HMC

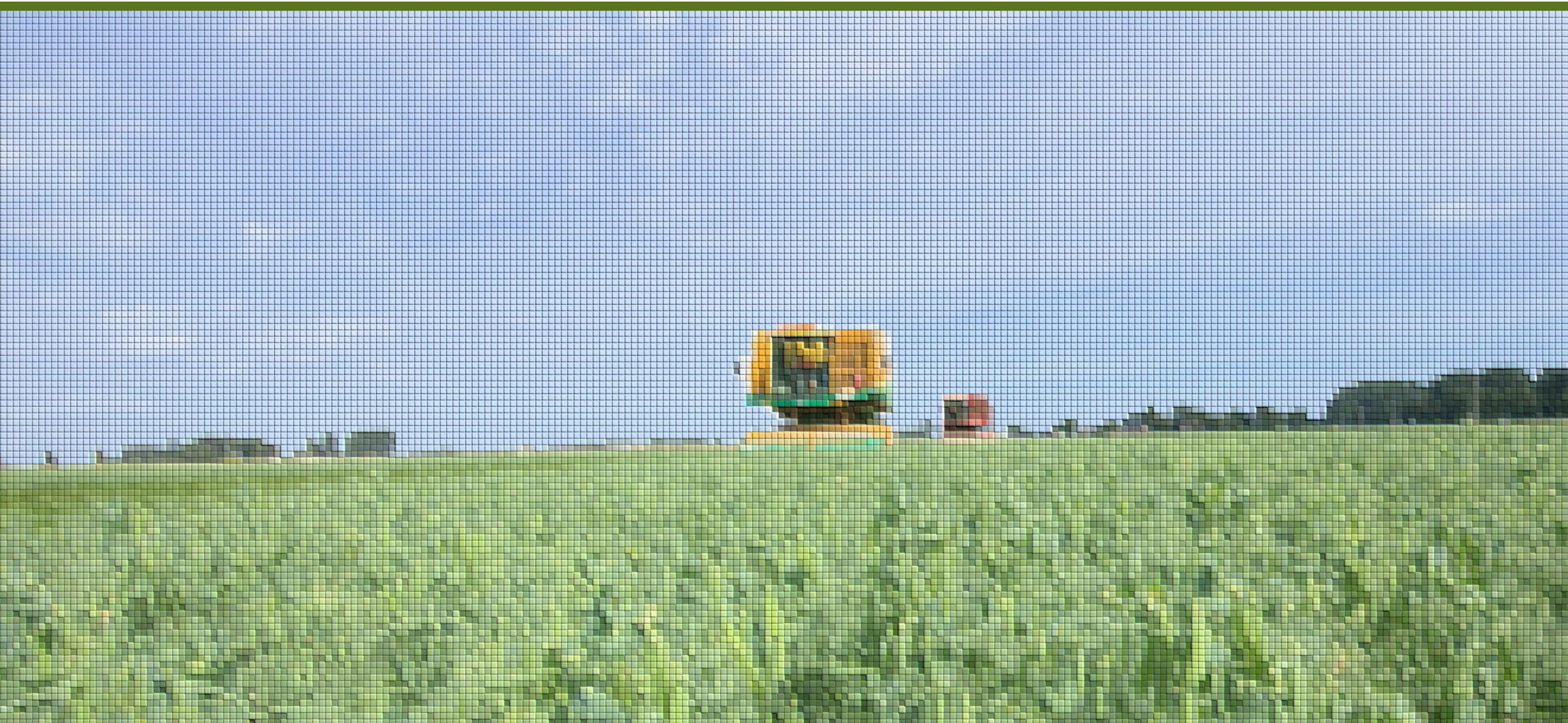
TECHNICAL MEETING 2022

HMC

Agenda

- **Richard Fitzpatrick – Welcome & Introductions, Contract update**
- **Jack Harris & Richard Fitzpatrick – Trials Final Results & Yield Prediction Update**
- **Lizzie Sagoo (ADAS)– INNOVEG Project Update & ADAS/HMC Collaboration on PEASAT**
- **Break**
- **Jack Harris & Richard Fitzpatrick – New Projects, Future Technologies & Edamame**
- **Scott Garnett (ICL) – Introduction to Polysulphate**
- **Becky Howard (PGRO) – Cover Crops Update & Plant Protection Update**
- **Simon Ward (Increment) – Carbon Calculator**
- **Lunch & Depart**

Richard Fitzpatrick



Welcome and Introductions

- Allen Giles – New General Manager of HMC
- Dr Lizzie Sagoo (ADAS) – INNOVEG & PEASAT
- Scott Garnett (ICL) – Polysulphate
- Dr Becky Howard (PGRO) – Cover crops and Plan Protection update.
- Simon Ward (Increment) – Carbon Calculator

HMC Business

- Contracts 2022
- Drilling Programme
- New Growers
- Machinery & Personnel update
- Housekeeping

Contracts 2022

- Greenyard Frozen

- Peas 4500 Tonnes
- Petits Pois 3800 Tonnes

- Princes

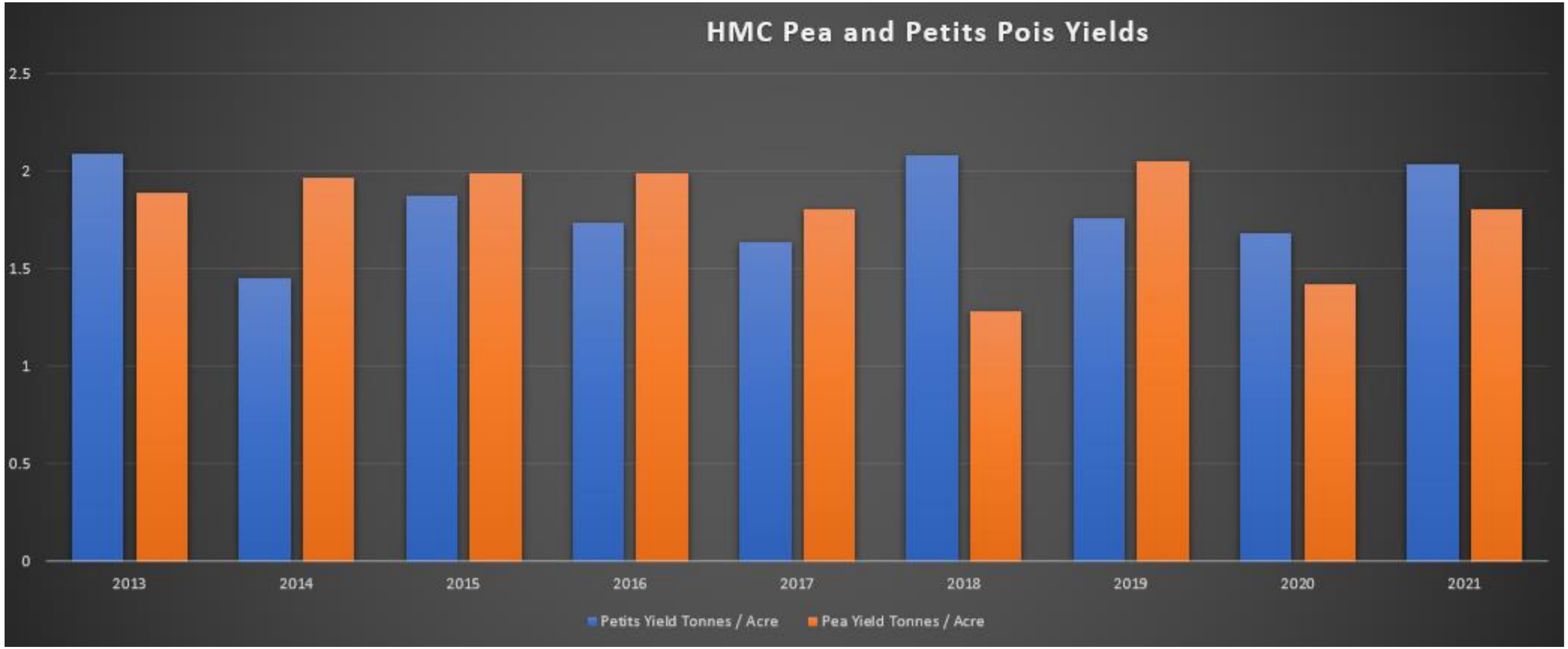
- Peas 1000 Tonnes
- Petits Pois 200 Tonnes

- The prices for 2022 will remain at 2021 levels.

Drilling Programme

- Area 5500 Acres – approximately 200 acres more than last year.
- Need average yield of 1.76 tonnes / Acre to achieve contracts.
- All growers should had received a copy of the programme.
- 2021 problems with seed production has led to difficulties.
- 1st / 2nd Earlies in Long Sutton to Wisbech area, then Norfolk.
- Petits on silts
- Finish on Holbeach/Lutton Marsh and organics at Sandringham.

Processed Yields



New Growers

- H Prins Ltd
- E W Bell
- Simon Booth

Machinery & Personnel Update

- New harvester ordered for 2022.
- New harvester will be on the new wheeled system.
- The new measures introduced as regard to the washing/hygiene of harvesters.

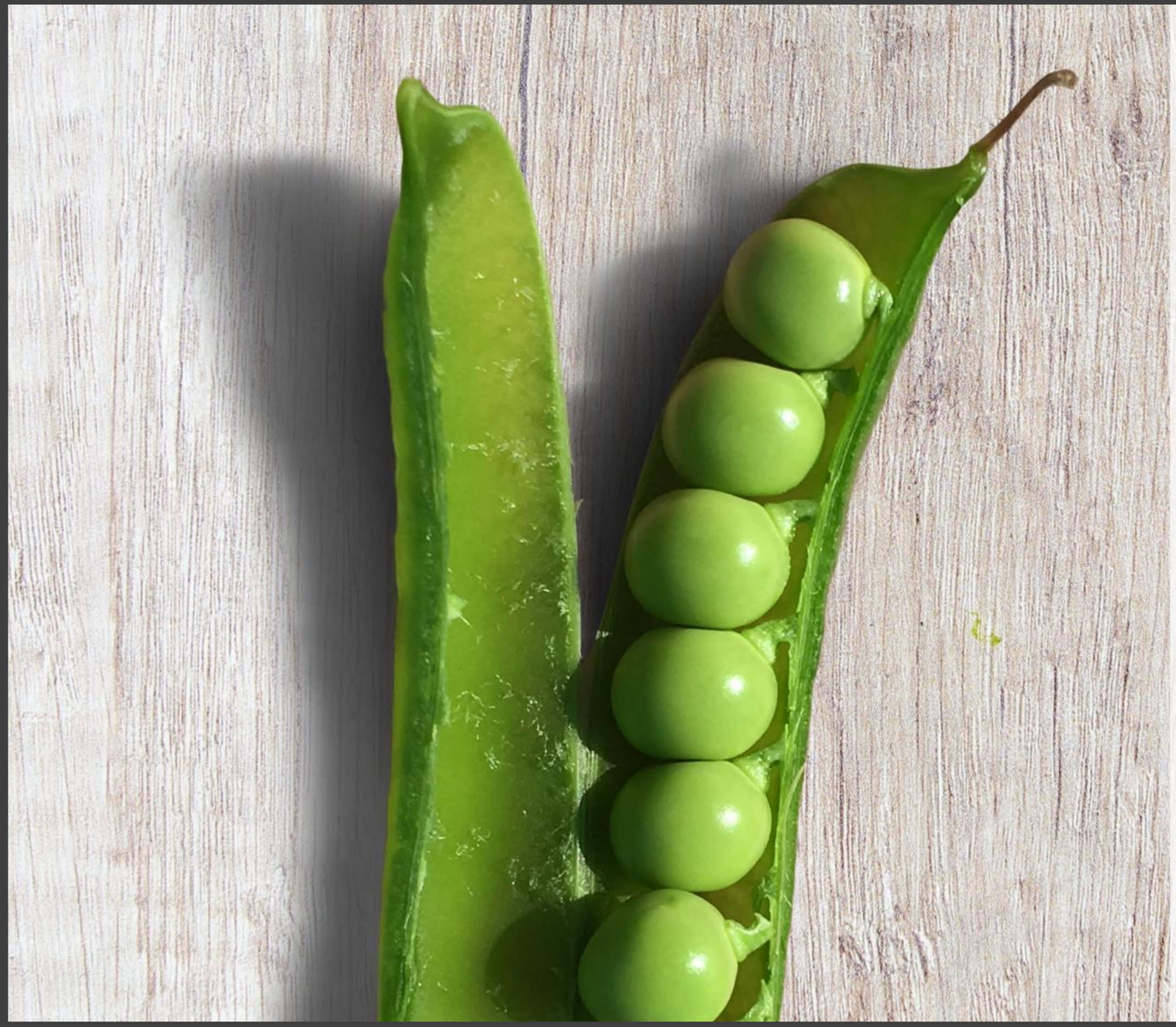
Housekeeping

- Washdown Areas – Must be adjacent to field and safe.
- Access to fields.
- Field information for following season – complete with all back cropping details and new columns for field hazards.
- Foot rot samples – best in Spring before following year.

Machinery & Personnel Update

Please fill out field selection and also Field Risk

Pea Area (Auto calculated from Drill Area)	0		SEASON 2022		Grower	Bloggs			Year of Last Legume Crop	2014			Year of Last potato Crop	2015					
			Previous Cropping							Details of Last Soil Analysis					HAZARDS				
Farms / Field No / Name	OS No	Drill Area (Ha)	2020	2019	2018	2017	2016		Soil Type	Date	ph	P	K	Mg	Ditches	Trees on Headland	Powerlines	Nut Trees (Wallnut,Chessnut, Hazelnut)	White Brioney	Deadly Nightshade
															Yes	Yes	No	No	No	No
																No	No	No		



HMC

Grower Guide

Quality is our passion

HMC Peas have been growing vining peas to the highest standards for over 50 years.

Predominantly for freezing, HMC also supplies a local canning factory.

The experience HMC has gained over these years is invaluable and in partnership with some of the best growers and PGRO, we have produced the HMC Grower Guide.

This document is aimed to help new growers in the group and maybe even experienced growers too.

The document contains some the tips from our best growers, PGRO and HMC.

If we all produce high quality, high yielding crops we will all see the benefit.

The HMC Grower Guide is split into different categories:

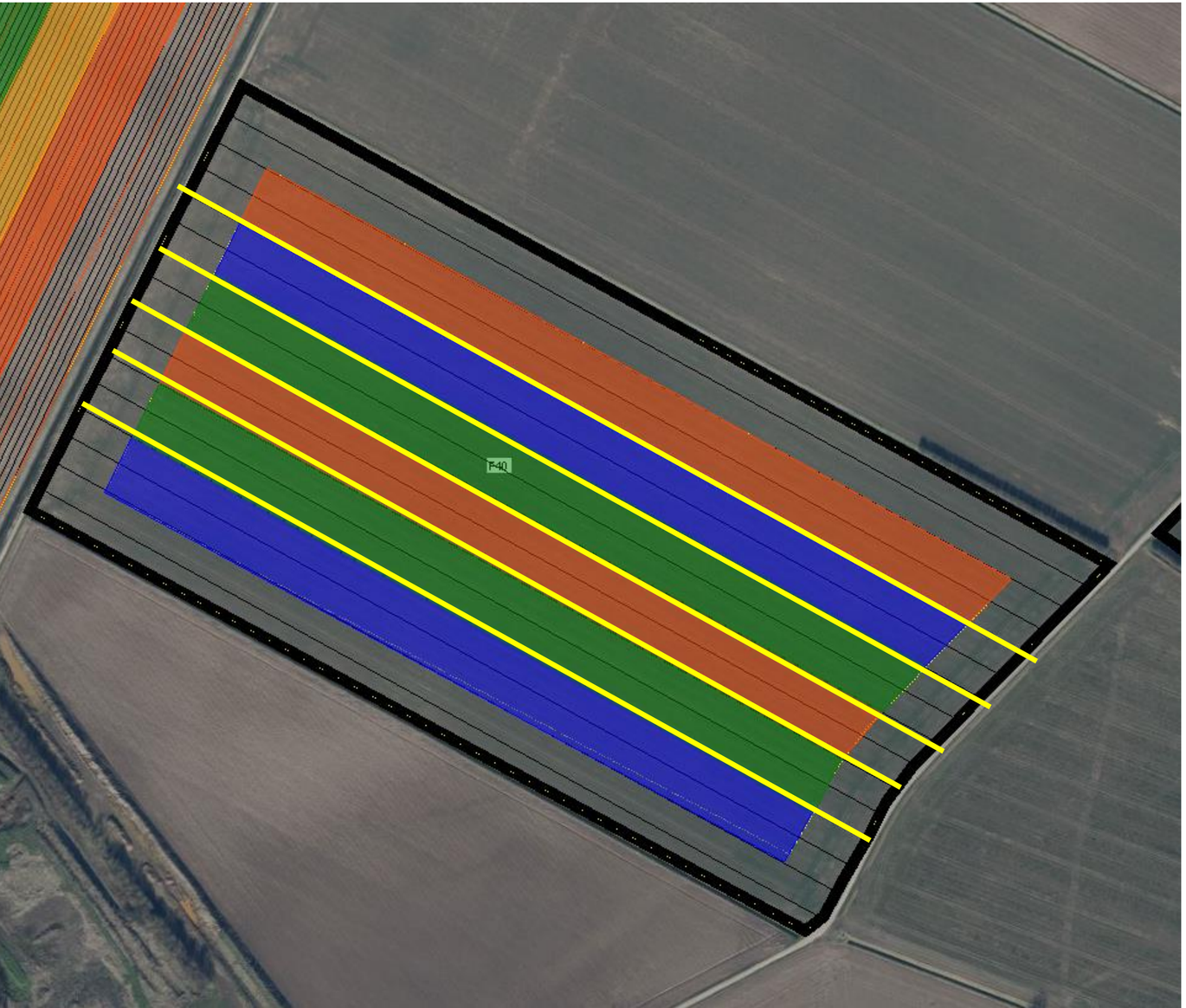
1. **Rotation**
2. **Field selection**
3. **Previous cropping**
4. **Drilling and rolling**
5. **Basic nutrition**
6. **Pigeon control**
7. **Chemical applications**

Jack / Richard

Trials Final Results & Yield Prediction Update

- Trial results and final overview
- Yield Prediction Update
- Harvest Date Model

2021 Trials



Amalfi

Drilled 29th March (148kg/ha)

Harvested 9th July

Rainfall during grow period 200 mm

This year we reduced number of treatments but replicated across the field.

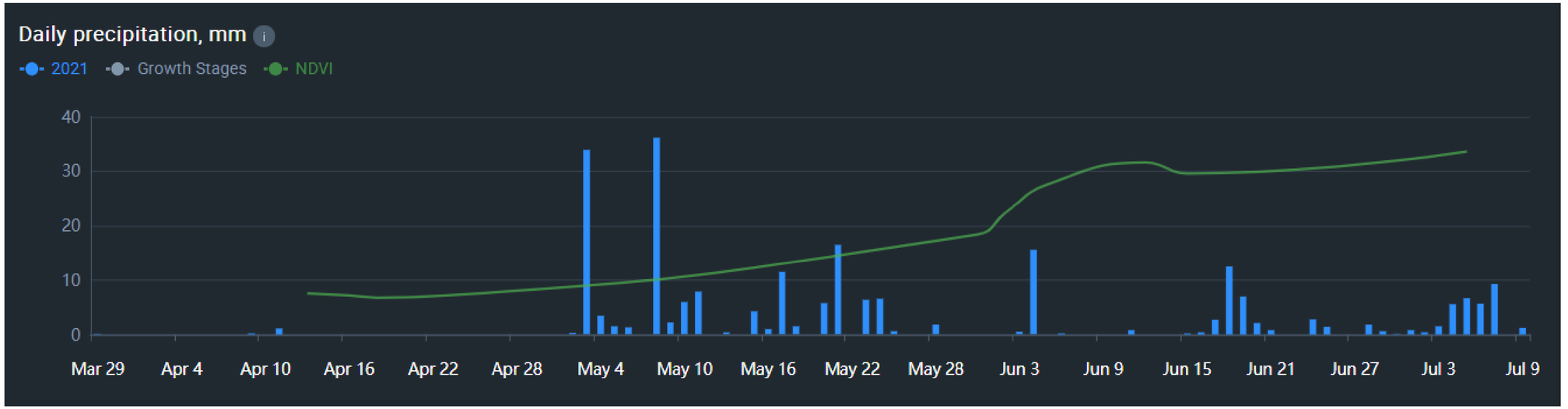
Treatments were;

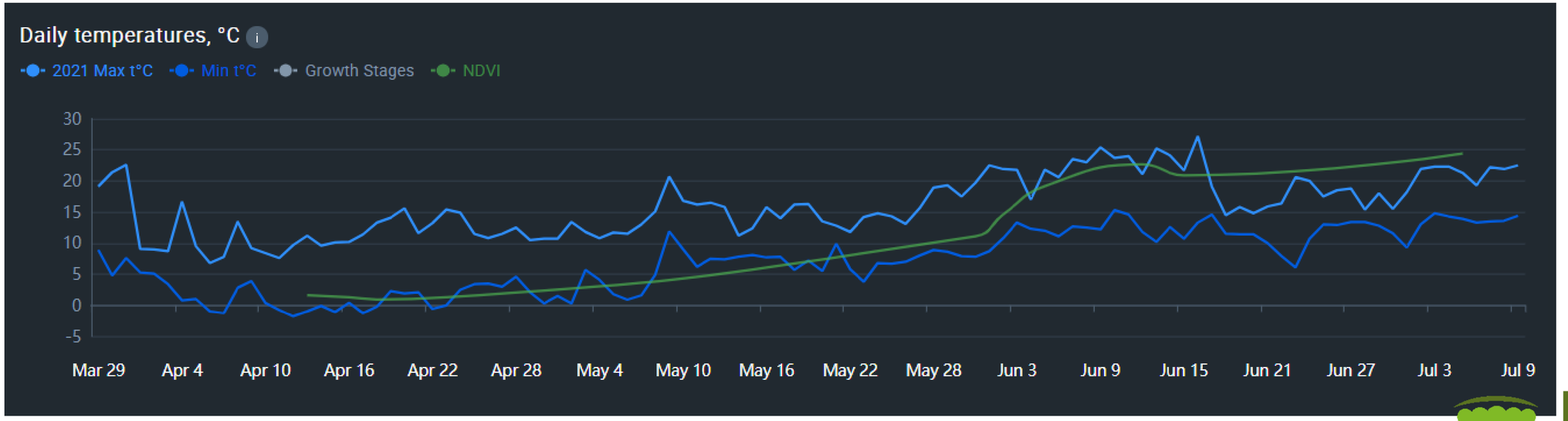
-Untreated

-Poly Sulphate

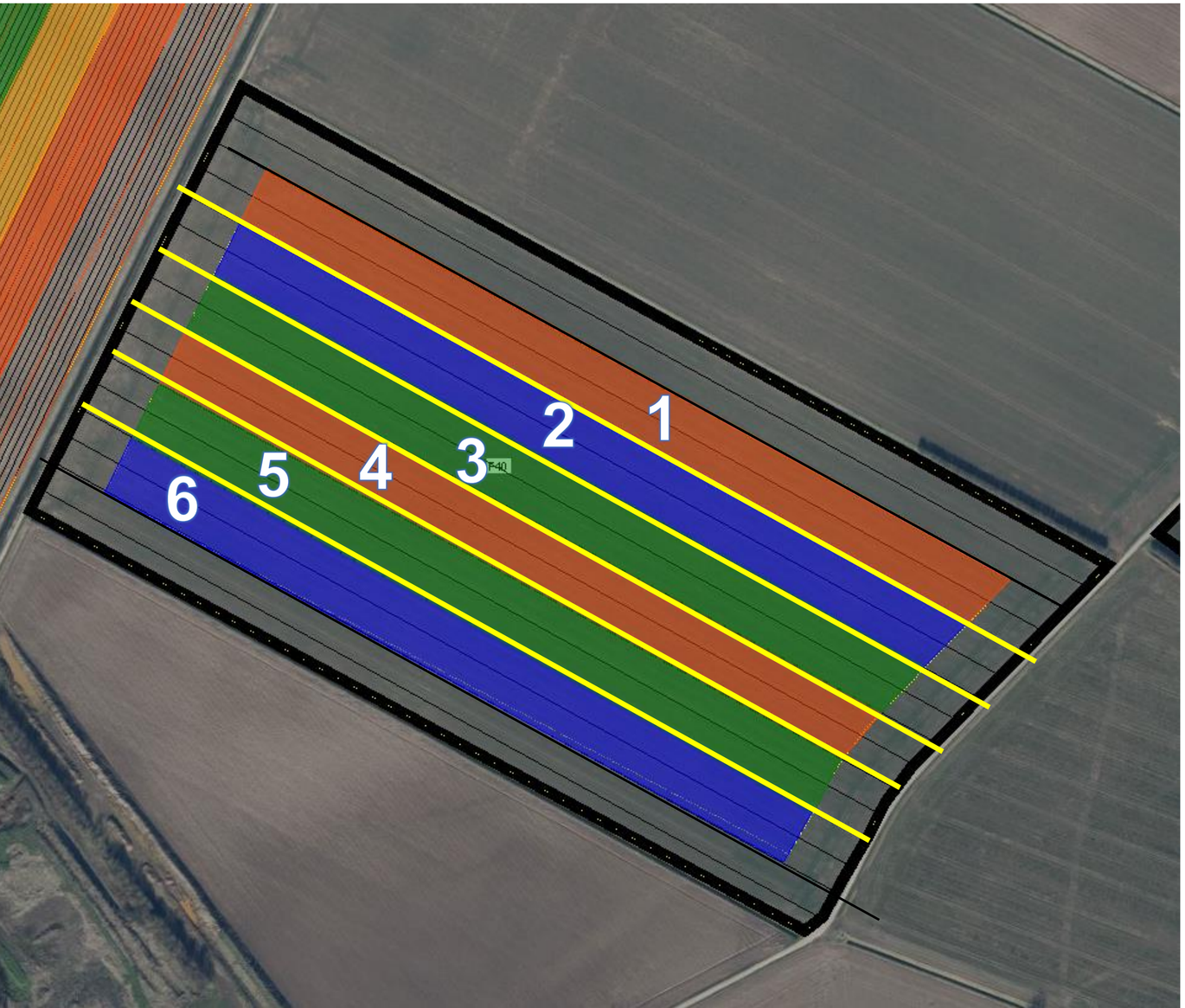
-StartUp Maxx

2021 Trials


Daily precipitation, mm
2021
Growth Stages
NDVI
40
30
20
10
0
Mar 29
Apr 4
Apr 10
Apr 16
Apr 22
Apr 28
May 4
May 10
May 16
May 22
May 28
Jun 3
Jun 9
Jun 15
Jun 21
Jun 27
Jul 3
Jul 9

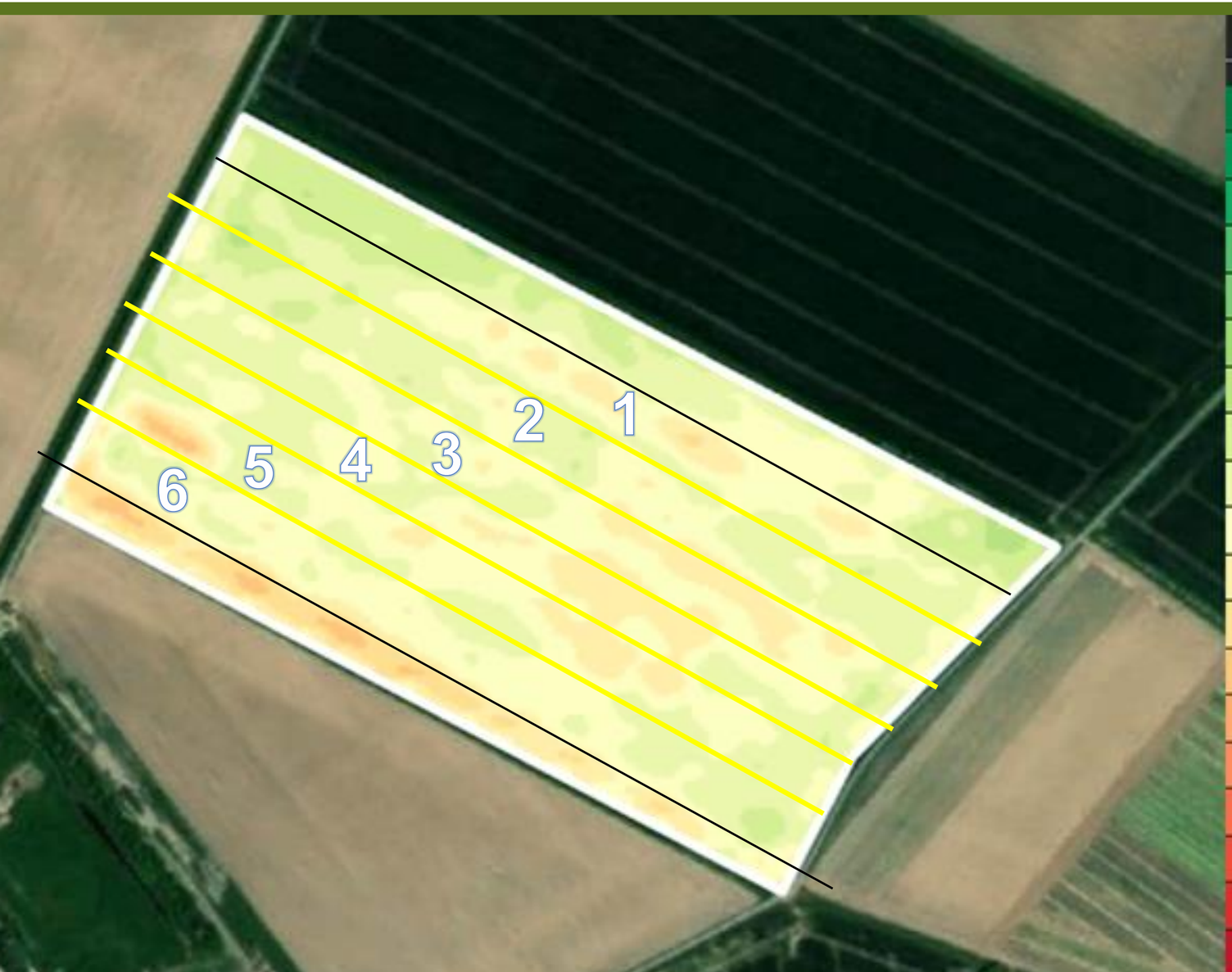

Daily temperatures, °C
2021 Max t°C
Min t°C
Growth Stages
NDVI
30
25
20
15
10
5
0
-5
Mar 29
Apr 4
Apr 10
Apr 16
Apr 22
Apr 28
May 4
May 10
May 16
May 22
May 28
Jun 3
Jun 9
Jun 15
Jun 21
Jun 27
Jul 3
Jul 9

