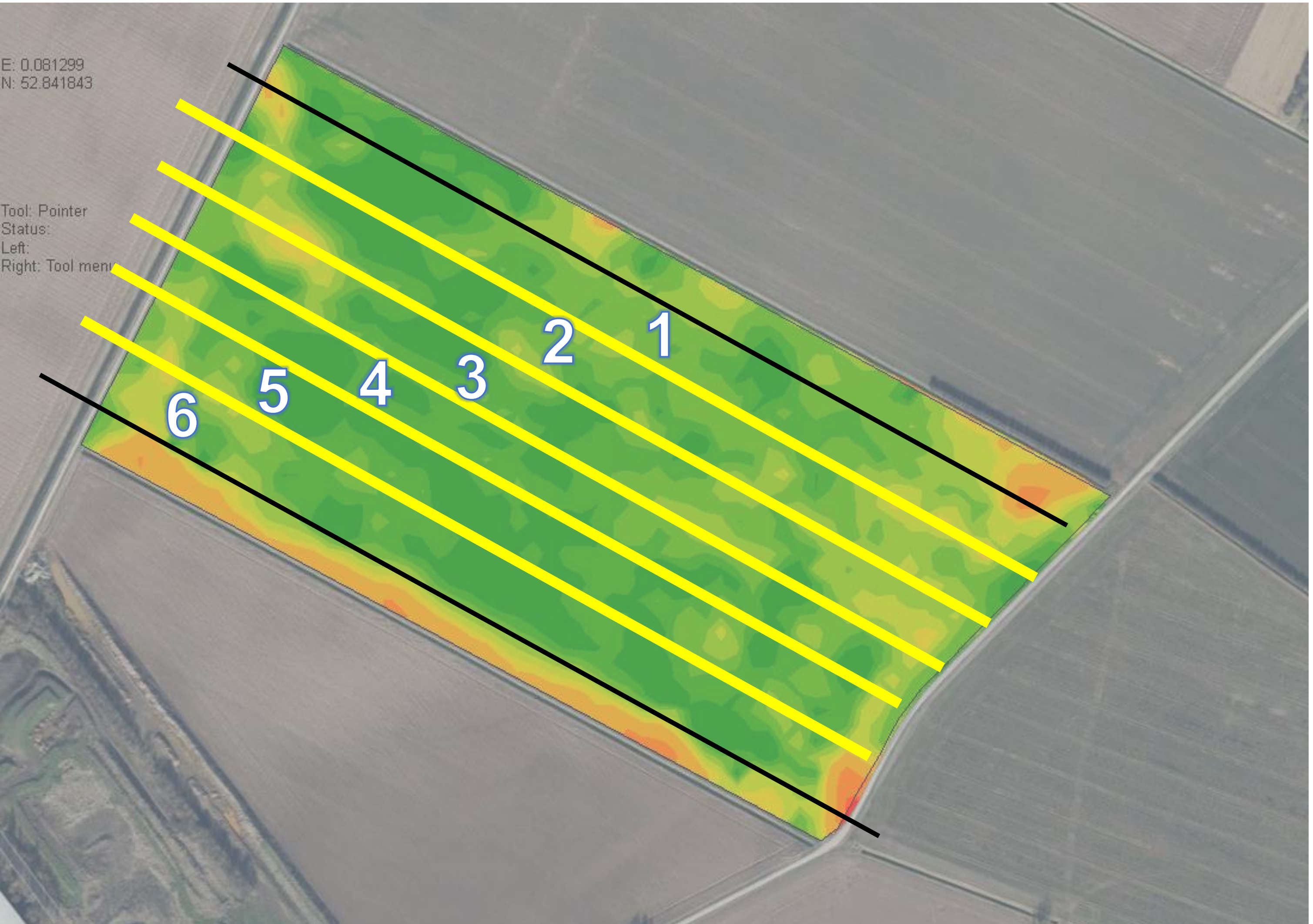
HMC

2021 Trials



5th July

2021 Trials

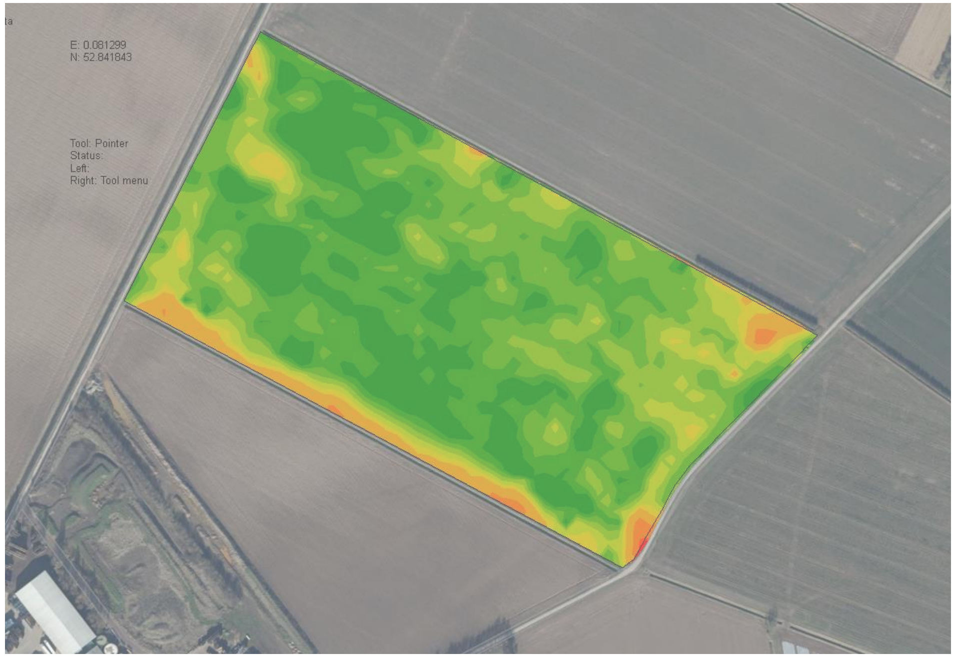


Yield Fresh

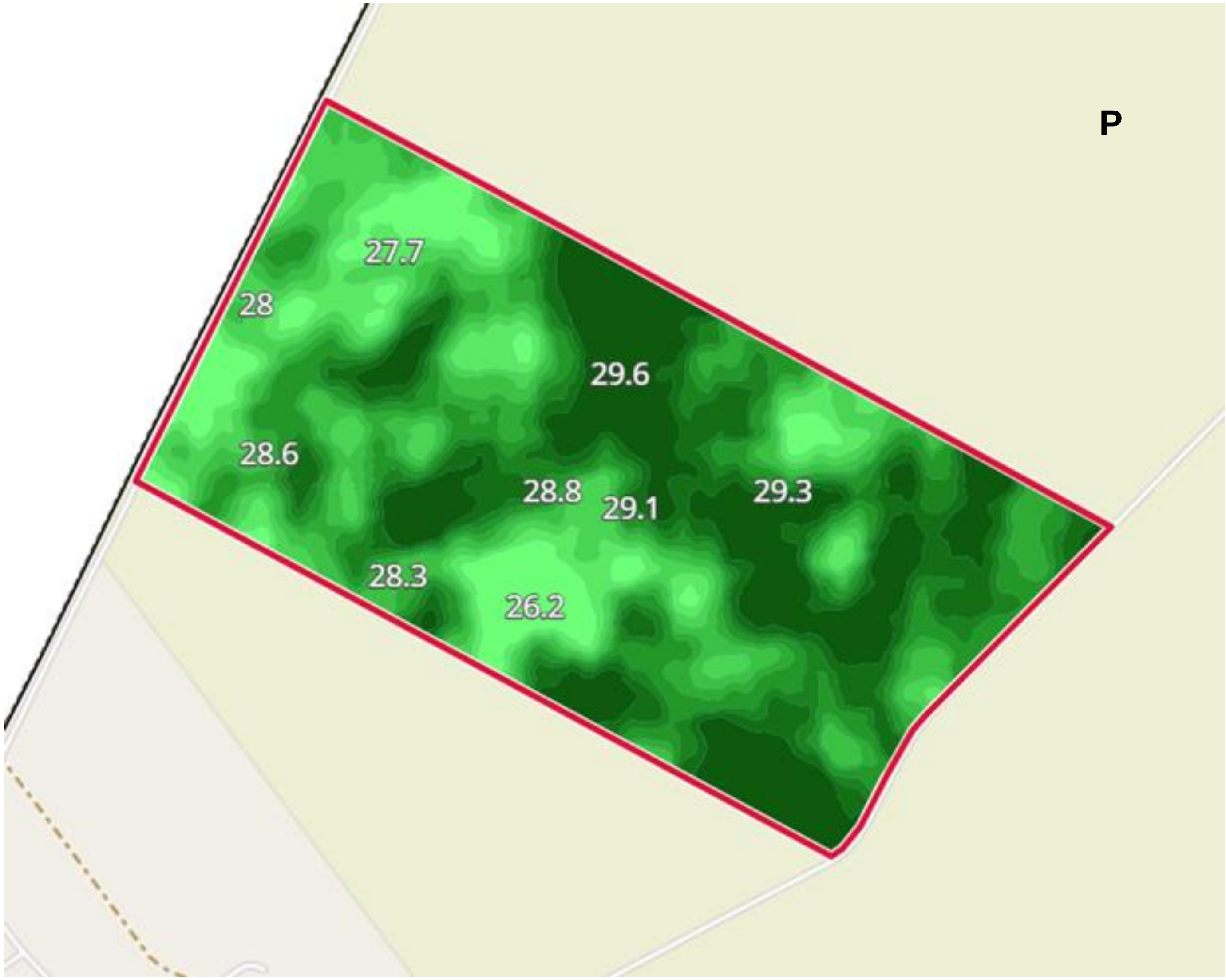
1. Untreated = 10.1 T/ha
2. StartUp Maxx = 9.5 T/ha
3. Poly Sulphate = 8.8 T/ha
4. Untreated = 8.9 T/ha
5. Poly Sulphate = 9.2 T/ha
6. StarUp Maxx = 9.5T/ha

