HMC

TECHNICAL MEETING 2023

Agenda

- **Allen Giles**– Welcome & Introductions, Contract Update
- **PGRO – Dr Becky Howard** - Virus Diagnostics in Vining Peas / P & K in Vining Peas / Chemical updates / Variety Trial updates
- **Vaderstad – Nick Tinker** – Developing Innovative Drills
- **BREAK** – 10 mins
- **ADAS - Dr Lizzie Sagoo** – INNOVEG Final recommendations and guidance / PEASAT Project aims and updates / Soil Health / Anglia water cover crop work after vining peas / Pea YEN
- **HMC - Jack Harris / Allen Giles** - Seed rate trials
- **Greenyard Frozen– Stuart Ashton / Jasmine Collins –** Pea Harvest from a Greenyard Perspective / Market Update / Red Tractor
- **Allen Giles** – Back to Basics / Pigeon Damage Costs / Close

HMC

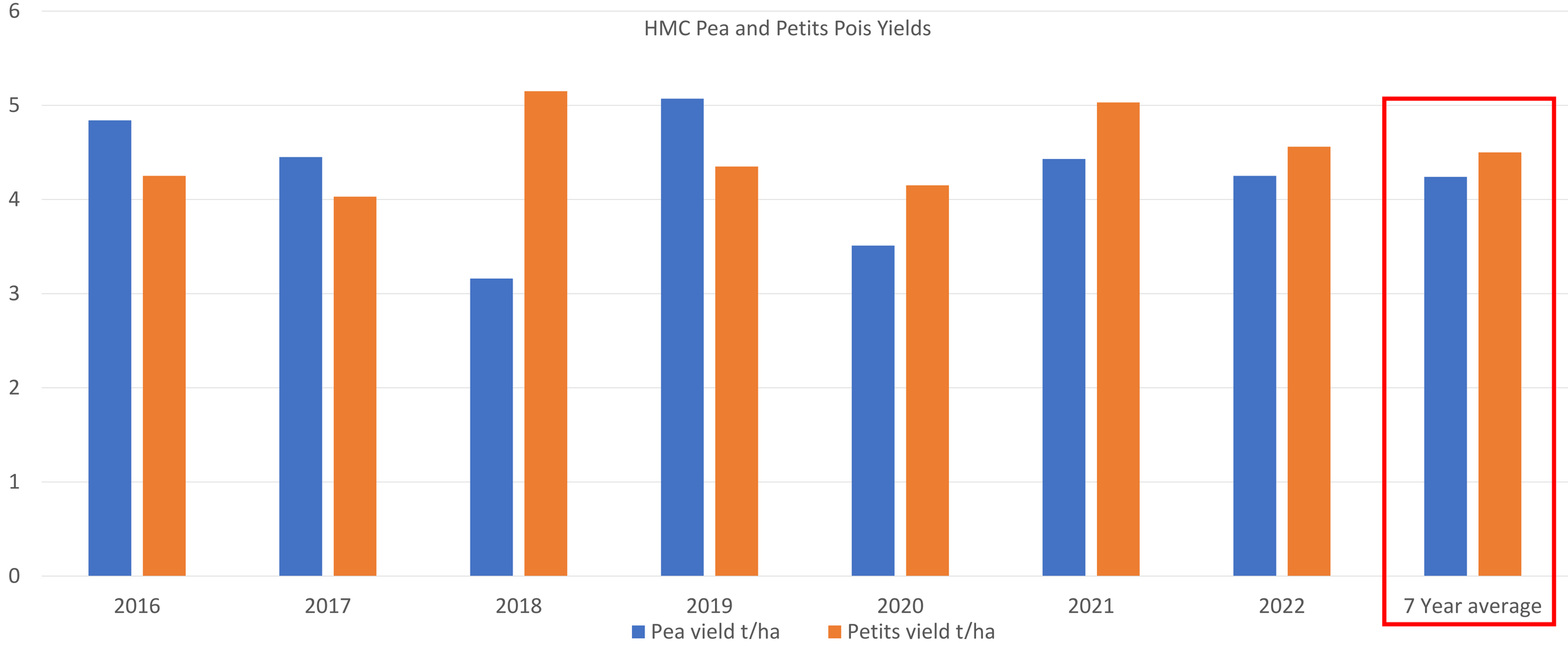
Allen Giles

2022 Recap

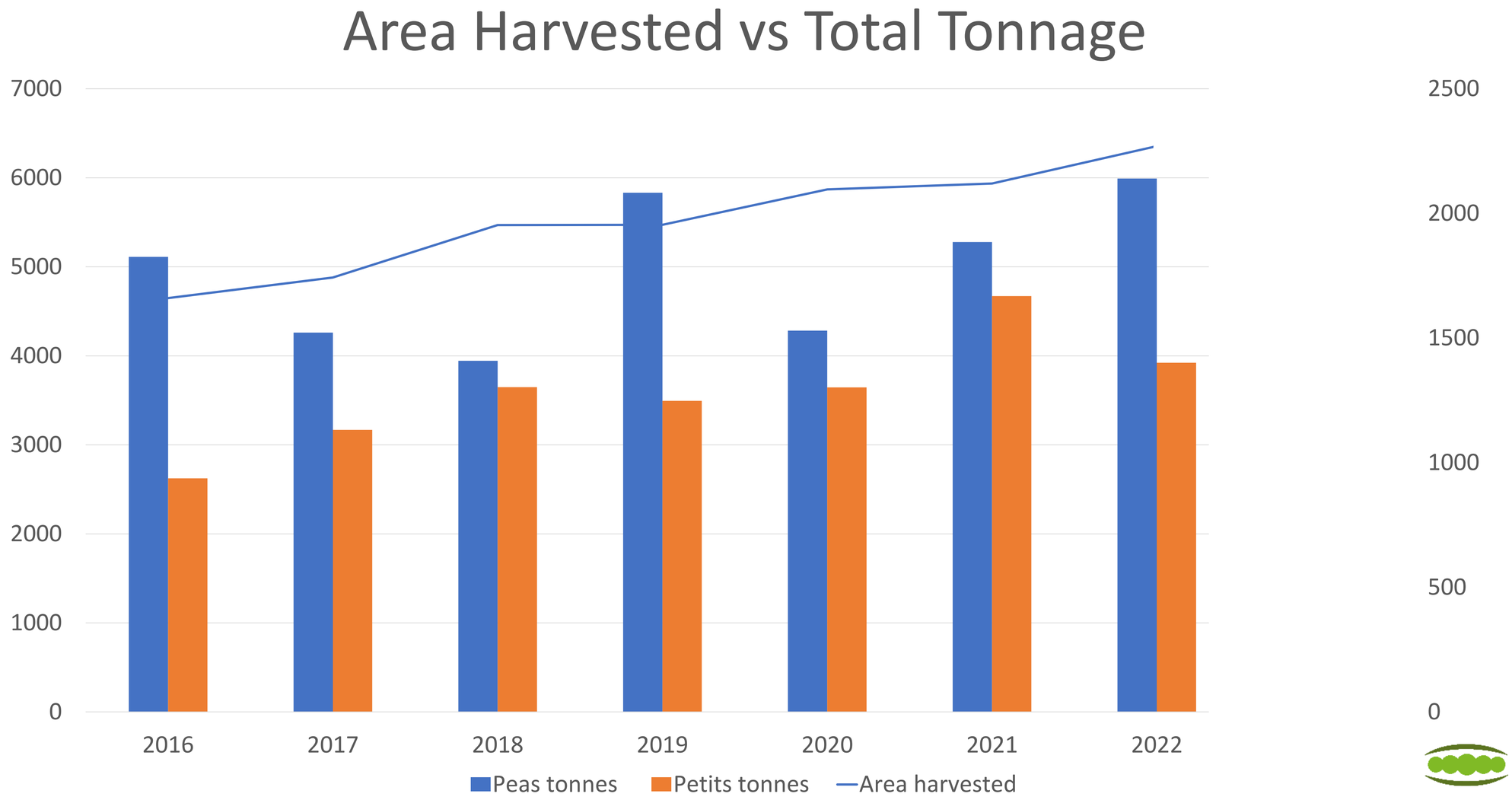
- Harvested 5,991 Tonnes Peas Total
- 8% over contract
- Harvested 3,922 Tonnes Petits Total
- 1% under contract

- 90% A-AA on Petits
- 64% A-AA on Standards
- Bypass 0.6% Crop

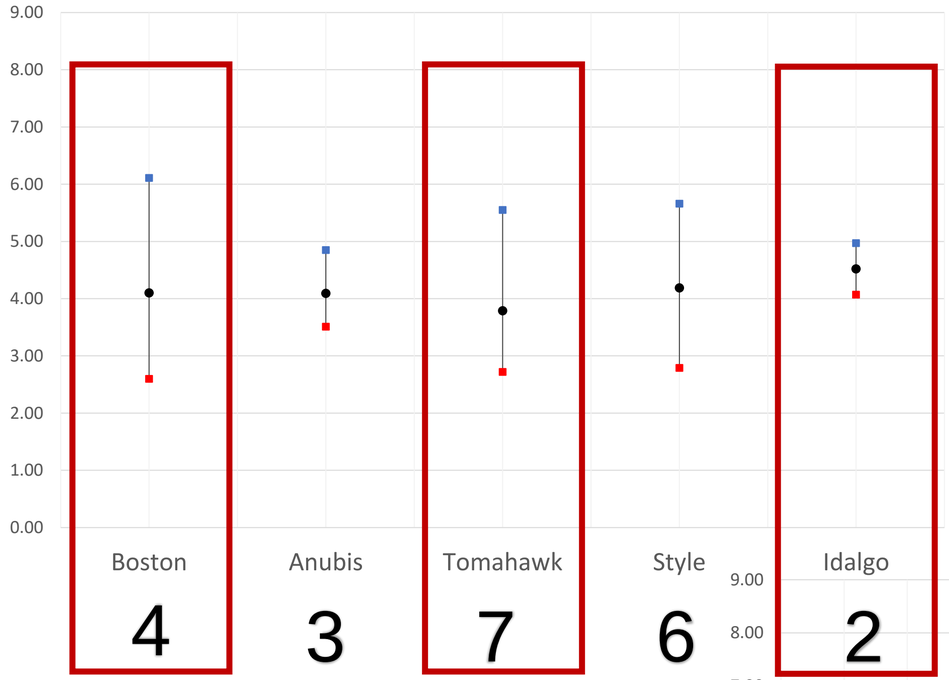
Processed Yields T/ha

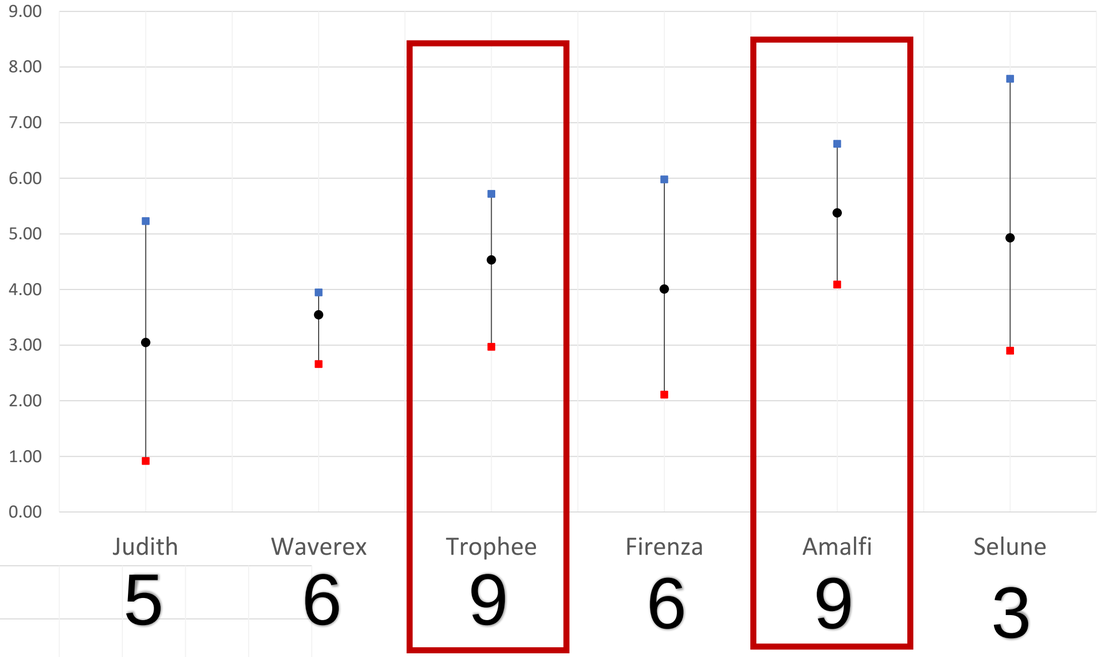


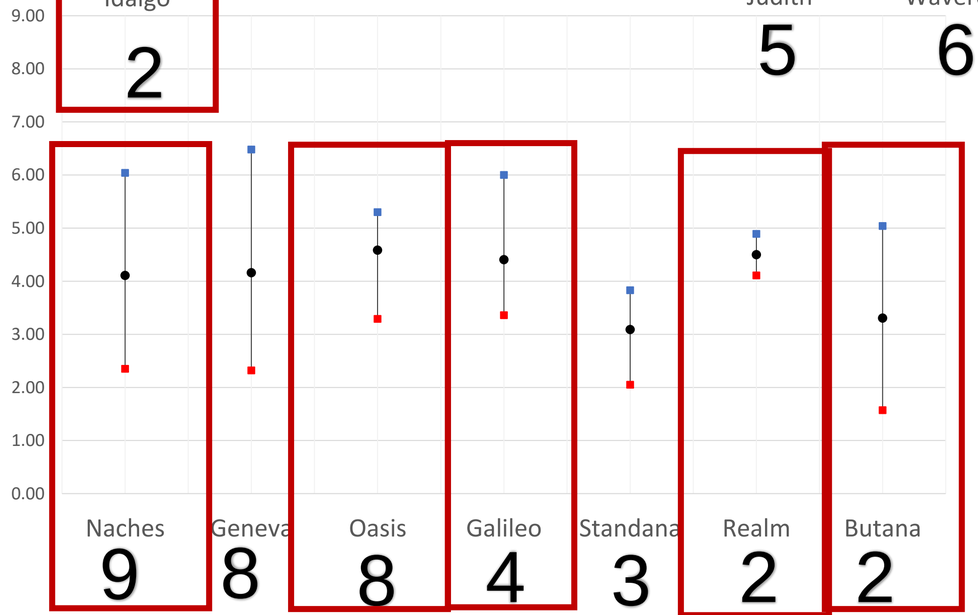
Processed Yields Tonnes



Variety Yields







Contracts 2023

- Greenyard Frozen

- Peas 5000 Tonnes
- Petits Pois 3800 Tonnes
- Prices for 2023 20% above 2022 prices one year fixed