2021 Trials



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

2021 Trials

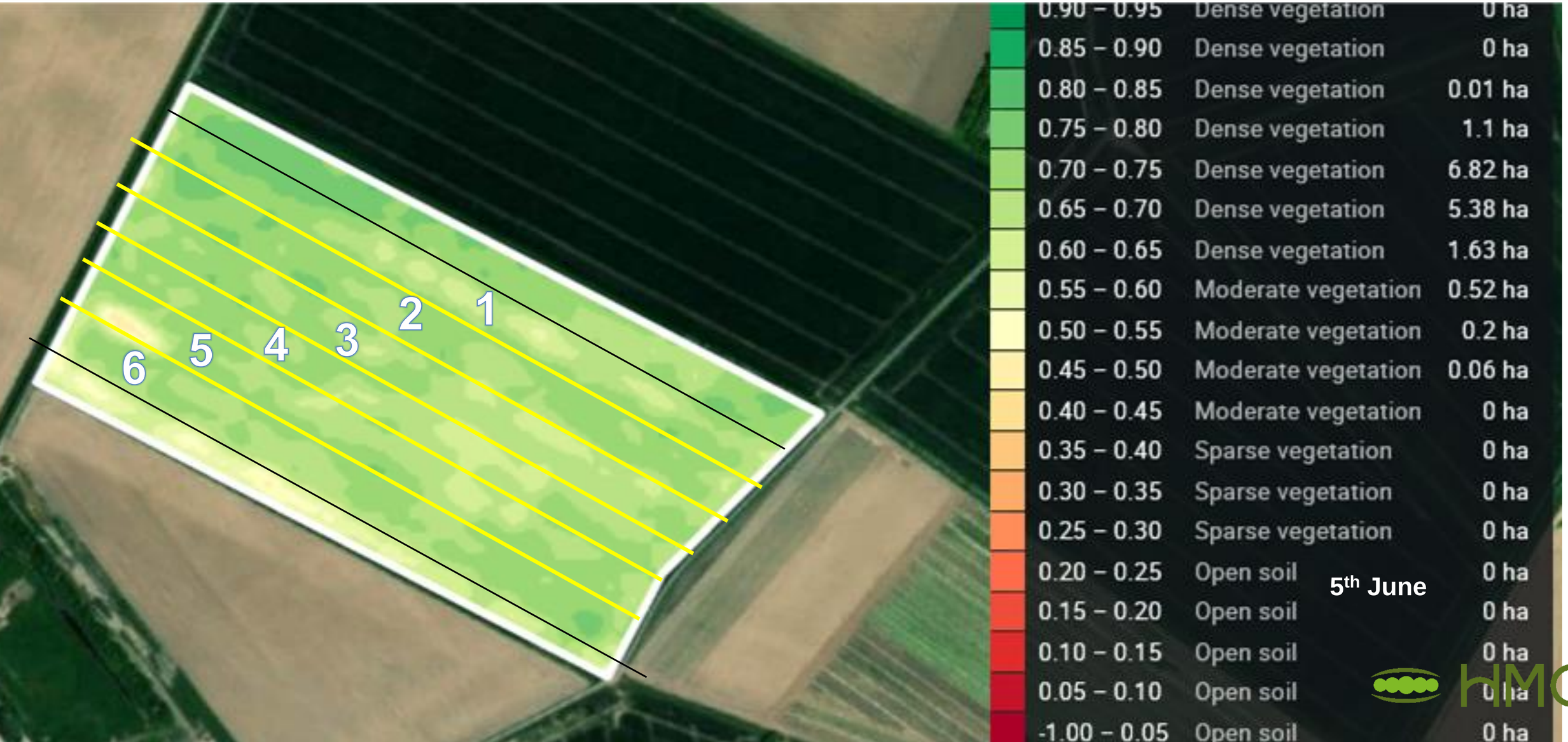


0.95 – 1.00	Dense vegetation	0 ha
0.90 – 0.95	Dense vegetation	0 ha
0.85 – 0.90	Dense vegetation	0 ha
0.80 – 0.85	Dense vegetation	0 ha
0.75 – 0.80	Dense vegetation	0 ha
0.70 – 0.75	Dense vegetation	0 ha
0.65 – 0.70	Dense vegetation	0.13 ha
0.60 – 0.65	Dense vegetation	1.52 ha
0.55 – 0.60	Moderate vegetation	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

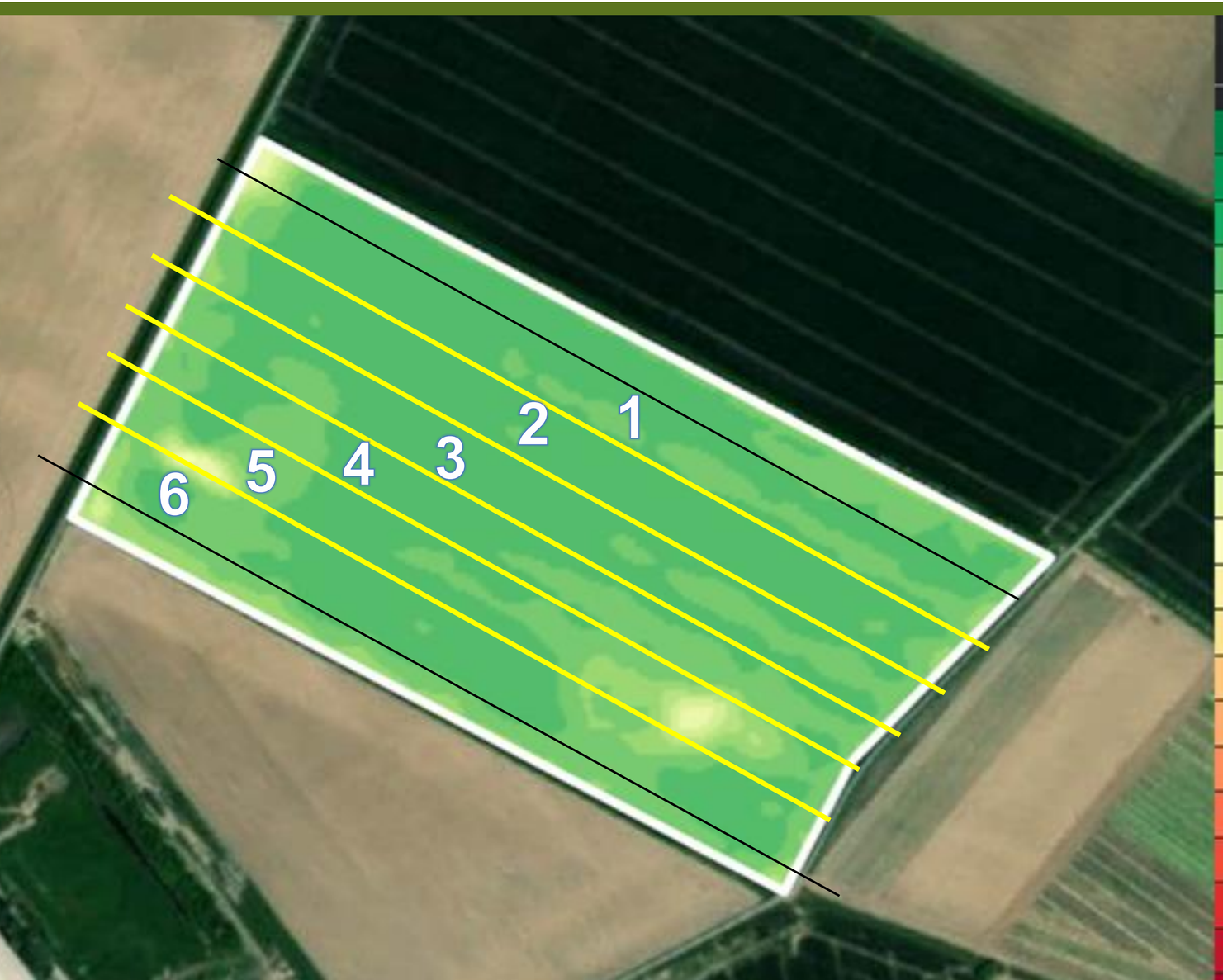
2nd June

HMC

2021 Trials


6
5
4
3
2
1
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



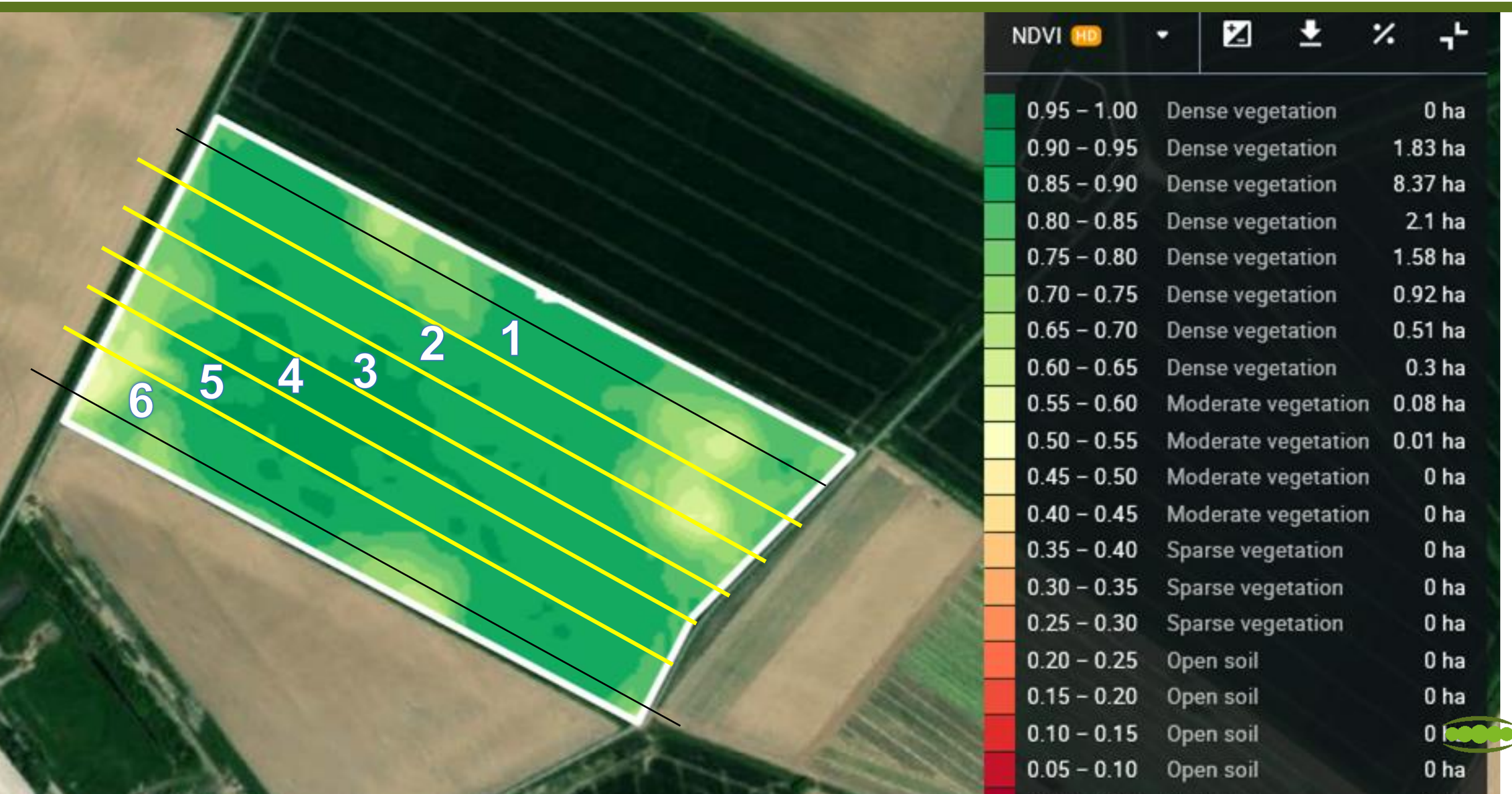
NDVI HD

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	9.12 ha
0.75 – 0.80	Dense vegetation	4.95 ha
0.70 – 0.75	Dense vegetation	1.05 ha
0.65 – 0.70	Dense vegetation	0.3 ha
0.60 – 0.65	Dense vegetation	0.13 ha
0.55 – 0.60	Moderate vegetation	0.14 ha
0.50 – 0.55	Moderate vegetation	0.02 ha
0.45 – 0.50	Moderate vegetation	0 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
0.05 – 0.10	Open soil	0 ha

12th June

HMC

2021 Trials



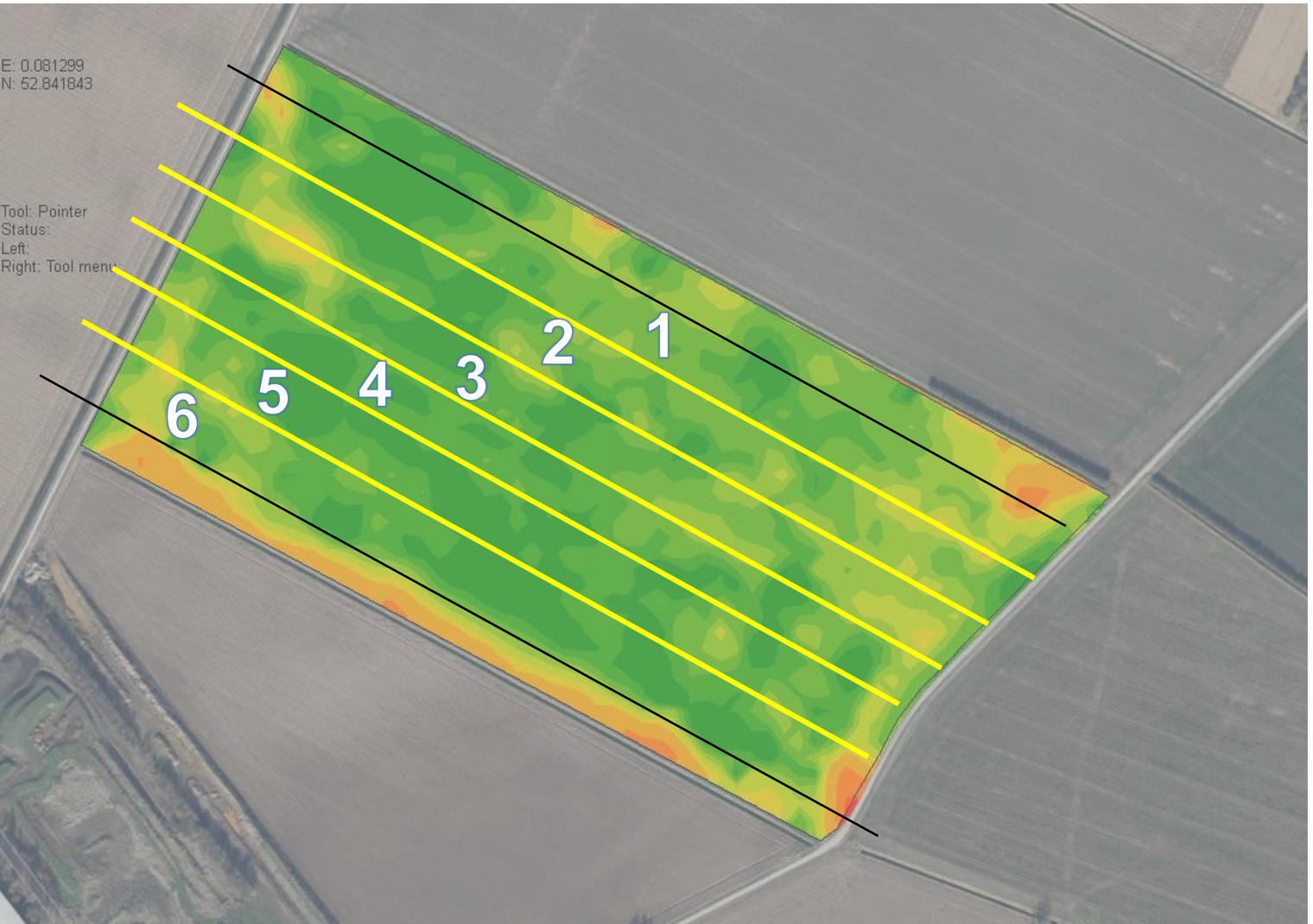
NDVI HD

0.95 – 1.00	Dense vegetation	0 ha
0.90 – 0.95	Dense vegetation	1.83 ha
0.85 – 0.90	Dense vegetation	8.37 ha
0.80 – 0.85	Dense vegetation	2.1 ha
0.75 – 0.80	Dense vegetation	1.58 ha
0.70 – 0.75	Dense vegetation	0.92 ha
0.65 – 0.70	Dense vegetation	0.51 ha
0.60 – 0.65	Dense vegetation	0.3 ha
0.55 – 0.60	Moderate vegetation	0.08 ha
0.50 – 0.55	Moderate vegetation	0.01 ha
0.45 – 0.50	Moderate vegetation	0 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

5th July

HMC

2021 Trials



Yield Fresh

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6. StarUp Maxx = 9.5T/ha

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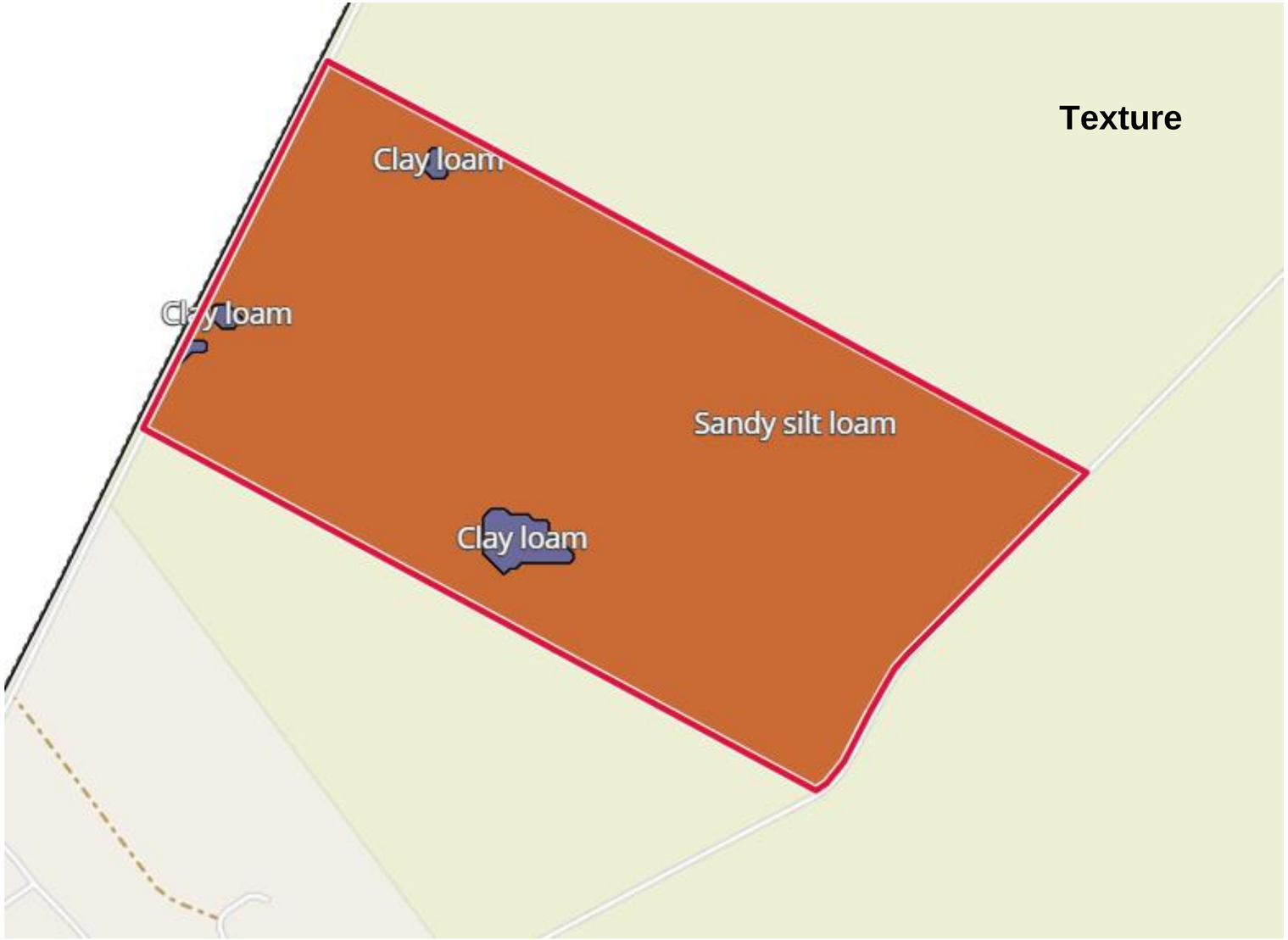
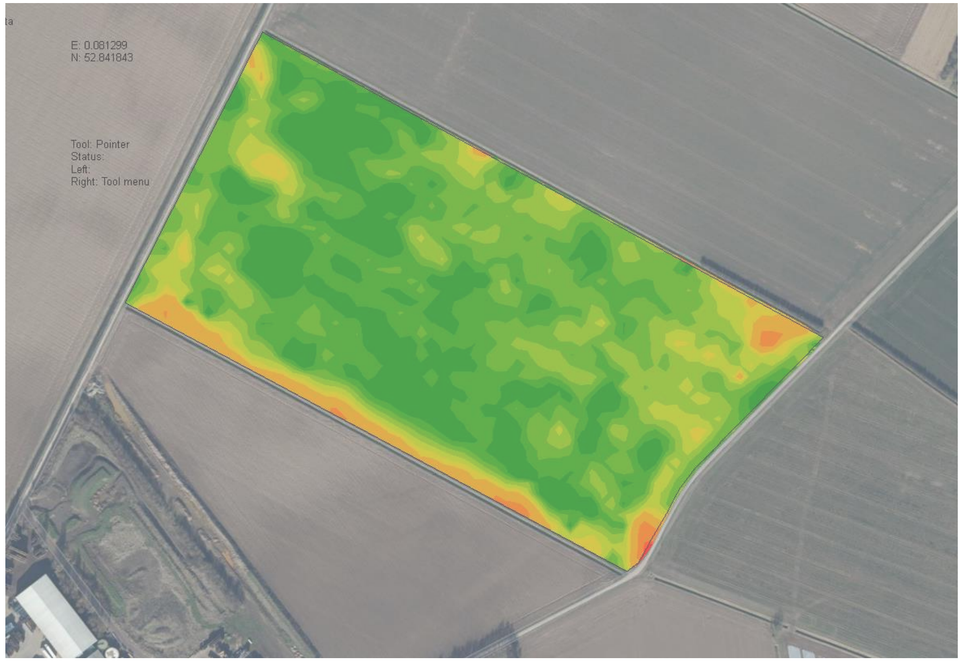
2021 Trials Soil Optix Scan





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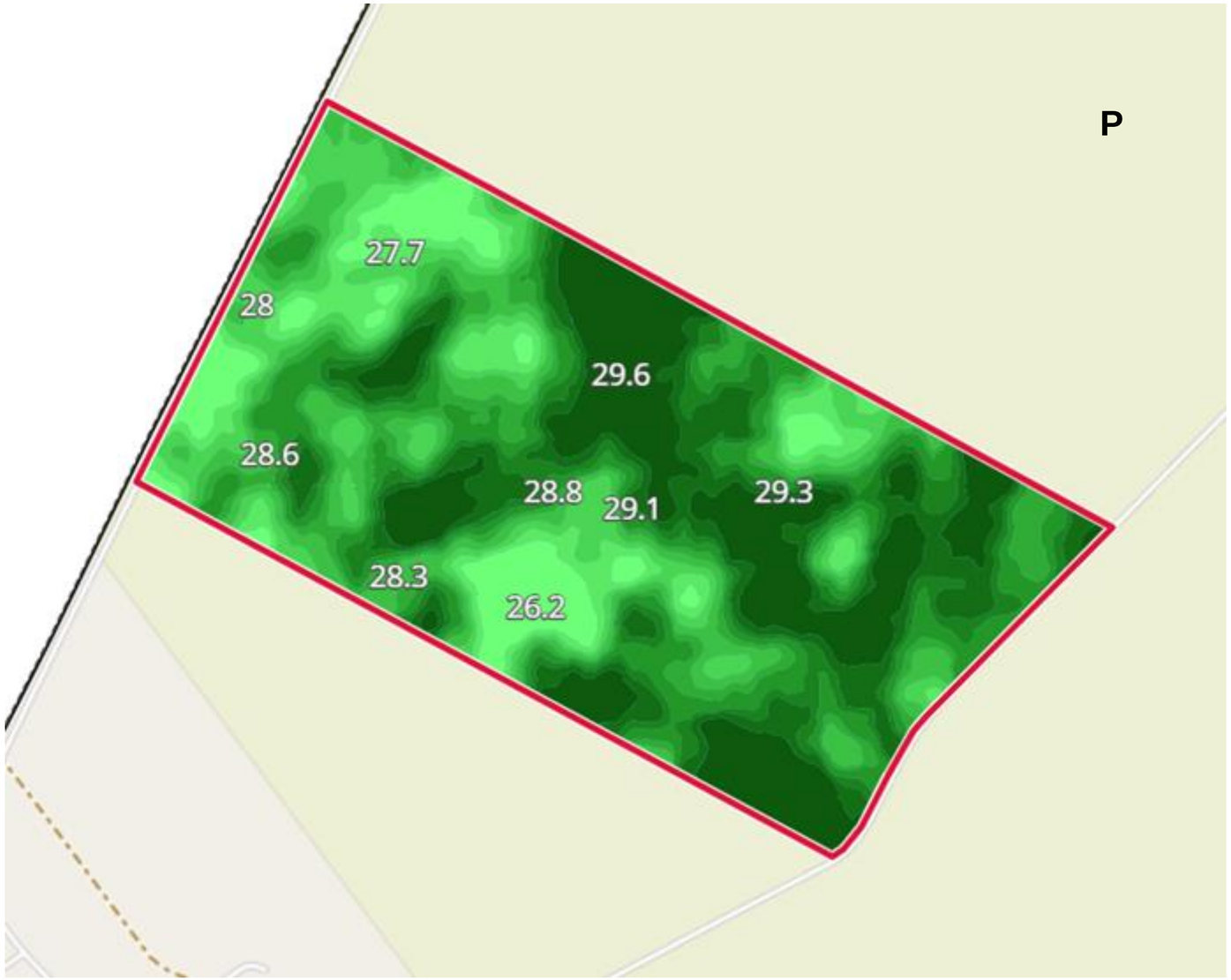

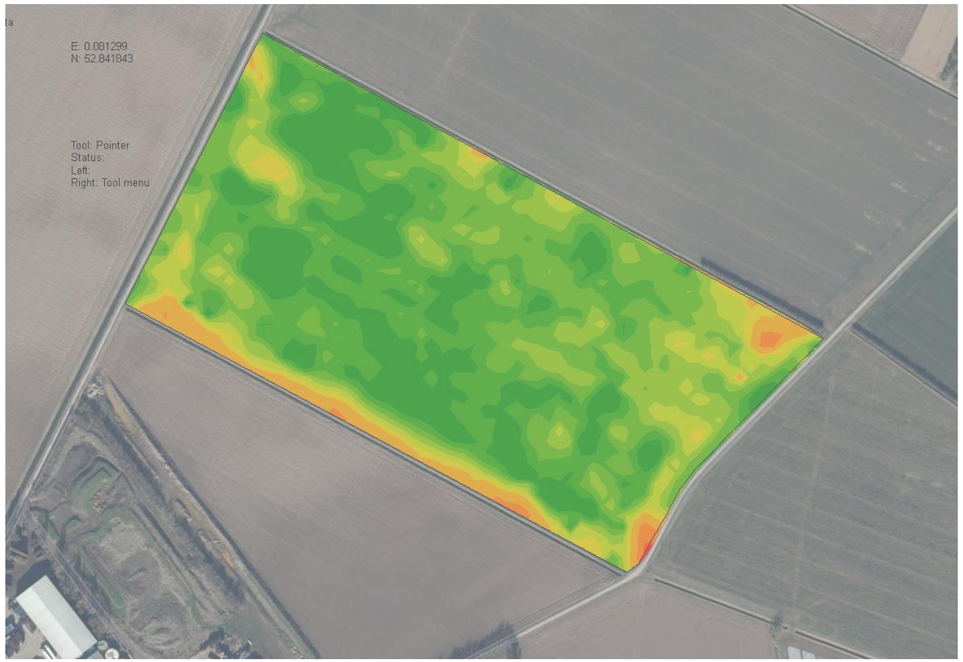

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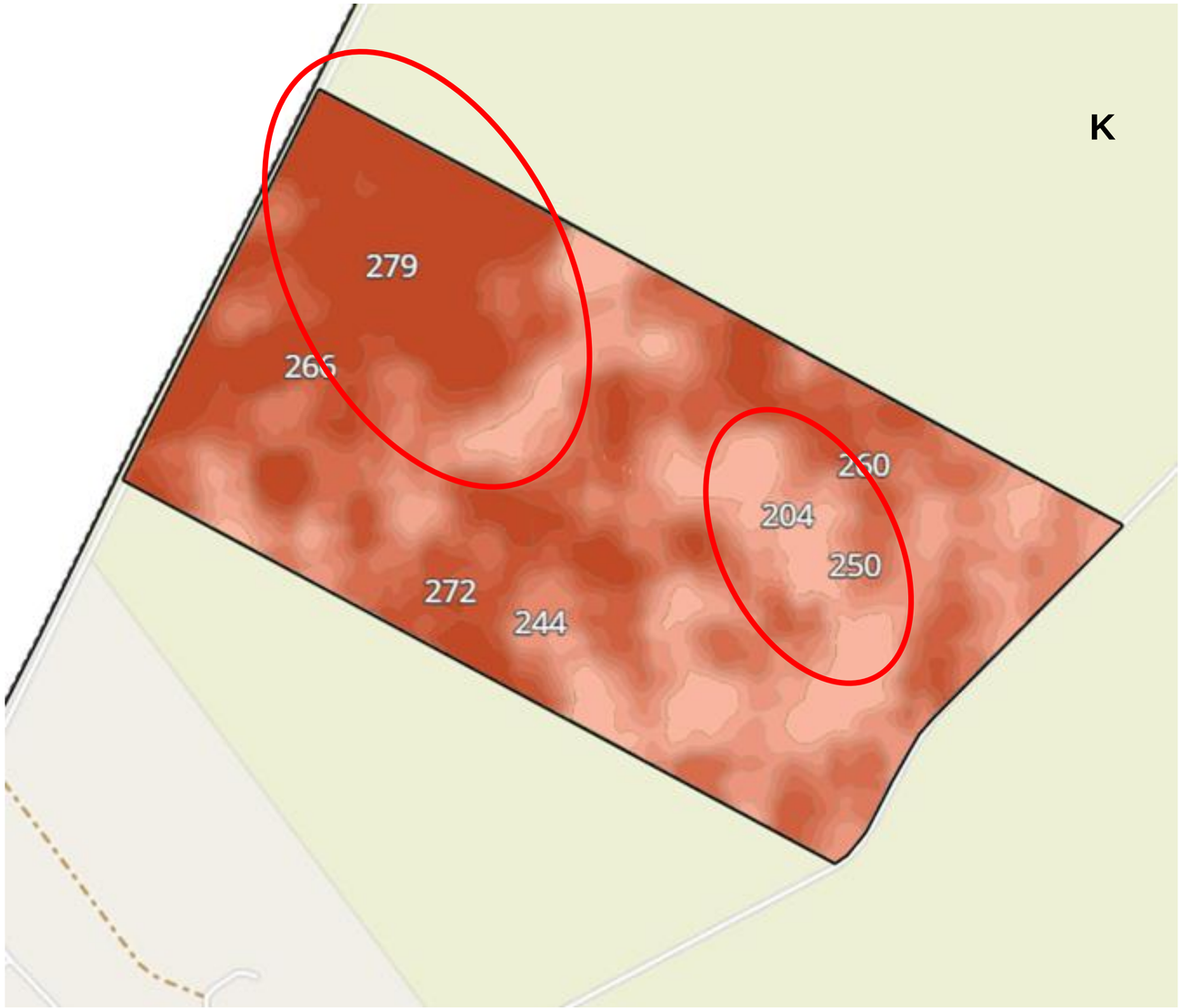
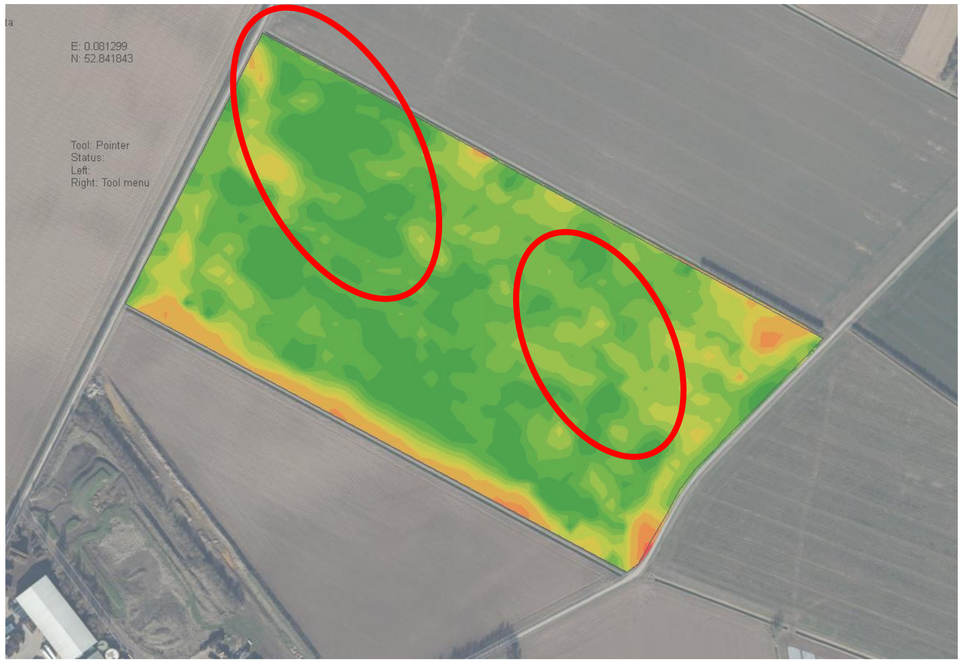
2021 Trials Soil Optix Scan