HMC

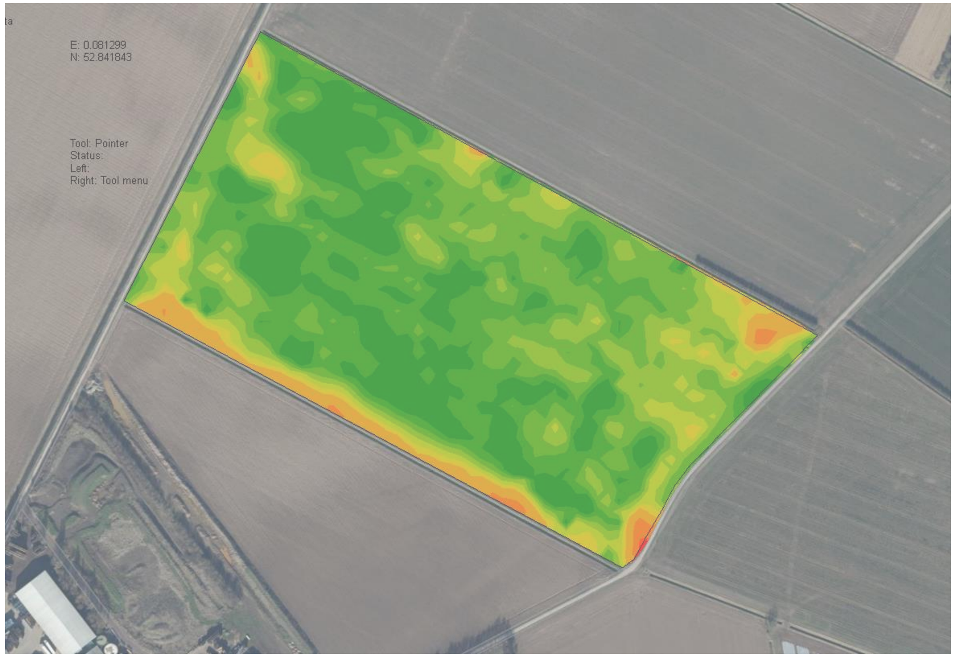
2021 Trials Soil Optix Scan



2021 Trials Soil Optix Scan

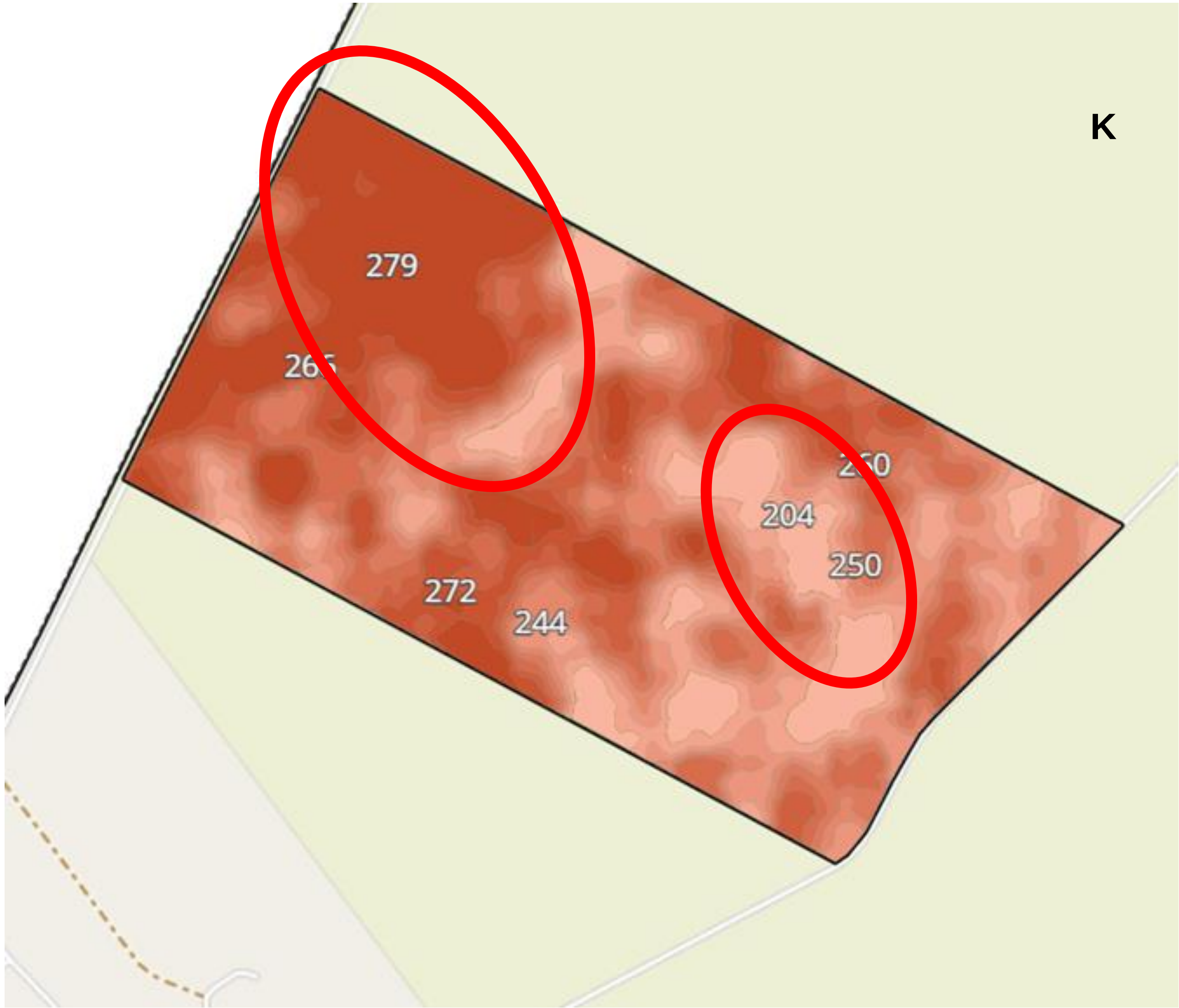


P



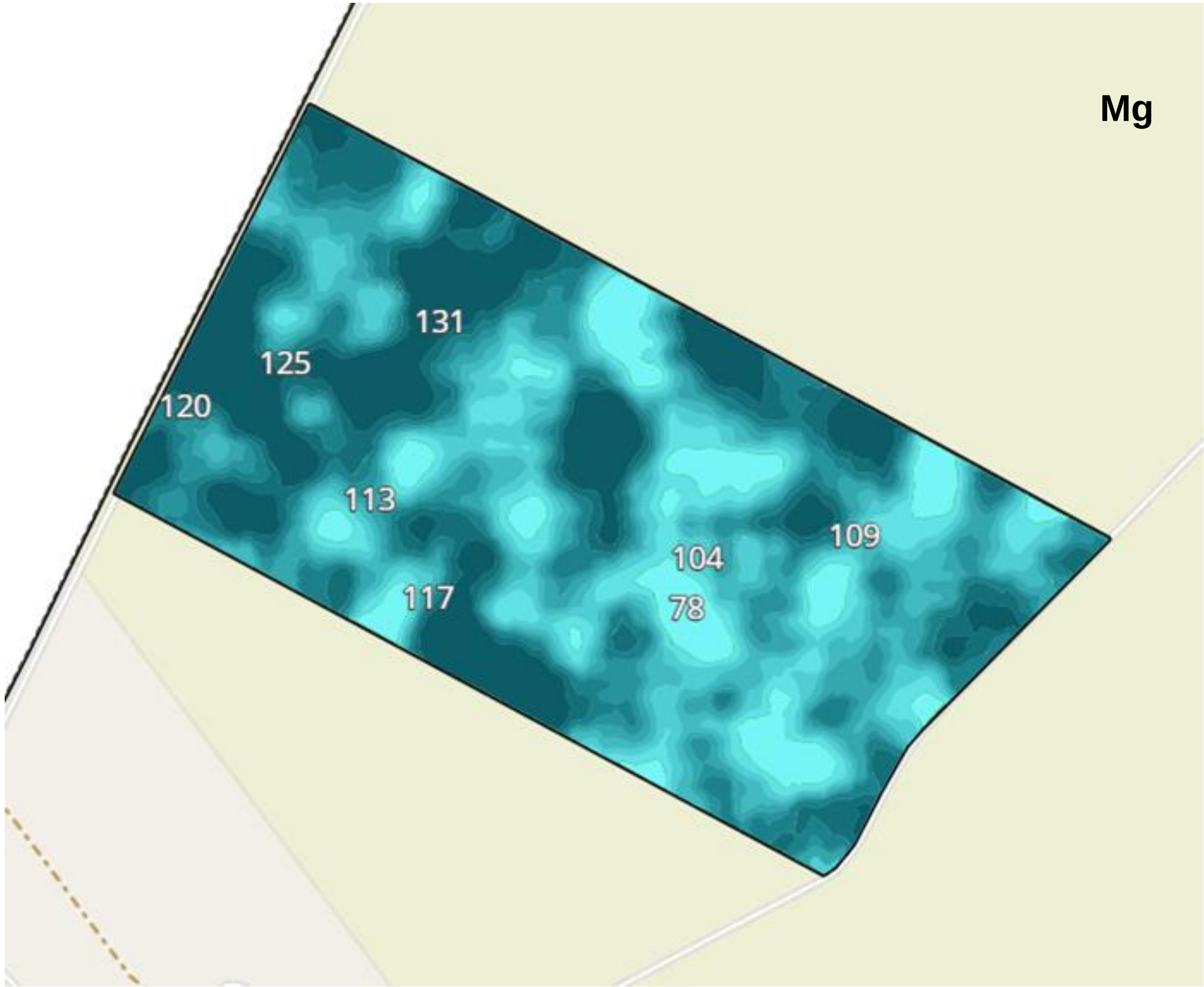
HMC

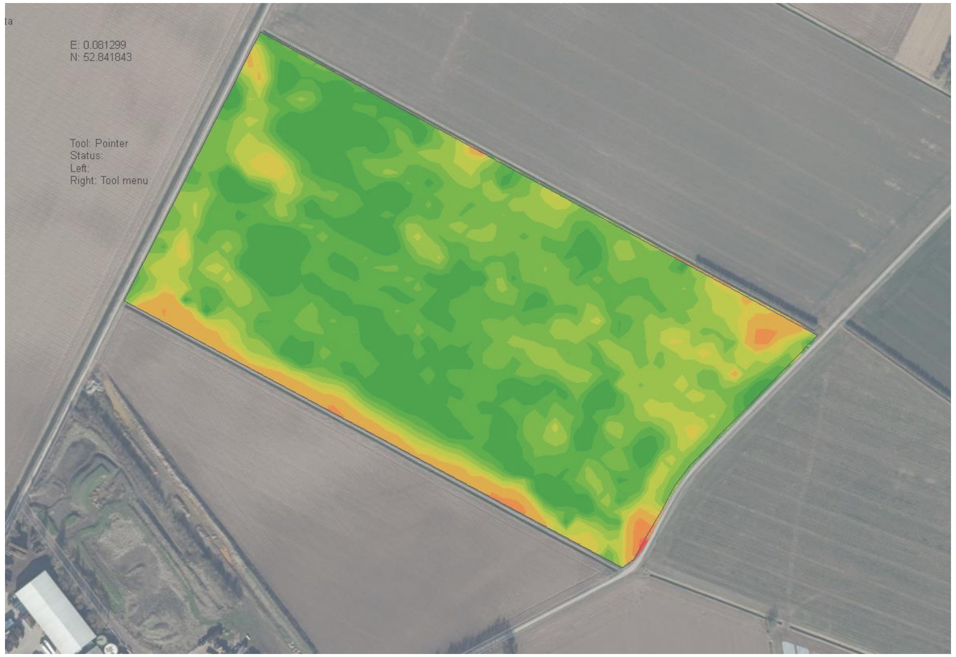
2021 Trials Soil Optix Scan



HMC

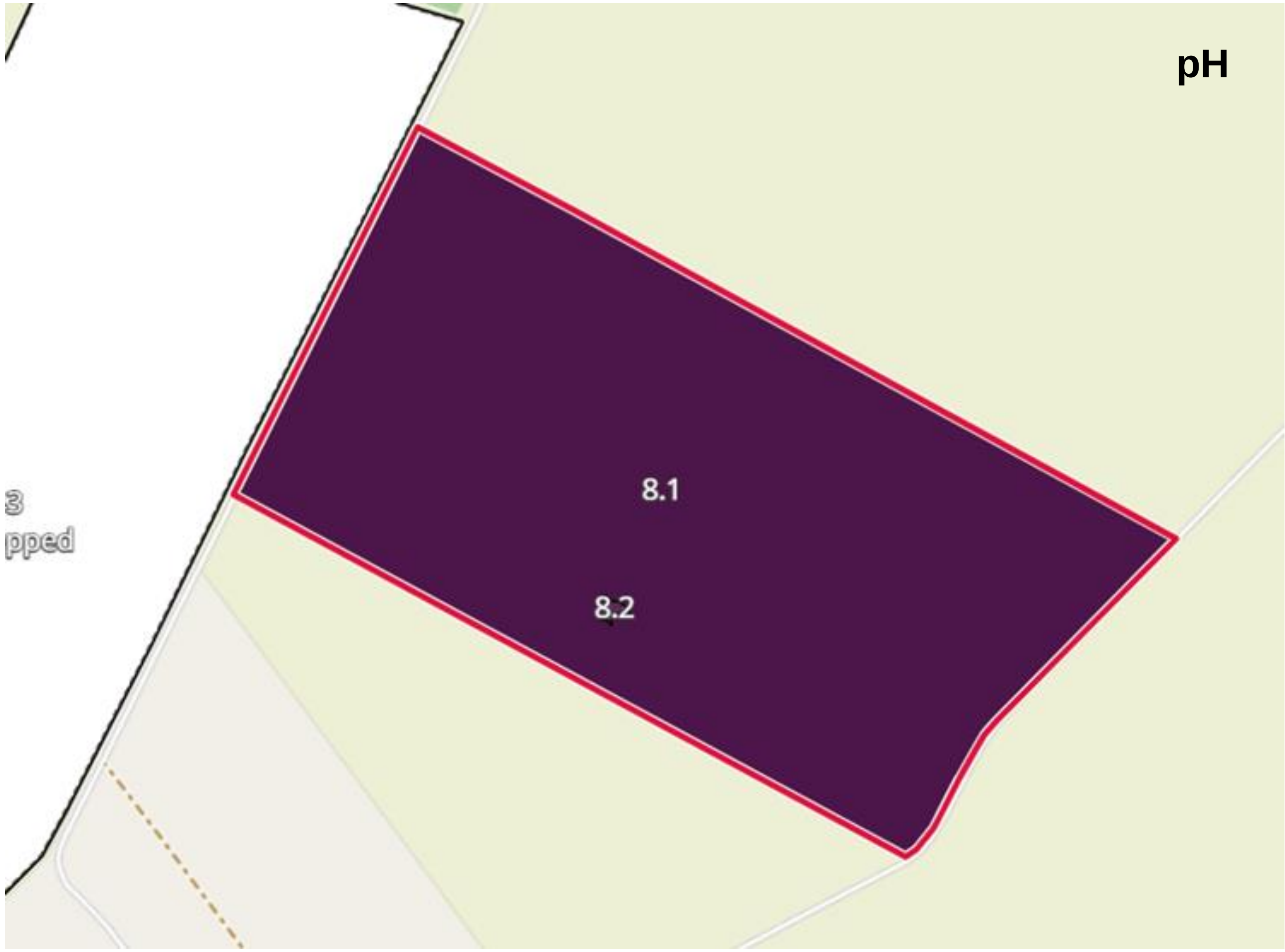
2021 Trials Soil Optix Scan

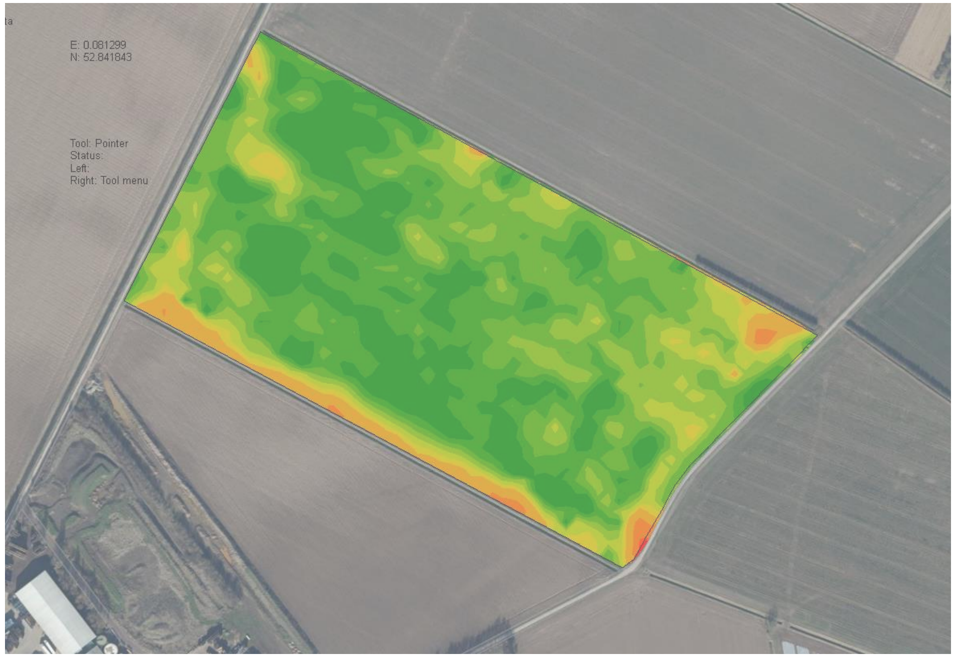




HMC

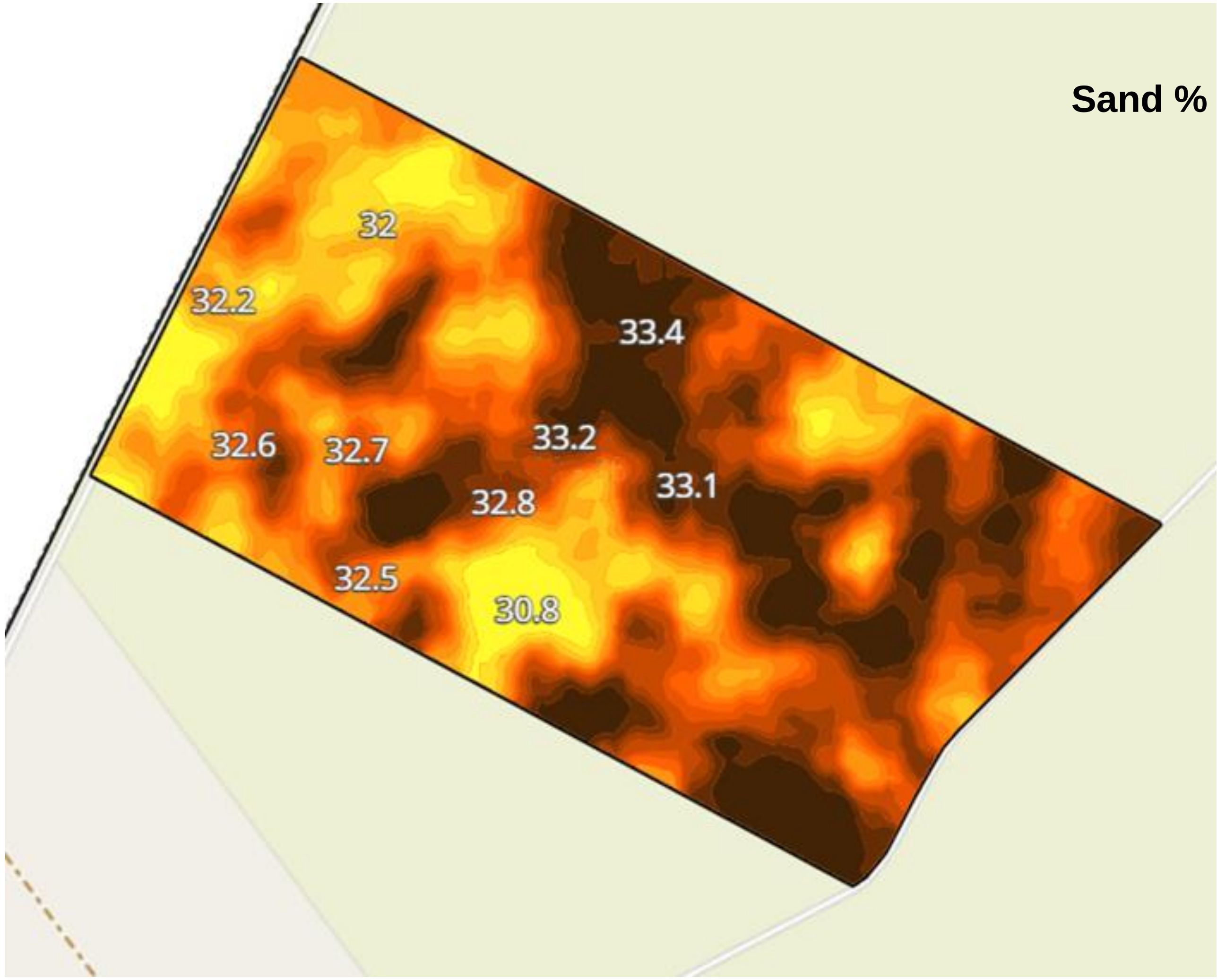