- Princes

- Peas 800 Tonnes
- Petits Pois 0 Tonnes
- Prices for 2023 25% above 2022 prices one year fixed

Drilling Programme

- Area 2,275 ha
- Need average yield of 4.22 tonnes / ha to achieve contracts.
- All growers should had received a copy of the programme.
- No seed issues for 2023. Reduced to 10 varieties this year from 13 last
- 1st / 2nd Earlies in Long Sutton to Wisbech area, then Norfolk.
- Petits on silts
- Finish on Holbeach/Lutton Marsh and organics at Sandringham
- Trialling this year new drill workplan for growers to fill in to aid traceability and seed usage

Drilling Programme

CALEY SEED PLAN — **Vining Peas / OASIS**

Quantity required: 19,955 kg — *Stock:* OASIS PC572251/286/3 – *In stock:* 3,000 kg

Field		Plan				Application		
Field	Area	Quantity	Average rate	Sowing date		Date	Total product	Operator
	(ha)	*(kg)*	*(kg/ha)*				*(kg)*	
Caley BR07 Greenhouse to A47	16.14	3,374	209	14/05/2023				
Caley V07 Silt Road 1	4.51	943	209	16/05/2023				
Caley V08 Silt Road 2	10.23	2,139	209	16/05/2023				
Caley V09 Silt Road 2	10.28	2,149	209	18/05/2023				
Caley V11 Old River	17.56	3,671	209	18/05/2023				
Caley V12 Old Railway 2	7.79	1,629	209	18/05/2023				
Caley V13 New Drain 1	15.76	3,295	209	18/05/2023				
Caley V14 New Drain2	3.96	828	209	20/05/2023				
Caley V16 Beehive	9.22	1,927	209	20/05/2023				

New Growers

- Andrew Branton
- Nigel Harrison
- Loveden Estates (A H Worths)

Machinery & Personnel Update

- Took delivery of new harvester in 2022. Some teething issues but overall worked very well and wheel system proved efficient.
- New flatbed trailer to hold compressor, extra ad blue, spare wheels for viners and high tip cart, room for waterproofs etc proved successful. Incident of flat tyre resolved by replacing viner wheel in less that 30 minutes. Saved a great deal of down time.
- The new measures introduced as regard to the washing/hygiene of harvesters worked well. No need to go on top of harvesters unless for deep clean or maintenance.
- Safety rail on top of harvester no3 as a trial proved a success with positive feedback from all that used it. Being rolled out to all harvesters for 2023.
- Last minute change in night shift supervisor saw Janine step up to the plate and become night shift supervisor. She did an excellent job and will continue the role this year.
- Burt from AH Worths took her place in no1 viner and settled into the role very well.
- New hire Liam took on the role of relief driver. Driving viners when operators needed breaks and making sure fuel and water is available when needed.
- Allen Giles new General Manager……performance review after harvest!

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Housekeeping

- Washdown Areas
- Grower field visits
  - High viz
  - Sign in
  - Make yourself known to shift supervisor
- Access to fields – Clear gateways and cut low trees
- Foot rot samples – best in Spring before following year.
- Field information for following season – complete with all back cropping details and new columns for field hazards.

Dr Becky Howard

PGRO research and crop protection update

Becky Howard

10th February 2022

PGRO & HMC

Vining Peas Trials with HMC

Variety Evaluation for Descriptive List

- Petits Pois (2002-Present)
- Replication of standard varieties (2008-2018)

Industry Choice Variety Trials

- HMC chosen varieties (2022)
- Grower Group/AHDB (2019-2021)
- Additional AHDB work (Pre 2006)

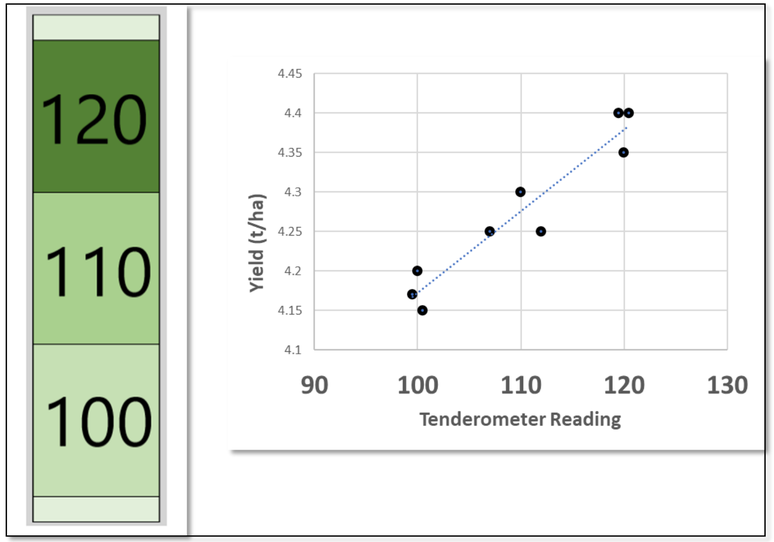
Private Variety Trials

- Allows comparison with DL material
- Good growing conditions for screening new Vining Peas

PGRO & HMC

Why Vining Peas Trials with HMC?

- Continuity with historical data for long term analysis
- Good working relationship
- Alternative soil type to other vining site
- Works well for good harvest timing
- Usually good yields

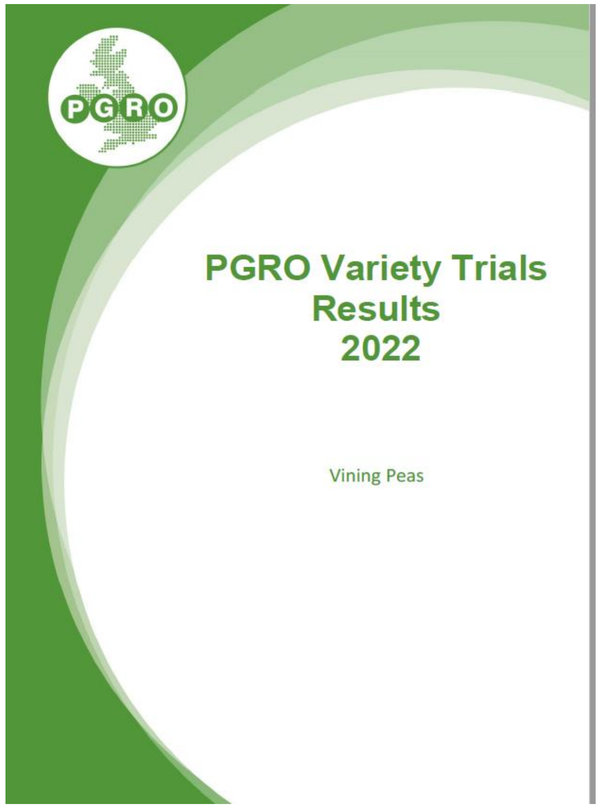


Trial Operation: Petits Pois @HMC

- Drilling and Harvest Area definition
- Inspection and notes on varieties
- Flowering scores for maturity estimation
- Haulm length and standing ability (yearly reports)
- Three harvests targeting TR 100 and TR120
- Size grading and yield measurements

Data from trials at HMC

- Data from each year goes into Variety Trial Results Manual



- When a Petit Pois variety has three or more years of data it can be added to the Descriptive List

Descriptive List of Petits Pois Varieties of Vining Peas, Holbeach - Data Summary - 2023

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

Variety	Leaf type	No. trials	Breeder (UK Source)	TSW g	@TR 100						@TR120				Additional data							
					Maturity to ±days	Yield % of Waverex	% in size grade L	M	S	VS	Yield % of Waverex	Haulm length cm	Downy mildew	Powdery mildew	Site	Sort	@TR120 % in Size grade L	M	S	VS	Year last Trialled	Harvest Index %
Natalie	C	3	vW	101	-7	62	1	9	46	44	62	58	MFR[IR]	[S]	HH	1	1	14	57	28	2020	12.0
Bartesa	C	3	Nun	79	-4	84	1	16	52	31	81	50	(S)	-	HH	2	1	20	55	24	2016	17.7
Norvert	C	3	Syn	100	-4	89	1	13	50	36	86	66	GFR[HR]	[S]	HH	3	1	18	58	23	2019	18.0
Eloise	SL	3	vW(DT)	100	-2	79	1	18	51	30	89	62	MFR[IR]	[S]	HH	4	3	32	57	8	2022	16.0
Noroit	C	3	Syn	96	-2	105	1	17	51	31	101	60	S	R	HH	5	2	23	56	19	2009	14.0
Legato	C	3	Syn (EI)	108	-2	107	3	23	55	19	106	71	SS	S	HH	6	3	27	56	14	2006	13.7
Trophee	C	3	Syn	118	-2	126	1	18	59	22	124	69	(SS)	S	HH	7	3	23	58	16	2013	13.0
Judith	C	3	vW (DT)	93	-1	116	0	10	48	42	102	54	MFR[IR]	[S]	HH	8	1	12	50	37	2017	15.7
Corus	C	5	Syn	88	0	88	1	16	53	30	79	62	GFR	S	HH	9	2	19	56	23	2006	17.7
Waverex	C	21	vW (DT)	114	0	100	3	22	44	31	100	60	SS	[S]	HH	10	4	30	47	19	2022	15.3
Tendrilla	SL	3	Vil (LUK)	113	0	109	2	23	56	19	99	80	(S)	S	HH	11	3	28	55	14	2005	22.0
Katie	SL	3	vW (DT)	88	+1	94	1	9	49	41	86	63	SS	S	HH	12	1	14	56	29	2015	15.3
Lunanvert	C	3	Syn	101	+1	96	3	26	51	20	100	69	MFR[HR]	[S]	HH	13	3	31	51	15	2021	10.0
Oracle	C	3	vW (DT)	96	+1	99	1	12	47	40	99	67	-	[IR]	HH	14	1	13	57	29	2005	18.7
Noelle	C	3	vW(DT)	115	+1	100	1	18	58	23	104	59	MFR[IR]	[IR]	HH	15	2	29	57	12	2022	17.0
Firenza	C	3	Vil (LUK)	90	+1	104	0	10	50	40	93	64	GFR	S	HH	16	1	13	53	33	2010	12.0
Rhianna	C	3	vW (DT)	83	+1	113	1	12	49	38	112	65	MFR[IR]	S	HH	17	1	15	57	27	2015	16.7
Ambience	SL	3	SVS	107	+1	121	2	21	52	25	120	59	GFR[IR]	S	HH	18	3	30	56	11	2008	19.3
Festivert	SL	4	Syn	87	+2	80	2	18	43	37	88	67	SS	[IR]	HH	19	3	26	53	18	2020	12.7
SV3946QB	C	3	SVS	112	+2	100	11	45	36	8	86	66	GFR	[S]	HH	20	12	53	30	5	2019	13.7
Afivert	SL	3	Syn	90	+3	83	0	8	51	41	82	66	GFR[HR]	[S]	HH	21	1	11	58	30	2020	16.3
Contravert	C	3	Syn	109	+3	87	2	28	53	17	97	82	MFR[HR]	R[IR]	HH	22	3	31	52	14	2011	22.3
Wav 7300	C	3	vW(DT)	103	+3	87	2	16	53	29	97	63	MFR[IR]	[IR]	HH	23	1	19	62	18	2022	16.0
SV6064QC	SL	3	SVS	86	+4	94	1	6	41	52	93	66	MFR	[R]	HH	24	1	10	51	38	2019	16.3

Cover crops in peas

- 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
- 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

- Drilling issues?
- Crop contamination?
- Pest/ disease incidence?