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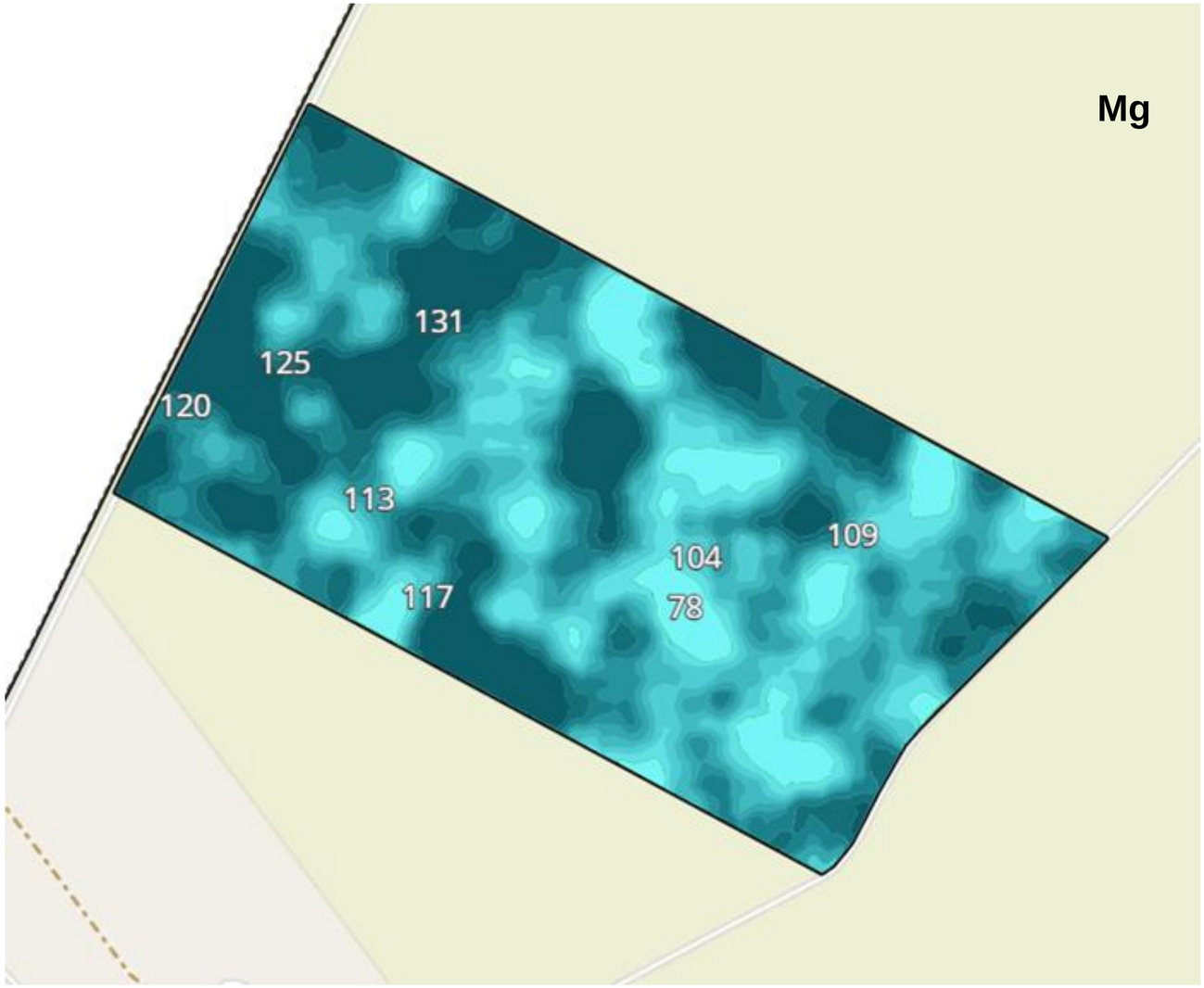

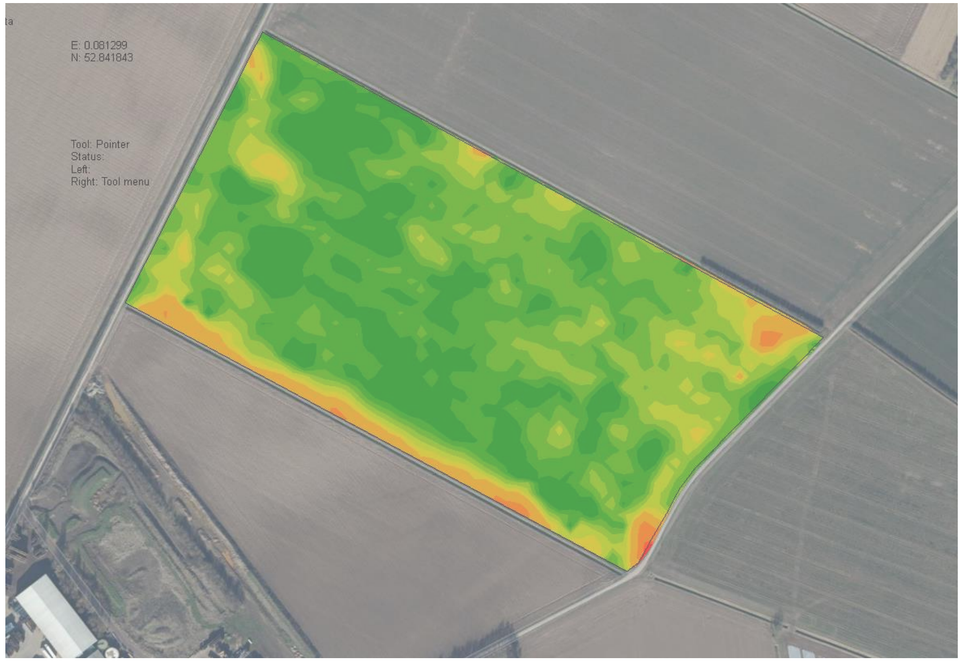

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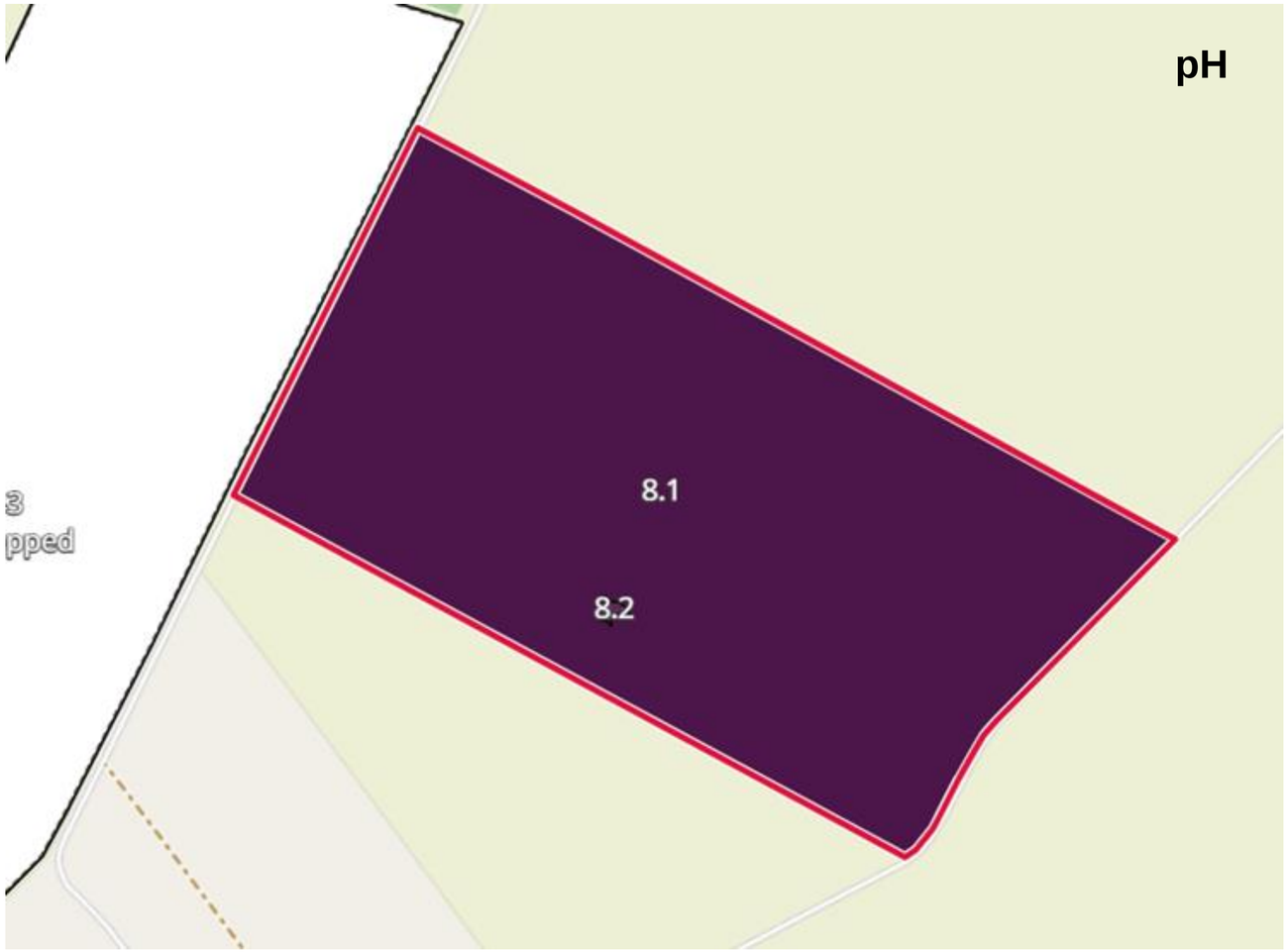

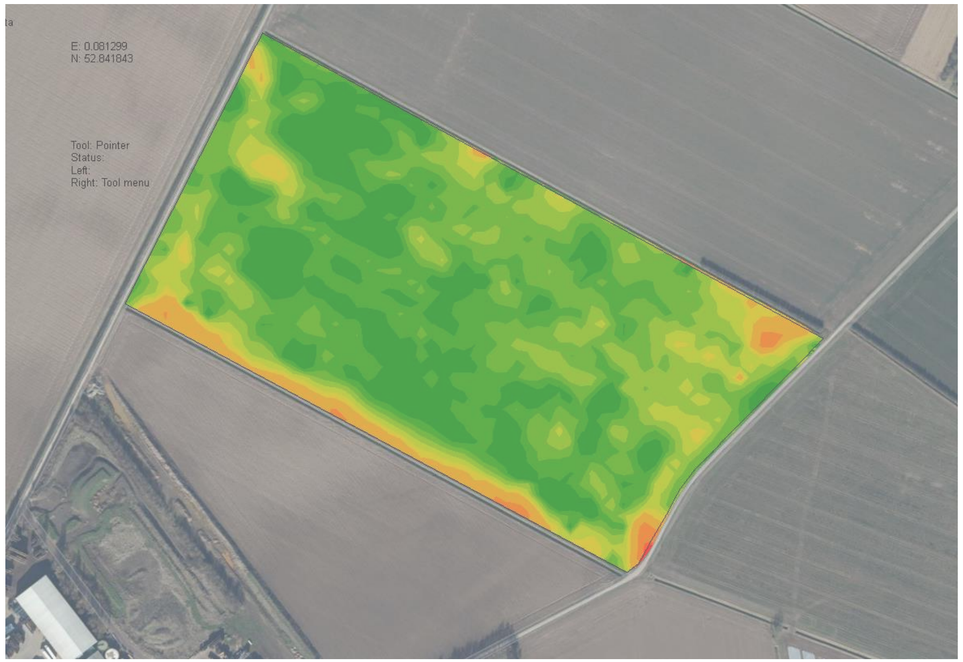

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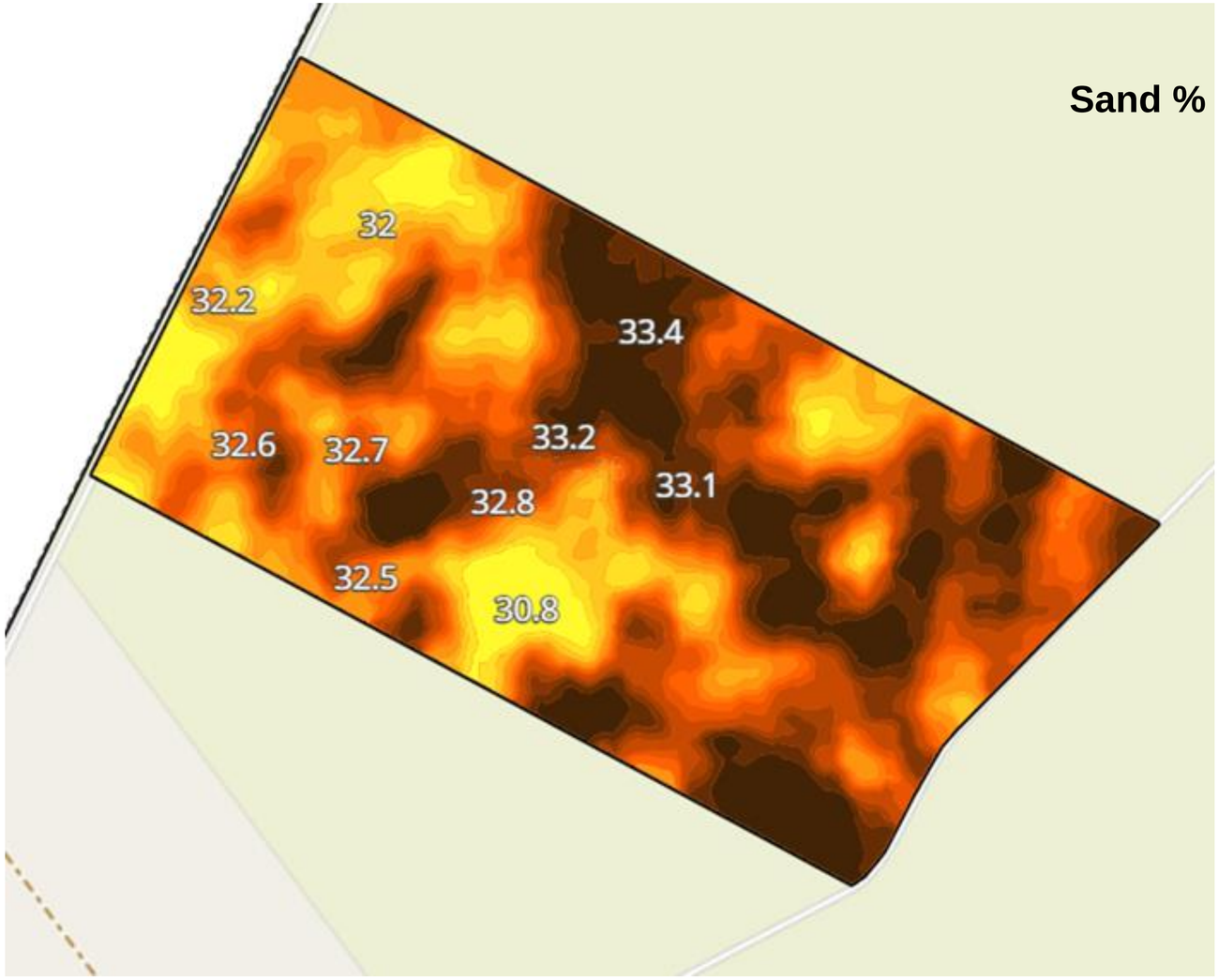

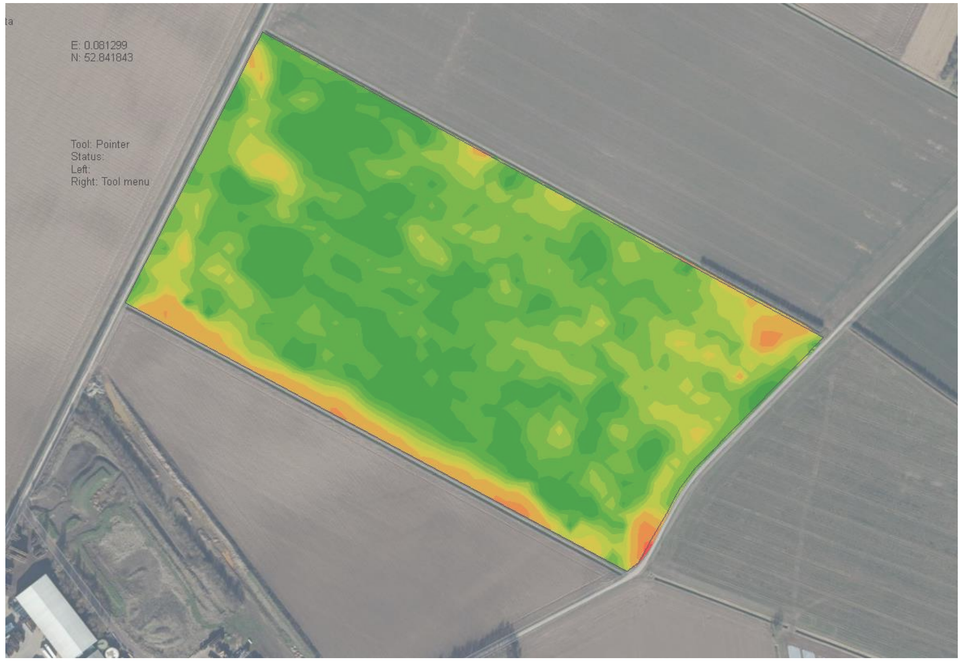

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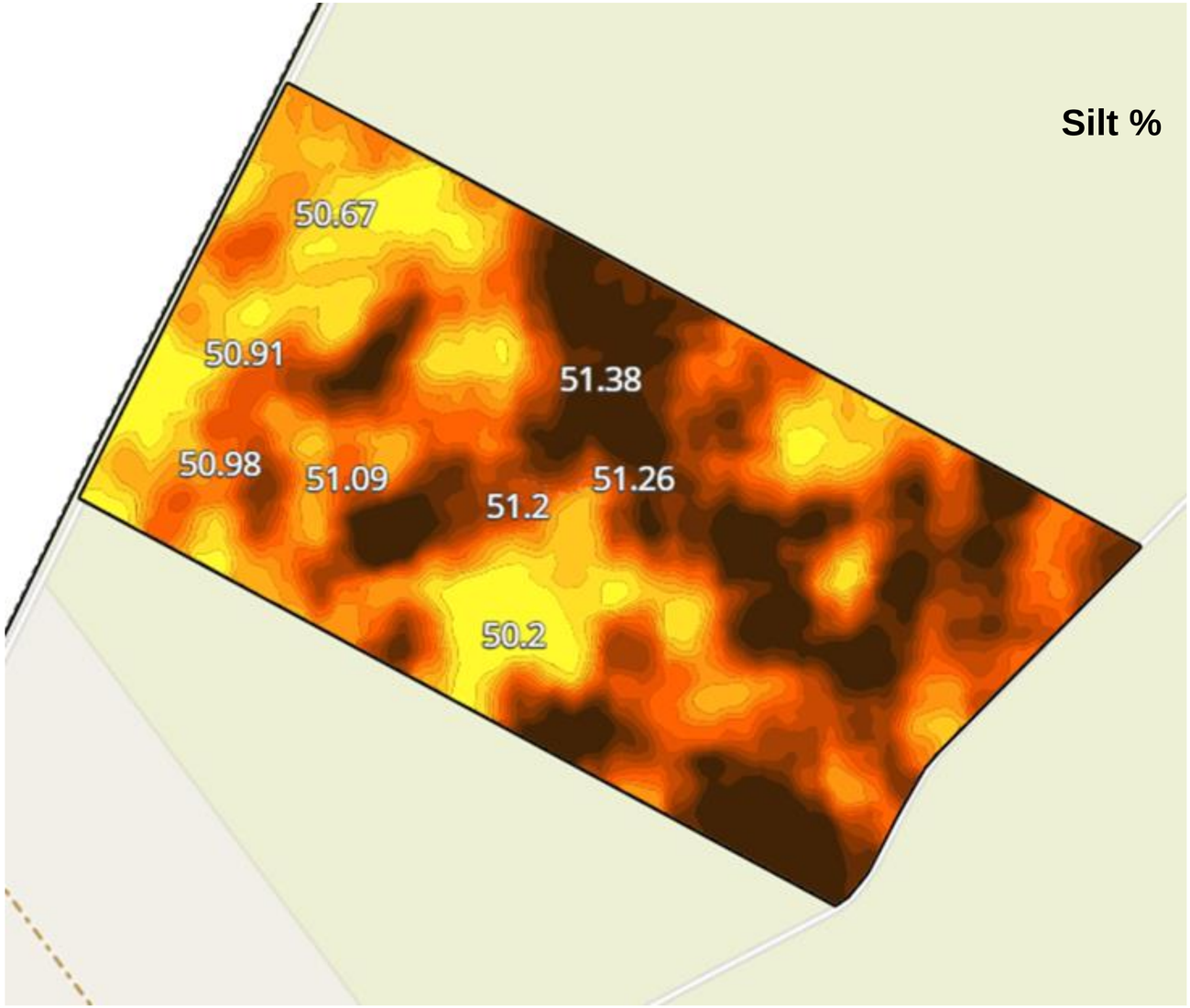

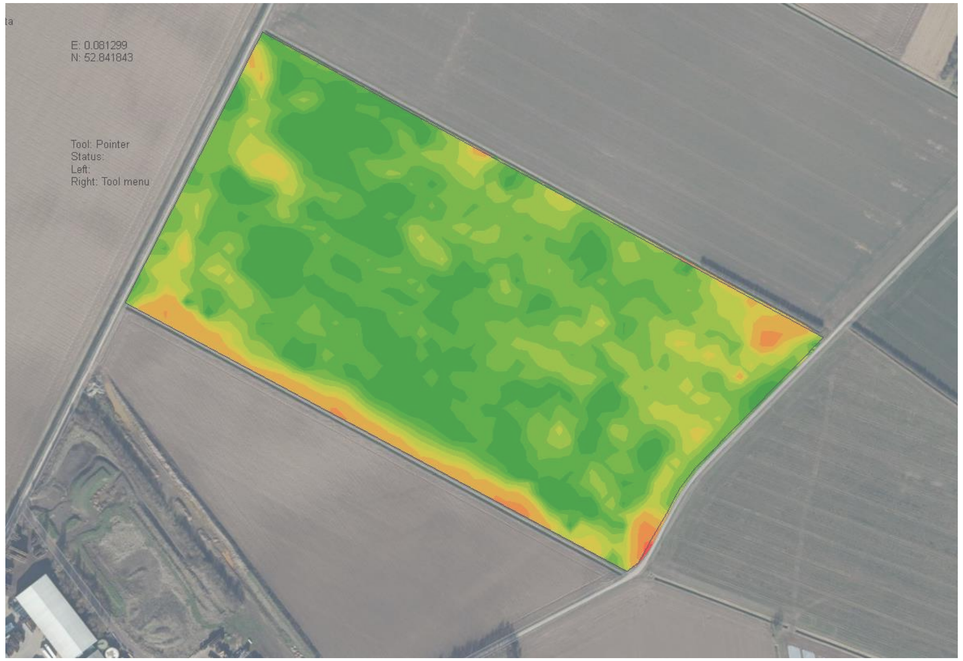

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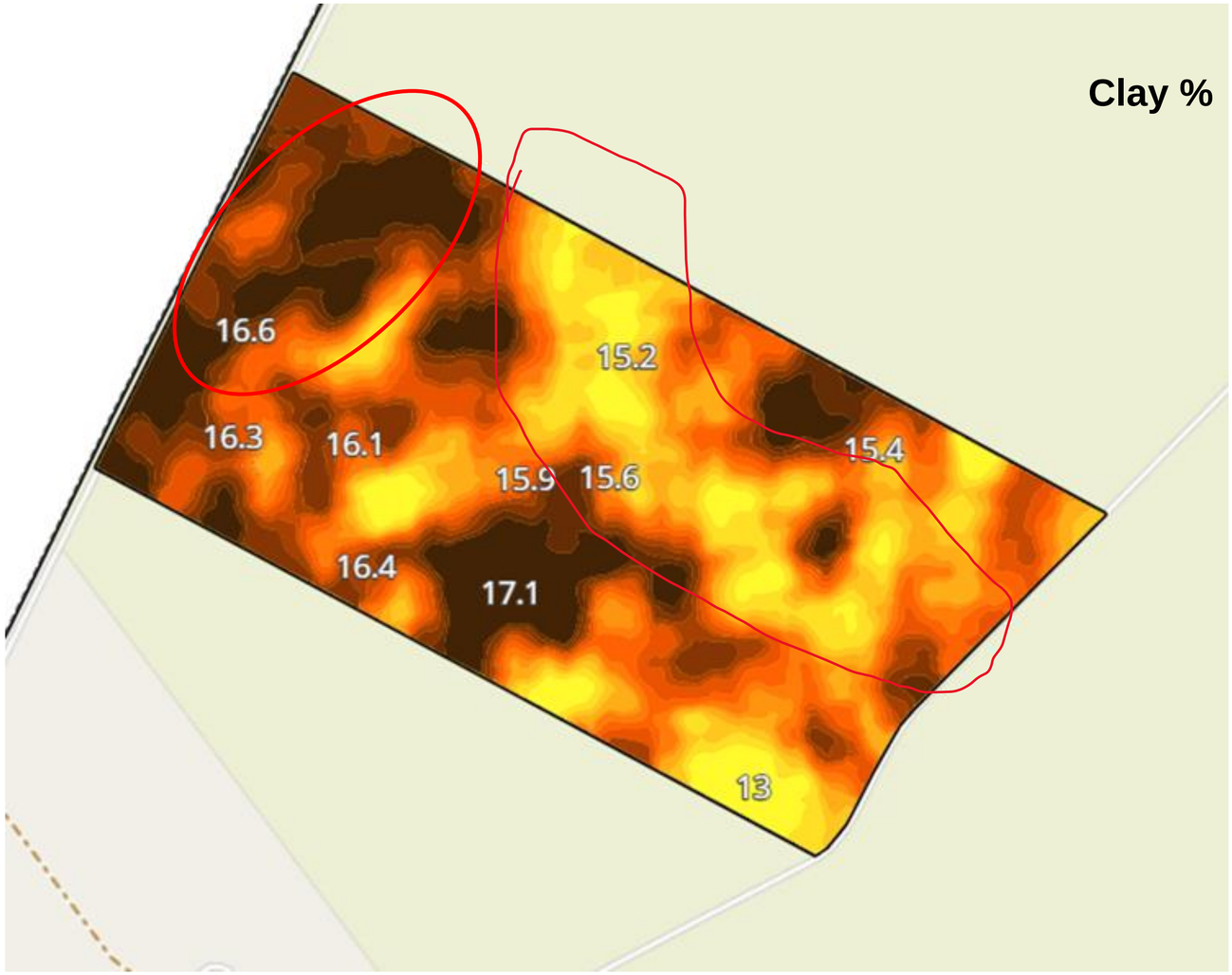