2021 Trials Soil Optix Scan

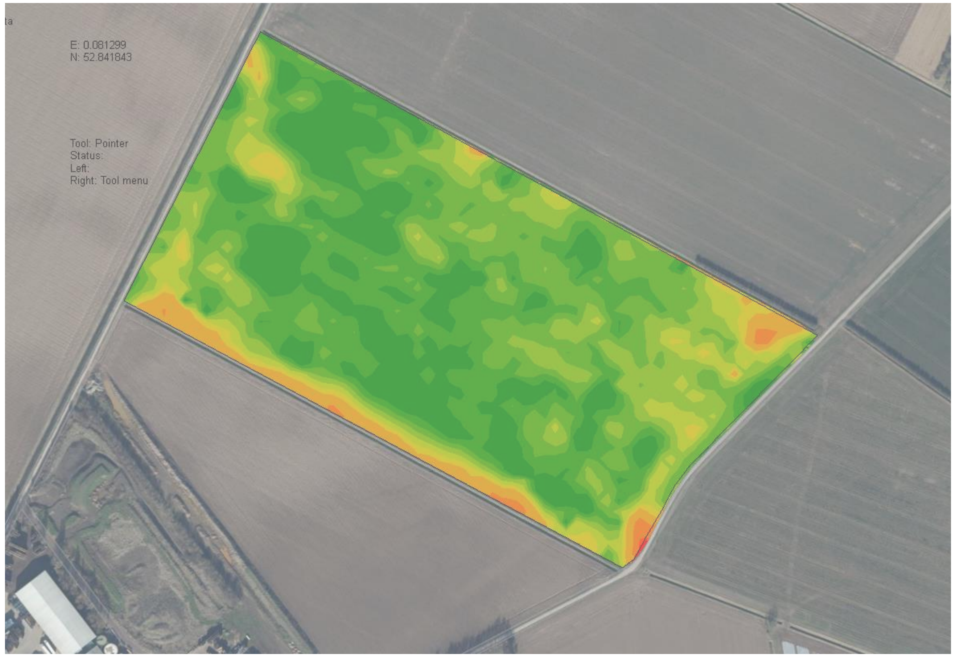




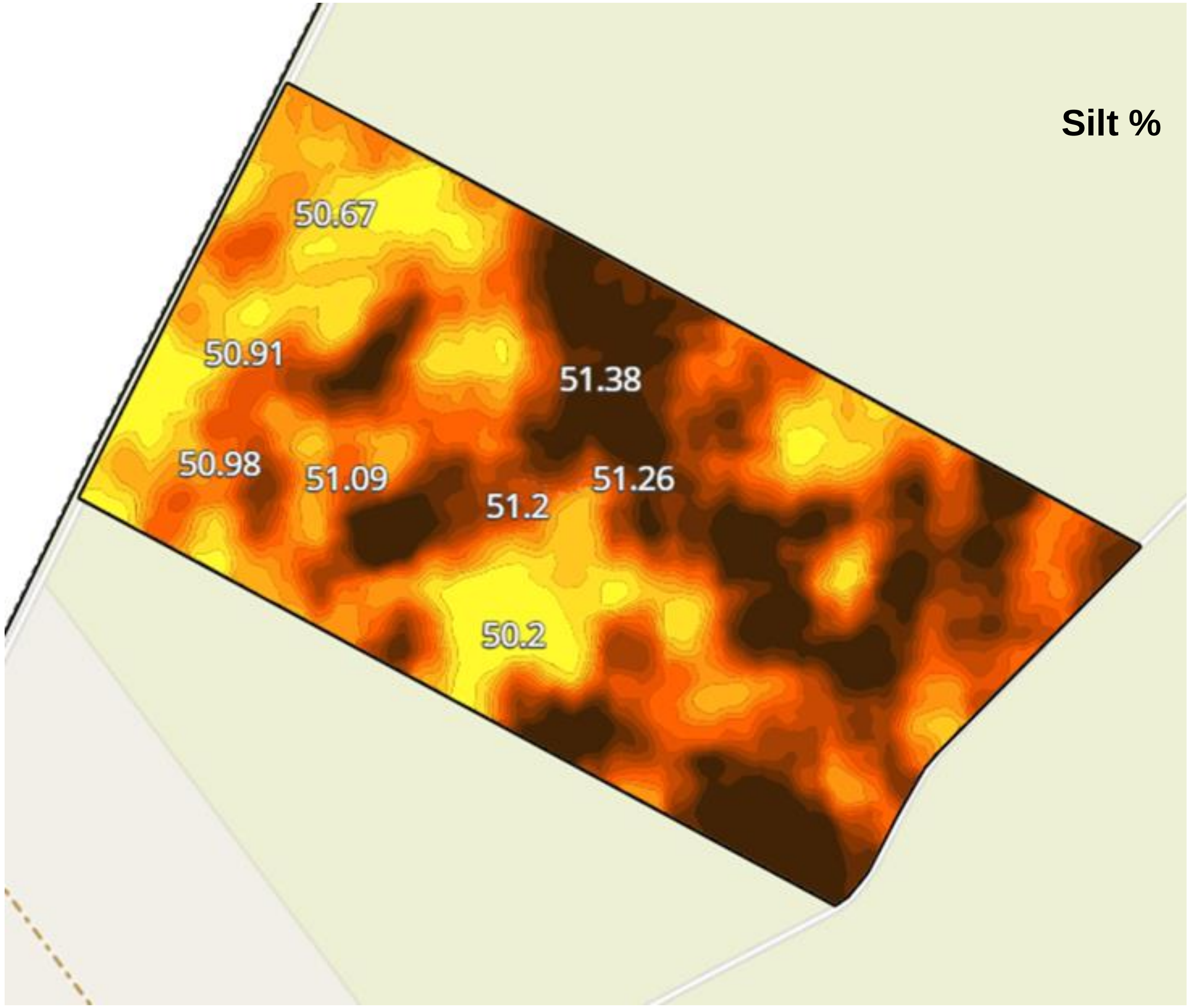
HMC

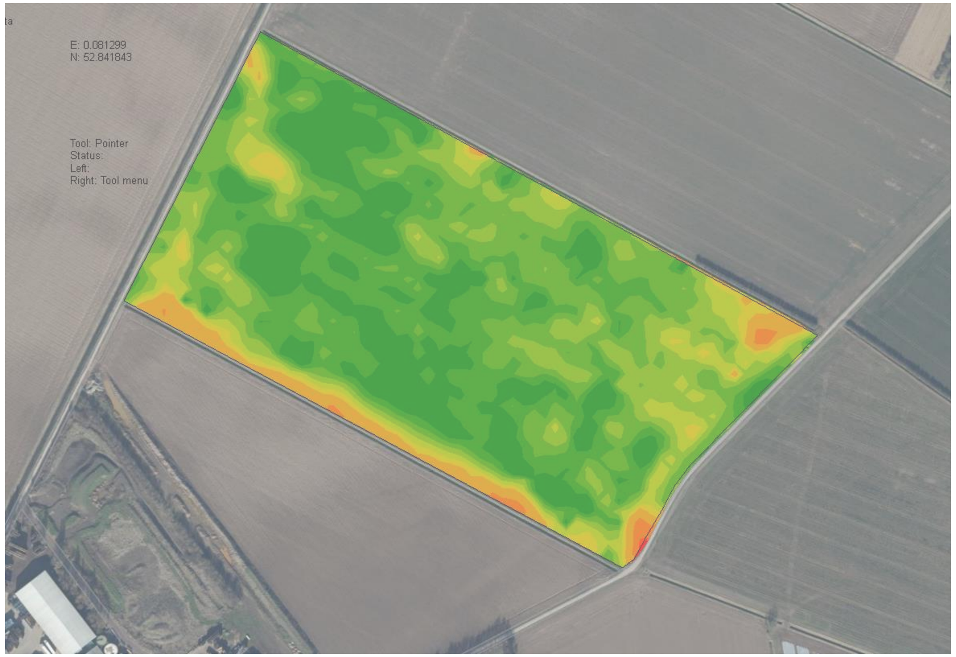
2021 Trials Soil Optix Scan





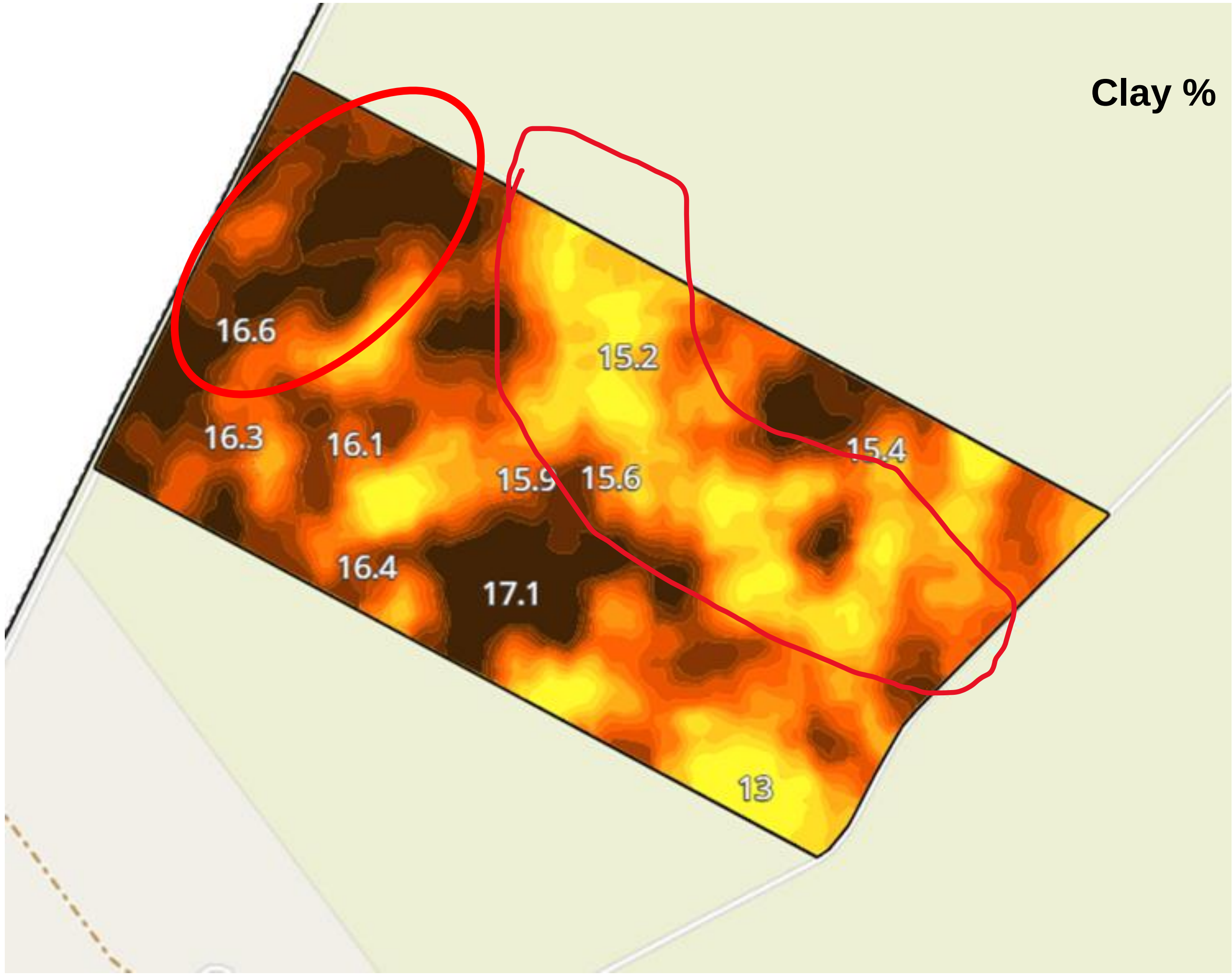
2021 Trials Soil Optix Scan



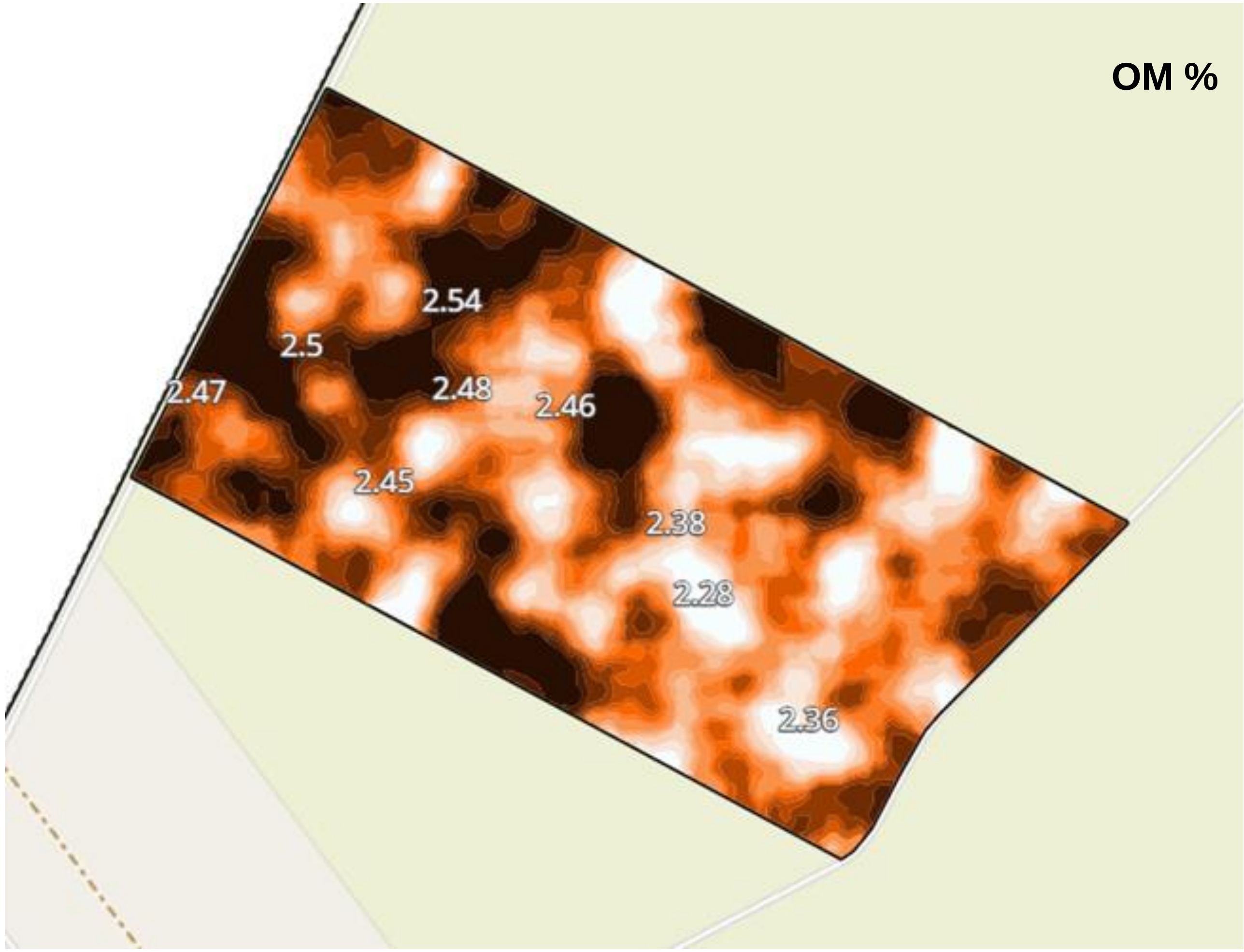


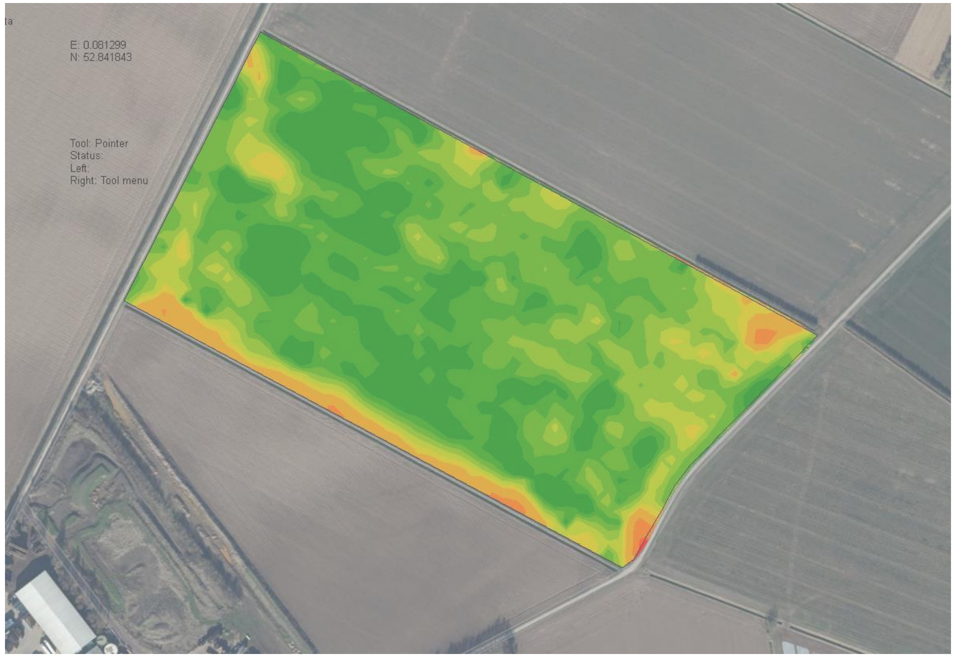
HMC

2021 Trials Soil Optix Scan



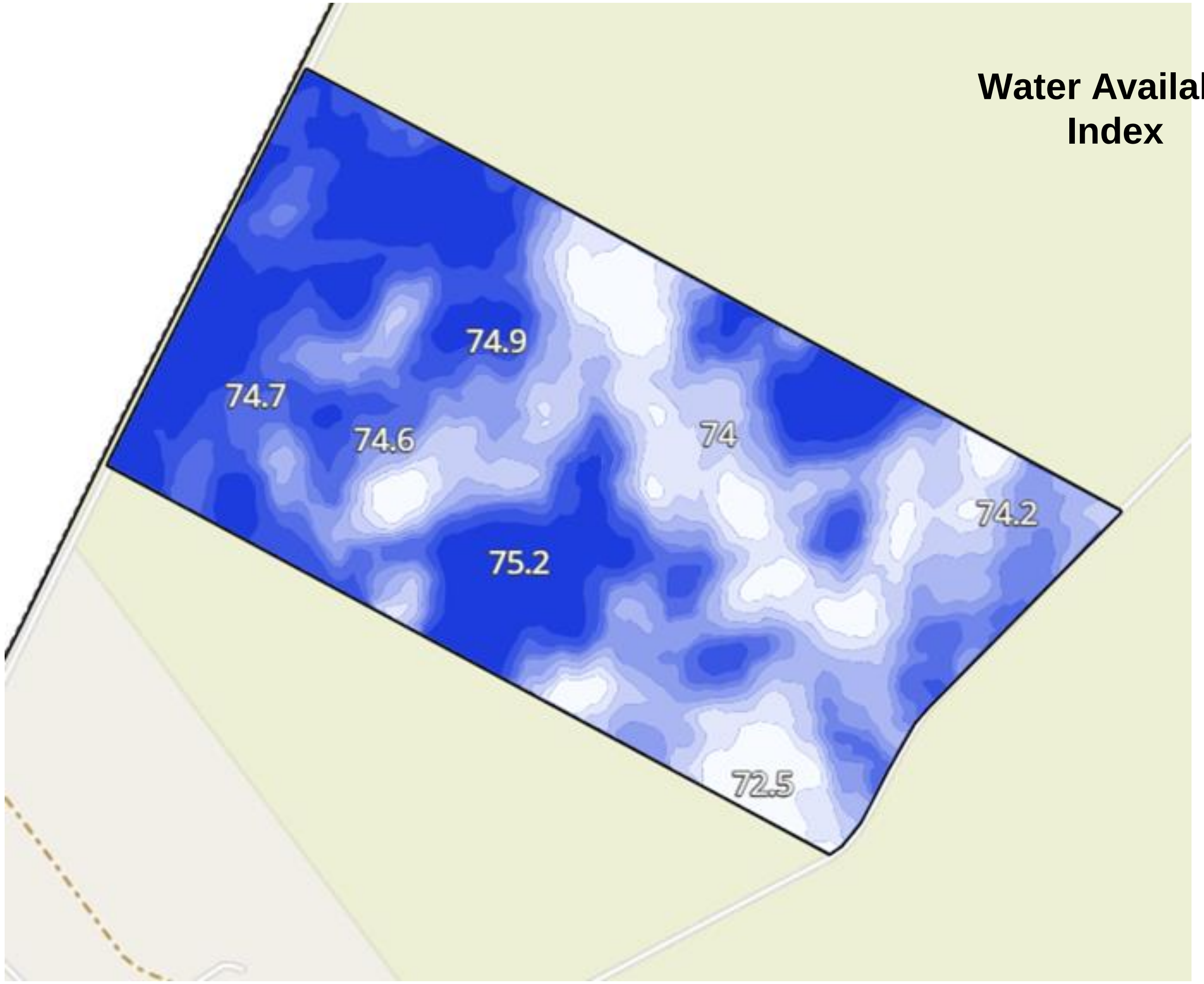
2021 Trials Soil Optix Scan