Cover crops 2022 – 1 site at Long Sutton

Black oats in combination with

- Phacelia
- Vetch

Measurements were taken for

- Plant density
- Soil moisture throughout the pea season
- Foot rot – soil test and crop assessment

Overview

- Control plots were cultivated and had no cover crop
- Cover crop establishment moderate
- High number of vetch volunteers in the peas

Foot rot

- Poor root system
- Pale or yellow plants
- Stunted plants
- Impact on yield

- Cold, wet soils
- Compaction
- Water logging
- Poor soil health
- Plant stress
- Frequent legume cropping

➢ Disease complex

Foot rot pathogens

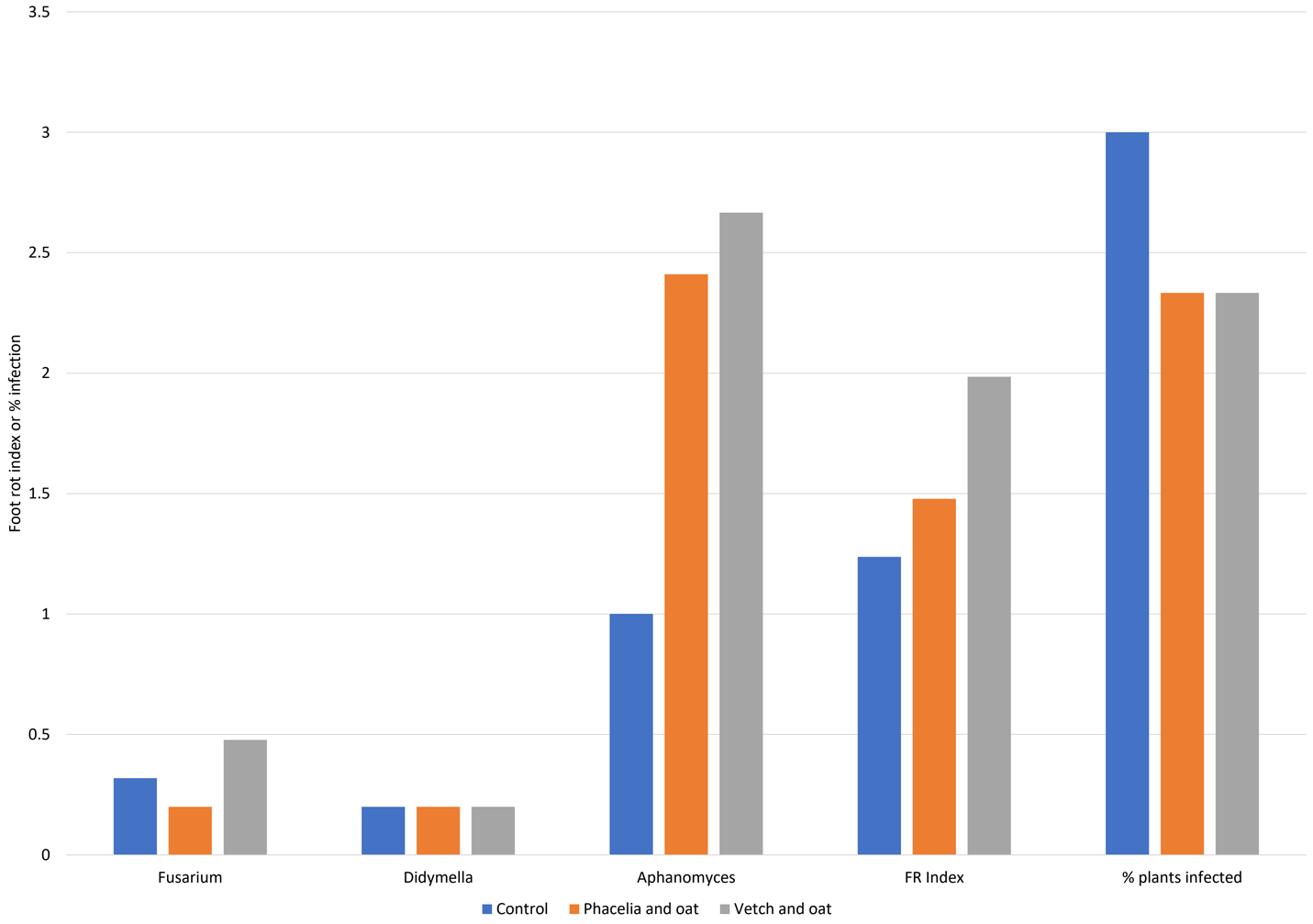
- *Fusarium solani* – red vascular tissue (and *F. oxysporum* – wilt)

- *Didymella pinodella* – black stem base

- *Aphanomyces euteiches* – soft roots, honey coloured

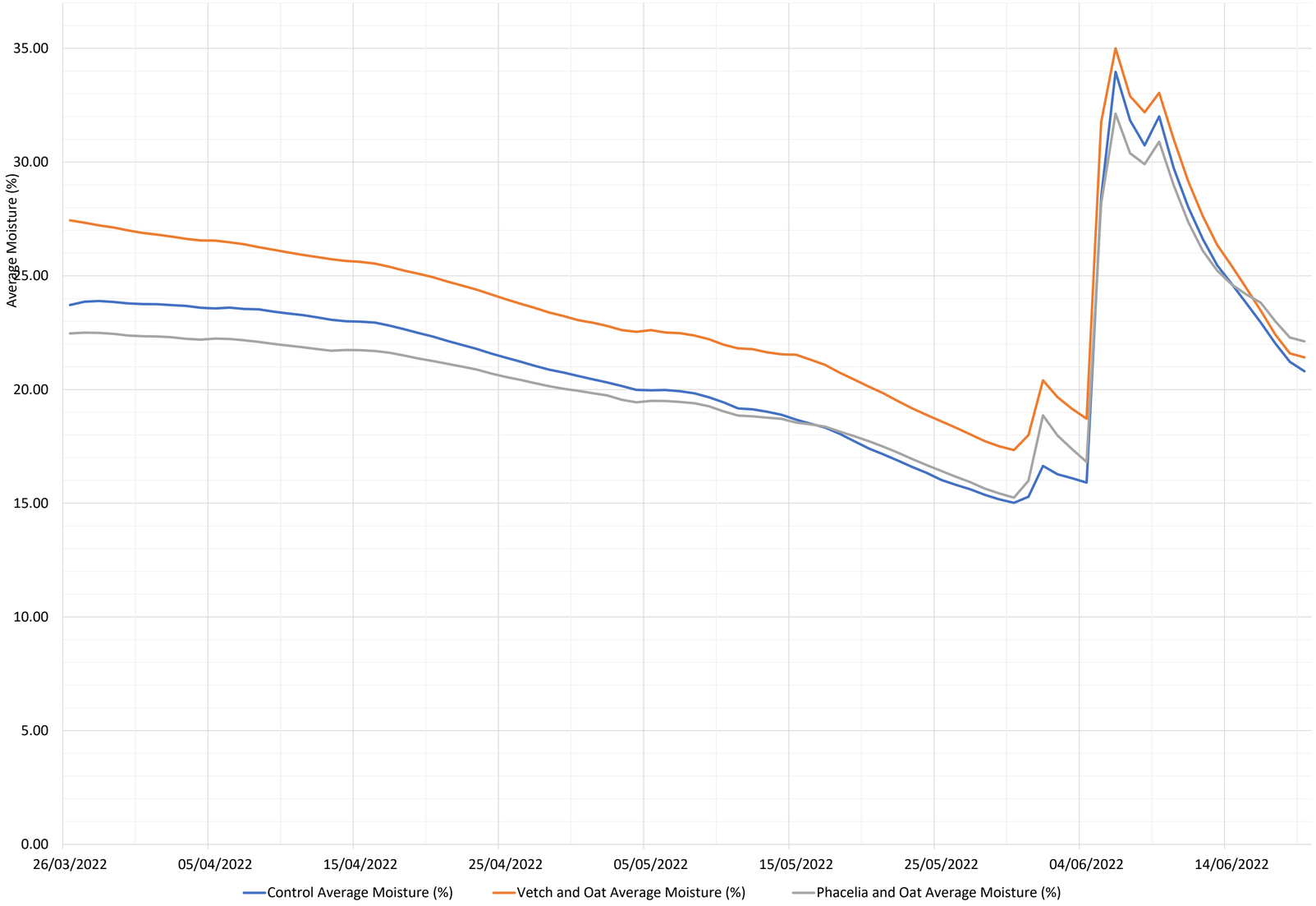
- Soil tests
  - Colony numbers – risk factor (*Fusarium* and *Didymella*)
  - Disease severity seedling – risk factor (*Aphanomyces*)

Foot rot results 2022



- Aphanomyces was the dominant soil-borne disease
- Aphanomyces requires warm, wet weather to develop severe infection
- Field scores of above ground infection gave very low levels of foot rot infection, possibly due to dry weather
- Vetch and oat mixture gave the highest soil indices for Aphanomyces
- There were no significant differences in pea plant density between treatments (~70 plants/square metre)

Soil moisture 2022



Vining pea fungicide actives 2022

Crop protection

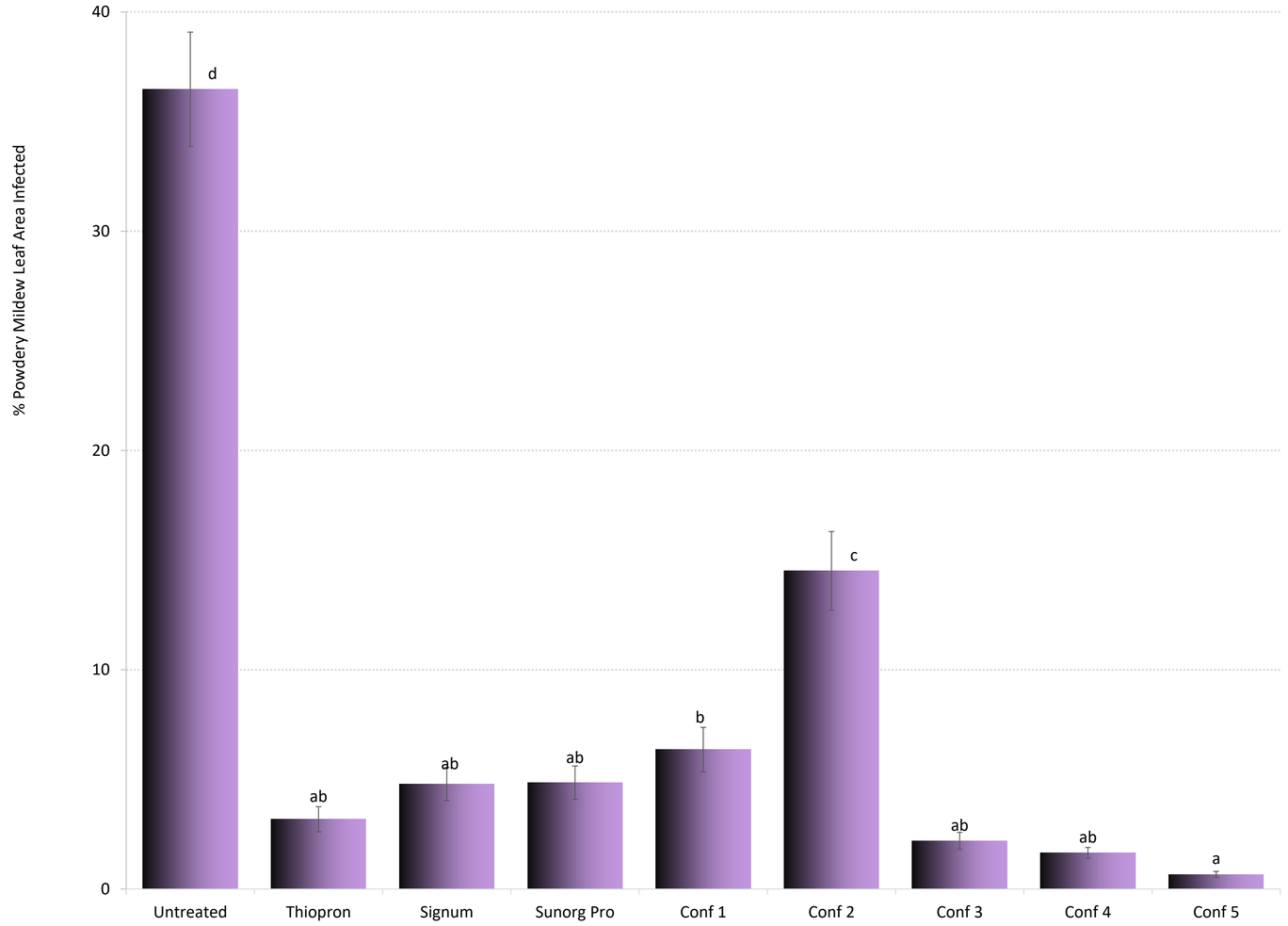
- Azoxystrobin (14 day HI)
- Boscalid + pyraclostrobin (14 day HI)
- Cyprodinil + fludioxonil (14 day HI)
- Difenoconazole + fluxapyroxad (Perseus) (14 day HI)
- Mandipropamid (Revus) (14 day HI)
- Metconazole (14 day HI)
- Sulphur (Thiopron) – apply when pods have reached typical size and peas are fully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

Fungicides awaiting approval

- Frutogard – potassium phosphonate – peas and beans – for downy mildew control – EAMU application submitted and waiting approval.
- Microthiol Special – sulphur – peas – for powdery mildew control – EAMU submitted and waiting approval.