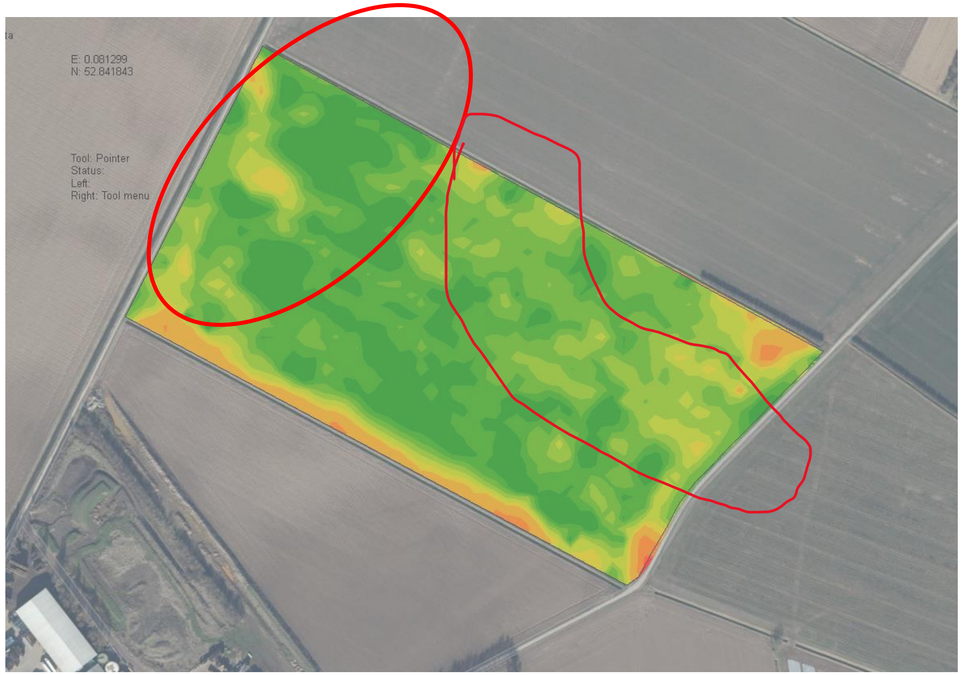

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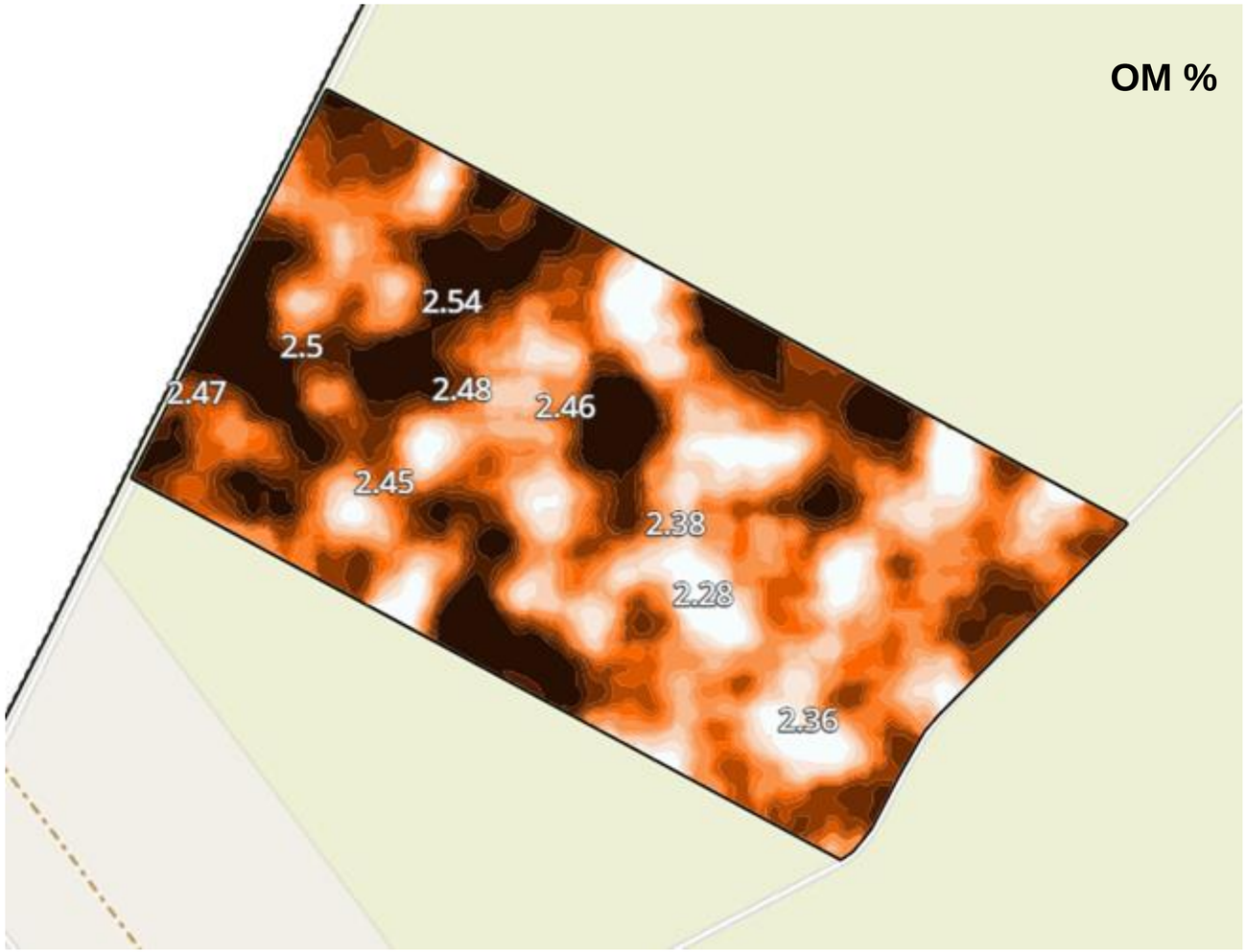

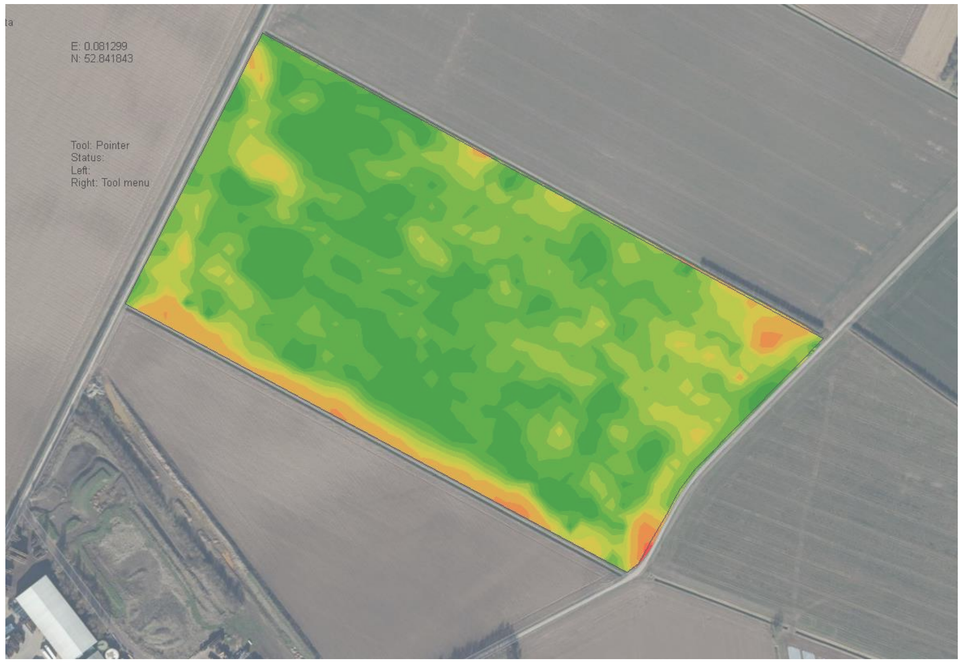

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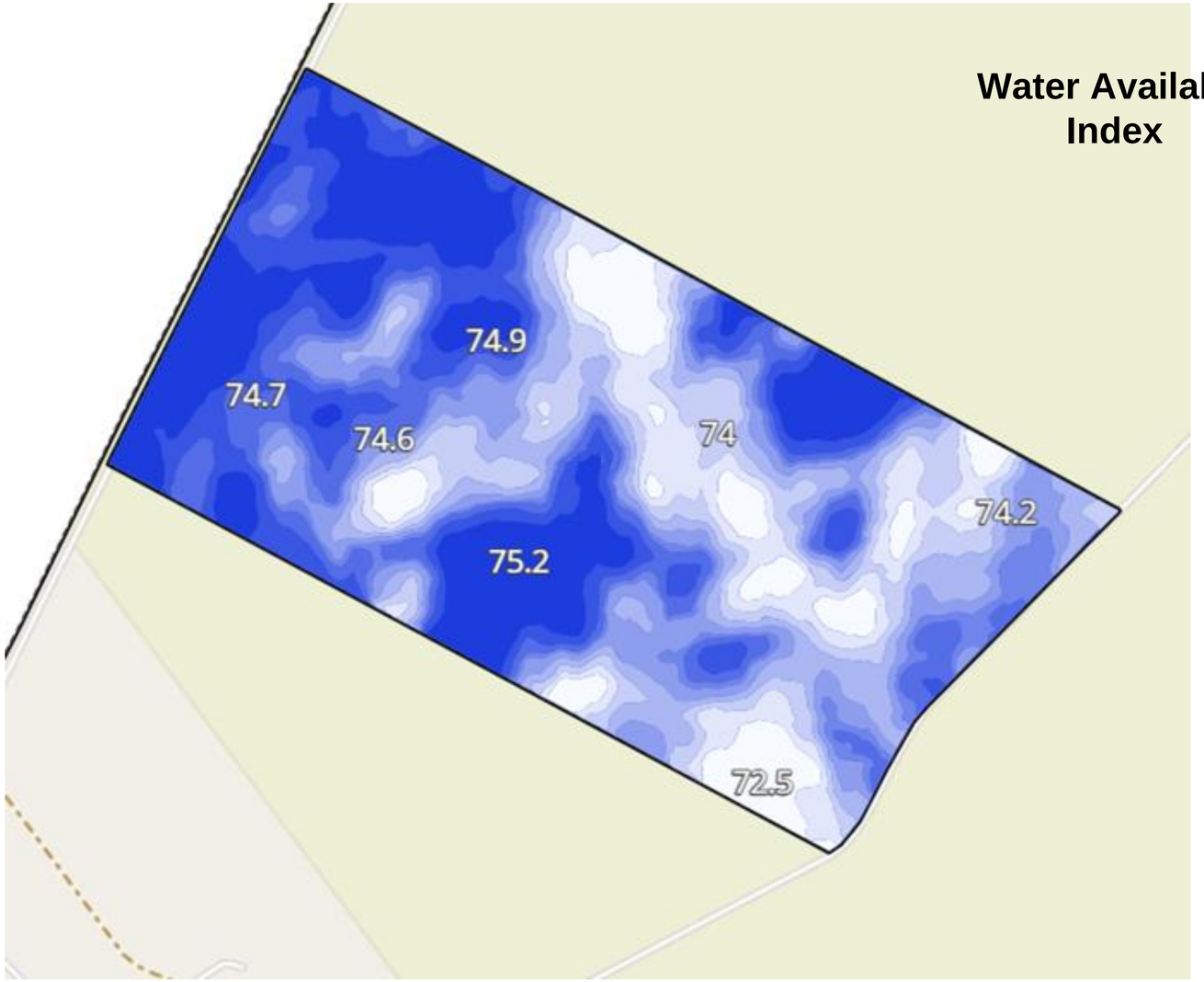
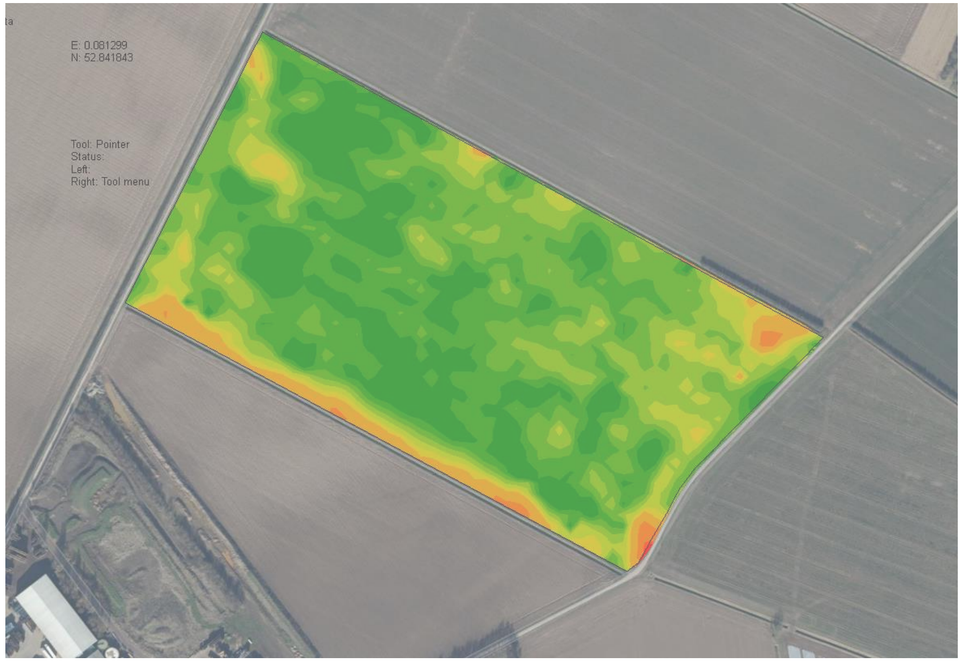
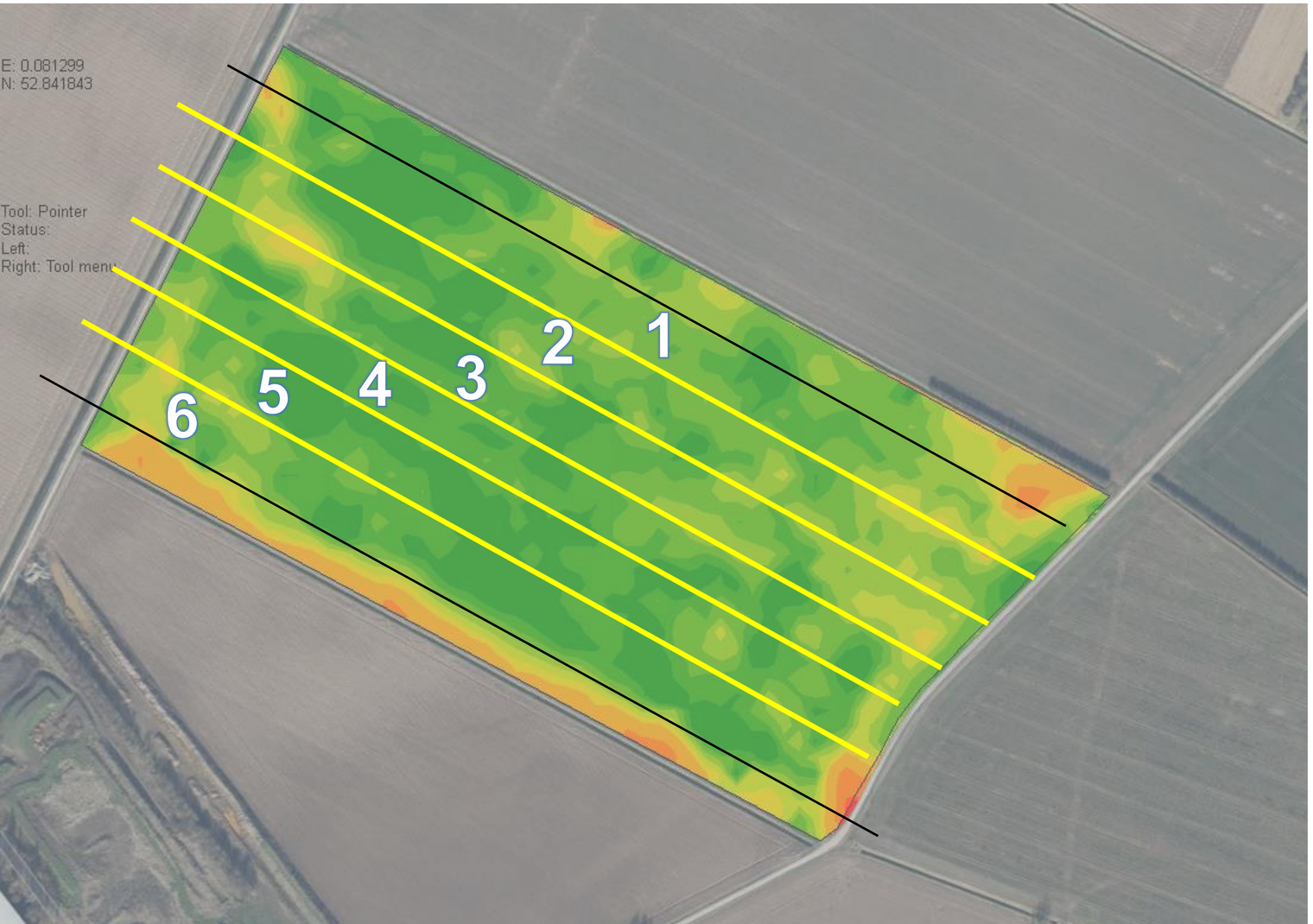




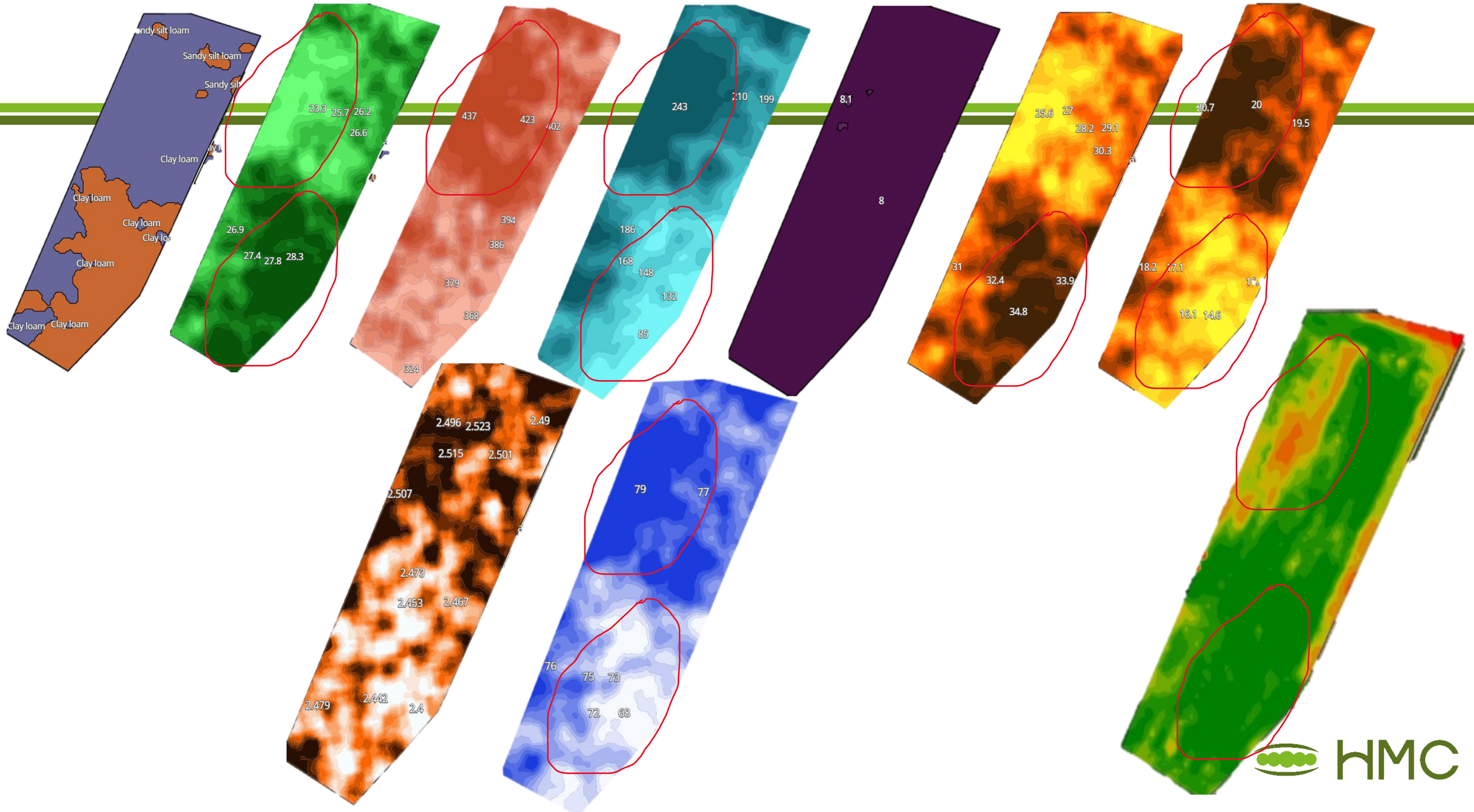
2021 Trials



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

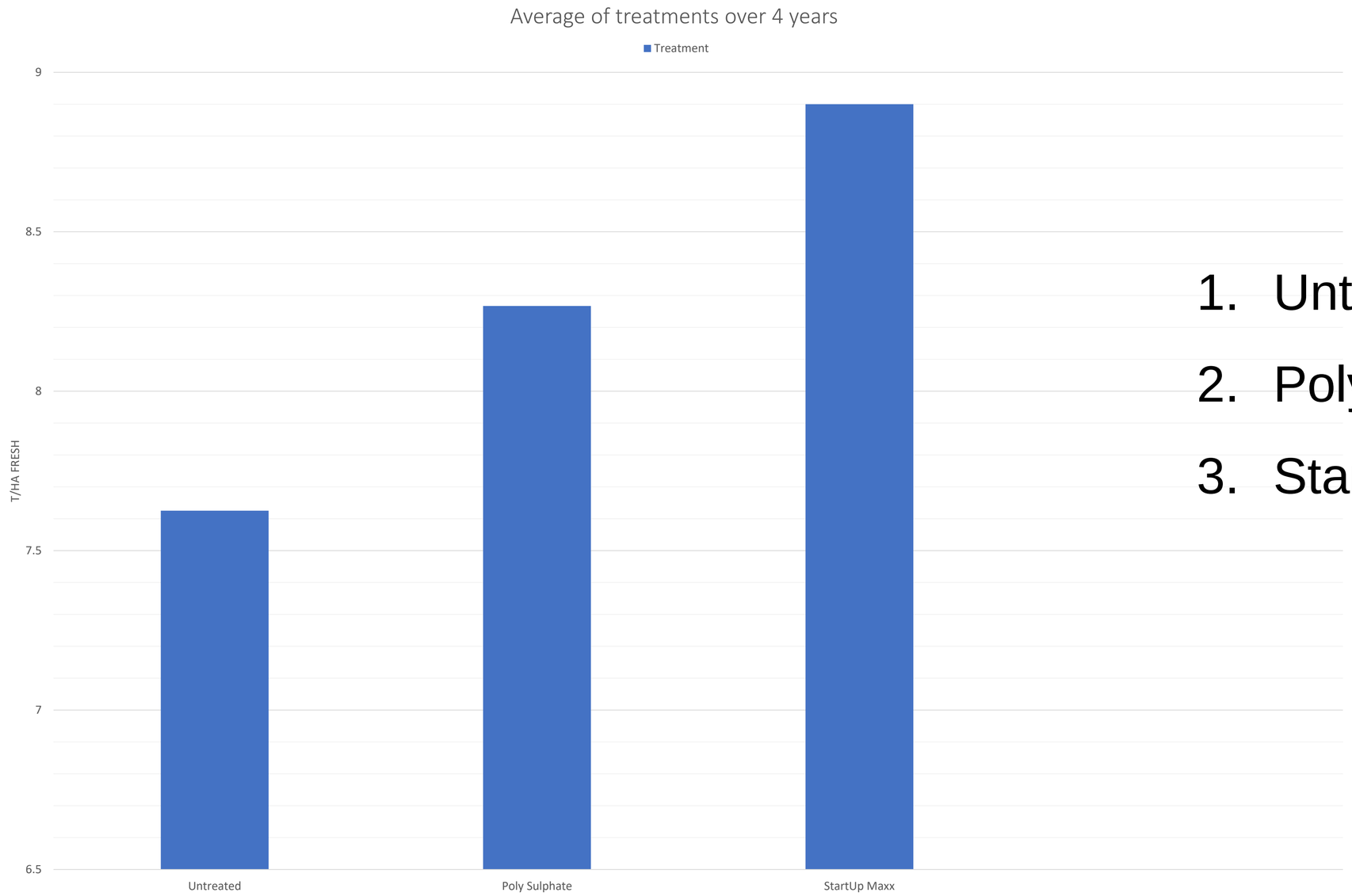
HMC


Sandy silt loam
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
210
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
17.1
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

Overall Trials Summary

- 4 years worth of data captured
- Years 1 & 2 drilled with Sly direct drill in not ideal conditions for the drill
- Years 3 & 4 drilled with Worths Vaderstad in ideal conditions for drill
- Gap between products became less significant with the VS
- Shows importance of products and also shows in less than ideal conditions what they can achieve

Overall Trials Summary



1. Untreated = 7.6 T/ha
2. Poly Sulphate = 8.2 T/ha
3. StartUp Maxx = 8.9 T/ha

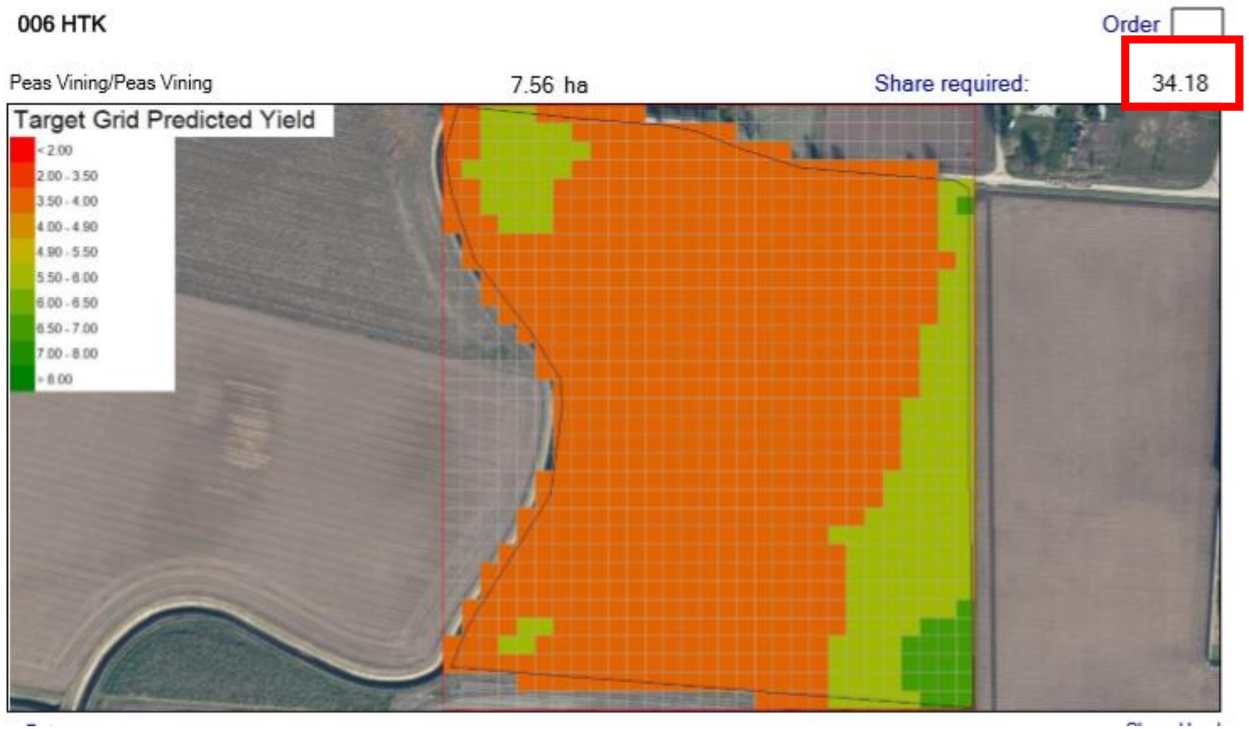
Yield Prediction Update

- From work done in conjunction with ADAS we are considering moving from NDVI wavelengths to NDRE which will give a wider spectrum at higher crop health which should improve accuracy of predictions.
- During harvest last year we were able to get some accurate yield predictions which did help feed the factory
- We also worked more closely with the factory and managers and had visits to the factory and had managers visit the field to better understand the idea behind the model
- The predictions allowed better live load management