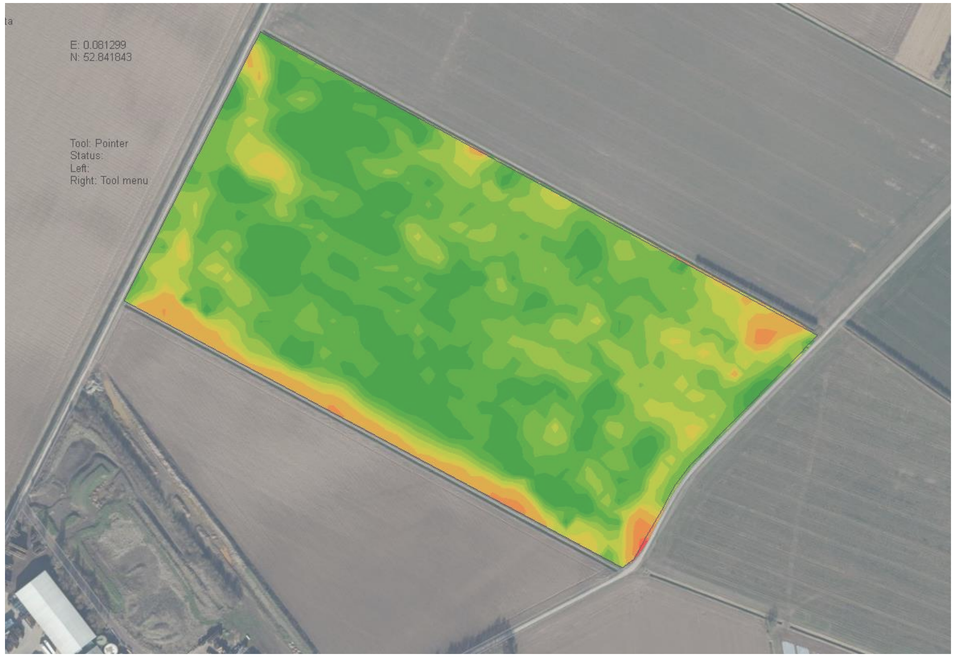




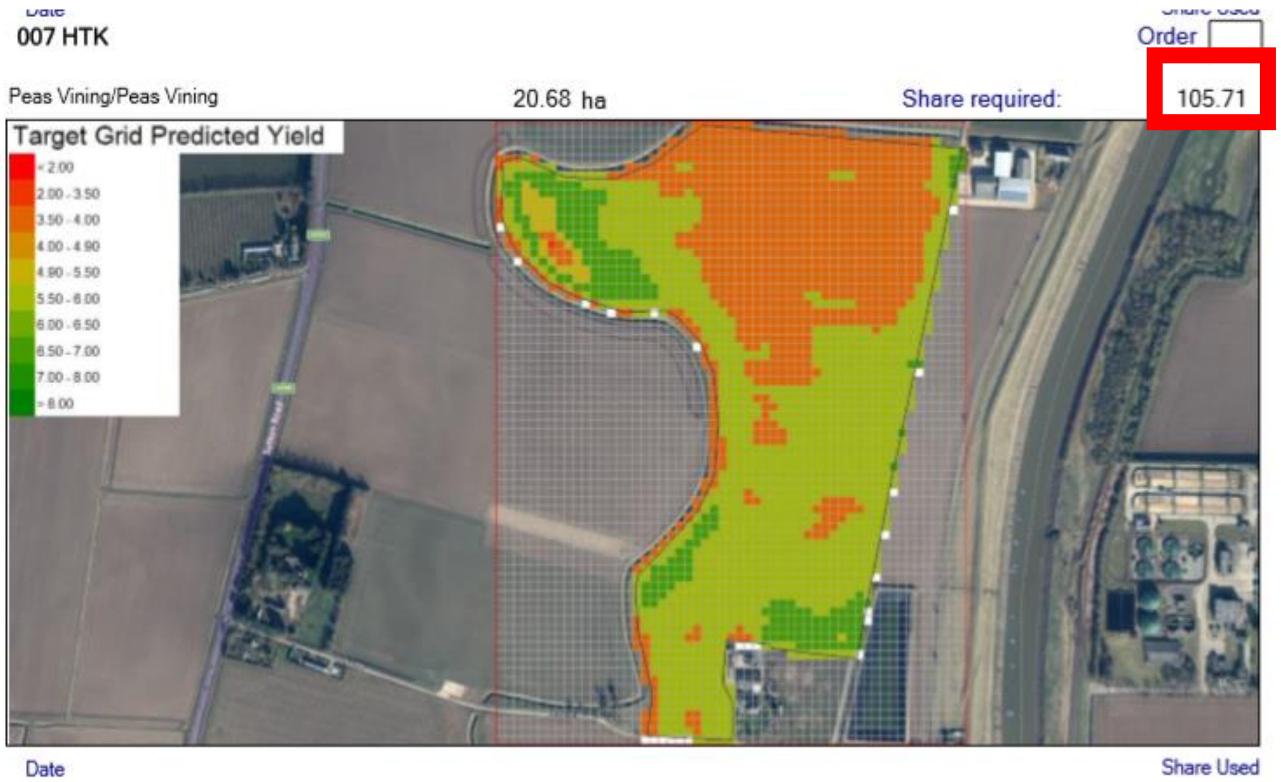
2021 Trials Soil Optix Scan

Water Available Index





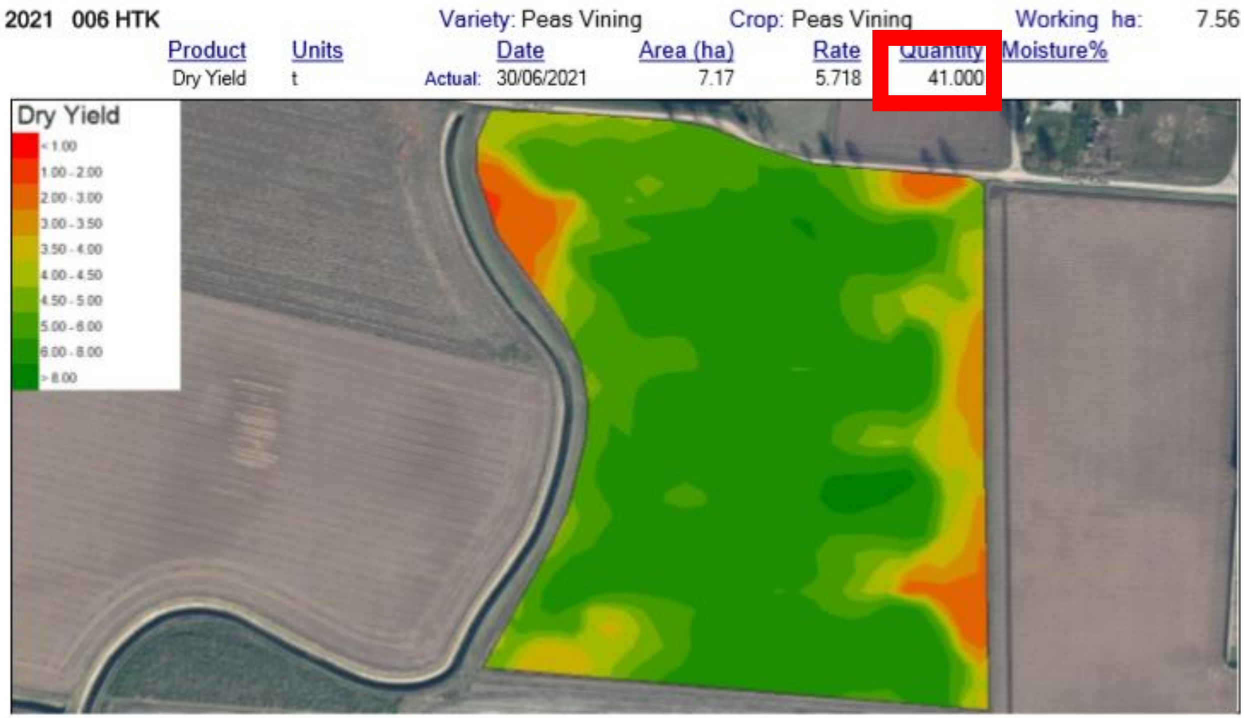
Yield Predictions

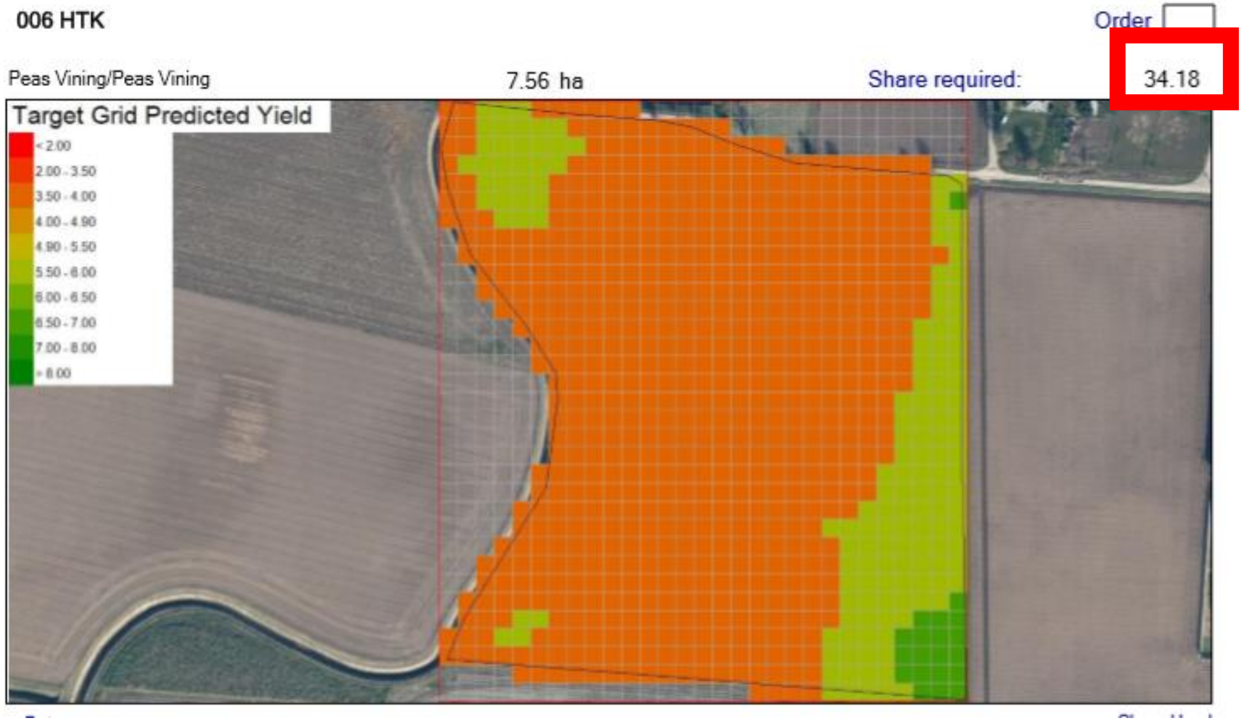


4.46%

HMC

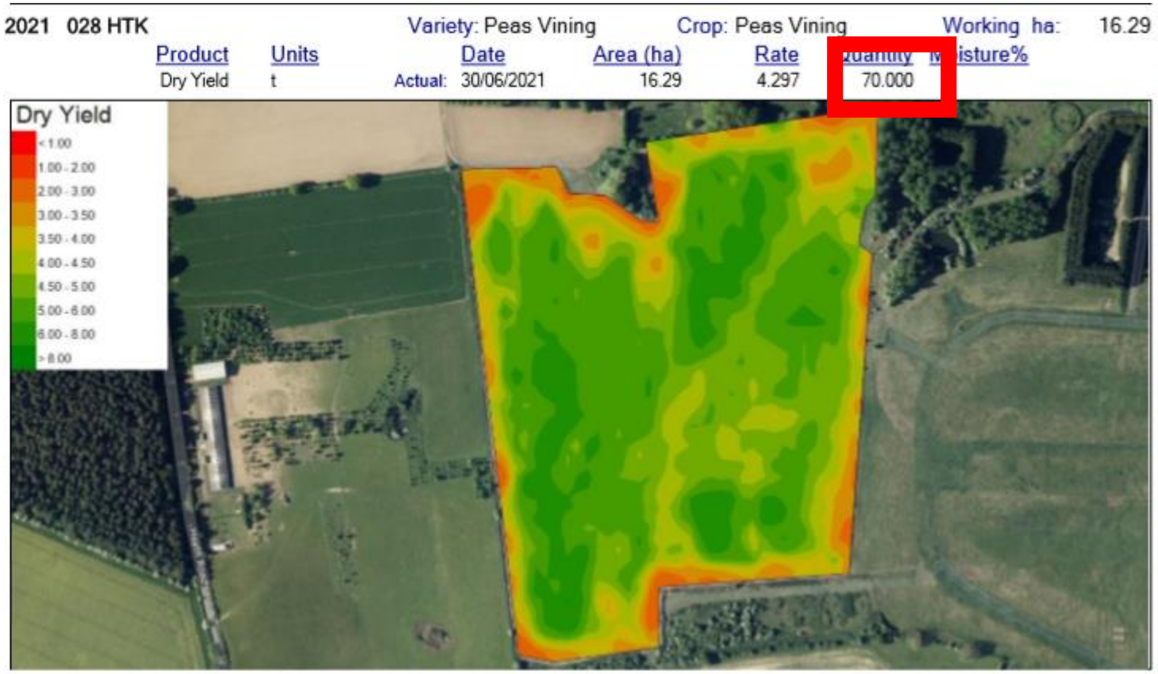
Yield Predictions





19.95%

Yield Predictions



2.01%

HMC

Thank You

www.hmcpeas.co.uk

Interreg
EUROPEAN UNION
2 Seas Mers Zeeën