Powdery mildew and sulphur



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)

Insecticides awaiting approval

- Insyst – acetamiprid – peas and beans – for aphid control – EAMU application submitted and waiting approval.

Surveillance of virus disease in UK pea crops

- AHDB funded project to develop a generic method for surveillance
    - FV 459 – three year project
    - Working with FERA Science Ltd. (National reference laboratory for plant health in England and Wales)
- To show the feasibility of integrating high throughput sequencing (HTS) into disease surveillance.
    - To provide an up to date baseline of viruses in UK peas.
    - Using pea as an example Pathosystem.
- Largest survey in the world for peas and first thorough survey since the 1960's in the UK

AHDB AGRICULTURE & HORTICULTURE DEVELOPMENT BOARD

fera

defra

Department for Environment Food & Rural Affairs

Existing knowledge for peas

- Pea enation mosaic virus-1 (Pea enation mosaic virus-2)
  - Limited host range, legumes
  - Persistent aphid transmission
    - Long acquisition times by aphids, so possible chemical control
  - Limited aphid range
  - Mechanical transmission, but not known to be seed transmitted
  - Resistant varieties
- Pea seed-borne mosaic virus
  - Limited host range, legumes
  - Seed-borne, use of clean seed for control
  - Non-persistent aphid transmission
    - Short acquisition times by aphids, so chemical control is more challenging

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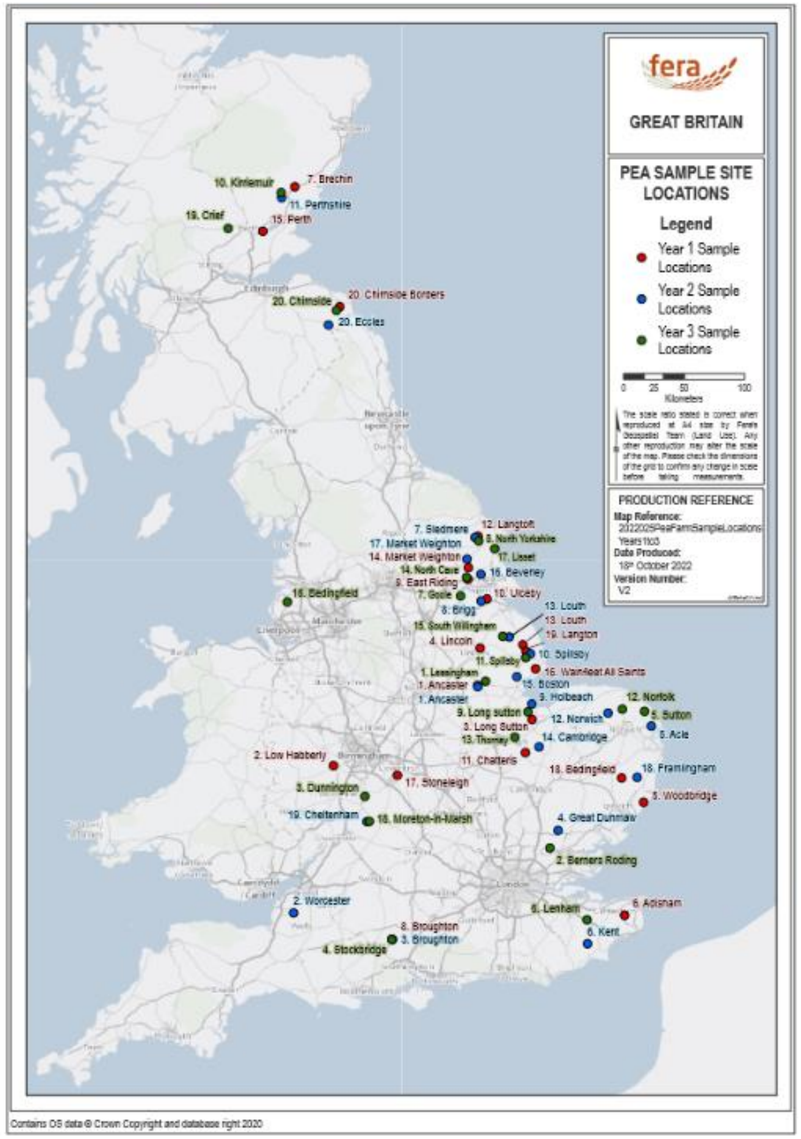
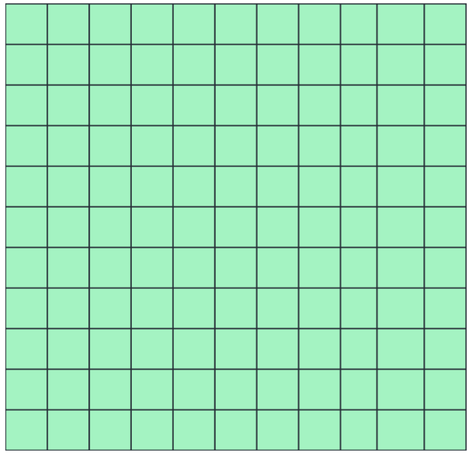
fera

Survey 2019, 2021 and 2022



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



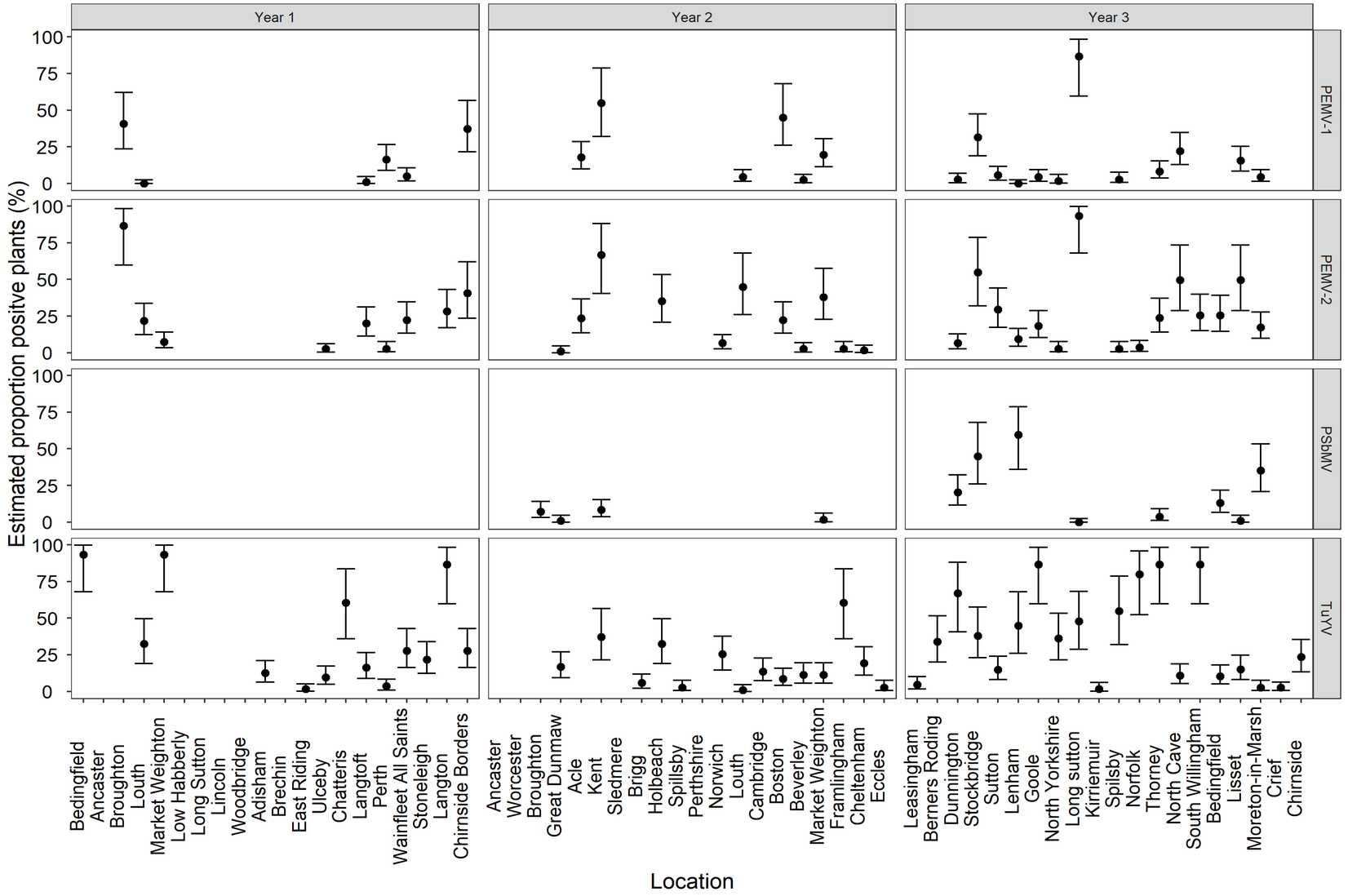
100m x 100m (1ha) – sampled every 10m to give 121 samples per field

Diagnosis

- Using high throughput sequencing (HTS) to identify candidate viruses (15 bulks of 7 plants)
- This asks the question ‘what is here?’ rather than ‘is this here?’
- Followed by RT-PCR to quantify (15 samples of individual leaves)

- Aim to improve our understanding and advice to growers regarding management and possible vectors

Virus incidence years 1 to 3

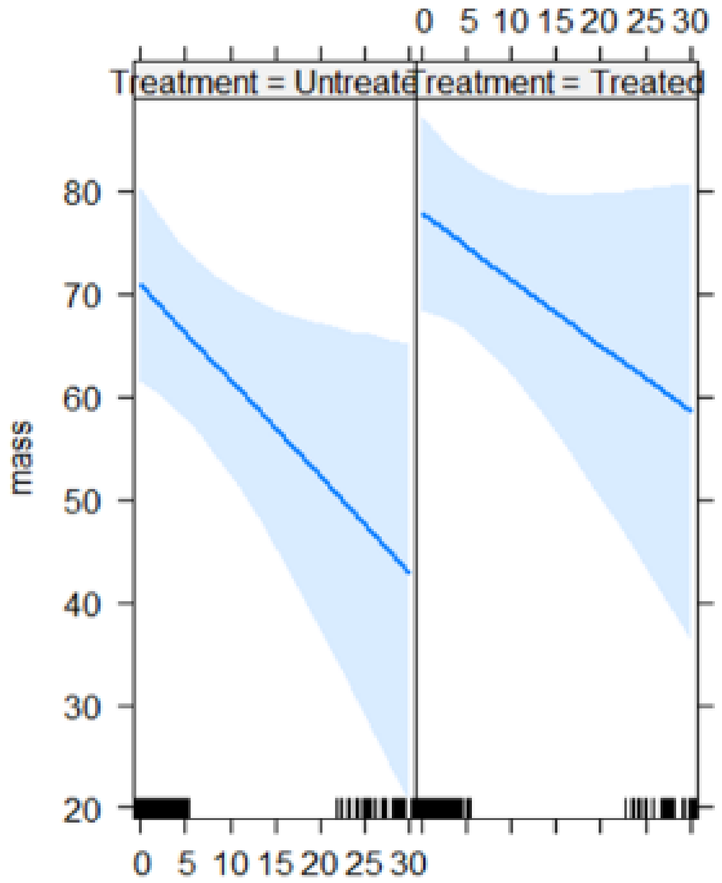


Turnip yellows virus (TuYV)

- Large host range, including legumes, brassicas, cucurbits etc.
- Persistent transmission by aphids
  - Long acquisition times by aphids, so possible chemical control
- Wide range of aphid vectors
  - Pea aphid
  - Peach-potato aphid
- Not known to be mechanical or seed transmitted
- Reported in peas in Australia (virus surveillance, epidemiology and yield reduction studies), Germany (virus surveillance).