Yield Prediction Update

4.46%

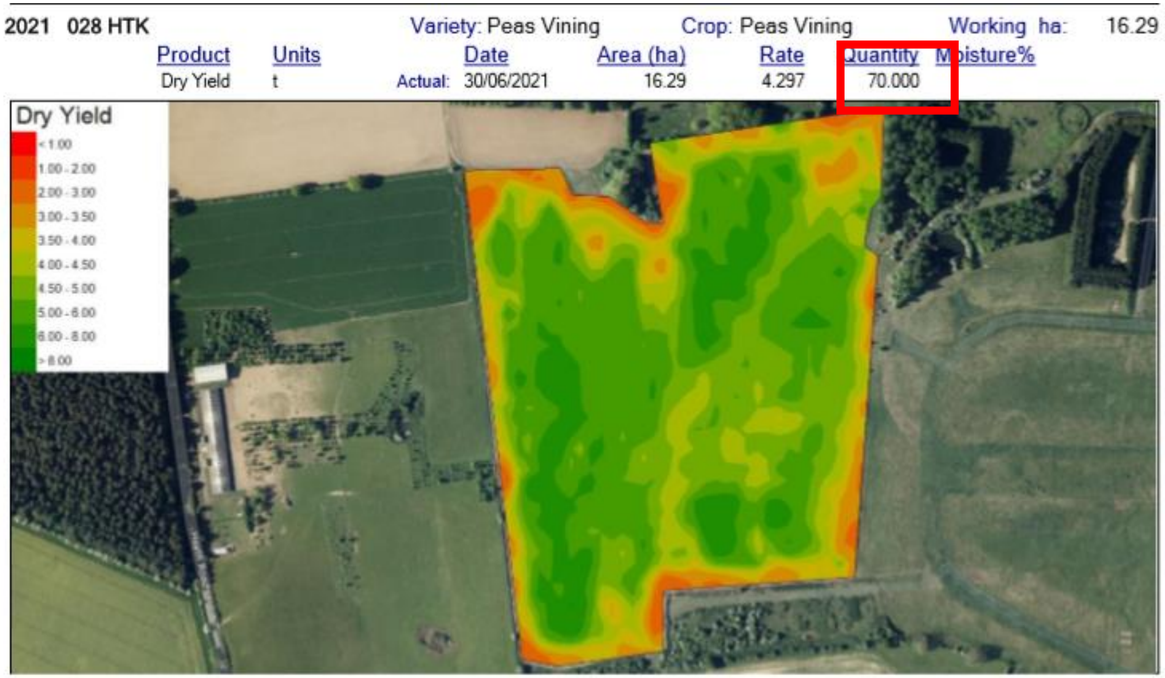
Yield Prediction Update



19.95%

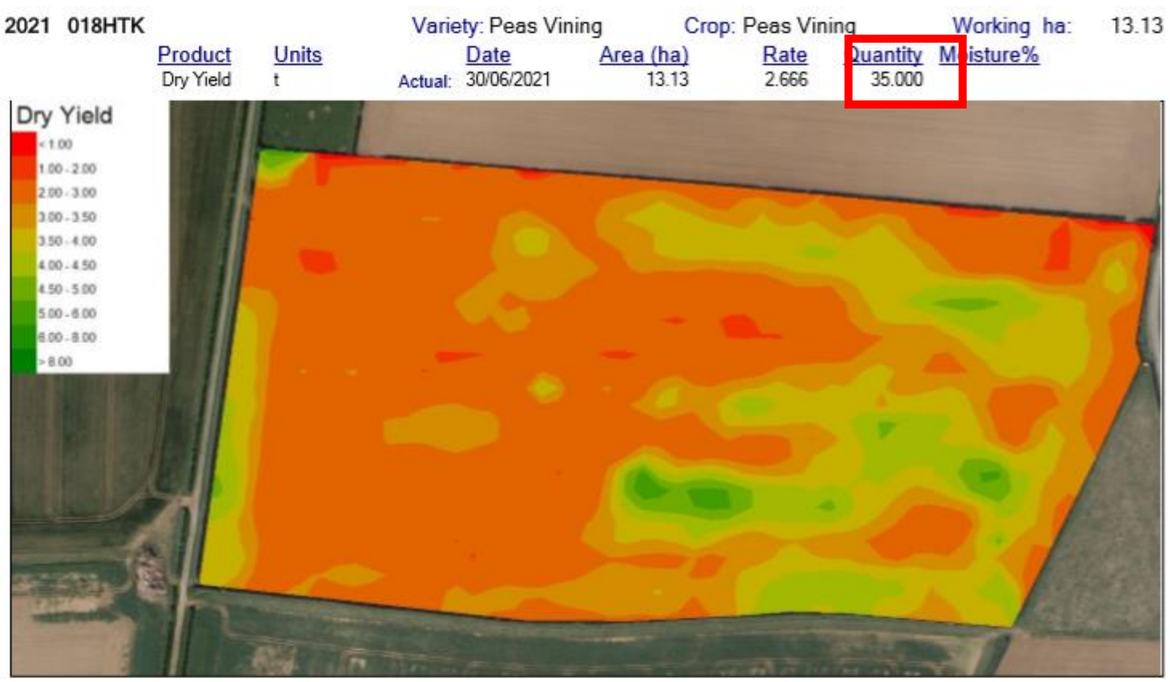
HMC

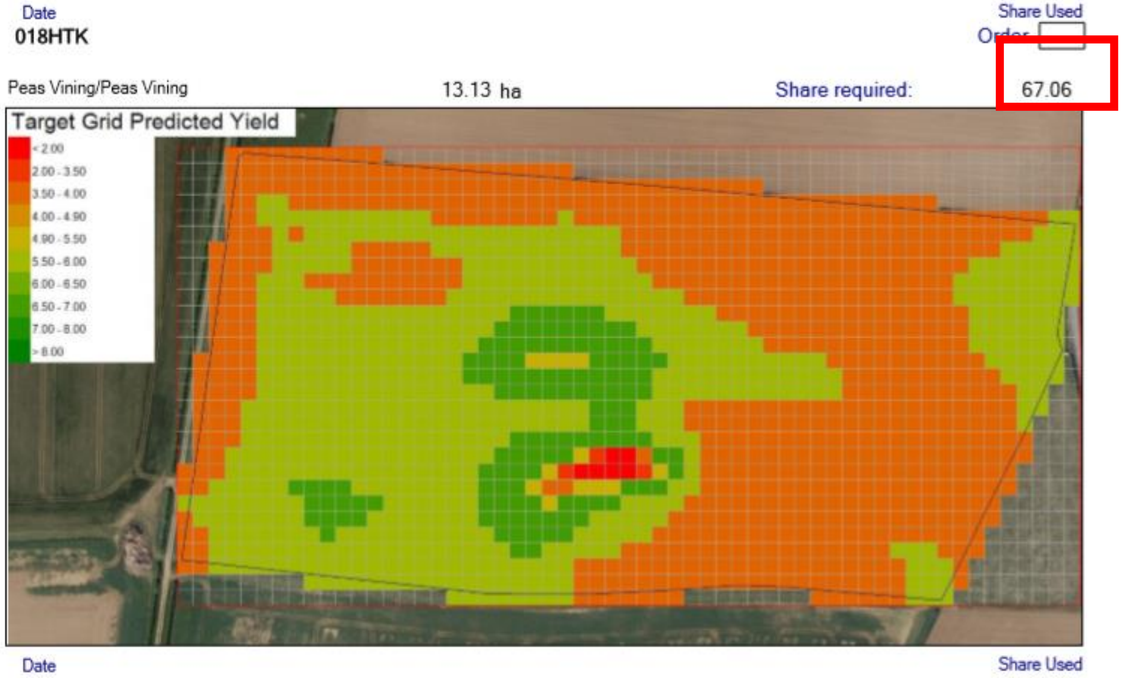
Yield Prediction Update



2.01%

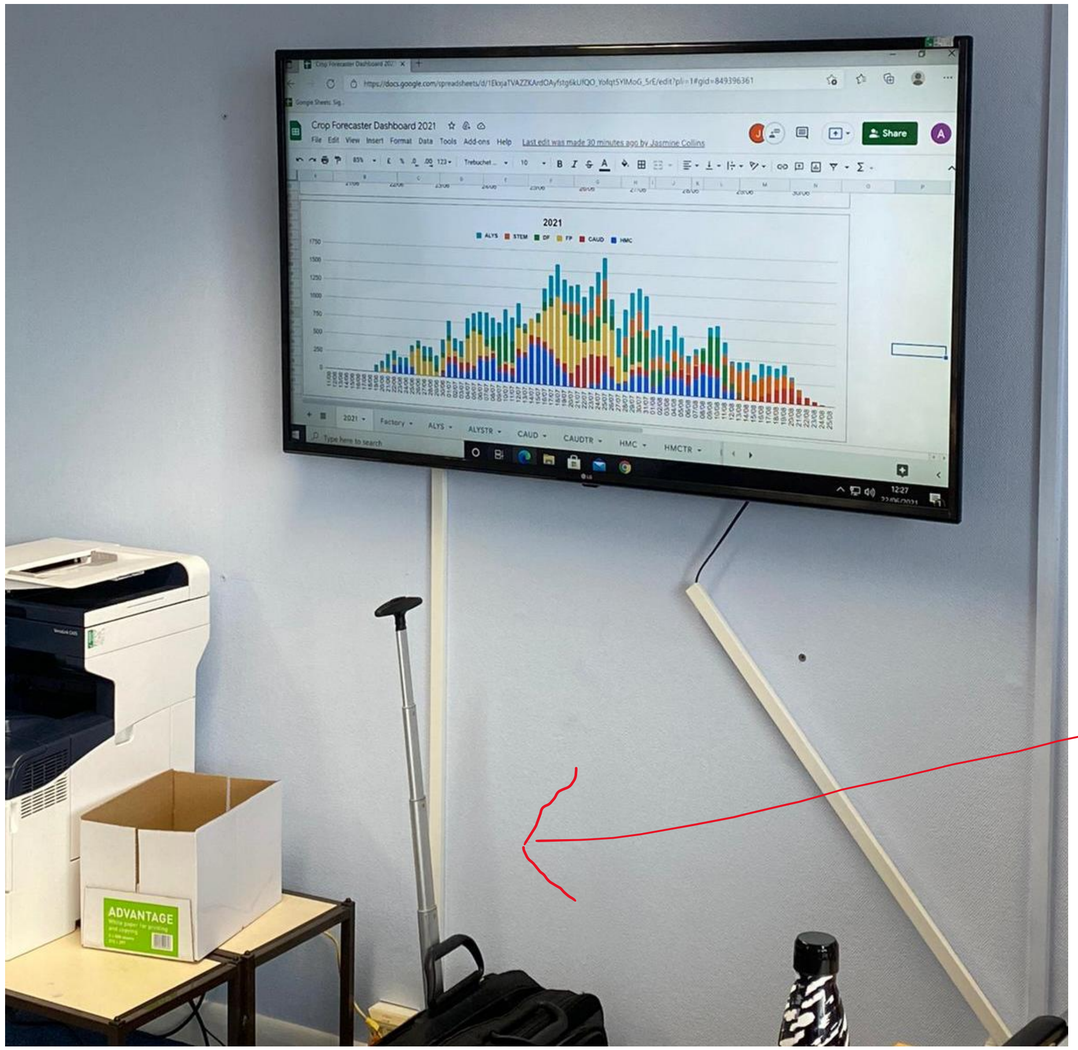
Yield Prediction Update





47.8%

Yield Prediction Update



- Live forecasts show in main office of Greenyard
- Shows all groups and forecast to manage peaks in season
- Stuart already has his bag packed for holidays!

Harvest date

- Fine tuning each year
- Web based version worked well last year
- As seen in previous slide, is being shown at factory
- 0% bypass in 2021

	FIELD NAME	AREA (HA)	AREA (ACRES)	FIELD NUMBER / CODE	VARIETY	Target Sowing Date	Total Heat Units at Drilling	Target Heat Units	Total Heat Units at Harvest	Spray Records Checked	Actual Harvest Date	Average TR at Harvest	Yield / Ha Estimate	Isaria Yield Estimate	Actual Yield	Total Yield (Fresh)	03-Jul Fri	04-Jul Sat	05-Jul Sun	06-Jul Mon	07-Jul Tue	08-Jul Wed	09-Jul Thu	10-Jul Fri	11-Jul Sat	12-Jul Sun	13-Jul Mon	14- Tu
	48 ac (Weston)	19.40	47.94	55	Selune	04-Apr	105	740	845				5		5.0	97	101%	103%	104%	106%	107%	109%	110%	111%	113%	114%	116%	117
	J3 Johnsons	16.20	40.03	56	Selune	04-Apr	105	740	845				5		5.0	81	101%	103%	104%	106%	107%	109%	110%	111%	113%	114%	116%	117
	F 6/6A	13.76	34.00	57	Selune	04-Apr	105	740	845				5		5.0	69	101%	103%	104%	106%	107%	109%	110%	111%	113%	114%	116%	117
)	Bicker/Swineshead	45.00	111.20	58	Selune	07-Apr	120	740	860				5		5.0	225	99%	101%	102%	104%	105%	107%	108%	109%	111%	112%	114%	115
	Ex Carrots	10.00	24.71	59	Selune	07-Apr	120	740	860				5		5.0	50	99%	101%	102%	104%	105%	107%	108%	109%	111%	112%	114%	115
	Braybrooks 1	13.28	32.81	60	Selune	07-Apr	120	740	860				5		5.0	66	99%	101%	102%	104%	105%	107%	108%	109%	111%	112%	114%	115
	Braybrooks 2	13.57	33.53	61	Selune	07-Apr	120	740	860				5		5.0	68	99%	101%	102%	104%	105%	107%	108%	109%	111%	112%	114%	115
	Braybrooks 6	6.22	15.37	62	Selune	10-Apr	135	740	875				5		5.0	31	98%	99%	101%	102%	103%	105%	106%	108%	109%	110%	112%	113
	Braybrooks 8	4.76	11.76	63	Selune	10-Apr	135	740	875				5		5.0	24	98%	99%	101%	102%	103%	105%	106%	108%	109%	110%	112%	113
	Braybrooks 5	15.04	37.16	64	Selune	10-Apr	135	740	875				5		5.0	75	98%	99%	101%	102%	103%	105%	106%	108%	109%	110%	112%	113
	Sneath 5	12.82	31.68	65	Selune	10-Apr	135	740	875				5		5.0	64	98%	99%	101%	102%	103%	105%	106%	108%	109%	110%	112%	113
	GFF 21	21.70	53.62	66	Geneva	04-Apr	105	775	880				5		5.0	109	97%	98%	100%	101%	103%	104%	106%	107%	108%	110%	111%	112
	24ac	9.20	22.73	67	Geneva	04-Apr	105	775	880				5		5.0	46	97%	98%	100%	101%	103%	104%	106%	107%	108%	110%	111%	112
	Hatchet	6.00	14.83	68	Geneva	04-Apr	105	775	880				5		5.0	30	97%	98%	100%	101%	103%	104%	106%	107%	108%	110%	111%	112
	F1	8.00	19.77	69	Geneva	04-Apr	105	775	880				5		5.0	40	97%	98%	100%	101%	103%	104%	106%	107%	108%	110%	111%	112
	Horseshoe Road A/B/C	18.89	46.68	70	Geneva	07-Apr	120	775	895				5		5.0	94	95%	97%	98%	100%	101%	102%	104%	105%	107%	108%	109%	111
	F4	21.85	53.99	71	Trophee	16-Apr	165	735	900				5		5.0	109	95%	96%	98%	99%	101%	102%	103%	105%	106%	107%	109%	110
	B1	11.93	29.48	72	Trophee	16-Apr	165	735	900				5		5.0	60	95%	96%	98%	99%	101%	102%	103%	105%	106%	107%	109%	110
td	Bridge	7.36	18.19	73	Trophee	16-Apr	165	735	900				5		5.0	37	95%	96%	98%	99%	101%	102%	103%	105%	106%	107%	109%	110
td	Glebe 40	16.49	40.75	74	Trophee	16-Apr	165	735	900				5		5.0	82	95%	96%	98%	99%	101%	102%	103%	105%	106%	107%	109%	110
td	Marsh 50	21.02	51.94	75	Trophee	19-Apr	180	735	915				5		5.0	105	93%	95%	96%	98%	99%	100%	101%	103%	104%	105%	107%	108
	S18	8.50	21.00	76	Trophee	19-Apr	180	735	915				5		5.0	43	93%	95%	96%	98%	99%	100%	101%	103%	104%	105%	107%	108
rms)	HCCT 5/9	24.97	61.70	77	Trophee	19-Apr	180	735	915				5		5.0	125	93%	95%	96%	98%	99%	100%	101%	103%	104%	105%	107%	108
rms)	HCCT 6/10	13.36	33.01	78	Trophee	19-Apr	180	735	915				5		5.0	67	93%	95%	96%	98%	99%	100%	101%	103%	104%	105%	107%	108
	C5	9.71	23.99	79	Trophee	19-Apr	180	735	915				5		5.0	49	93%	95%	96%	98%	99%	100%	101%	103%	104%	105%	107%	108
	C6	18.21	45.00	80	Trophee	22-Apr	195	735	930				5		5.0	91	92%	93%	95%	96%	97%	99%	100%	101%	103%	104%	105%	106
	Middlemarsh Watsons	19.46	48.09	81	Trophee	22-Apr	195	735	930				5		5.0	97	92%	93%	95%	96%	97%	99%	100%	101%	103%	104%	105%	106
	Middlemarsh Yard	19.02	47.00	82	Trophee	22-Apr	195	735	930				5		5.0	95	92%	93%	95%	96%	97%	99%	100%	101%	103%	104%	105%	106
	Somerset 14 acre	5.42	13.39	83	Trophee	22-Apr	195	735	930				5		5.0	27	92%	93%	95%	96%	97%	99%	100%	101%	103%	104%	105%	106
	Somerset Middle Field	10.93	27.01	84	Trophee	22-Apr	195	735	930				5		5.0	55	92%	93%	95%	96%	97%	99%	100%	101%	103%	104%	105%	106
	40 Acre	16.19	40.01	85	Trophee	25-Apr	210	735	945				5		5.0	81	90%	92%	93%	94%	96%	97%	98%	100%	101%	102%	103%	105
	Bottom New Road	7.00	17.30	86	Trophee	25-Apr	210	735	945				5		5.0	35	90%	92%	93%	94%	96%	97%	98%	100%	101%	102%	103%	105
	Bottom Yard	4.80	11.86	87	Trophee	25-Apr	210	735	945				5		5.0	24	90%	92%	93%	94%	96%	97%	98%	100%	101%	102%	103%	105
	Yard 1	4.50	11.12	88	Trophee	25-Apr	210	735	945				5		5.0	23	90%	92%	93%	94%	96%	97%	98%	100%	101%	102%	103%	105
	Jep 09	5.40	13.34	89	Trophee	25-Apr	210	735	945				5		5.0	27	90%	92%	93%	94%	96%	97%	98%	100%	101%	102%	103%	105
	Jep 21	5.56	13.74	90	Trophee	25-Apr	210	735	945				5		5.0	28	90%	92%	93%	94%	96%	97%	98%	100%	101%	102%	103%	105
	Jep 27	14.62	36.13	91	Trophee	25-Apr	210	735	945				5		5.0	73	90%	92%	93%	94%	96%	97%	98%	100%	101%	102%	103%	105
	Jep 54A	13.41	33.14	92	Trophee	25-Apr	210	735	945				5		5.0	67	90%	92%	93%	94%	96%	97%	98%	100%	101%	102%	103%	105
	Jep 61A	13.20	32.62	93	Trophee	28-Apr	225	735	960				5		5.0	66	89%	90%	92%	93%	94%	96%	97%	98%	99%	101%	102%	103
	Jep 71A	5.13	12.68	94	Trophee	28-Apr	225	735	960				5		5.0	26	89%	90%	92%	93%	94%	96%	97%	98%	99%	101%	102%	103
	ard/Water Tank/ 8 Acr	11.90	29.40	95	Trophee	28-Apr	225	735	960				5		5.0	60	89%	90%	92%	93%	94%	96%	97%	98%	99%	101%	102%	103

Dr Lizzie Sagoo

Framework conditions for innovation

INNO-VEG project update

HMC Technical Meeting 23rd Febraury 2022

@InnoVeg

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

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

Vining pea experiments 2019

- Tilney St Lawrence
  - Two fields
  - Focus on within field variability
  - Planted 14th May; harvested 28th Jul
  - 45 small plots (2 x 4m)
- Worth Farm
  - Farm applied fertiliser treatments
  - Planted 4th April; harvested 10th Jul
  - 21 small plots (2 x 4m)

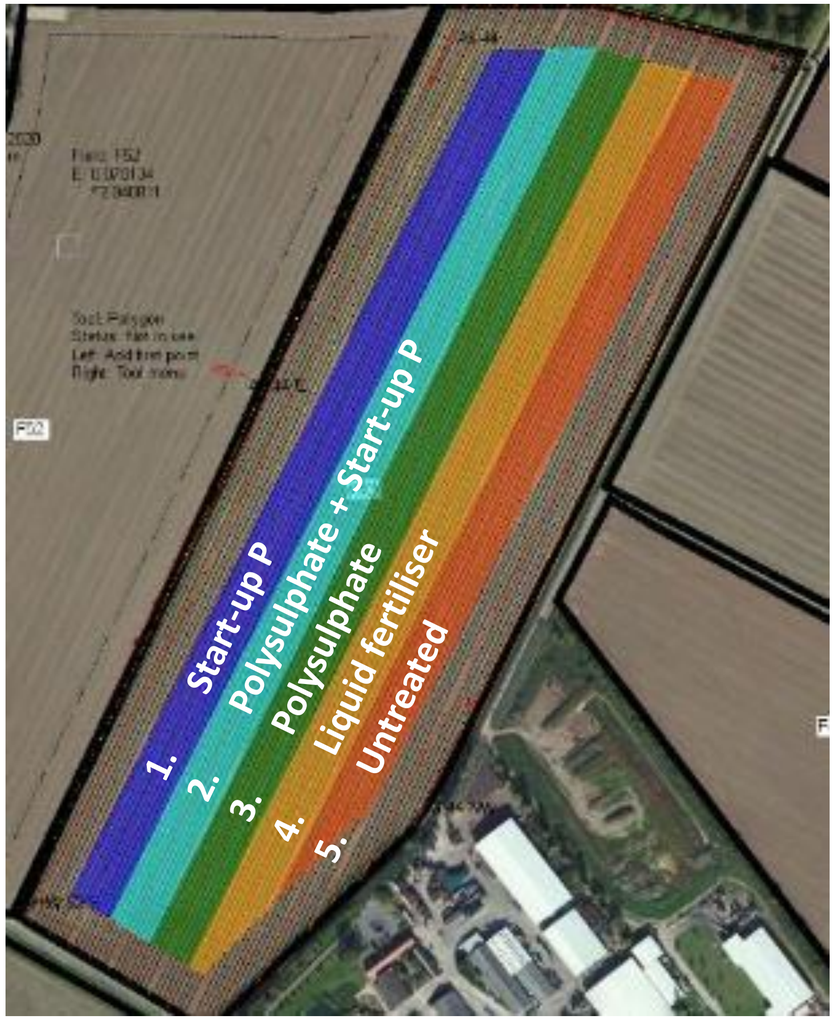
- Good relationship between VI's and yield when crop at full flower
  - R^2 0.82 Tilney St Lawrence
  - R^2 0.68 Worth Farm

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
- Develop a ‘Framework for farmer led research’

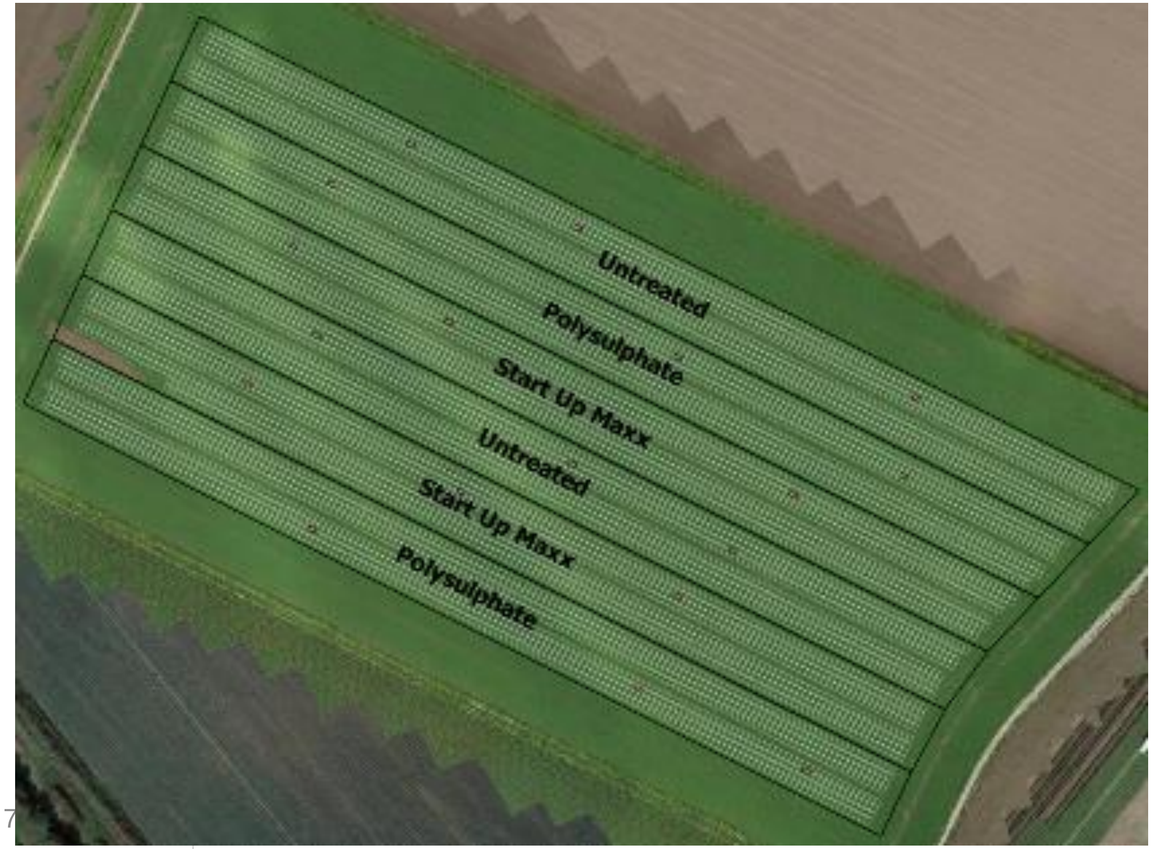
HMC 2020 trial site Worth Farm

- Upscale from small plot to field scale
- HMC trial site - five unreplicated treatments
- Plots one tramline (36m) wide
- Two drone flights
- 20 yield validation plots
- Plus yield map data from farm



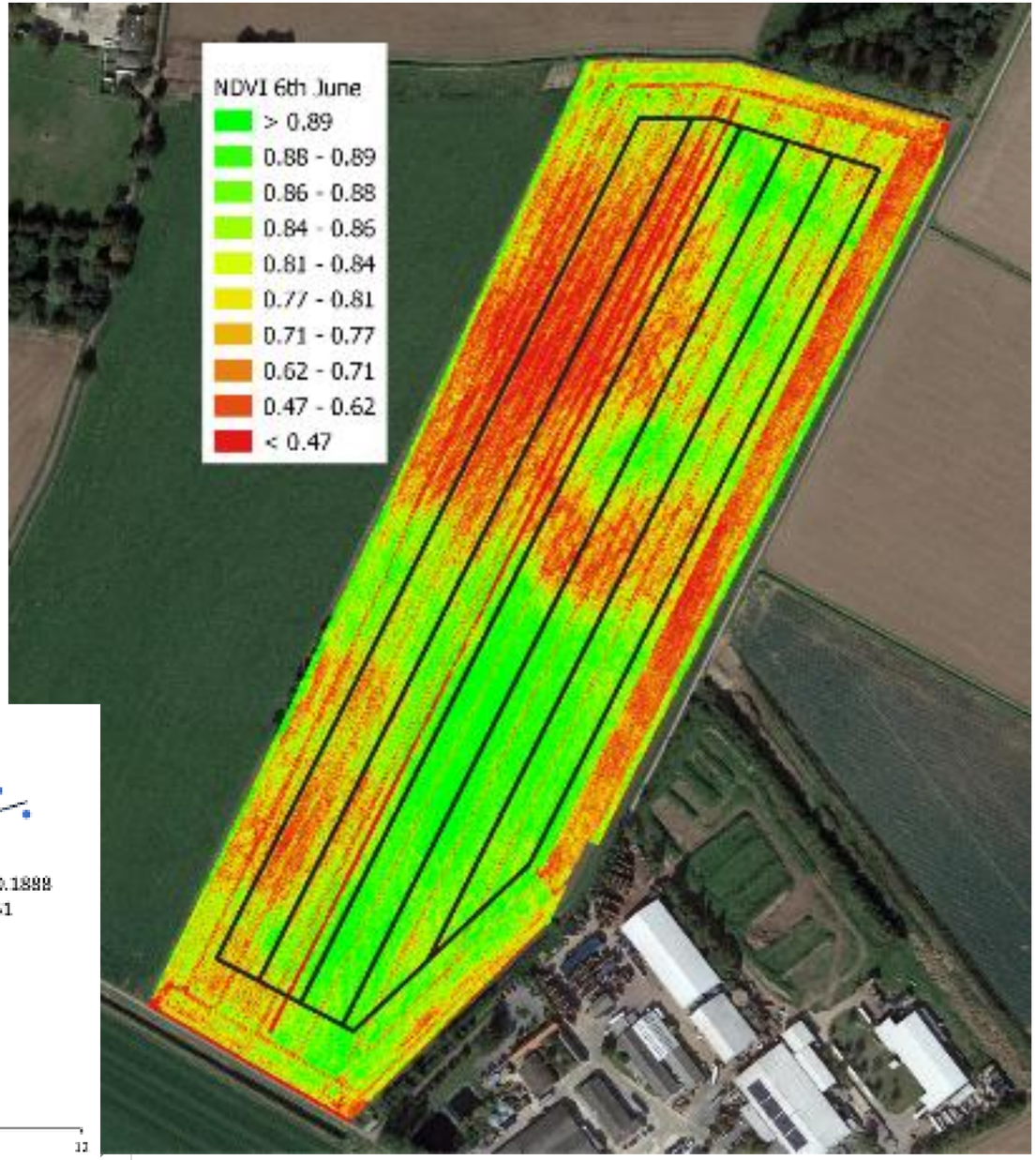
HMC 2021 trial site Worth Farm

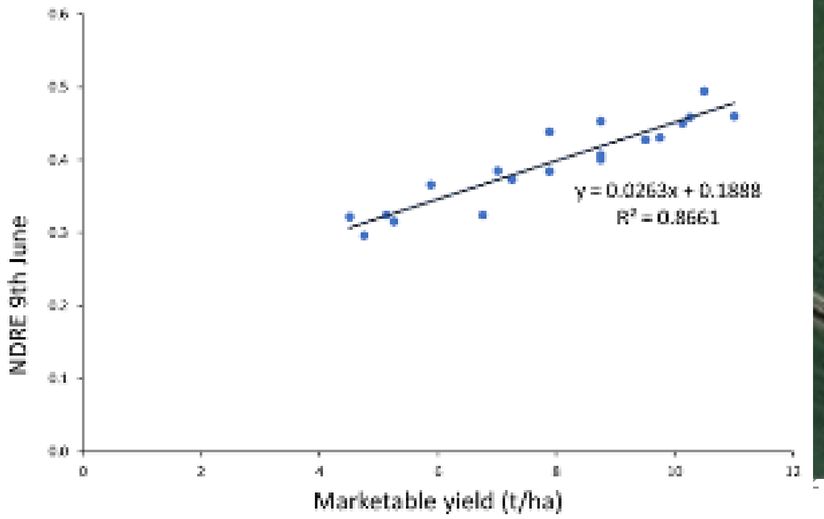
- HMC trial site – 3 treatments x 2 replicates
- Plots one tramline (36m) wide
- Ideal trial design
- Two drone flights
- 18 yield validation plots
- Plus yield map data from farm



Spatial data analysis

- Vegetation index data
  - Six Vegetation Indices (VIs) calculated
  - NDVI, MCARI2, MTCI, CI Green, CI Red Edge, NDRE & REIP
- Estimated yield map
- Actual yield map (from farm)





Interreg 2 Seas Mers Zeeën INNO-VEG

Agronomics spatial data analysis

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

Agronomics

Innovate UK
Technology Strategy Board

AG Space

BASF
The Chemical Company

BGS 1835

Harvesting the future
TRIALS EQUIPMENT

vsn

Interreg
2 Seas Mers Zeeën
INNO-VEC

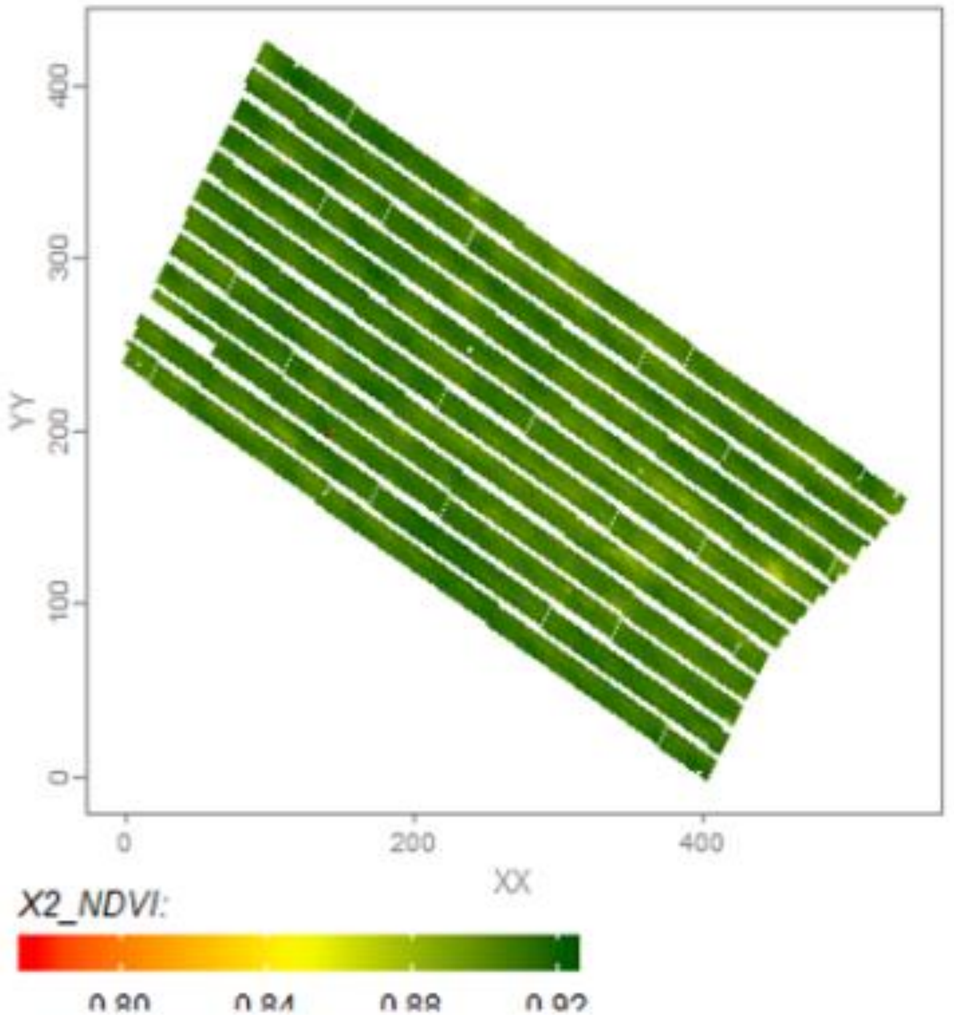
Vining peas - data preprocessing

- Raster data needs converting to point data (≤12500)
- Rows of points must be in line with treatments.