INNO-VEG
European Regional Development Fund

ADAS inagro Delphy ARVALIS Institut du végétal west-vlaanderen de gedreven provincie

Framework conditions for innovation

INNO-VEG, our project's story

Main achievements of the project

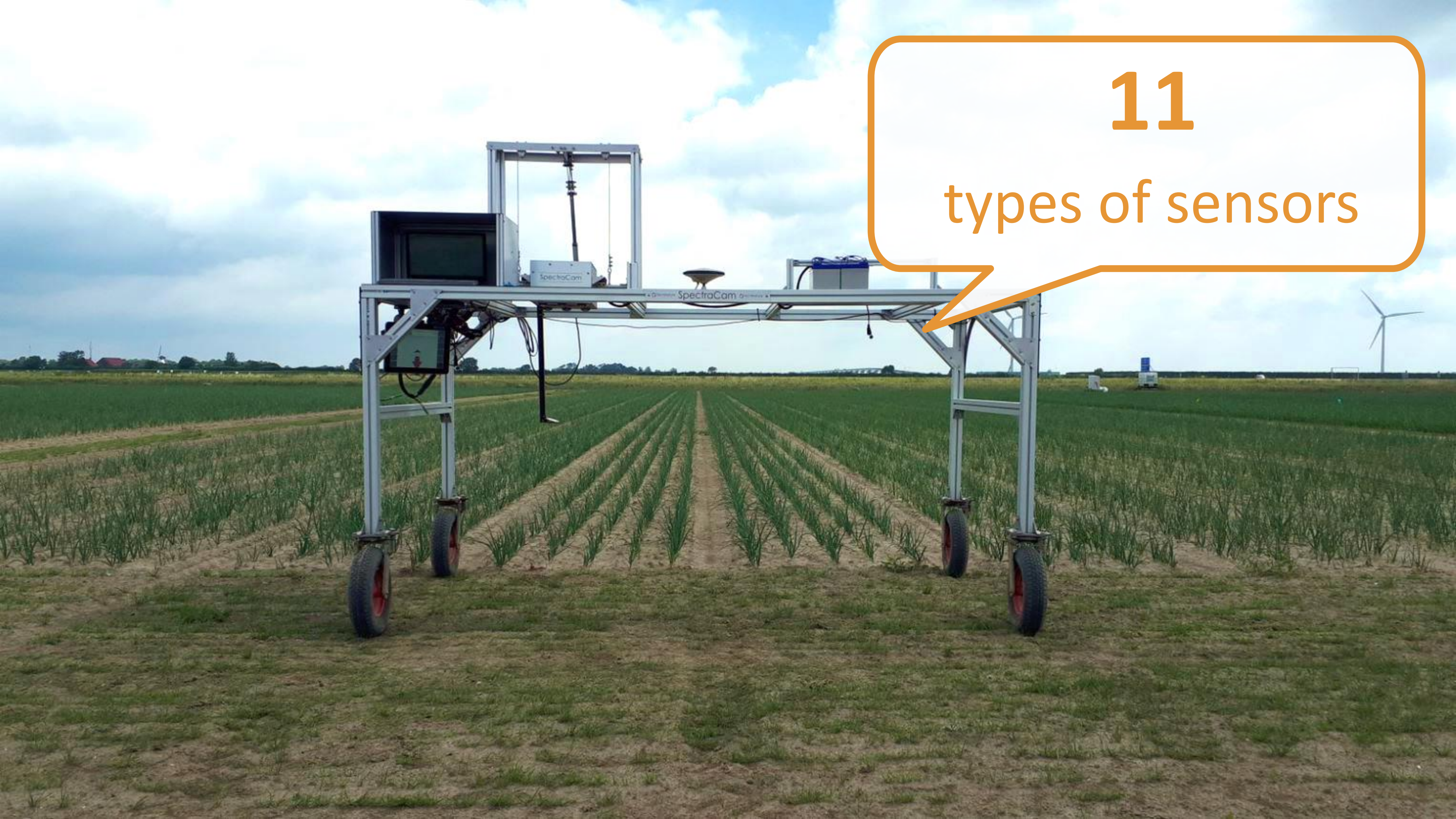
@InnoVeg
#INNOVEG


1
project


4
partners
ADAS
inagro
ONDERZOEK & ADVIES IN LAND- & TUINBOUW
Delphy
ARVALIS
Institut du végétal


Interreg
2 Seas Mers Zeeën
INNO-VEG
Smart farming via
innovatie op het veld van
vollegrondsgroenten
en in de aardappelsector
ADAS
Delphy
inagro
www.interreg2seas.eu/innoveg




11
types of sensors
SpectraCam


13
crops


29
media highlights
AkkerbouwActueel
Restrain
100% residu vrije bewaring voor aardappels
STAL & AKKER
Brabant/Zeeland 7
Lancering Cross Border Innovation Network van project INNO-VEG
'Betere data winst voor akkerbo
INNO-VEG-project volgt gro
GROWER RESEARCH
A grower approa
NEWS
EU project aims to cut cost of g
LIMEX
INNO-VEG-protocol poogt dronetechniek bij groenteteeltexperimenten te stimuleren
Met dronebeelden de opbrengst vergelijken in eigen veldproeven
Pomme de terre hebdo
LE JOURNAL DE LA POMME DE TERRE - n°1267 - 22 octobre 2020
EN BREF
Webinaire INNO-VEG
ASSESSING THE PERFORMANCE OF LEEKS AND OTHER FIELD VEGETABLE
INNO-VEG: Using crop sensing technology to assess onion yields