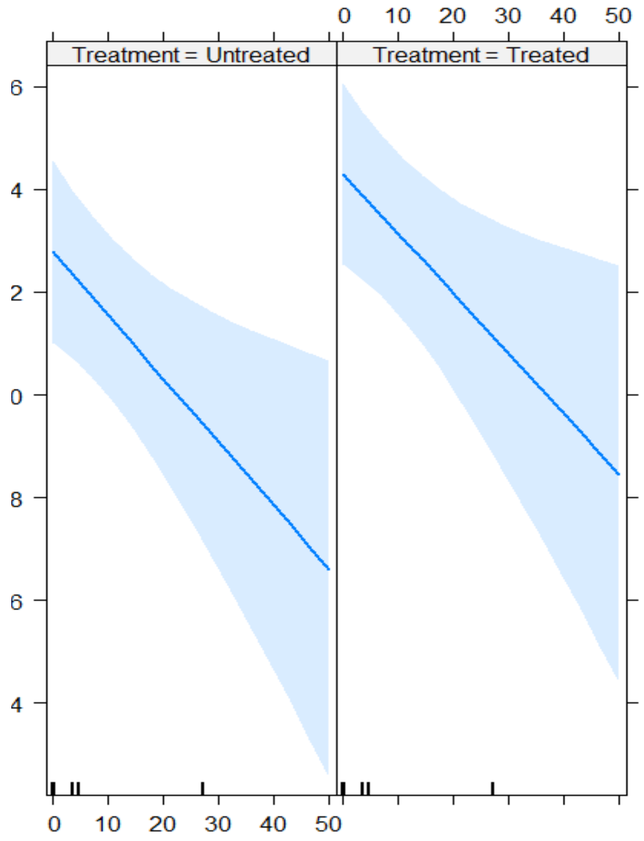
Yield loss pea enation mosaic virus

2019



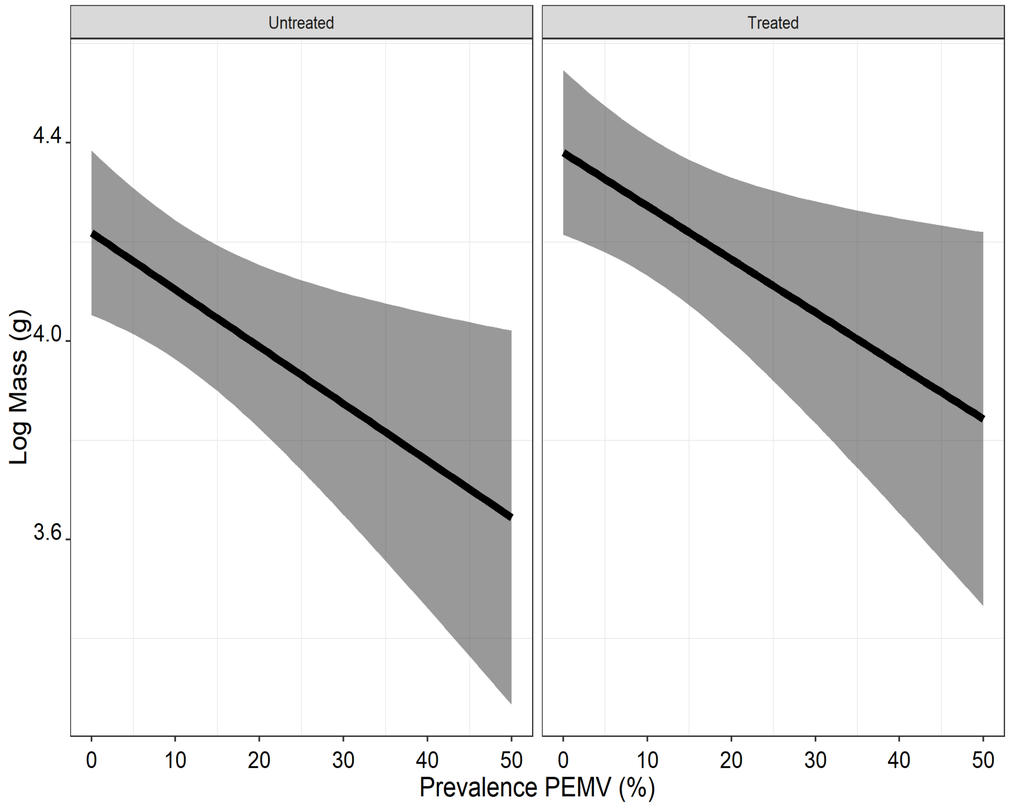
5 sites

2021



5 sites

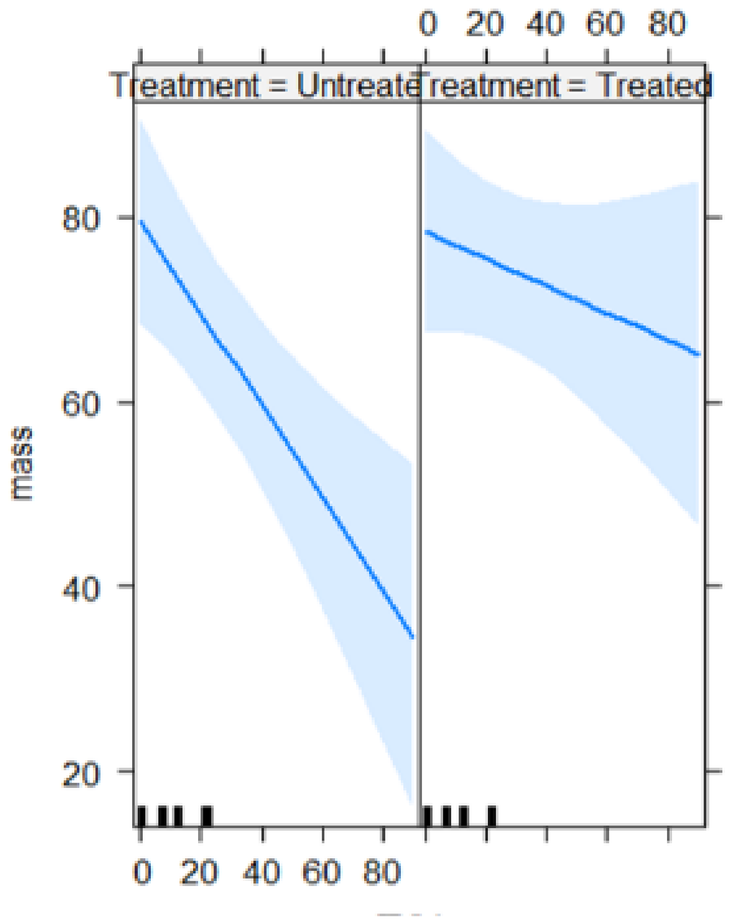
2022



4 sites

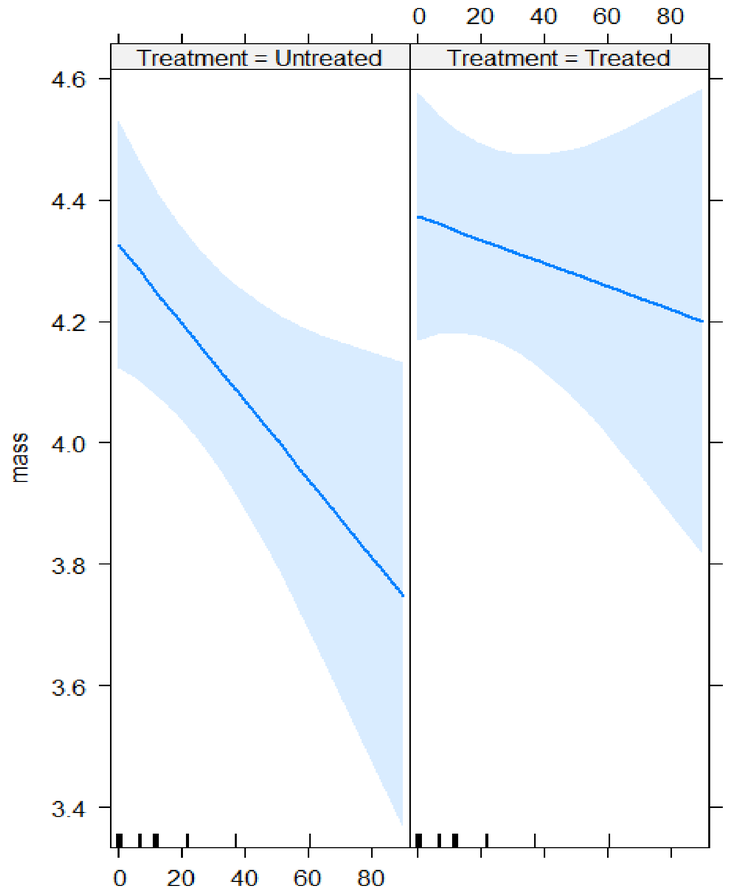
Yield loss turnip yellows virus

2019



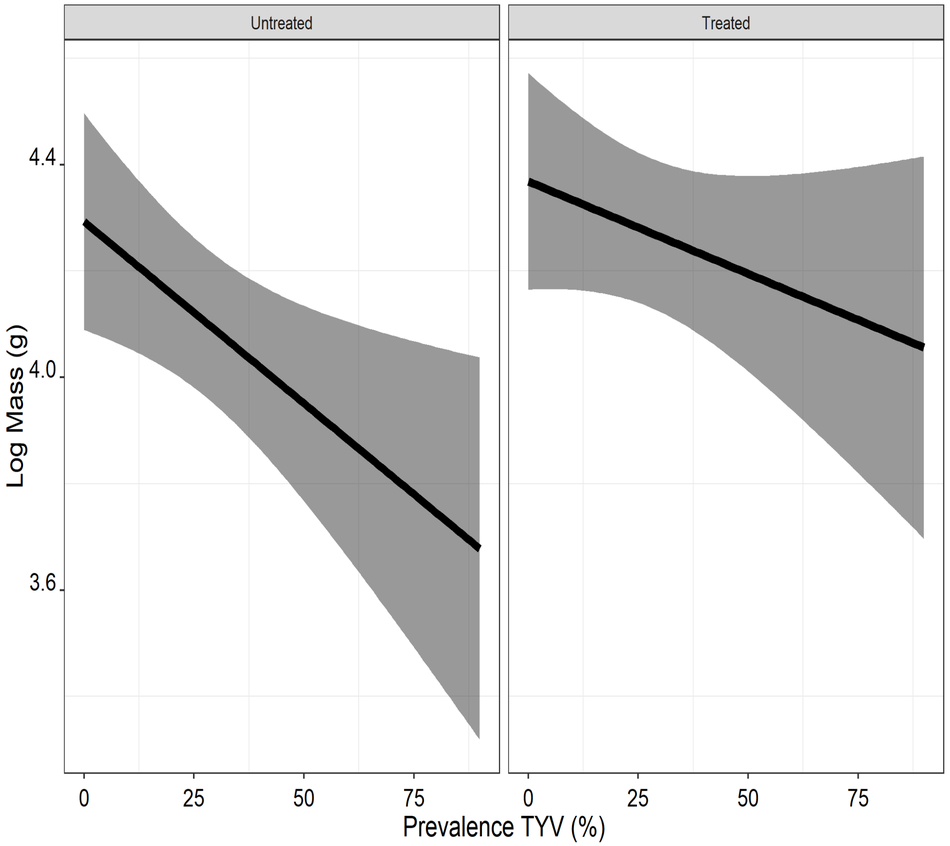
5 sites

2021



5 sites

2022



4 sites

Pea necrotic yellow dwarf virus

- Found in only one crop in three years, but a potential threat to peas
- Limited host range - legumes
- Persistent transmission by aphids
- Not known to be seed or mechanically transmitted
- Can cause high yield losses
- Found across Europe, first finding of this virus in the UK
- Work ongoing in Germany to look at resistant varieties and the effect of PNYDV on nodulation, N_2 fixation and yield (Ziebell, JKI)

Gaafar et al., 2017

Other findings

- Soybean dwarf virus (SbDV)
  - Limited host range, legumes
  - First finding in UK
  - Persistent transmission
  - Sporadic findings through the study
- Bean yellow mosaic virus (BYMV)
  - Limited host range, legumes
  - Non-persistent transmission
  - Known to occur in UK
  - Sporadic findings
- Bean leafroll virus (BLRV)
  - Limited host range, legumes
  - Persistent transmission
  - Known to occur in UK
  - Only found in year 3

Conclusions

- This work is helping to provide a better understanding of which viruses are present in UK peas and their incidence.
    - First findings of three viruses in UK peas- turnip yellows virus, soybean dwarf virus and pea necrotic yellow dwarf virus.
    - This can go towards management of viruses in UK peas.
    - Further work could include, looking at varietal resistant to TuYV, is it the same TuYV in OSR, weeds and peas? The effect of virus on pea marketability and nutritional content. The effect of TuYV on yield.
    - The effect of other crops in the rotation/ region and use of cover crops.
- High throughput sequencing can be successfully integrated into plant health surveillance.

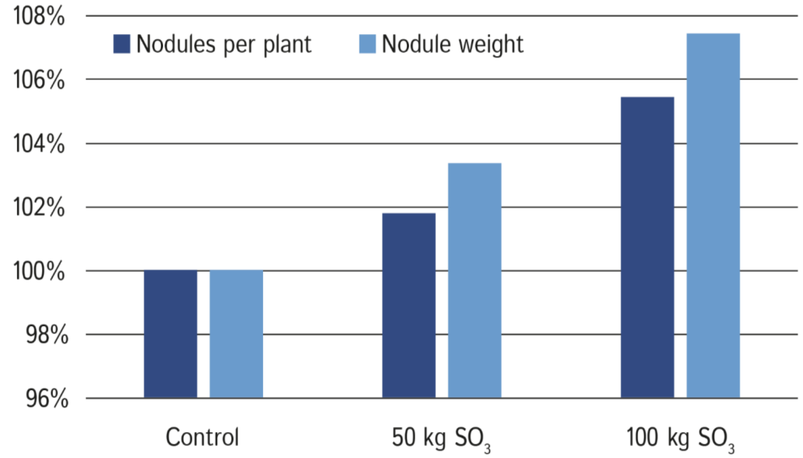
The importance of key nutrients

- **Phosphorus** is associated with key functions within plants, especially early root growth, and therefore accessing available water and nutrients. Plant growth, photosynthesis and seed formation. Water use efficiency.
- **Potassium** is an activator for enzymes involved in protein synthesis. Helps to maintain water balance in legumes. Important for development and functioning of root nodules. Disease tolerance and standing ability.
- **Sulphur** is a constituent of amino acids essential for protein production. Important for plant growth, photosynthesis and seed yield. Important for nodulation.