1. Created grid of cells 3.5m wide x 3m long
2. Four rows of cells placed in each half tramline, avoiding wheelings, drill misses and treatment boundaries
3. Mean values for drone data calculated for each cell (QGIS ‘zonal statistics’ tool)
4. Cells converted to points (QGIS ‘centroids’ tool)

Agronomics analysis – NDVI data

Treatment	Mean	Modelled difference from control, with 95% confidence interval
First flight		
Untreated control	0.863	
Polysulphate		0.013 ± 0.009
Start up P Maxx		0.002 ± 0.009
Second flight		
Untreated control	0.908	
Polysulphate		0.002 ± 0.002
Start up P Maxx		0.001 ± 0.002



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

Treatment	Mean	Modelled difference from control, with 95% confidence interval
Untreated control	8.74	
Polysulphate		0.191 ± 0.485
Start up P Maxx		-0.021 ± 0.470

Interreg
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INNO-VEC

Summary

- Yield is always more affected by soil variation than treatments
  - Trials should be laid out with reference to underlying soil variation
  - Treatments should be replicated where possible
- VIs measured at full flower correlated well with vining peas marketable yield (R^2 up to 0.90)
- Spatial yield data – measured or using VI as proxy for yield – can be analysed using Agronomics approach to assess the impact of farm applied field scale treatments

Interreg
2 Seas Mers Zeeën
INNO-VEG

Framework conditions for innovation

Project website

www.inno-veg.org

Lizzie.Sagoo@adas.co.uk

PeaSat

Using satellite imagery to estimate final yield of vining peas to maximise the efficiency and profitability of harvest and processing

Project proposal

- **Project aim**: to develop a **yield prediction package** to allow vining pea growers and processers to forecast intake volumes around 2 weeks before harvest.
- **Project partners**: HMC & ADAS
- **European Space Agency Feasibility project proposal**

The challenge - bypass

What we need to do:

- Manage an even supply of crop into the factory
- Forecast harvest date
- Forecast harvest volumes

Current capabilities:

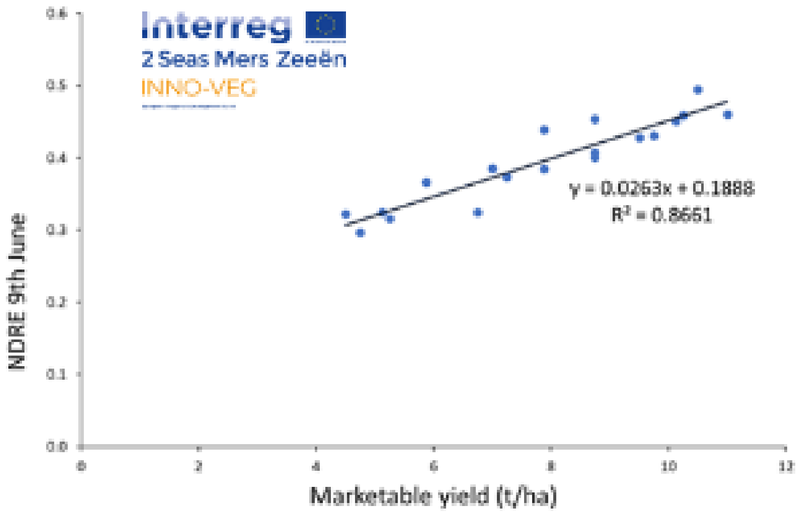
- Planting schedules/varieties to manage consistent intake of high quality product
- Harvest date model

Next step:

- Yield prediction (this project)

Proof of concept

- HMC and ADAS have demonstrated good correlations between Vegetation Indices and vining pea yields
- Focus on satellite data – only practical & cost effective method of collecting data over larger areas

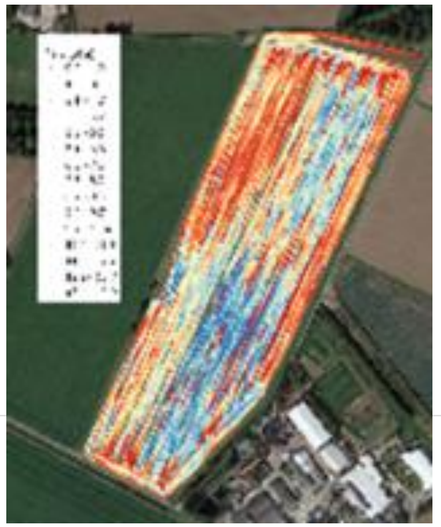


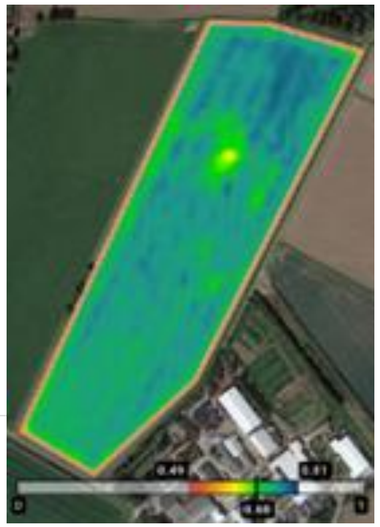
Current challenges/questions to be addressed:

- Utilise available yield map and satellite data to produce the most accurate yield prediction model(s) possible
- How accurate is the yield prediction model across fields and years?
- What is the impact of variety? Do we need separate yield prediction models?
- How sensitive is the model to crop growth stage when image is taken?

Innovation

- We are not aware of any commercial yield prediction tools for vining peas
- Use of satellite data for yield prediction well established in other crops
  - But this has not been developed for vining peas
  - Need yield data to produce a yield prediction model
  - HMC are the only vining pea group with yield mapping
- Existing yield map data for 2017-2021 (for 2,200 ha/year)
  - Key resource to enable development of yield prediction model
  - Market advantage - as no other group has the capacity to build a model with this quantity of data





Application process

Three stage application process:

- Activity Pitch Questionnaire
  - Pitch session to UK Space Agency & ESA (Sep 2021)
- Outline proposal
- Full proposal

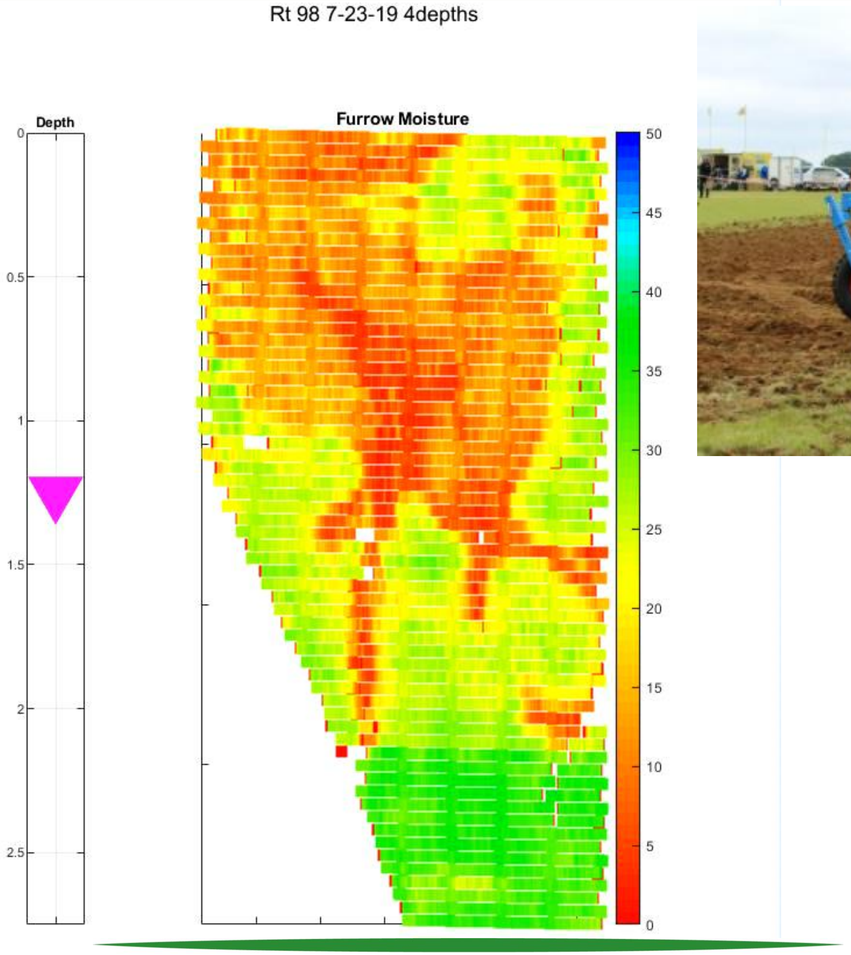
BREAK

Jack / Richard

New Projects

- Previous trials with starter fertilisers has come to a close
- Establishment trials and Drill comparisons
- Different drill technologies
  - Variable depth control and moisture hunting
  - Precision planting

Future Technologies



HORIZON AGRICULTURE

AGXEED

Small Robot Company

HMC

Future Technologies

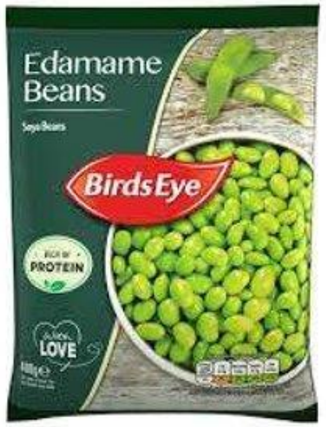
- See and Spray Technologies
- Mainly using RGB Imagery and machine learning to ID weeds on the go and spray where needed
- Can be used in Peas?
- Potatoes/Thistles/Mayweed?

Future Technologies

- Not all systems are live see and spray
- Might be something to look into to save input costs and help retain ag chem in future?

Edamame

Consumption mainly frozen and mainly imported from Asia



Edamame

Consumption mainly frozen and mainly imported from Asia

- 2019 – Field Trial but not harvested
- 2020 – Field Trial to harvest
- 2021 – Not Grown but Development project taken on by Brendan Leegrove at Greenyard
- 2022 – Looking to produce 150 – 200 tonnes for freezing

Edamame

Edamame

- 2022 – Aiming for 150-200 tonnes
- HMC have undertaken all the risk so far
- 2022 Looking to share the risk with Greenyard
- Seed costs extremely high at present. (£1000 per ha)
- Require good silt land and the ability to irrigate.

Scott Garnett

Dr Becky Howard

Research and crop protection update

24th February 2022

Becky Howard

Cover and catch crops

- Retains and improves availability of soil nutrients
- Increases levels of soil organic matter
- Protects and improves soil structure
- Alleviates compaction – soil penetrometer readings and foot rot infection are strongly correlated
- Assists in pest management
- Can improve soil moisture activity
- Protects water quality by preventing nitrate leaching and can accrue N for following crop (50-100 kg/ha)
- Catch crops following vining peas may accrue up to 30 kg/ha for following cereal crop
- 18 field trials over 5 years

- Drilling issues?
  Crop contamination?

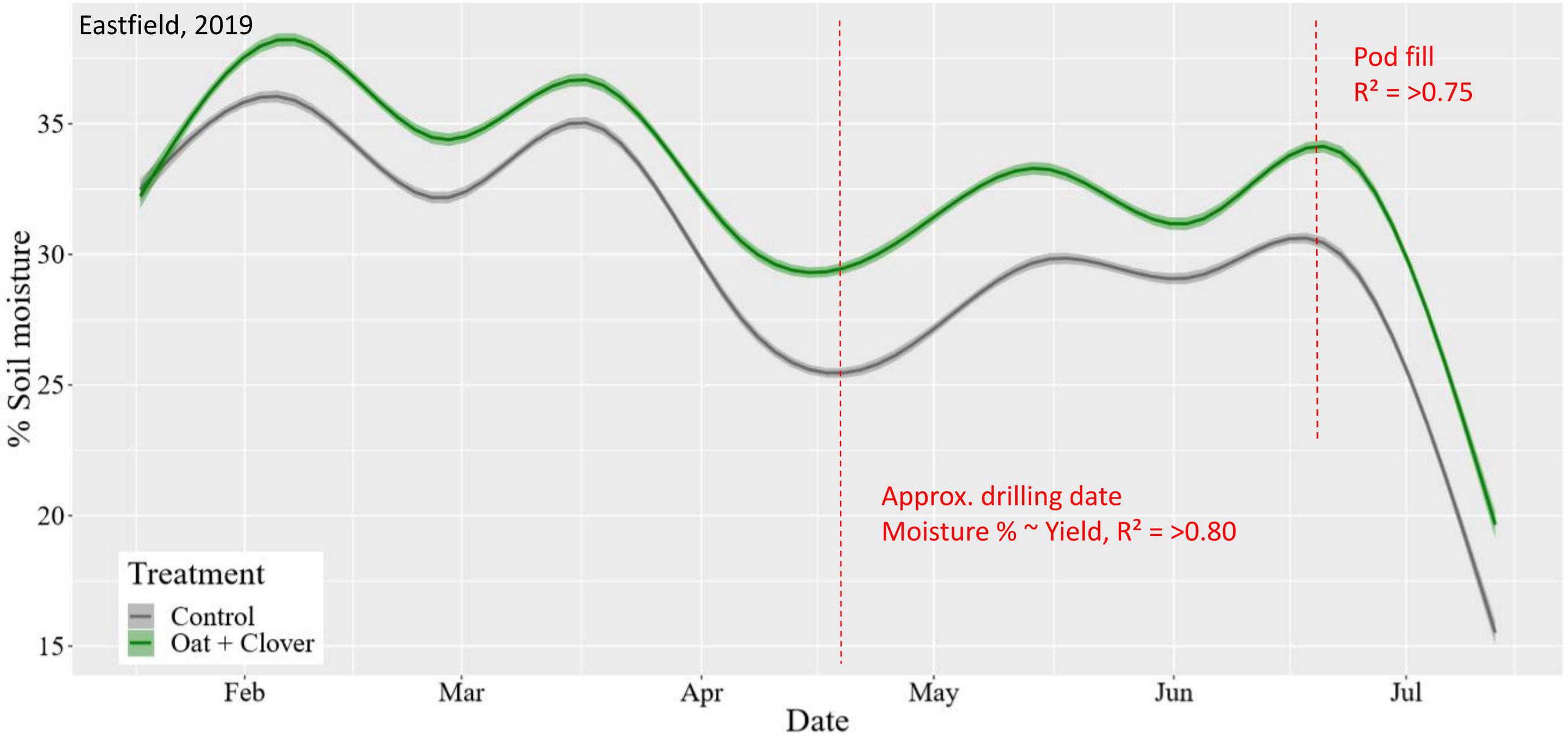
Conditions encouraging foot rot disease

- Cold, wet soils
- Poor soil structure
- Compaction and water logging (release of root exudates)
- Stressed crop
- Frequent legume cropping


Courtesy of S. Chatterton, Agriculture and Agri-Food Canada

Control (no cover crop)
Dry

Oat + Phacelia cover crop
Improved WHC at pod fill



Increased moisture retention at drilling and during pod fill improved yield.

Recommendation

- Oat based cover crop mixtures - good partners are phacelia, linseed, borage, mustard and berseem clover or winter vetch (no negative impact on foot rot observed)

- Sow clover carefully – does not like to be buried

- Best avoid using oil radish prior to peas – seems to aggravate foot rot risk, although we do not understand this interaction

Recommendation

- Drill cover crops early, ideally mid-August (mid-September at the very latest) into moisture
- 10-20 kg/ha starter N can accelerate establishment of later drilled cover crops
- Destroy cover crops about 6 weeks prior to drilling peas (from around the end of January) by spraying or cutting. Try not to leave compaction and aim to have highly deteriorated residues by the time of drilling
- Shallow cultivations prior to peas seem sufficient – no contamination issues and preserves positive effects on soil structure
- https://www.youtube.com/watch?v=UirDMjfdVe4

Conclusions

Yield – up to 1.5 t/ha improvement

Improvement

Foot rot

Improvement

Water balance
Soil structure

Reduction

Compaction

Improvement

Reduction

Cover crops

Summary 2021

- 4 sites drilled 21st August to w/c 14th September 2020
- Earlier sown cover crops accumulated greater biomass – reasonable biomass at Long Sutton but low ground cover
- Establishment was poor overall
- Positive changes to nutrition, OM% and pH at some sites, though often associated with the whole site including control plots
- No significant effects on foot rot abundance in soil or crop, or yield in 2021
- Soil moisture retention was improved at one site but not at the other 3 sites
- Lack of significant effects may have been due to low cover crop biomass and more temperate weather with adequate rainfall in May and June

Vining pea fungicide actives 2022

Crop protection

- Azoxystrobin (14 day HI)
- Boscalid + pyraclostrobin (14 day HI)
- Cyprodinil + fludioxonil (14 day HI)
- Difenoconazole + fluxapyroxad (Perseus) (14 day HI)
- Mandipropamid (Revus) (14 day HI)
- Metconazole (14 day HI)
- Sulphur (Thiopron) – apply when pods have reached typical size and peas are fully formed, between May and September

- No seed treatments available now, although seed treated in member states can be imported and used in the UK until 31st December 2023 (this does not include Wakil XL).
- https://www.hse.gov.uk/pesticides/databases/faq-on-information-on-pesticide-products.htm

Pea seedling diseases

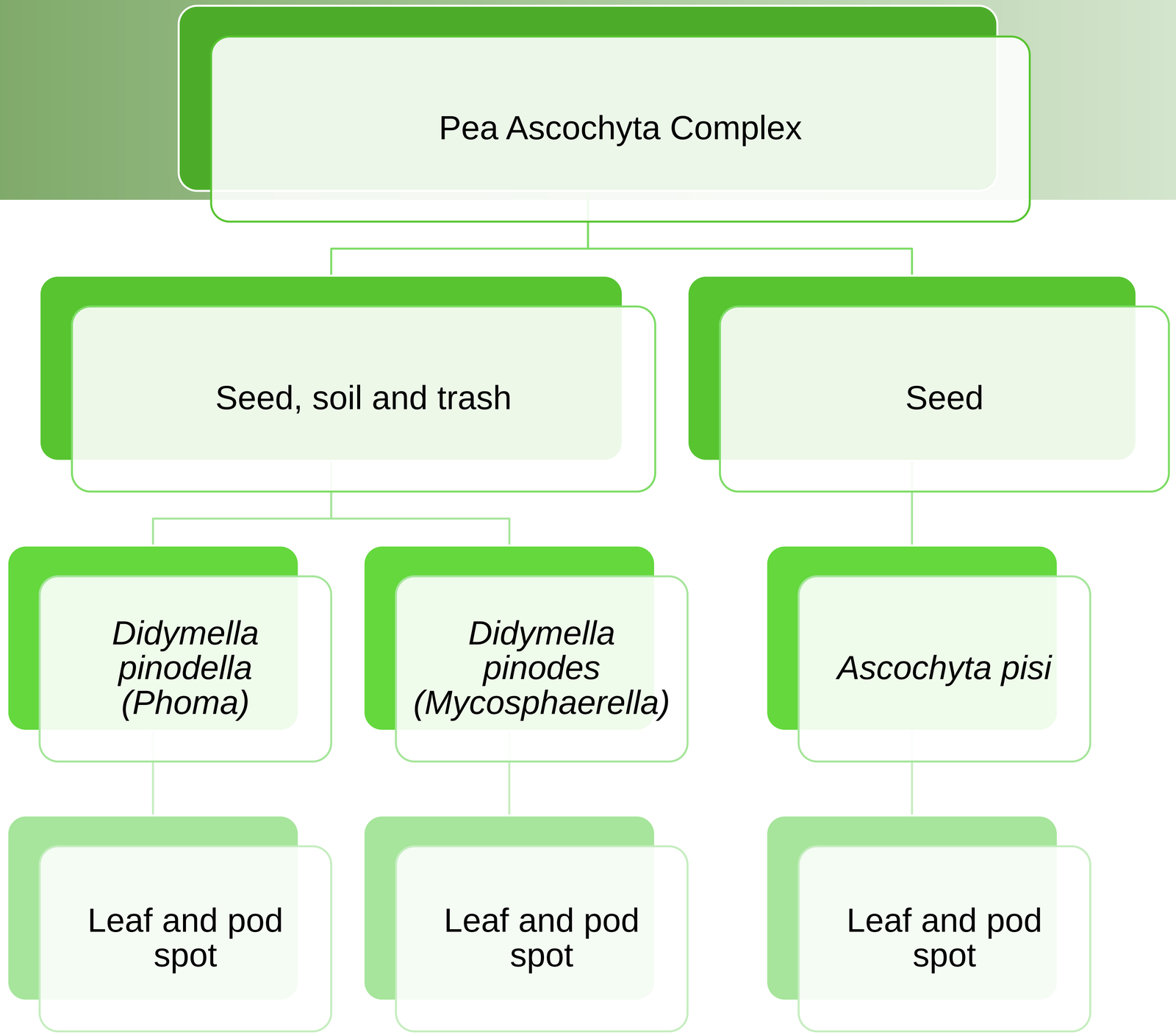
Damping off – *Pythium* spp. Prevalent in cold, wet conditions

Downy mildew – *Peronospora viciae.* Prevalent in cooler, humid, overcast conditions

Soil-borne

Ascochyta leaf and pod spot complex – prevalent in wet conditions

Seed, soil and trash-borne


Pea Ascochyta Complex
Seed, soil and trash
Seed
Didymella pinodella (Phoma)
Didymella pinodes (Mycosphaerella)
Ascochyta pisi
Leaf and pod spot
Leaf and pod spot
Leaf and pod spot

Pea Ascochyta disease complex

Seedling infection

Favoured by wet weather at pod set to pod fill

Preventative treatment is effective in changeable weather

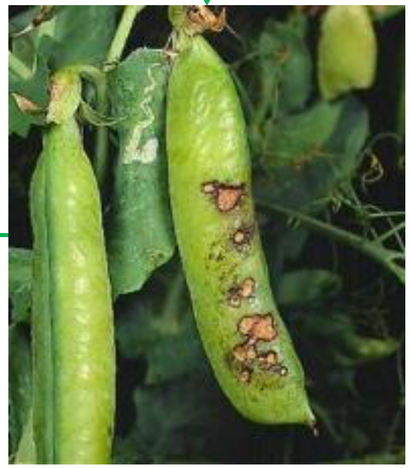
Foliar infection

Spray at first pod and repeat 14d (azoxystrobin/ metconazole/ cyprodinil + fludioxonil)