38
presentations at
external events
Interreg
EUROPESE UNIE
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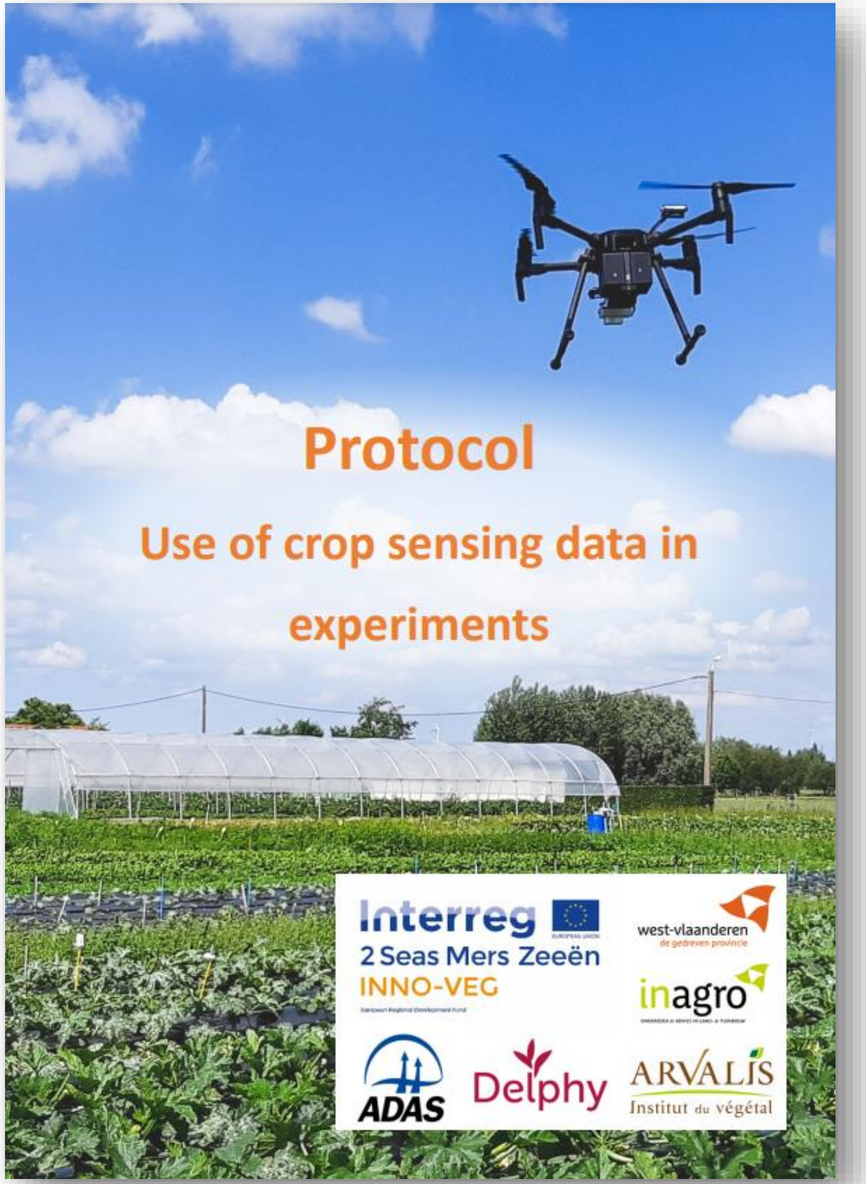
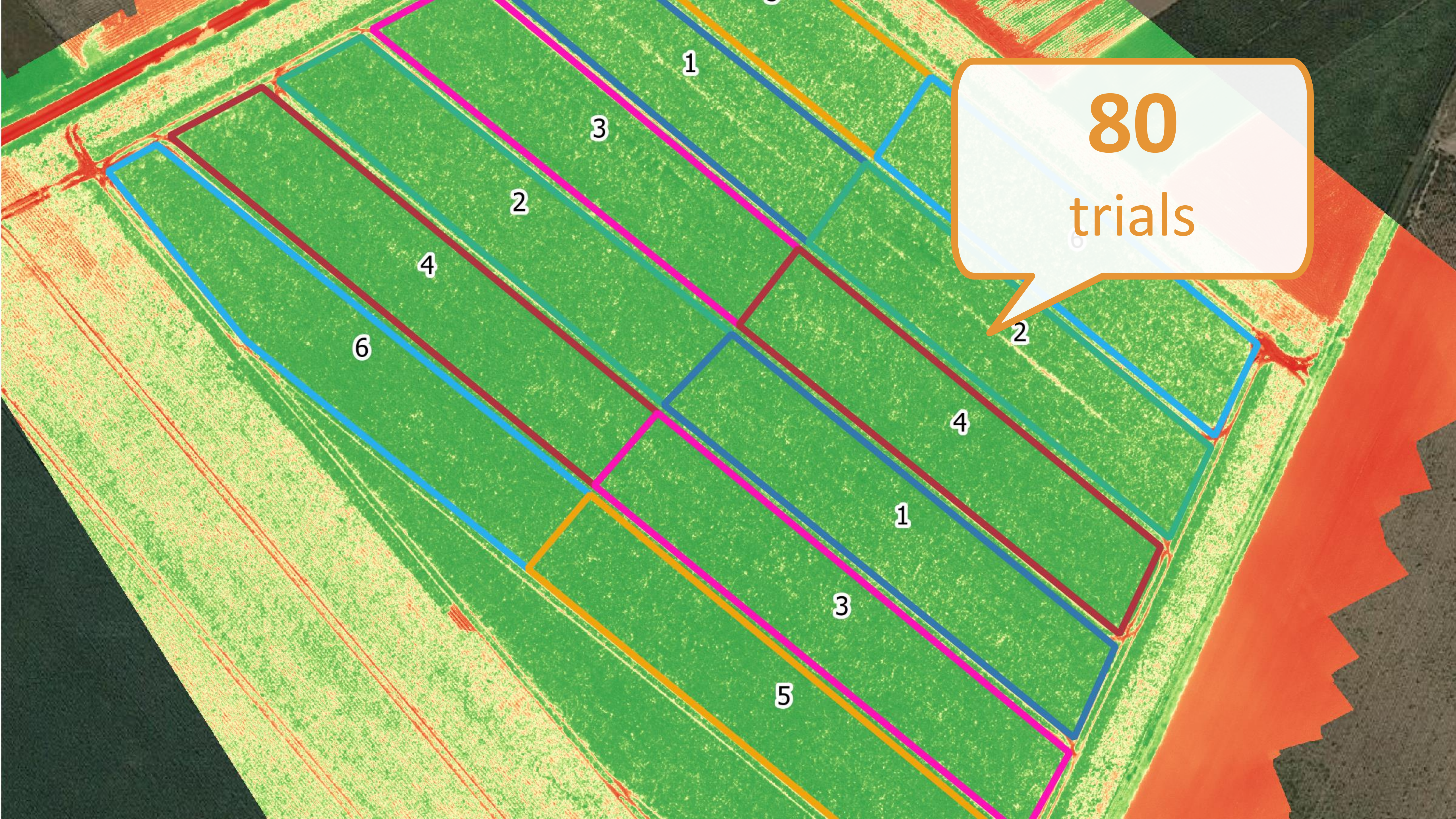
INNO-VEG
Europees Fonds voor Regionale Ontwikkeling
Smart farming via
innovatie op het veld van
vollegrondsgroenten
en in de aardappelsector
Projectpartners:
ADAS
ARVALIS



40

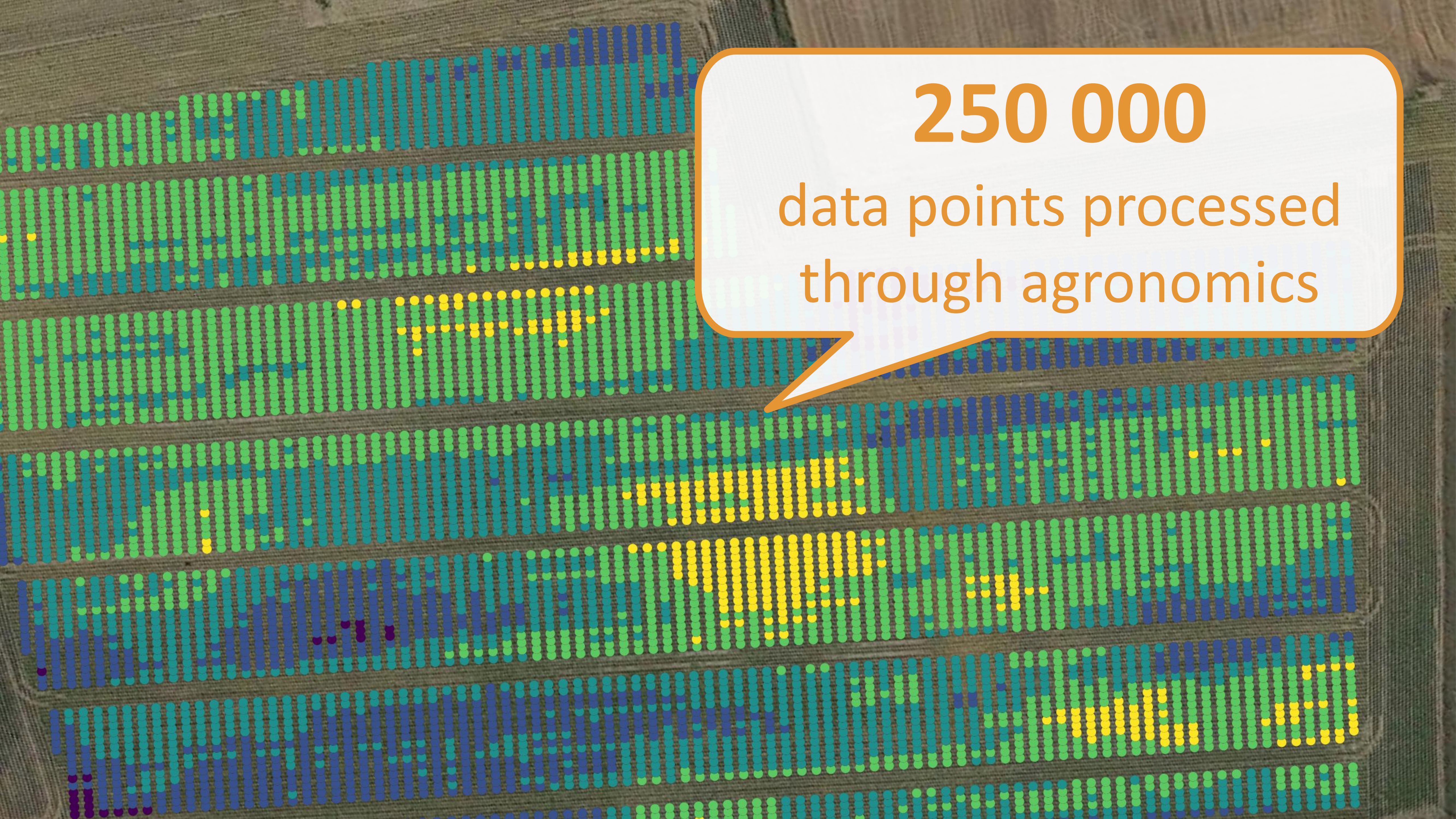
pages of guidelines


80
trials
1
3
2
4
6
2
4
1
3
5


Startpagina
Verkennen
Meldingen
INNO-VEG @InnoVeg · 28 sep. 2020
Join @ADASGroup @Arvalisofficiel @InagroBeitem & @DelphyAkkerbZW for this free #INNOVEG webinar on crop sensing.
October 8th at 14:00-15:00 UK, 15:00-16:00 CET.
For more information and to register: inno-veg.org/en/Event/Detai...
INNO-VEG @InnoVeg · 18 nov. 2020
Agri-Tech Week 2020 event: crop sensing for field vegetables
Read about our event last week
348
social media posts
INNO-VEG 2020 field scale experiments
Interreg
Delphy
Afspelen
U en 3 anderen
Interessant
Jij en 5 anderen
Jij en INNO-VEG
Vertaling
#video


2 622
attendees at
INNO-VEG events


46 803
people reached via
communication actions

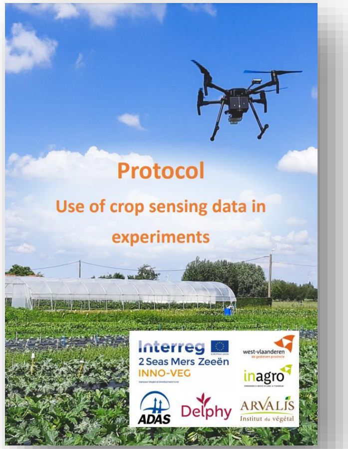

250 000
data points processed
through agronomics

Framework conditions for innovation

What next?

What next?

- Project website (www.inno-veg.org)
    - Guides
    - Videos
- Innovation network
- Agronomics for field vegetables



Thank you for joining us

Any Questions?

www.inno-veg.org