The importance of P, K and S

	Nodules per plant	Nodule weight
Control	7.69	94.44
20 kg/ha P_2O_5	8.47	95.21
40 kg/ha P_2O_5	10.02	101.77
60 kg/ha P_2O_5	10.36	102.9

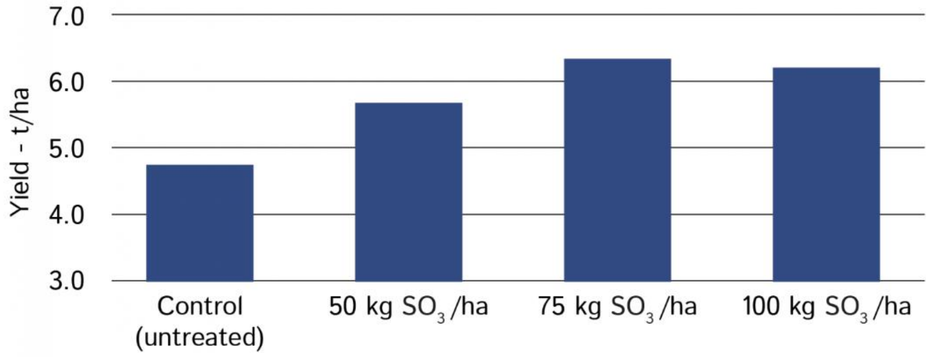
Source: PDA



Impact of sulphur application on nodules per plant and nodule weight.

	Potash supply		
	Low K	Medium K	High K
No. of nodules/plant	233	250	251
Size of nodules, %	100	111	129
Nodule N production, %	100	147	195

The influence of potassium on the activity of Rhizobium bacteria. Proc. 11th Int. Colloquium, IPI.



Polysulphate on vining peas – yield effect (PGRO 2017).

Determining critical levels of P in vining peas

- 4 year project in collaboration with NIAB-TAG and PGRO, funded by AHDB (FV380)
- Low inherent P index – at or below 1
- Trial – range of Olsen P levels ranging from 0 mg/kg to 24 mg/kg above the lowest value
- Different P fertiliser doses applied prior to the preceding crop to create a range of ‘stabilised’ P values
- Different P fertiliser doses applied prior to the vining pea crop to create a range of ‘fresh’ P values

Vining peas – crop growth and vigour

Low P index 1

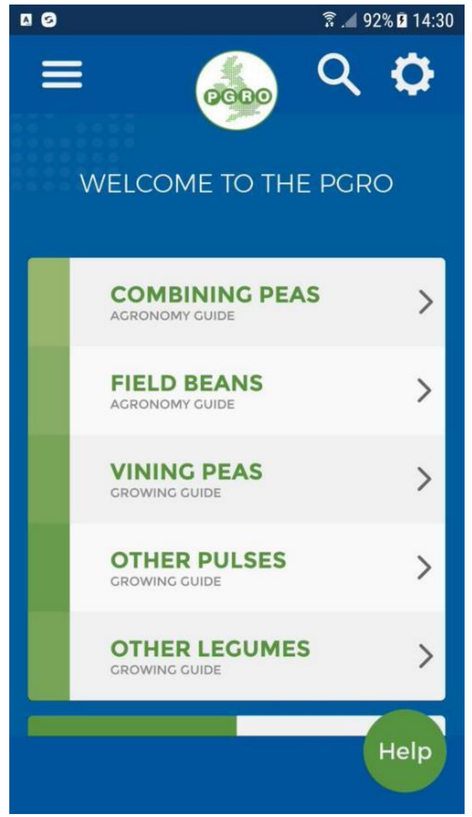
High P index 3

Maintaining soil phosphate in vining pea crops

- Significant vining pea yield losses are likely at soil P Indices of 0 or 1 on most soils.
- Maintain soil Olsen P at Index 2 for optimum yield in most situations. In high yield potential situations an Index 3 could be more appropriate.
- Average critical P levels for 95% of maximum yield were within the lower half of P Index 3.
- Applying a low dose of fresh P fertiliser (on average 199 kg P2O5 /ha) shortly ahead of vining pea crops increased yields by an average of 0.24 t/ha above an Index 2.

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
- Technical reports on the cover crop work can be found at https://www.pgro.org/r-d-news/



HMC

Nick Tinker

Developing Innovative Drills

Nick Tinker
Väderstad Limited

Väderstad started in 1962 with a farming couple who solved an everyday challenge.

VÄDERSTAD


VÄDERSTAD

We continue to be a family owned company
4 second generation + 9 third generation

VÄDERSTAD


Manufacturing
Sales company/ representation
Importer
2 000
Employees within Väderstad Group
40+
Countries represented
7 000
Machines manufactured annually
VÄDERSTAD

2022

500+

Mil EURO
Turnover 2022

25%

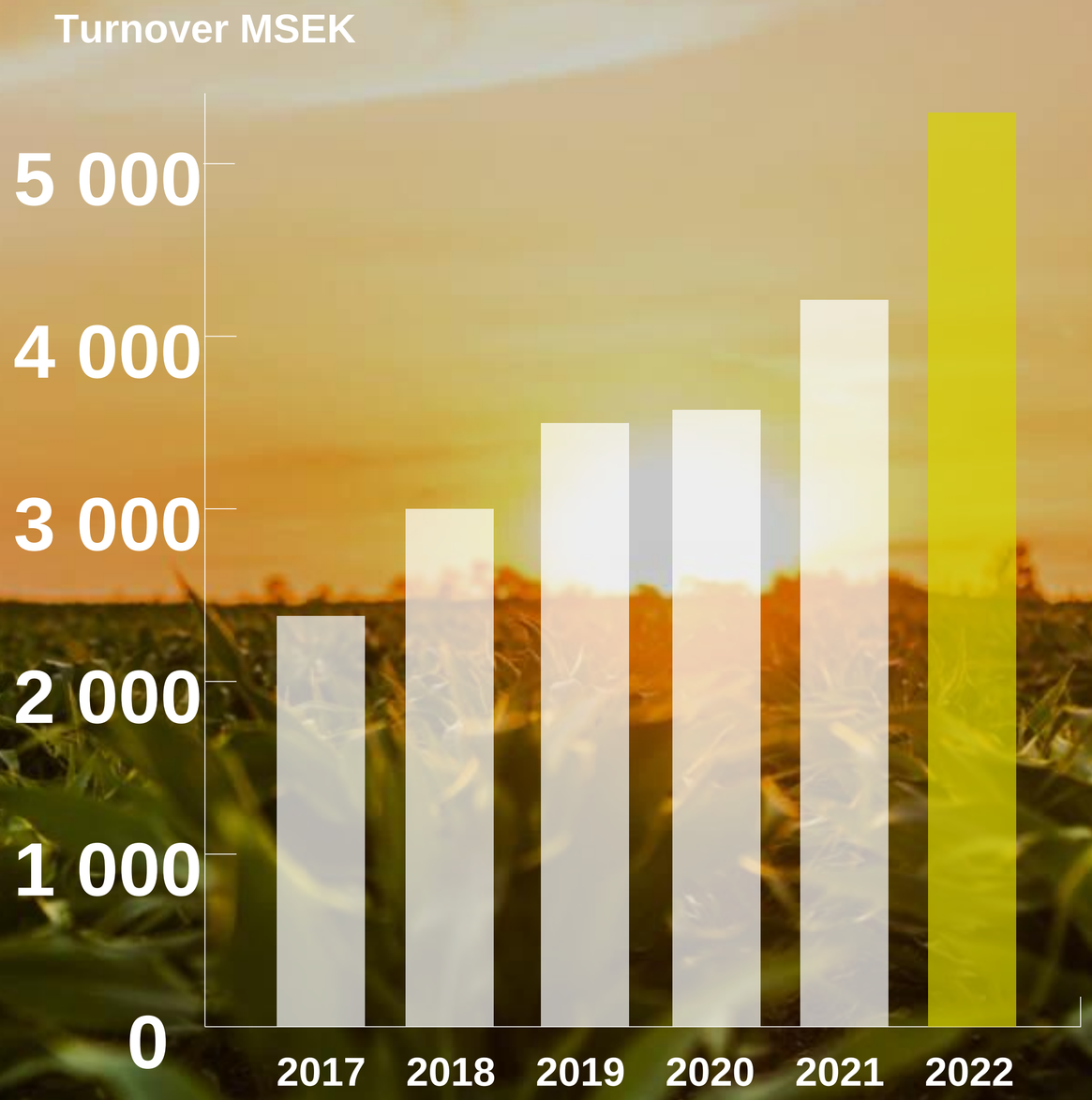
Growth from last year (2021)

+40%

Growth in North America

+40%

Growth in Eastern Europe



VÄDERSTAD

Rigid tine harrow

HV

NZ

Rapid

Carrier

TopDown

Tempo

Proceed

Innovations:

Market milestones:

1962 Väderstad founded

1976

1982

1991

1992 First subsidiary UK

1999

2004

2006 Vaderstad Industries Inc.

2007 Väderstad Components

2012

2021 Vaderstad Inc.

New solutions in detail

Rubber suspension packers

Rubber suspension disc arm

CrossBoard and stabilizer bar

OffSet wheel placement

Seed Hawk opener

Points and shins

PowerShoot

E-Control

SeedEye

CrossCutter Disc

The DS drill - 1985

The Rapid concept – accuracy and consistency

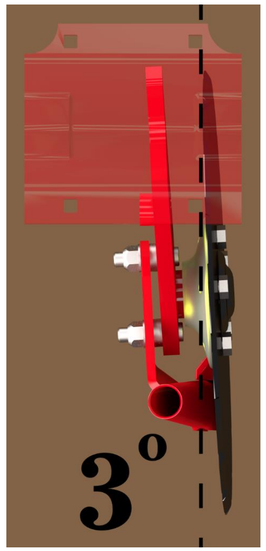
Parallel linkage - connection between one wheel and two seed coulters

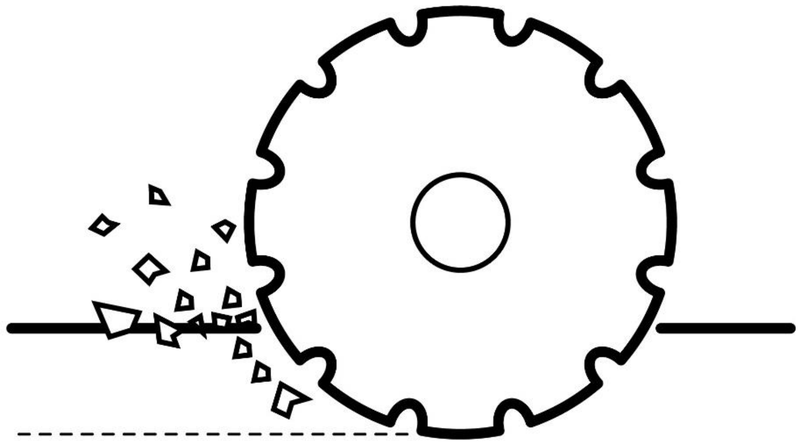
Depth maintained by wide wheel – good in varying conditions

Single disc coulter

- Cuts residue and penetrates hard ground efficiently.
- 150kg coulter pressure.