Survive in soil for many years

Seed infection

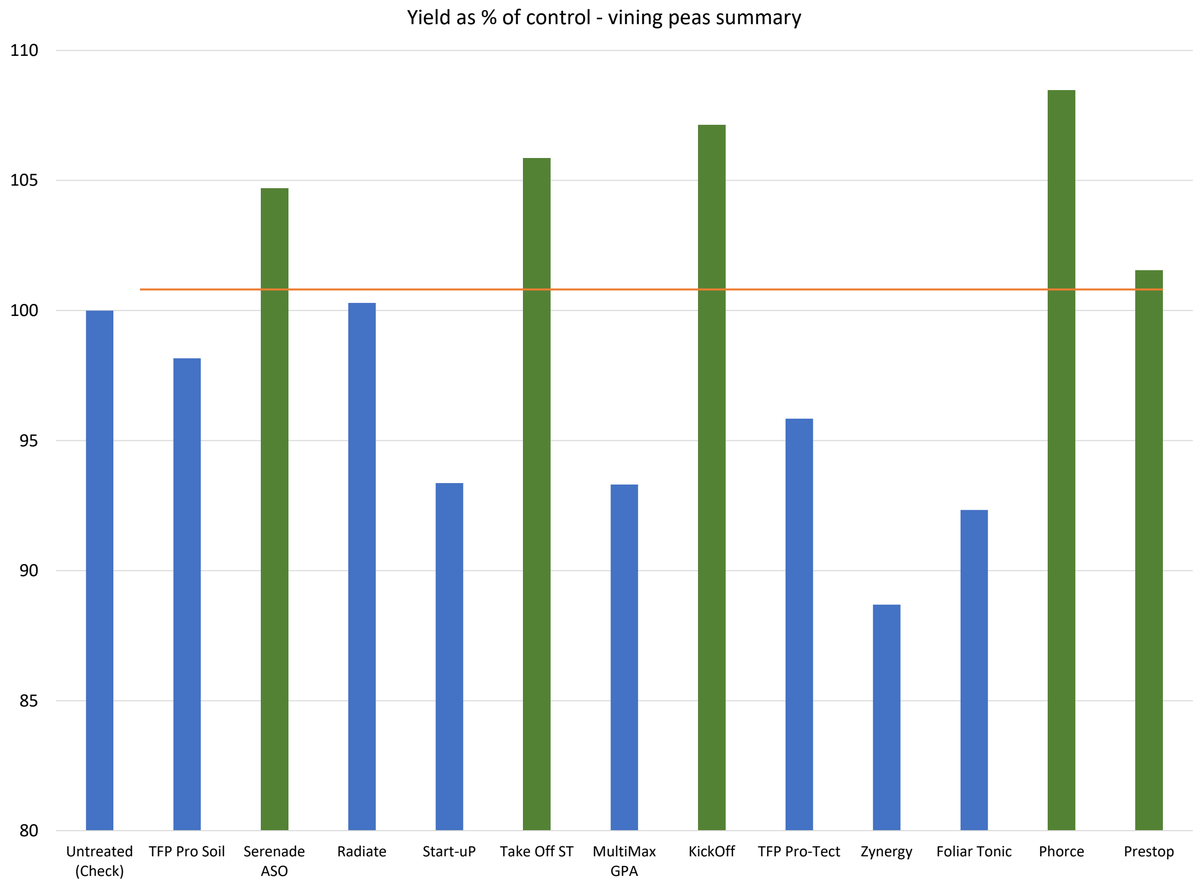
Have seed tested – no more than 5%

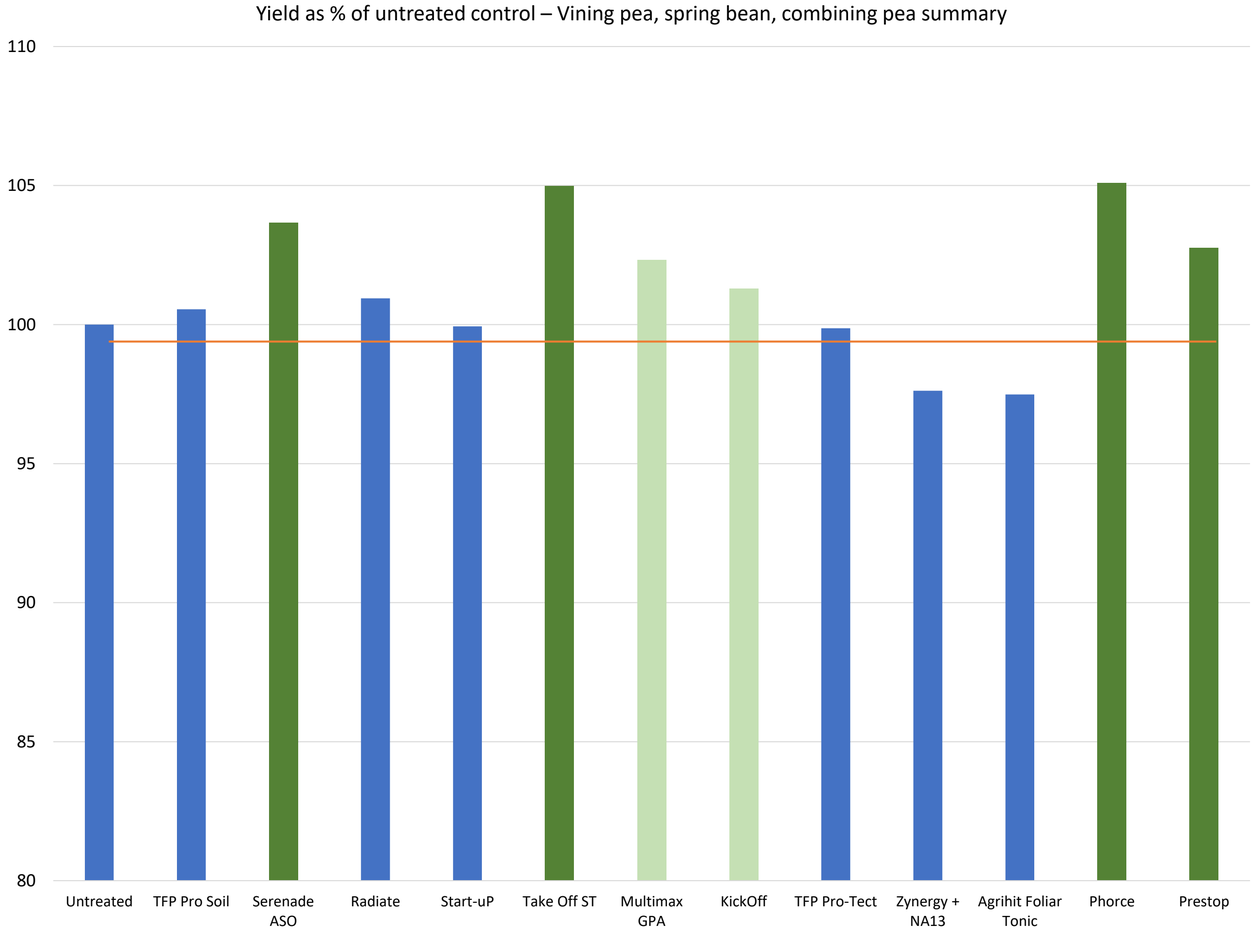


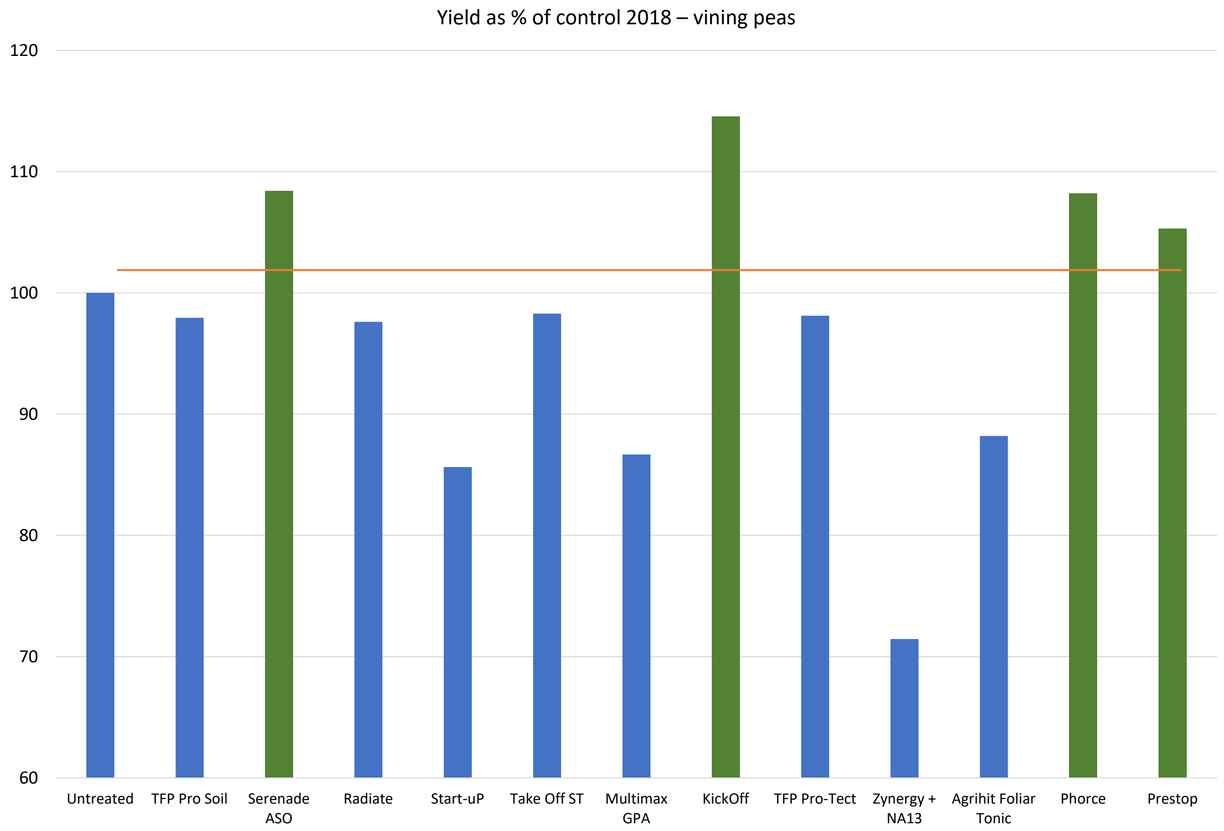
Pod infection

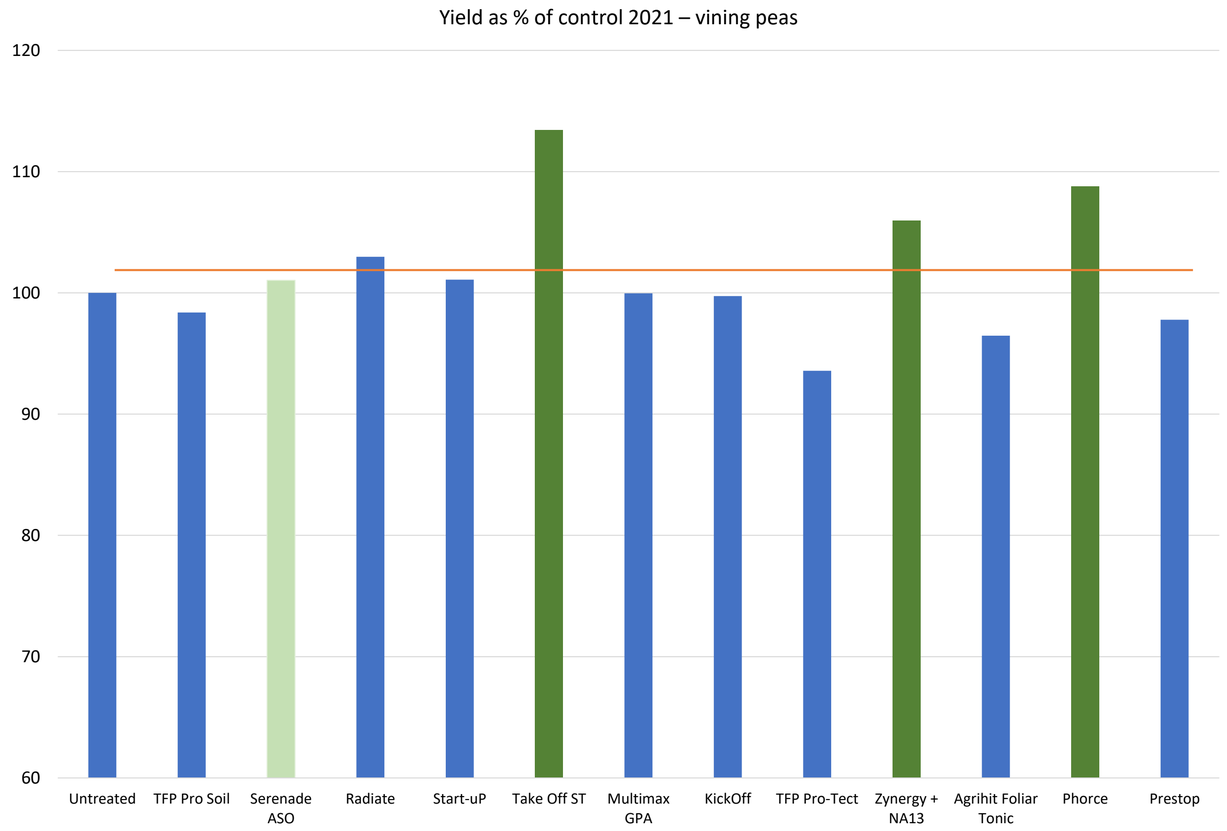
Biostimulants, biocontrol and nutrient products

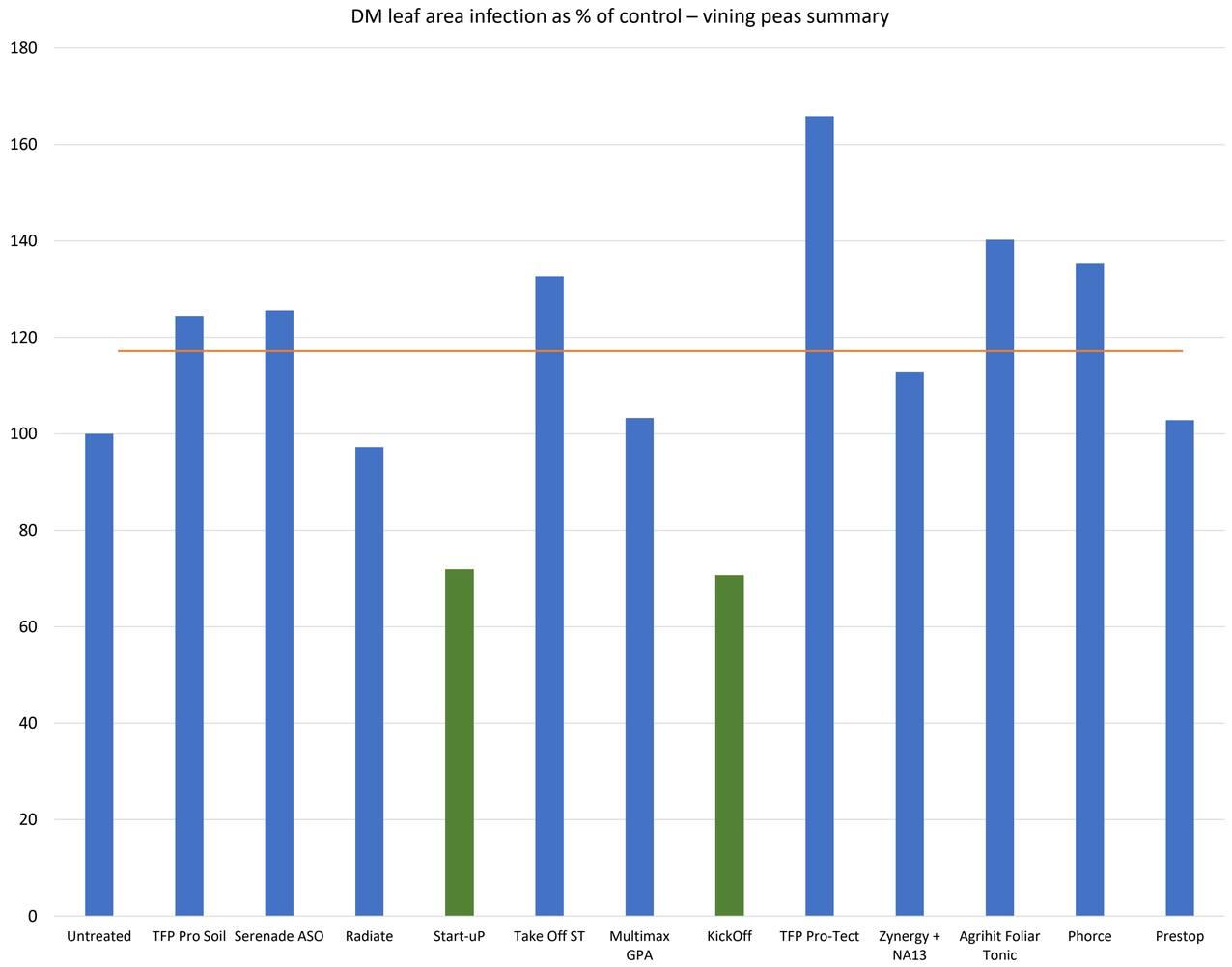
Trt	Description	Ingredients	Company	Rate(s)	Timing
1	Untreated	n/a	n/a	n/a	n/a
2	TFP Pro Soil	Plant extracts, enzymes, minerals and metabolites	Tricet UK	1 l/ha	T0 – soil
3	Serenade ASO	*Bacillus subtilis* strain QST 713	Bayer Crop Science	8 l/ha	T0 – soil
4	Radiate ST	Micronutrient blend (inc. zinc)	De Sangosse	2 l/ton	T0 – seed
5	Start-uP MAXX ST	P2O5 (phosphite)/ K2O/ SO3/ Mn + trace elements	Ilex EnviroSciences	2 l/ton	T0 – seed
6	Take Off ST	Phosphite, manganese, zinc, biostimulant PGA	Verdesian Life Sciences	1 l/ton	T0 – seed
7	Multimax GPA	Phosphite, manganese, zinc, biostimulant PGA	Verdesian Life Sciences	200 ml/ton	T0 – seed
8	KickOff ST	Phosphite, Mn, K, N, Zn, SO3, amino acids	Field Nutrition	4 l/ton	T0 – seed
9	TFP Pro-Tect	Plant extracts, enzymes, N, P, K and metabolites	Tricet UK	1 l/ha	T1 + T2 – foliar
10	Zynergy + NA13	Cu, Zn, S	Omex	1 l/ha + 0.1% vol	T1 + T2 – foliar
11	Agrihit Foliar Tonic	Plant extracts	Agrihit UK	0.67 l/ha	T1 + T2 – foliar
12	Phorce	NPK 05:38:15	Verdesian Life Sciences	1 l/ha	T1 + T2 – foliar
13	Prestop	*Gliocladium catenulatum* strain J1446	Lallemand	1.5 kg/ha	T0 – soil + T1 - foliar


Yield as % of control - vining peas summary
110
105
100
95
90
85
80
Untreated (Check)
TFP Pro Soil
Serenade ASO
Radiate
Start-uP
Take Off ST
MultiMax GPA
KickOff
TFP Pro-Tect
Zynergy
Foliar Tonic
Phorce
Prestop


Yield as % of untreated control – Vining pea, spring bean, combining pea summary
110
105
100
95
90
85
80
Untreated
TFP Pro Soil
Serenade ASO
Radiate
Start-uP
Take Off ST
Multimax GPA
KickOff
TFP Pro-Tect
Zynergy + NA13
Agrihit Foliar Tonic
Phorce
Prestop


Yield as % of control 2018 – vining peas
120
110
100
90
80
70
60
Untreated
TFP Pro Soil
Serenade ASO
Radiate
Start-uP
Take Off ST
Multimax GPA
KickOff
TFP Pro-Tect
Zynergy + NA13
Agrihit Foliar Tonic
Phorce
Prestop


Yield as % of control 2021 – vining peas
120
110
100
90
80
70
60
Untreated
TFP Pro Soil
Serenade ASO
Radiate
Start-uP
Take Off ST
Multimax GPA
KickOff
TFP Pro-Tect
Zynergy + NA13
Agrihit Foliar Tonic
Phorce
Prestop



Excel PGROViningPeaDescriptiveLists2022 - View-only

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A1

Readme

Descriptive List of Standard Size Varieties of Vining Peas, Thornhaugh/Nocton - Data Summary - 2022

Data is from at least 3 years trials, but not necessarily the same years. Yields are a percentage of the yield standard Oasis at TR100 and TR120 and are only indications of comparative yield.Small yield differences should be treated with caution.

Additional data

Variety	Leaf type	No. trial	Breeder (UK Source)	TSW g	@TR 100 Maturity to Avola ±days	@TR 100 Yield % of Oasis	@TR 100 % in size grade L	M	S	VS	@TR120 Yield % of Oasis	Haulm length cm	Downy mildew	Powdery mildew	Site	Sort	@TR120 % in Size grade L	M	S	VS	Year last Trialled
Eldorado	C	4	Syn	223	-1	53	24	47	24	5	52	58	MFR[HR]	S	NN	1	36	51	11	2	2020
Beverly	C	3	vW (DT)	198	-1	54	26	51	20	3	58	52	MFR	[S]	NN	2	38	46	14	2	2016
Pizarro	SL	6	SVS	223	-1	55	31	45	20	4	55	54	SS[IR]	S	NN	3	49	40	9	2	2012
Salinero	C	5	SVS	199	0	55	34	43	18	5	55	50	SS[IR]	S	NN	4	50	38	10	2	2012
Avola	C	46	SVS(GA)	221	0	57	44	42	12	2	59	58	MS	[S]	NN	5	59	34	6	1	2021
Bonfire	SL	3	vW (DT)	176	0	61	15	52	29	4	66	49	MFR[IR]	[S]	NN	6	25	64	10	1	2020
Tomahawk	SL	3	CS (EI)	213	0	65	21	57	19	3	71	46	SS	[R]	NN	7	35	52	11	2	2015
Aloha	C	3	vW (DT)	219	0	68	33	50	14	3	69	49	MFR[IR]	[S]	NN	8	44	46	9	1	2015
Twinkle	C	6	LUK	228	0	80	34	50	13	3	82	48	S	[S]	NN	9	46	46	7	1	2006
Sherwood	C	12	SVS	194	+1	58	25	49	22	4	62	52	SS[IR]	S	NN	10	35	50	13	2	2021
Kiss	C	3	vW (DT)	195	+1	63	30	52	15	3	69	62	MFR[IR]	[S]	NN	11	39	53	7	1	2015
Span	C	5	CS (EI)	191	+1	65	36	46	15	3	66	43	(SS)	[S]	NN	12	48	41	10	1	2010
Anubis	C	6	LUK	224	+1	72	28	46	21	5	75	51	SS	R	NN	13	40	46	12	2	2012
Hesbana	SL	6	Nun	187	+2	49	11	50	33	6	51	56	-	R	NN	14	24	62	13	1	2012
Ambler	SL	3	CS (EI)	213	+2	73	37	51	11	1	76	50	SS	-	NN	15	55	39	5	1	2019
Cargo	C	3	vW (DT)	199	+3	72	23	54	20	3	74	51	MFR[IR]	[S]	NN	16	28	56	14	2	2016
DGL0027	SL	3	Syn	197	+4	62	34	54	10	2	59	50	(MFR)[IR]	-	NN	17	41	51	7	1	2019
Saltingo	SL	4	Syn	197	+4	69	29	51	17	3	70	56	MFR[HR]	[IR]	NN	18	36	52	11	1	2020
Idalgo	SL	3	Syn	201	+4	72	29	52	17	2	74	50	GFR[HR]	[IR]	NN	19	37	53	9	1	2017
Romance	SL	6	SVS	175	+4	73	24	50	22	4	73	51	GFR[IR]	S	NN	20	33	53	12	2	2012
LG Element	SL	3	LUK	198	+4	74	21	44	28	7	79	45	(MS)	[R]	NN	21	26	49	21	4	2016

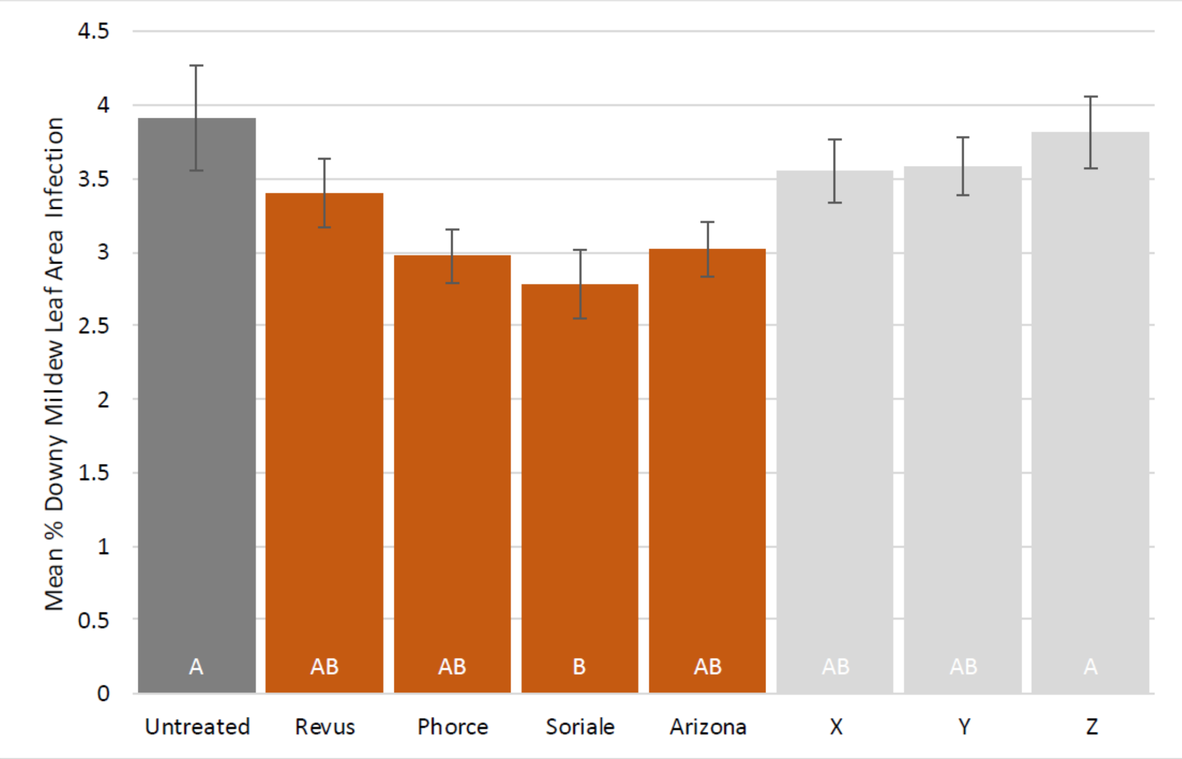
- Varietal tolerance
- Ratings for VP's are in PGRO Descriptive Lists www.pgro.org
- Rotational management

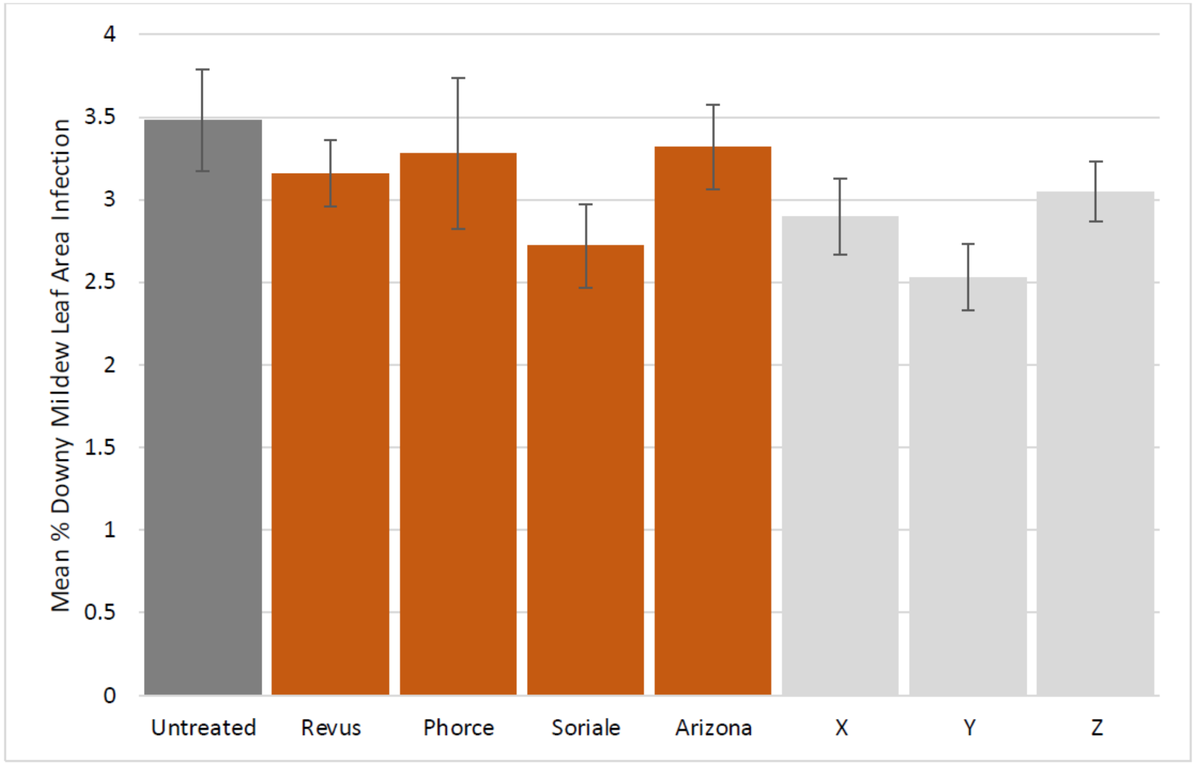
Downy mildew control 2021

Treatment	AI	Rate	AI rate	Timing
1. Untreated	-	-	-	-
2. Revus	Mandipropamid	0.6 l/ha	150 g/ha	T1 + T2
3. Phorce	N: P2O5: K2O	1 l/ha	0.05 + 0.38 + 0.15 g/ha	T1 + T2

T1 = early flower, T2 = full flower/ 1st pod
Soriale currently approved in apples and pears
Arizona currently approved in cereals

Downy mildew control 2021





Assessment 1 – 23rd June 2021

Assessment 2 – 5th July 2021

Powdery mildew

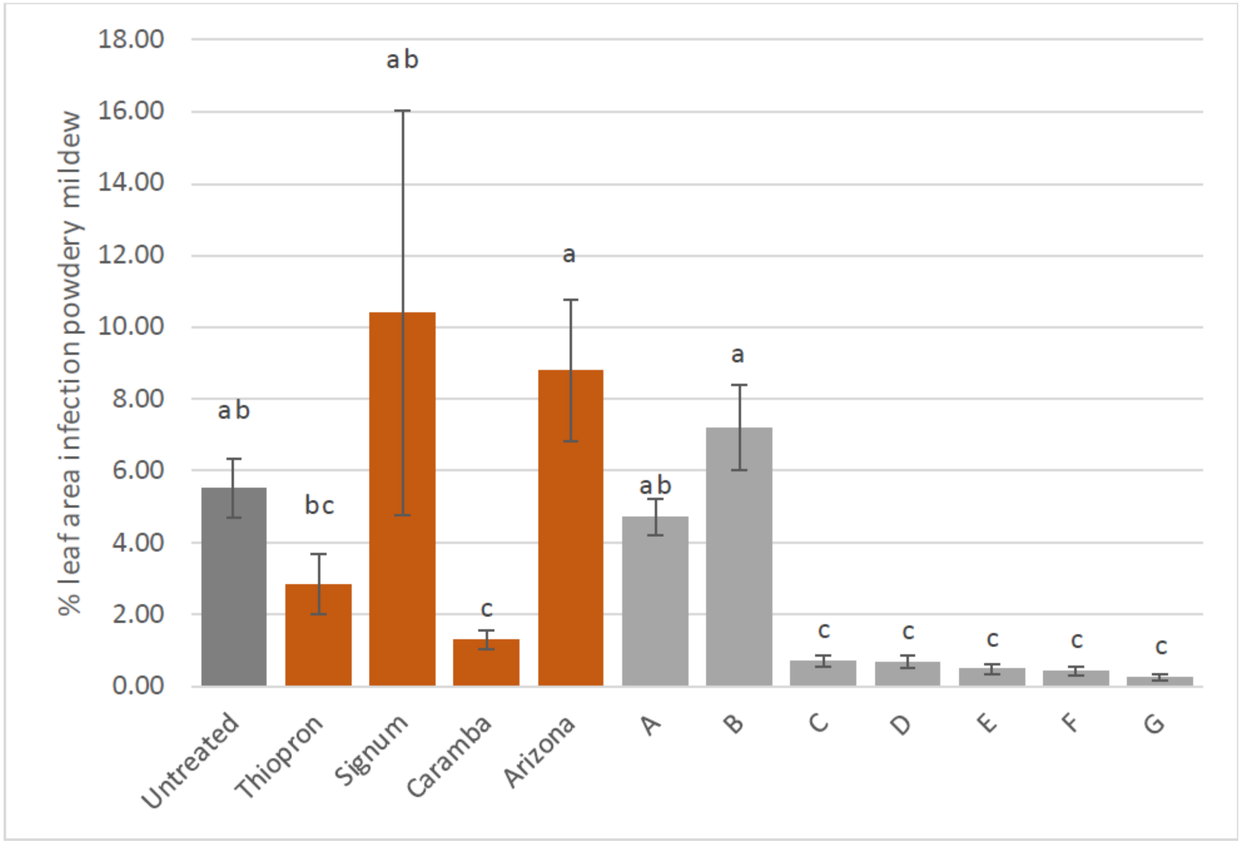
- Reduces yield in later sown crops
- Delays maturity
- Can cause harvest difficulty due to dust, and can lead to increased requirement for cleaning
- May taint the produce as it has an unpleasant smell

Powdery mildew management

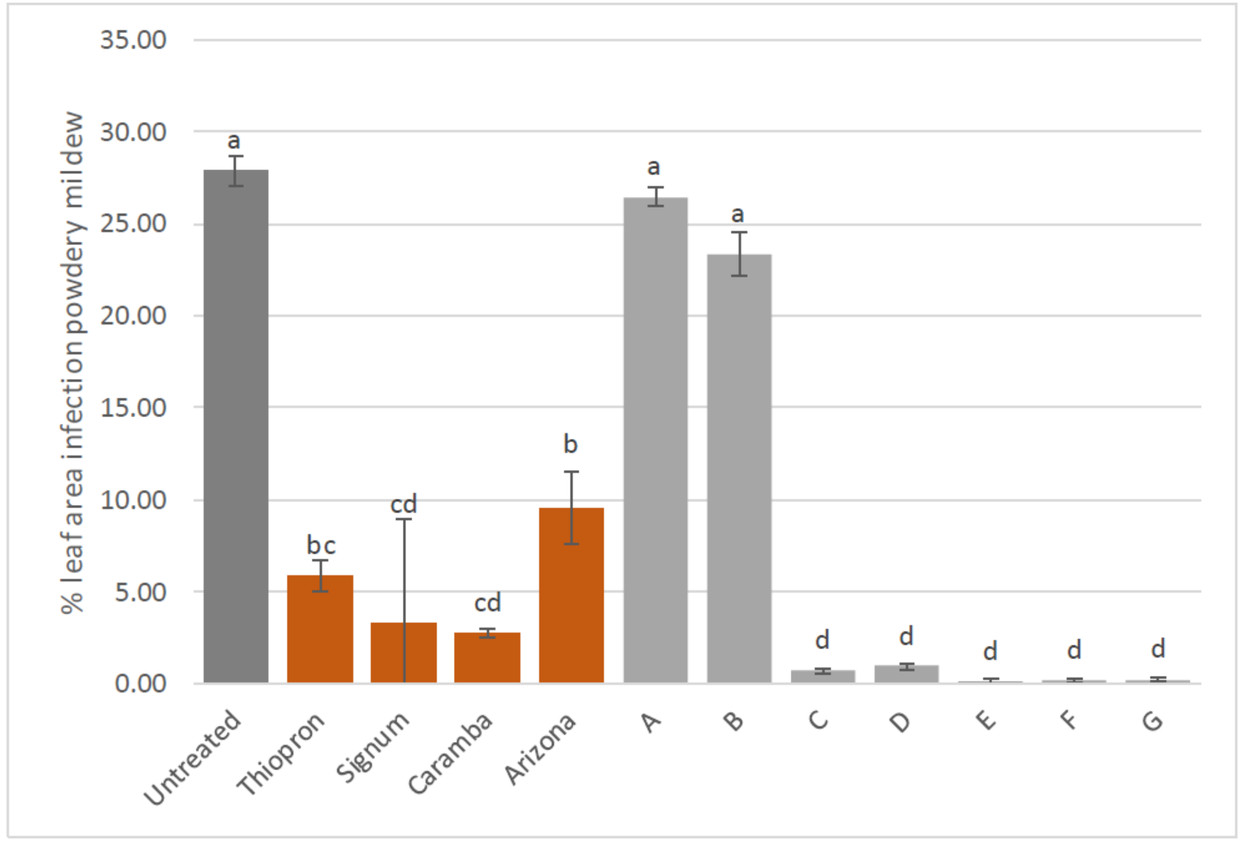
Treatment	AI	Rate	AI rate	Timing
1. Untreated	-	-	-	-
2. Thiopron	Sulphur	6 l/ha	4950 g/ha	T1 + T2
3. Signum	Boscalid + pyraclostrobin	1 kg/ha	267 + 67 g/ha	T1 + T2
4. Caramba 90	Metconazole	0.8 l/ha	72 g/ha	T1 + T2
5. Arizona	Folpet	1.5 l/ha	750 g/ha	T1 + T2
6. Undisclosed (A)				T1
7. Undisclosed (B)				T1
8. Undisclosed (C)				T1 + T2
9. Undisclosed (D)				T1 + T2
10. Undisclosed (E)				T1 + T2
11. Undisclosed (F)				T1 + T2
12. Undisclosed (G)				T1 + T2

T1 = peas fully formed, T2 = 10% pods ripe; Thiopron: Changes proposed to mitigate for skin sensitisation may lead to requirement for water use rate of 975 l/ha at full rate – we're waiting for further information