Angled disc acts like a saw creating fine tilth and leaves an open cultivated channel



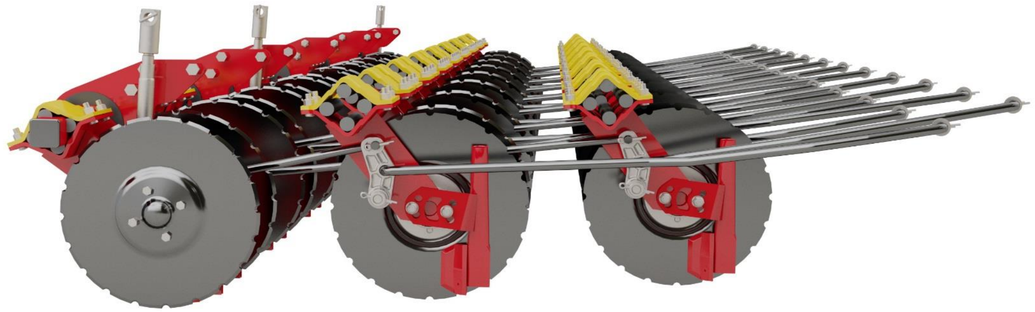


System Disc front tool option introduced

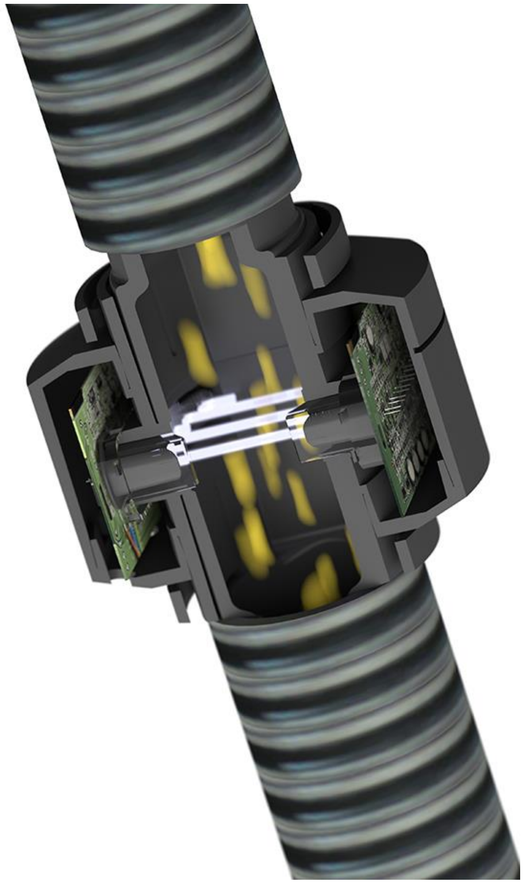
Makes the Rapid a more versatile drill, in direct, min-till & ploughing

Continued development

Third row seed coulter kit



SeedEye



Rapid direct drilling grass mixes

3,074 Rapid drills registered in UK

2006 : Tempo Concept development begins

PowerShoot technology

Full control of the seed all
the way down to the soil.
– Not effected by outside influences.

High-speed singulators.

Stop wheel ensures:
Seed-to-soil contact.
Moisture access.
Seeding depth.

Powershoot : accuracy – speed - consistency

2011 : Tempo sales commence

5 years development


VÄDERSTAD

Väderstad Proceed

Product Concept

VÄDERSTAD

The **Proceed** row unit

The seedbed optimization expert

Pre-seeding consolidation

Moisture access
Even field

Row cleaning

Stop wheel

Seed-to-soil contact
Quick germination

Closing

Precision furrow closing
Moisture access

Background

Challenges & New demands

- ✓Higher cost for seeds and fertilizers
- ✓Reduction of energy
- ✓Reduction of chemicals
- ✓Direct seeding and Cover crops is increasing
- ✓ Reduced number of seed treatments available

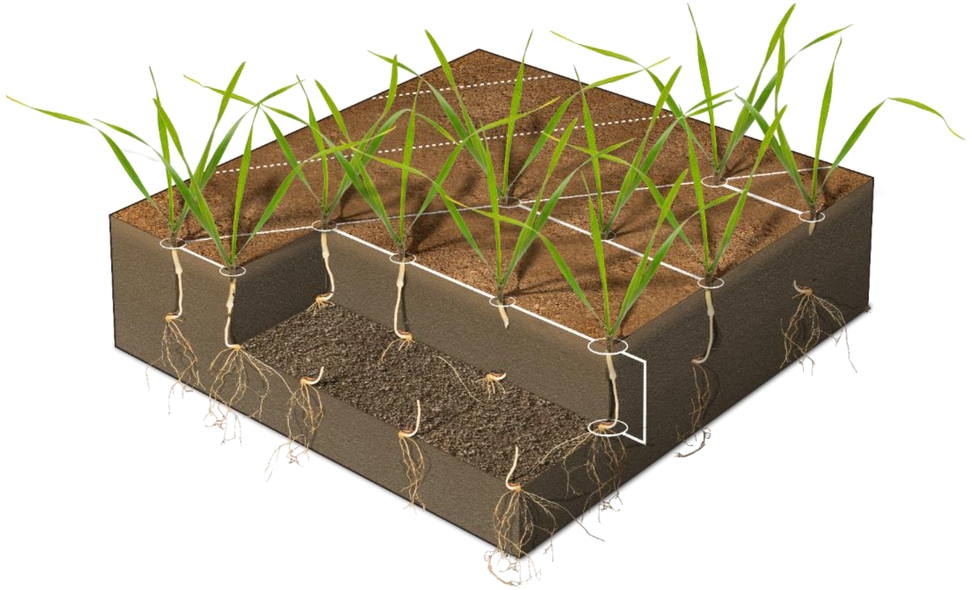
Meeting the Demands

- ✓ Better placement of seeds
- ✓ Possibility to precision seed
- ✓ Enable the use of inter-row cultivation for mechanical weed control
- ✓ Capability for no-till drilling into stubble and cover crops

VÄDERSTAD

New level **cereal seeding performance**

- ✓Exact depth precision
- ✓Singulated in-row precision
- ✓Seedbed optimization
- ✓Row-by-row control
- ✓Perfect distribution across working width



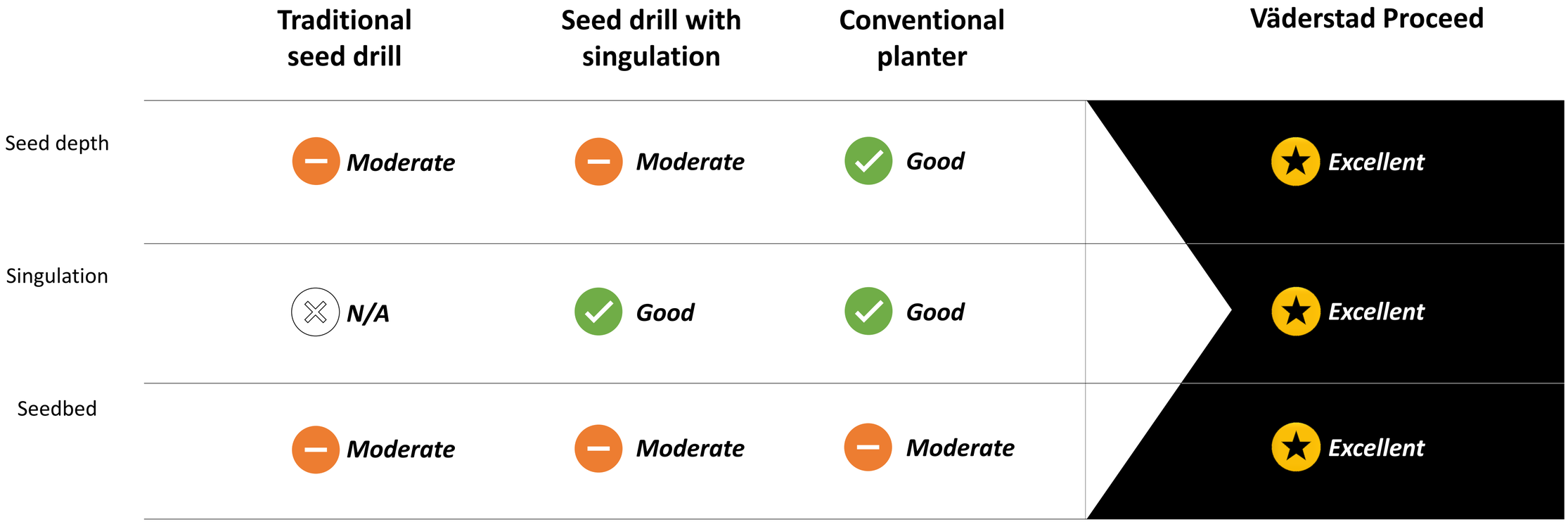
The **strongest cereal crop** we have ever seen

- ✓Quick emergence *– 2-3 days ahead*
- ✓Extremely even crop population
- ✓All seeds at the intended depth
- ✓High plant integrity *– access to moisture, nutrients, space, sunlight*
- ✓Vital crops with equal growth conditions

Modern seed drill | **10 weeks emergence** | **Väderstad**

VÄDERSTAD

A new seeding machine category
The first to optimize the yield potential in cereals



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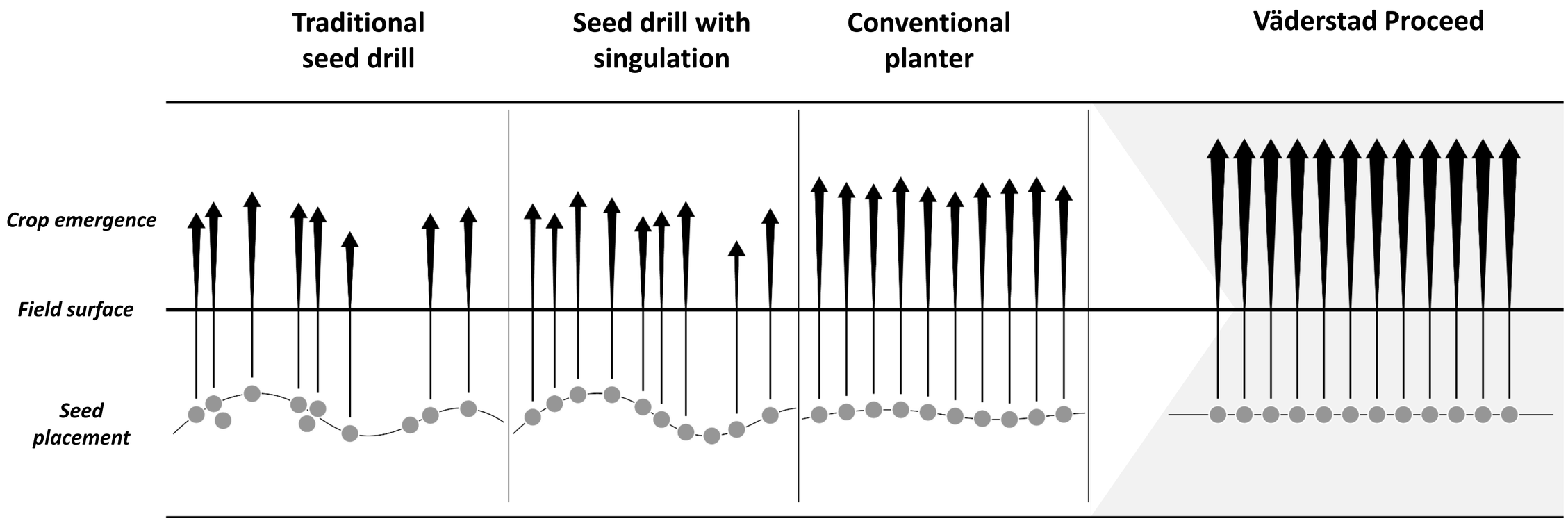
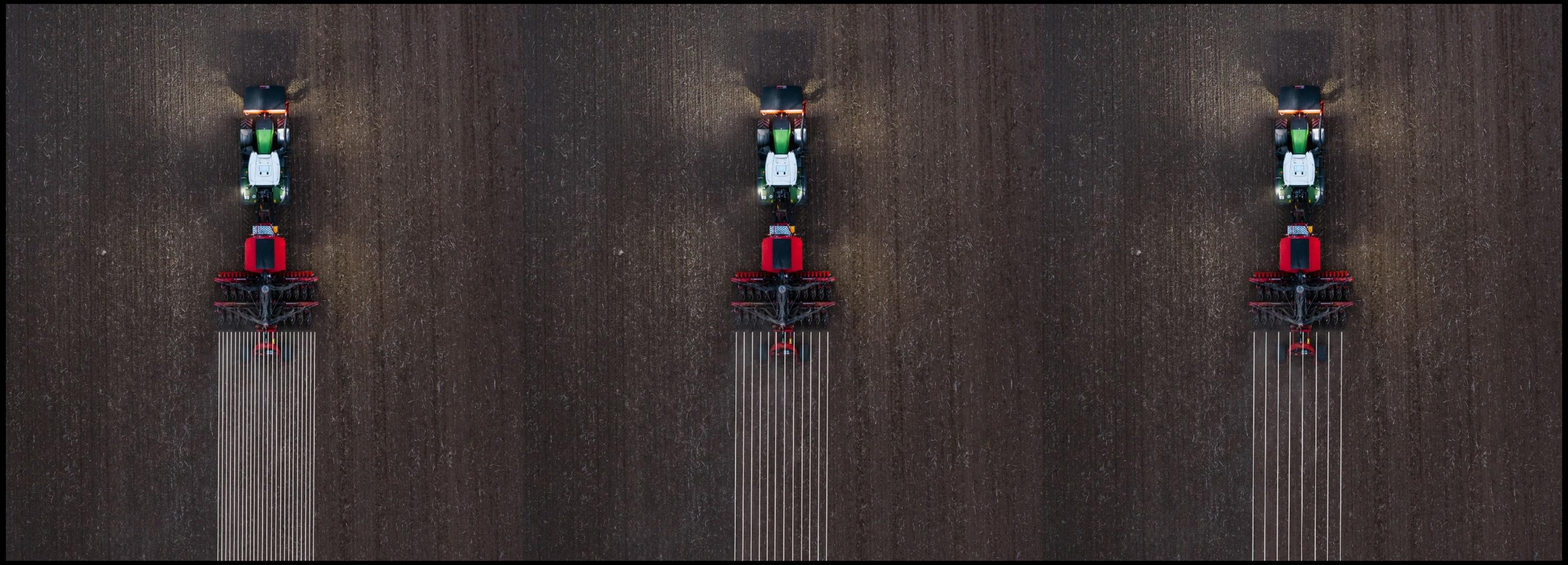


One machine – full range of crops



225/250mm

Wheat, barley, rye, etc.