Powdery mildew control

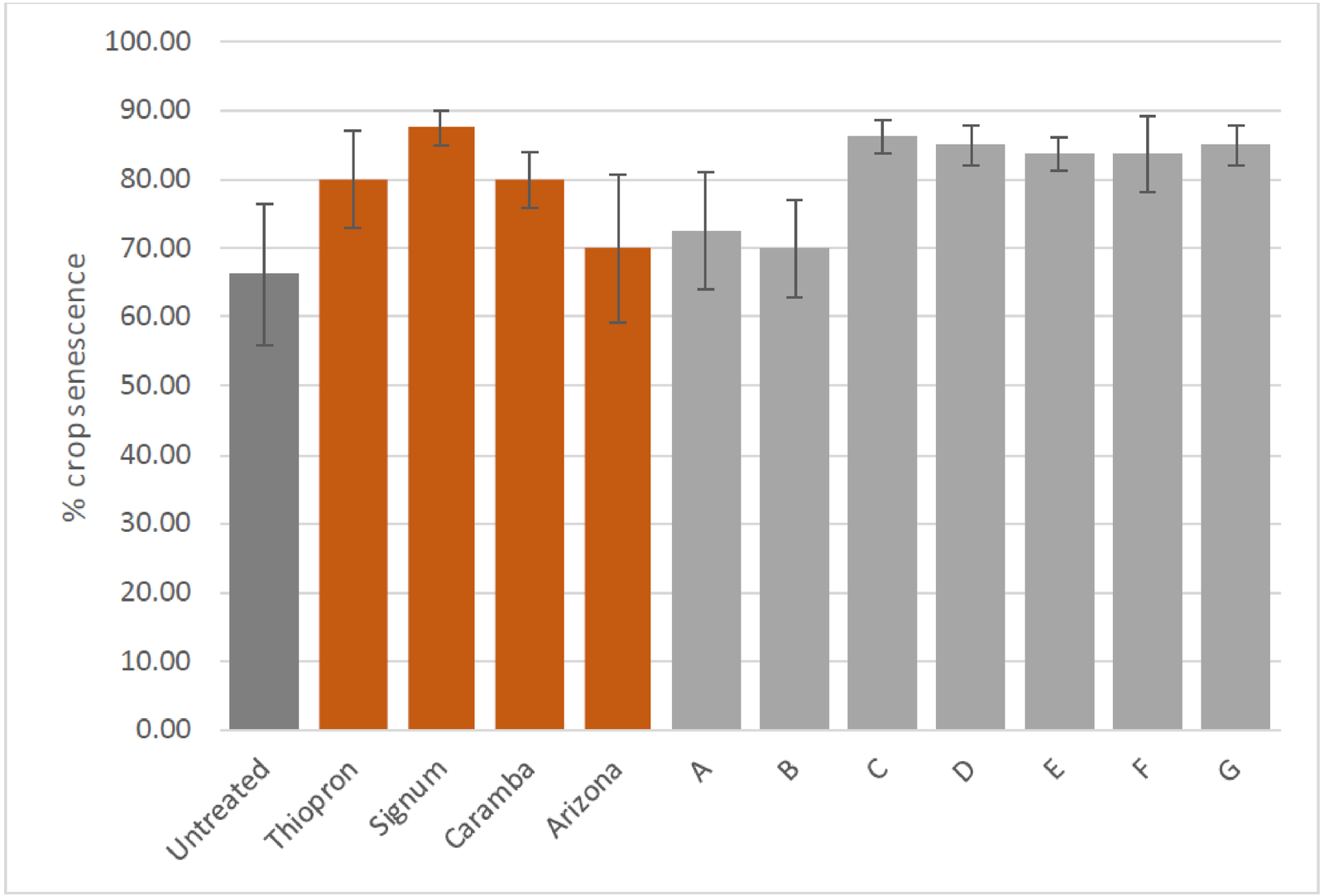


Assessment 1 – 26th July 2021



Assessment 2 – 2nd August 2021

Crop senescence



Powdery mildew

- Some resistant varieties of vining peas are available on the PGRO Descriptive List
- Protectant sulphur spray
- If Signum or Caramba have been applied for control of Botrytis, powdery mildew risk is significantly lower

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Vining pea insecticide actives 2022

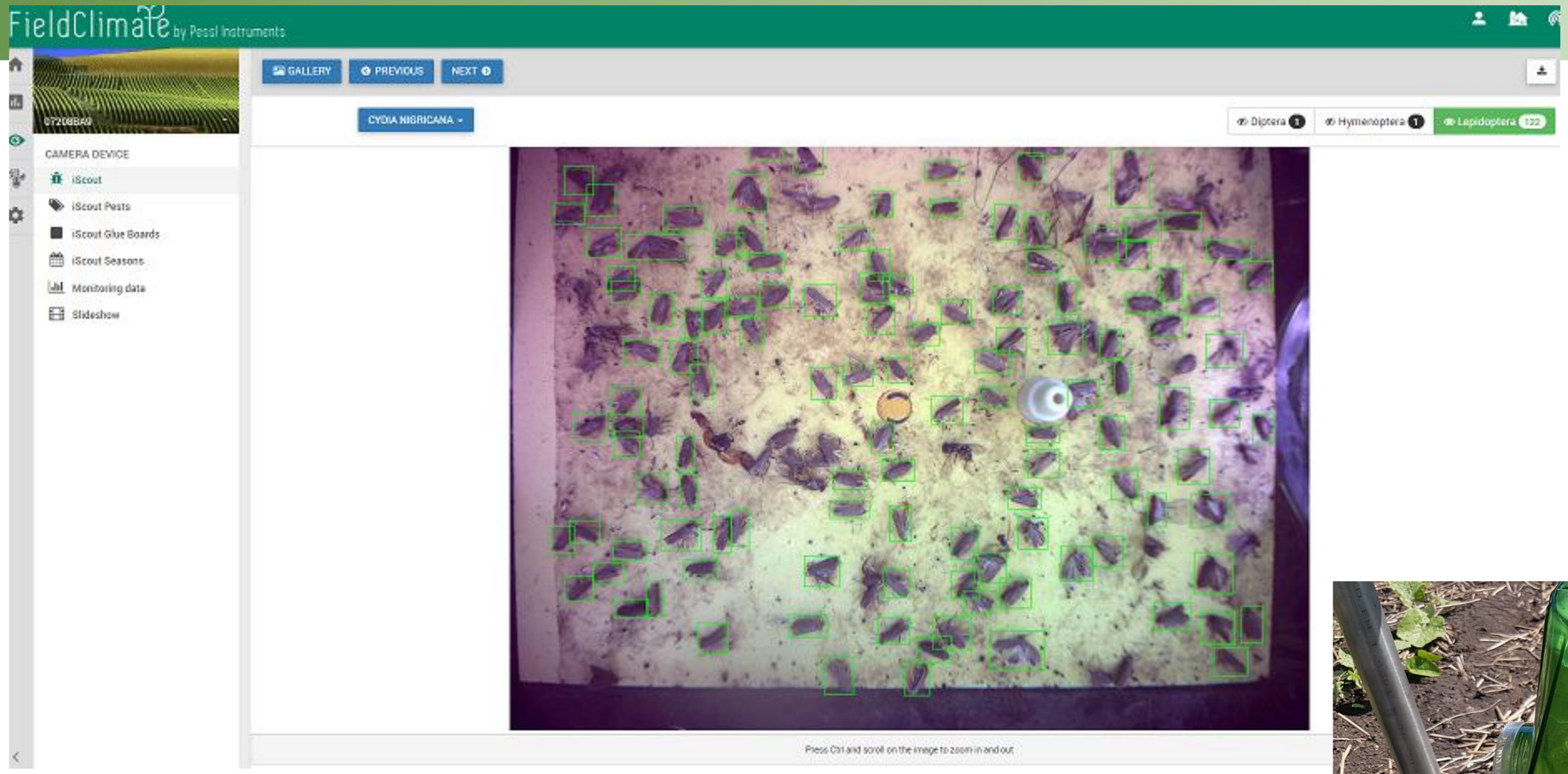
Crop protection

- Alpha-cypermethrin (not during flowering; 1 day HI)
- Cyantraniliprole (not before or during flowering; 3 day HI)
- Cypermethrin (not during flowering; 7 day HI)
- Deltamethrin (7 day HI)
- Esfenvalerate (7 day HI)
- Lambda-cyhalothrin (0-25 day HI)

- Pirimicarb (7 day HI; 1 application only)
- Flonicamid (not during flowering; 14 day HI; 1 application only)

- Threshold in vining peas is when first moths are recorded in traps – tolerance for damage is low
- Go to www.pgro.org to check predicted spray dates for your area
- Spray when the PGRO model predicts based on your threshold date (usually 10-20 days after threshold) if the crop is flowering or has set pods
- May need a second application 10-14 days later

Automatic camera trap



David Whatoff at Metos

Aphids in peas

- Large colonies cause significant feeding damage in peas and beans
- The presence of honeydew leads to the development of disease infections
- Aphids are virus vectors

Key aphid species in peas

- ***<u>Pea aphid (Acyrthosiphon pisum)</u>***
- Moderate host range including peas, field beans, broad beans, vetch, clover and lucerne
- Considered one of the 14 aphid species of most agricultural importance in the world
- Each adult female produces up to 12 nymphs per day – each nymph develops to adulthood in 7-10 days
- Is a vector for more than 30 viruses worldwide
- Overwinters as eggs or adults on wild legumes

Key aphid species in peas

- ***<u>Peach potato aphid (Myzus persicae)</u>***
- Highly polyphagous (potatoes, sugar beet, brassicas, lettuce and legumes); winter hosts are mainly *Prunus* spp. (eggs) and other crops and herbaceous plants (mobile stages)
- Has been shown to transmit over 100 viruses in about 30 different plant families
- Moves from plant to plant when crowded and doesn’t form dense colonies in peas
- Widespread resistance to carbamates (pirimicarb) in the UK

Viruses present in peas in the UK

- ***Seed-borne***

✓ Pea Seed-borne Mosaic Virus (PSbMV) – seed source, non-persistent and transmitted by pea aphid, black bean aphid, cereal aphids and peach potato aphid

✓ Pea Early Browning Virus (PEBV) – semi-persistent and transmitted by seed and stubby root nematodes – cannot survive in the absence of nematodes

- ***Aphid-borne***

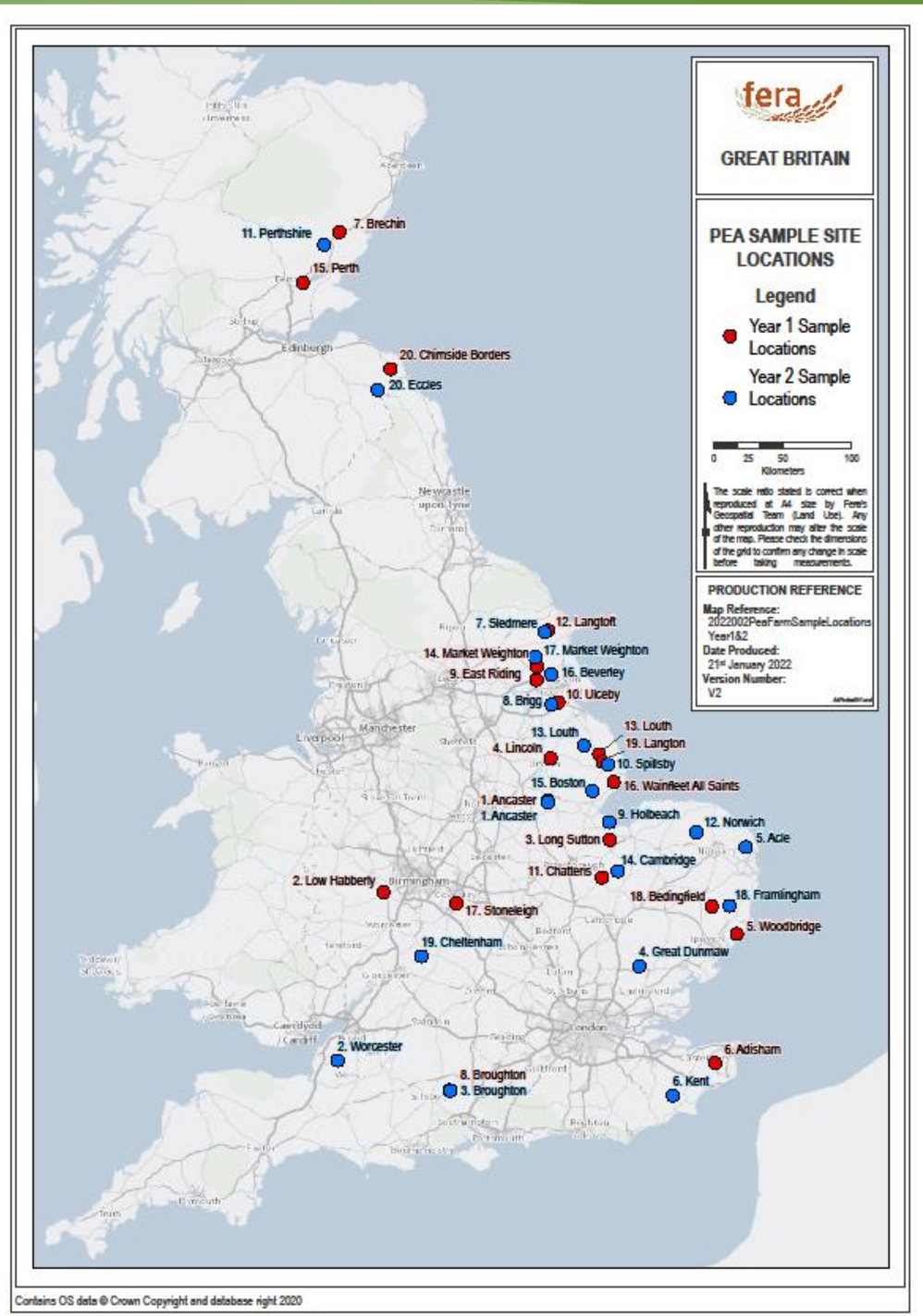
✓ Pea Enation Mosaic Virus (PEMV) – persistent – pea aphid, potato aphid and peach potato aphid

✓ Turnip Yellows Virus (TuYV) – persistent – peach-potato aphid, wheat aphids

✓ Pea Streak Virus (PeSV) – non-persistent – pea aphid

Surveillance of virus diseases in UK Pea Crops

- Surveillance of virus diseases in UK Pea Crops
- First thorough survey for over 40 years
- 20 sites in each year (2019 and 2021) distributed across the UK Sampled using a grid, leaving an untreated area at 5 sites for comparison of yield versus standard grower treatment



Map source: Lee Butler – Land Usage, Fera Science Ltd.

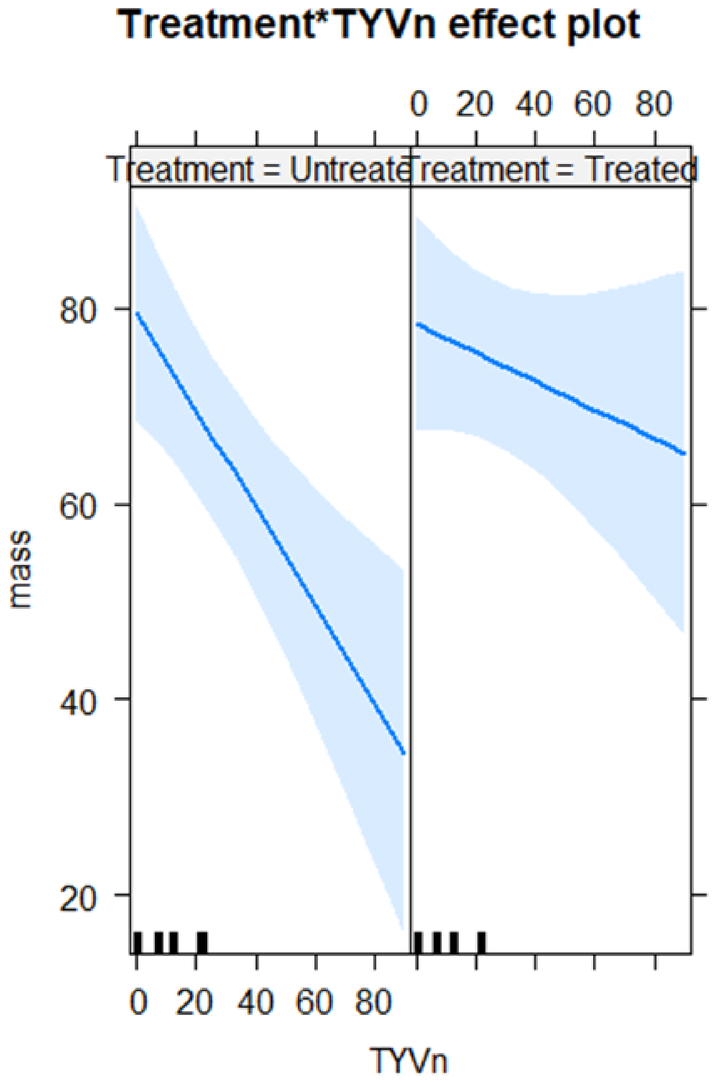
Surveillance of virus diseases in UK Pea Crops

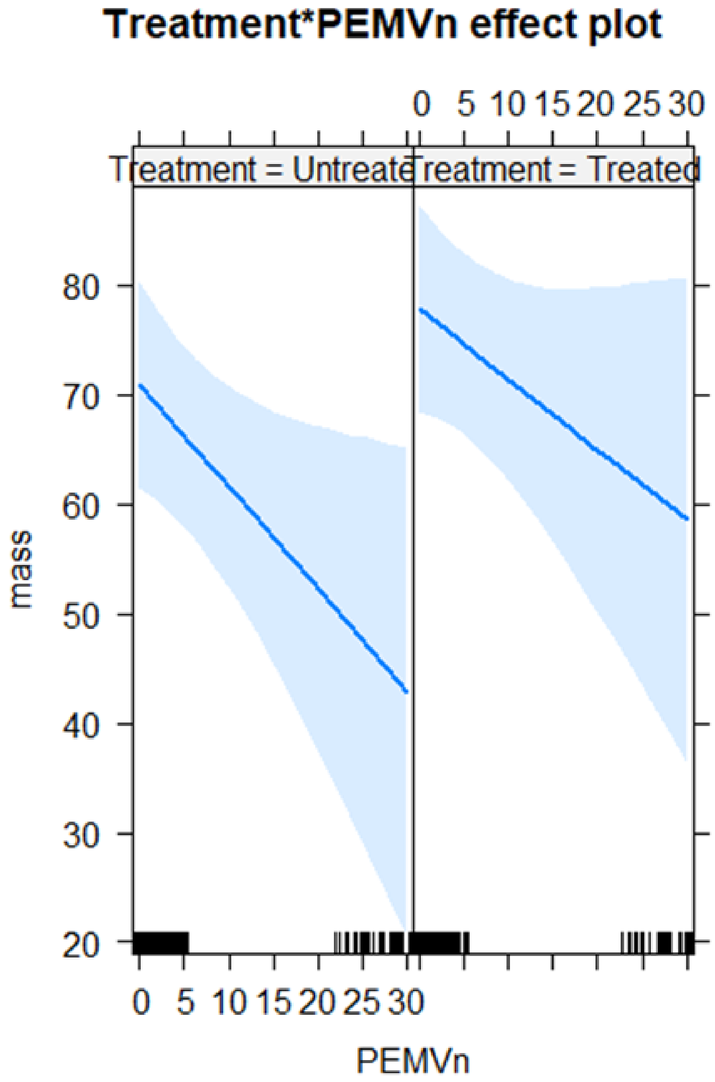
- Using high throughput sequencing to identify candidate viruses, followed by RT-PCR to quantify
- Most common viruses are turnip yellows virus (TuYV) and pea enation mosaic virus, with pea seed-borne mosaic virus at fewer sites
- TuYV has been present in the UK but not identified, pea necrotic yellow dwarf virus and soybean dwarf virus are new viruses, previously not present
- Aim to improve our understanding and advice to growers regarding management and possible vectors

Project management, HTS and RTPCR:
Adrian Fox and Aimee Fowkes,
Virology, Fera Science Ltd.

Effect of aphicide on yield 2019

- Preliminary results from 2019 indicate significant yield effect of viruses in peas
- For TuYV this was mitigated by treatment
- For PEMV treatment was less effective

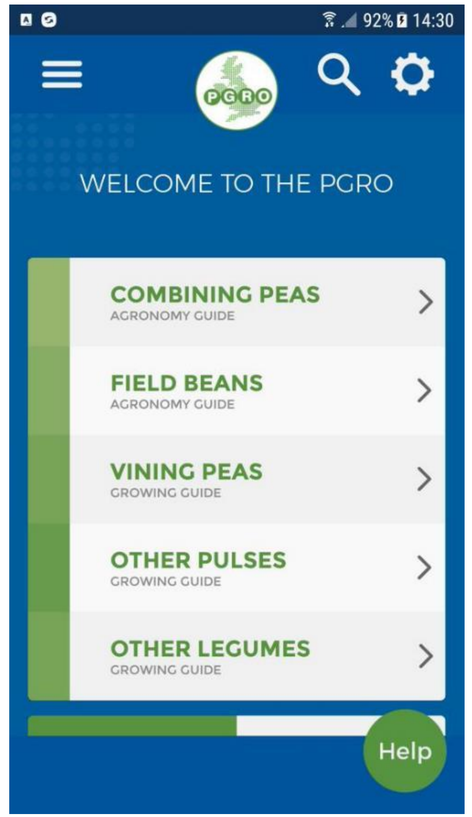




Statistic analysis courtesy of FERA Science Ltd.

Thank you for listening

- PGRO website for technical information and pesticide lists www.pgro.org
- PGRO App – Agronomy Guide – go to Google and Apple stores and search pea and bean agronomy
- becky@pgro.org
- 01780 781351/ 07972 665604



HMC

Simon Ward

CARBON BENCHMARKING PROJECT

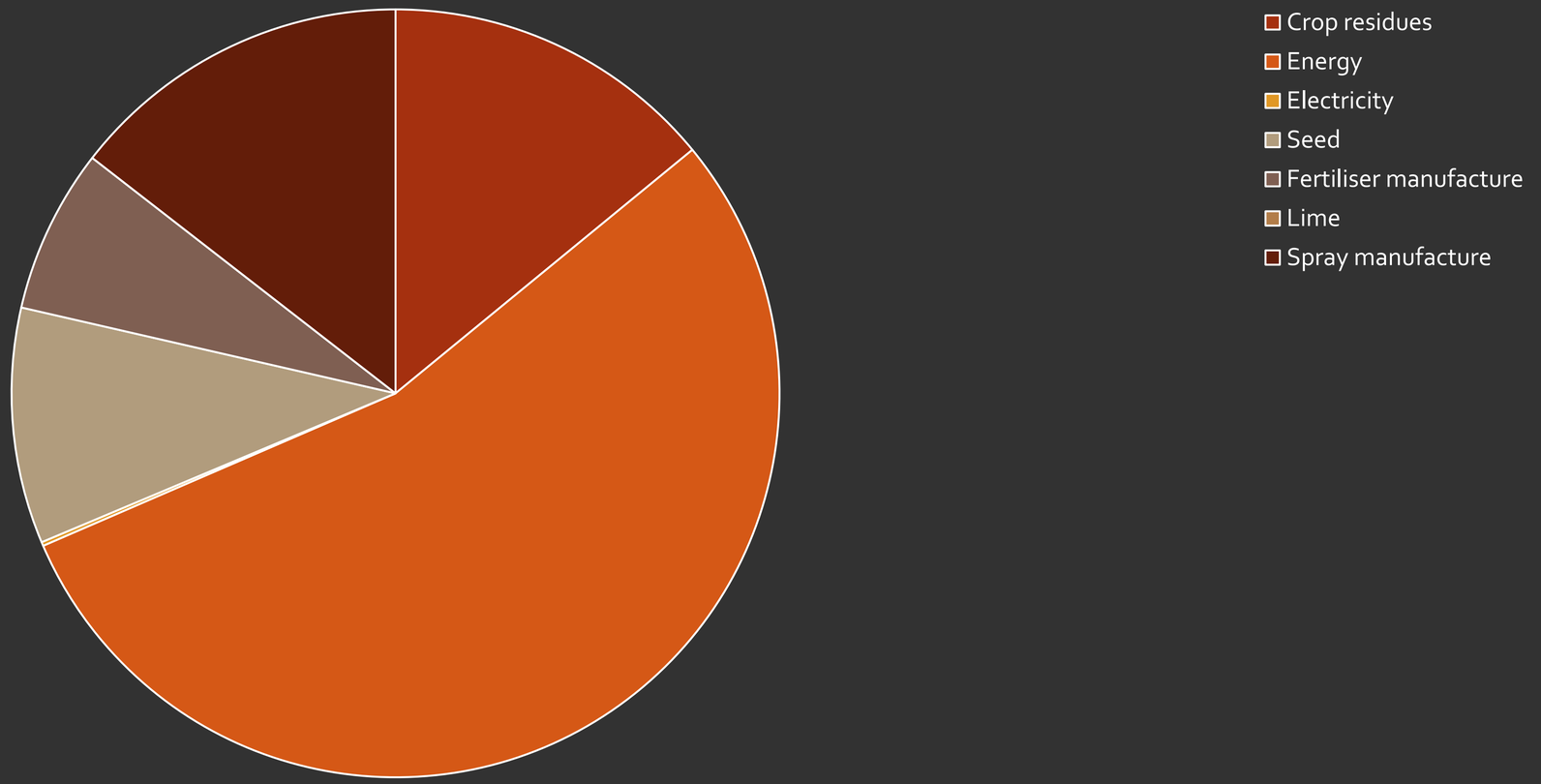
SIMON.WARD@INCREMENT.CO.UK

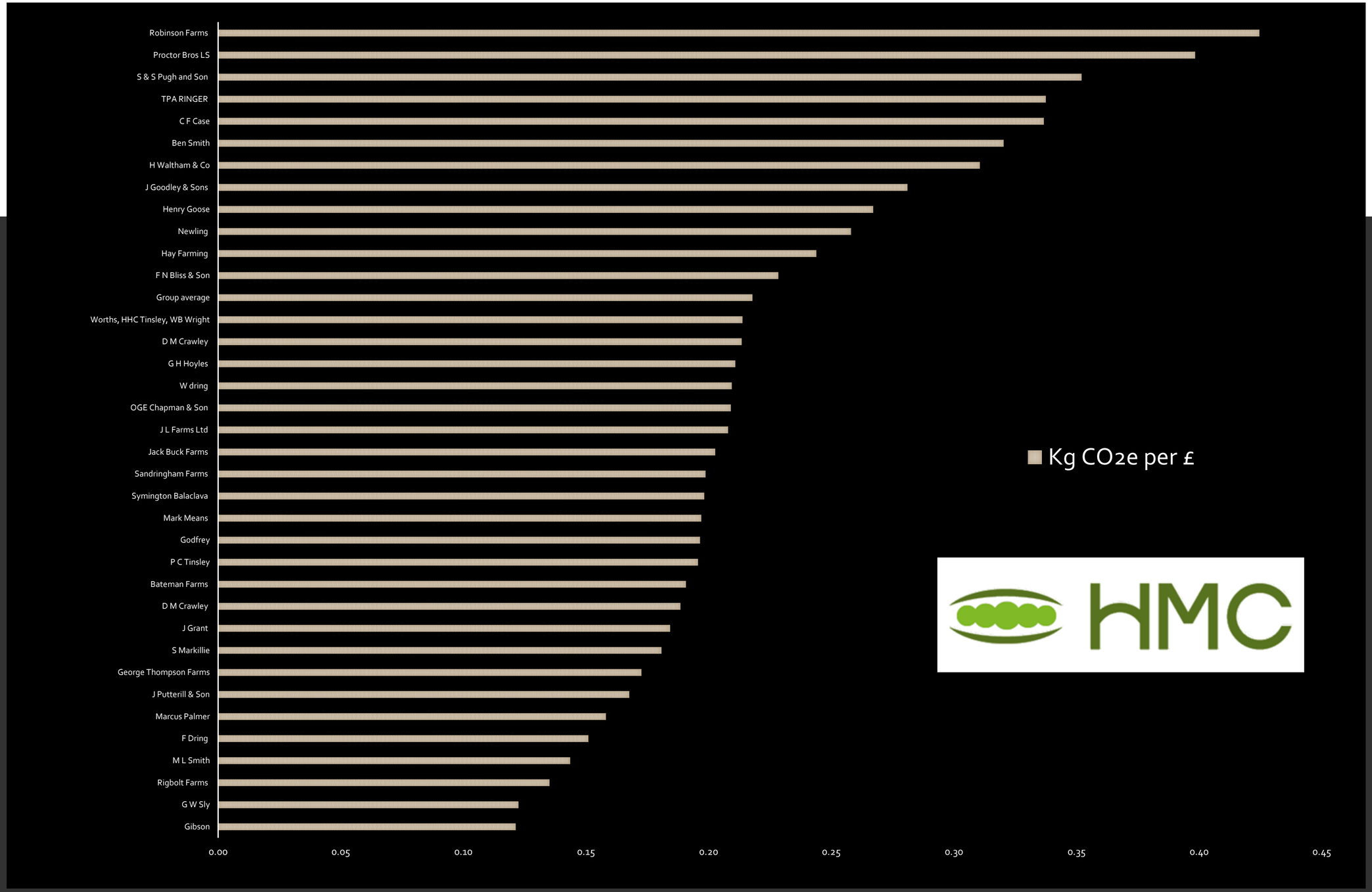
FARMER REPORT

	Early Peas	Petit Pois	Main crop	Carbon Equivalents (Enterprise)	Kg CO_{2e} per Ha	Kg CO_{2e} per tonne	Kg CO_{2e} per £
Scope 1 emissions							
Crop residues	0	24,049	4,472	28,521	116	21	0.05
Energy (fuel)	0	90,850	22,915	113,765	462	85	0.19
	0	114,900	27,387	142,286	578	106	0.24
Scope 2 emissions							
Electricity	0	225	55	280	1	0	0.00
	0	225	55	280	1	0	0.00
Scope 3 emissions							
Seed	0	9,329	2,300	11,629	47	9	0.02
Fertiliser manufacture	0	0	0	0	0	0	0.00
Lime	0	0	0	0	0	0	0.00
Spray manufacture	0	12,860	2,700	15,560	63	12	0.03
	0	22,189	5,000	27,189	110	20	0.05
Scope 3 credit							
Nitrogen manufacture saving	0	-34,832	-8,588	-43,420	-176	-32	-0.07
	0	-34,832	-8,588	-43,420	-176	-32	-0.07
Total Carbon Equivalent (kg)	0	102,481	23,854	126,336	513	94	0.21

GROUP REPORTS

Early Peas




Robinson Farms
Proctor Bros LS
S & S Pugh and Son
TPA RINGER
C F Case
Ben Smith
H Waltham & Co
J Goodley & Sons
Henry Goose
Newling
Hay Farming
F N Bliss & Son
Group average
Worths, HHC Tinsley, WB Wright
D M Crawley
G H Hoyles
W dring
OGE Chapman & Son
J L Farms Ltd
Jack Buck Farms
Sandringham Farms
Symington Balaclava
Mark Means
Godfrey
P C Tinsley
Bateman Farms
D M Crawley
J Grant
S Markillie
George Thompson Farms
J Putterill & Son
Marcus Palmer
F Dring
M L Smith
Rigbolt Farms
G W Sly
Gibson
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
Kg CO2e per £
HMC

COLOUR CODING

Farm name	Farm no.	Kg CO_{2e} per Ha	Kg CO_{2e} per tonne	Kg CO_{2e} per £
Gibson	22	516	55	0.12
G W Sly	3	488	55	0.12
Rigbolt Farms	23	463	57	0.14
M L Smith	30	573	65	0.14
F Dring	8	466	68	0.15
Marcus Palmer	9	401	71	0.16
J Putterill & Son	27	494	66	0.17
George Thompson Farms	29	551	71	0.17
S Markillie	10	516	72	0.18
J Grant	19	454	83	0.18
D M Crawley	14	496	85	0.19
Bateman Farms	31	439	86	0.19
P C Tinsley	6	487	88	0.20
Godfrey	26	513	75	0.20
Mark Means	32	603	75	0.20
Symington Balaclava	11	590	76	0.20
Sandringham Farms	24	436	76	0.20
Jack Buck Farms	5	494	91	0.20
J L Farms Ltd	33	434	94	0.21
OGE Chapman & Son	20	474	93	0.21
W dring	25	471	85	0.21
G H Hoyles	16	504	81	0.21
D M Crawley	38	561	96	0.21
Worths, HHC Tinsley, WB Wright	12	513	94	0.21
Group average	52	523	90	0.22

Next?

- SIMON.WARD@INCREMENT.CO.UK
- 01954 252859

AOB and Close

Thank You

- BASIS points available – put your basis number, name and postcode in comments
- PDF will be available of presentation on website
- Have a great season!