450/500mm

Oilseed rape, sugar beet, forage maize, etc.

750mm

Maize, sunflower, cotton, etc.

VÄDERSTAD

Farm Manager
Proceed field
June 2021

Farm impressions

Full-scale trails at three different Farms

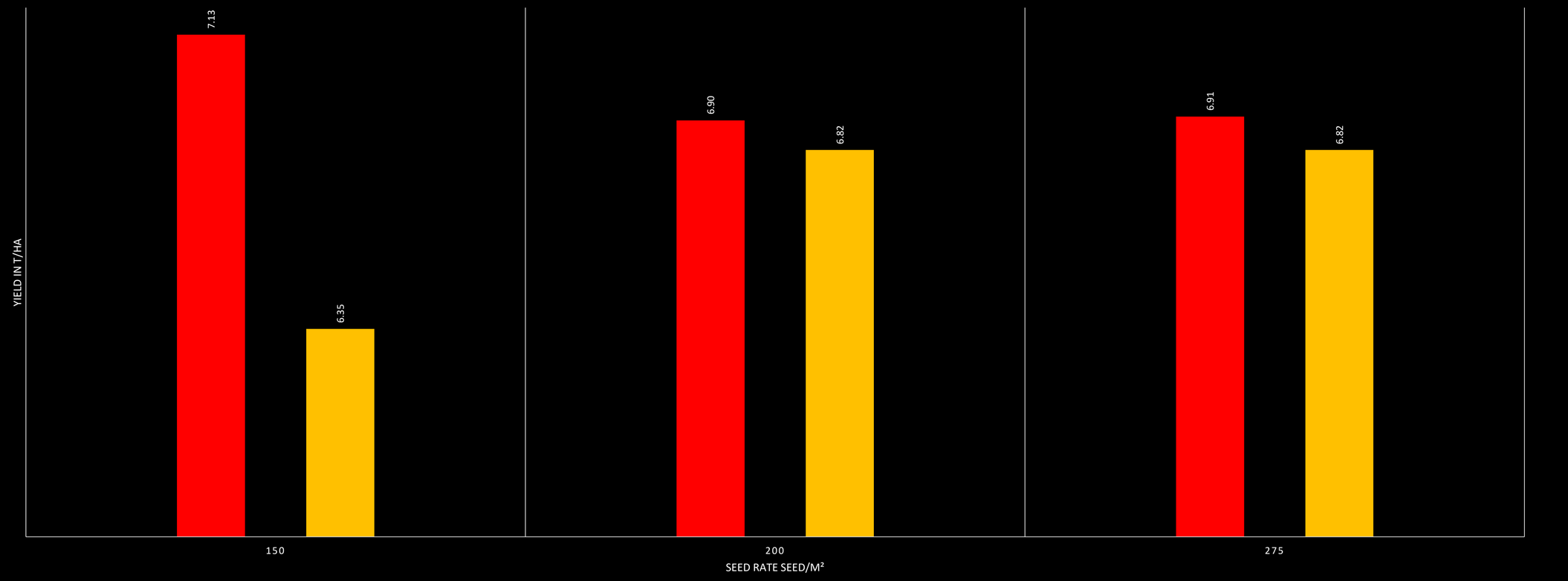
- ✓ Maximum yield potential
  - Maintained yield with lower seed rate
- ✓ Higher field germination rate
- ✓ Ability with an even crop to make the best effect of treatments during the crop year
  - Optimized fertilization
  - Optimized fungicide treatments with higher effect
  - Optimized herbicide treatments without penalizing the crop population evenness
- ✓ Very even maturity

Farm Manager
Proceed field

VÄDERSTAD


Standard drill 125 mm
Proceed 225 mm
VÄDERSTAD

Yield wheat Test farm 1



Proceed vs. Conventional pneumatic seed drill

Wheat trials Test farm 2

		Seed rate	Yield	Seed cost	Yield €/ha	Yield - cost	Rank
Hybrid	Proceed	80	10,9	104	2695	2591	2
Standard	Proceed	110	9,4	33	2324	2291	5
Standard	Proceed	150	9,8	45	2423	2378	3
Standard	Proceed	190	11,4	57	2818	2761	1
Standard	Pneumatic drill	210	9,2	63	2275	2212	6
Standard	Pneumatic drill	130	9,7	39	2398	2359	4

Average yield Proceed (hybrid excluded) 10.2 t/ha
Average Conventional 9.5 t/ha

VÄDERSTAD

“The Proceed fields and trials looked the best and most vigorous throughout the whole vegetation period”

“Out of my five fields with highest yields, four were seeded by Proceed”

Farm Manager
Proceed field

Farm own machine

8.47 ton/ha TR 109

£1679.26/ha (€1955/ha)

Proceed

8.26 ton/ha TR 96

£1828.18/ha (€2128/ha)

"It certainly is an exciting prospect for (hopefully) the near future! We are also very happy with the results from our first trial!"

Anglian Pea Growers Ltd.

VÄDERSTAD

Efficiency & Profitability

- ✓ One machine. All crops.
- ✓ High-yield with lower seed rate
- ✓ Improved efficiency of fertilizer and crop protection
- ✓ Less logistics on the farm
- ✓ Enables drilling into stubble or cover crop
  -Reduces costs, maximizes biomass production and prevent erosion
- ✓ Ease-of-use and reduced complexity
  -Väderstad E-control
  - One machine fits all

VÄDERSTAD

Environment

✓High-biomass crop establishment – higher carbon seizure

✓ Very quick germination and vital, competitive plant population – less herbicides needed

✓ Enables a reduced seed rate

-Less plant protection seed treatment needed

-Less seed-filling transports needed

✓ No-till seeding into stubble or cover crops – less fertilizer losses

✓ Precision fertilizer placement – less fertilizer usage

✓ Well aerated plant population with no double seeded areas – less fungicides needed

✓ 22.5cm row spacing allow for inter-row cultivation – less chemical plant protection needed

- Plant protection: -50%
- Fertiliser use: -20 %
- Fertiliser losses: -50%
- Organic farming: 25%

VÄDERSTAD

Thank you

VÄDERSTAD

BREAK

Dr Lizzie Sagoo

Research round up

Lizzie Sagoo, ADAS

HMC Technical Meeting 10th February 2023

Outline

- Pea YEN
- Post vining pea cover crops
- INNO-VEG
- PeaSat
- AHDB Soil health scorecard

The Pea YEN

Tom Wilkinson & Charlotte White, ADAS

HMC Technical Meeting 10th February 2023

The Yield Enhancement Network – an introduction

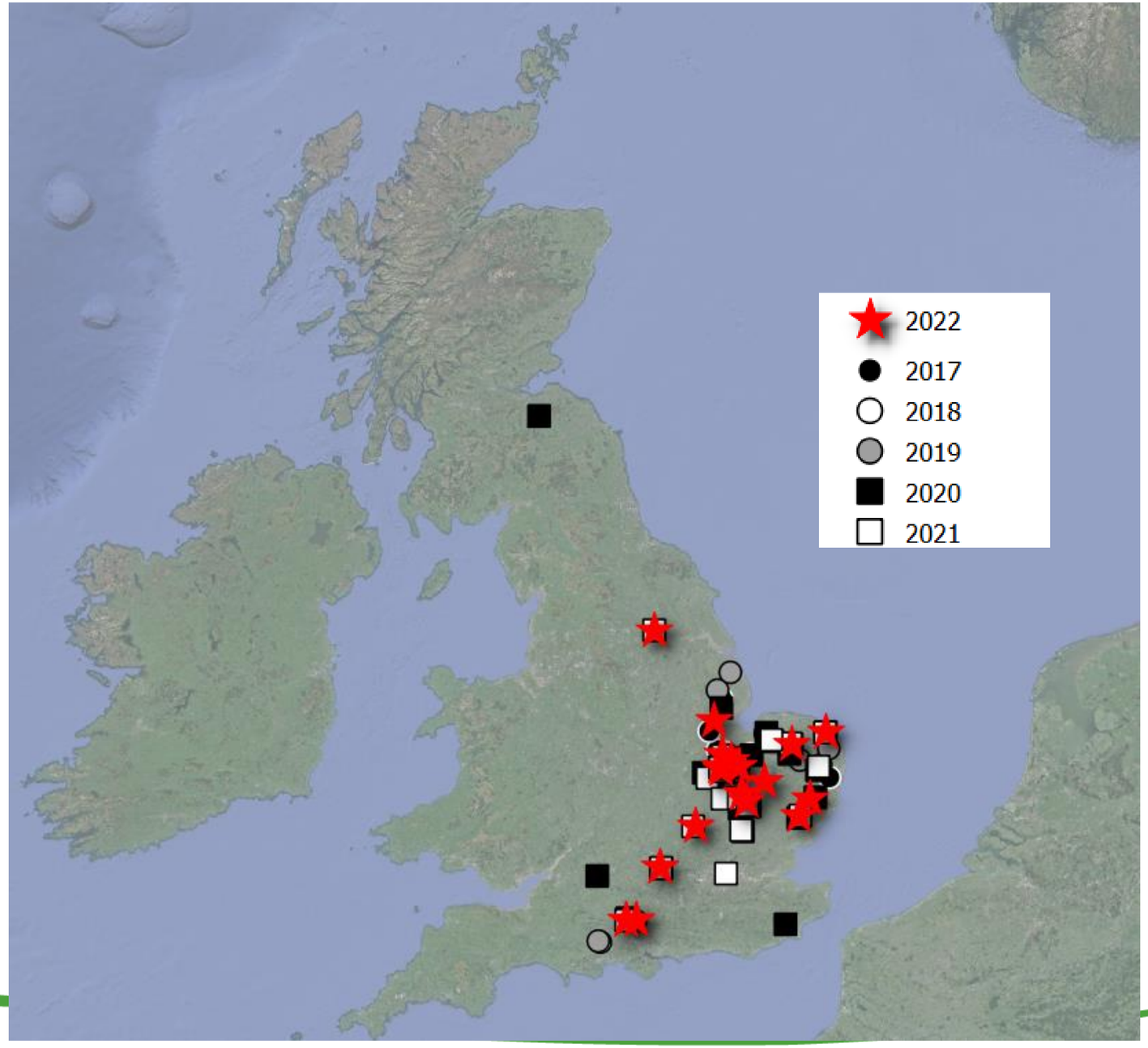
Growing YEN family

Pea YEN initiated in 2016

- Currently focused around combining peas, but have had vining peas for seed in the past
- Some learnings still likely to be relevant to vining peas

Pea YEN

- 25 entries registered in 2022
- 95 entries with Yields



How YENs work

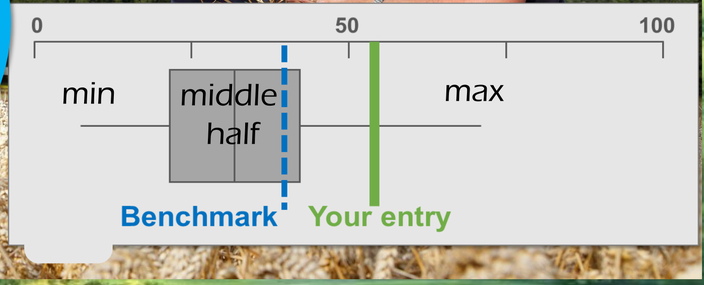
Analysing & Summarising

Growth Guides

ahdb.org.uk

Knowledge

Benchmarking & Reporting



Metrics

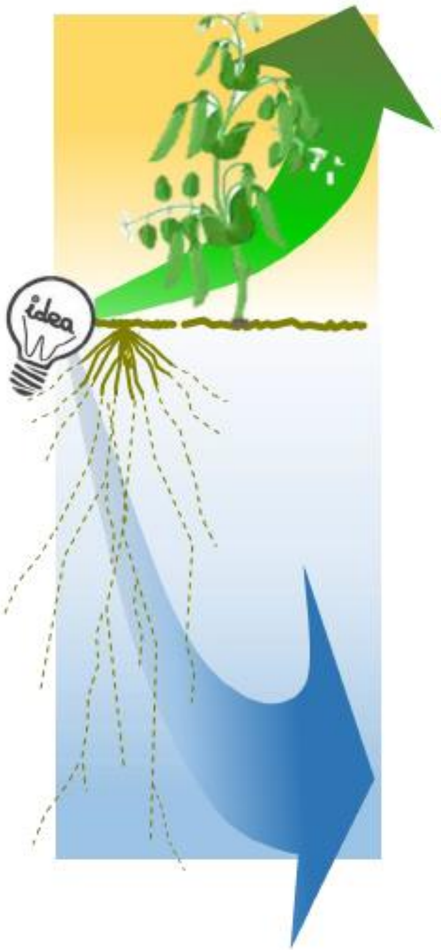
Tests

FIGs: F… Innovation Groups & Field Labs Multi-site Testing

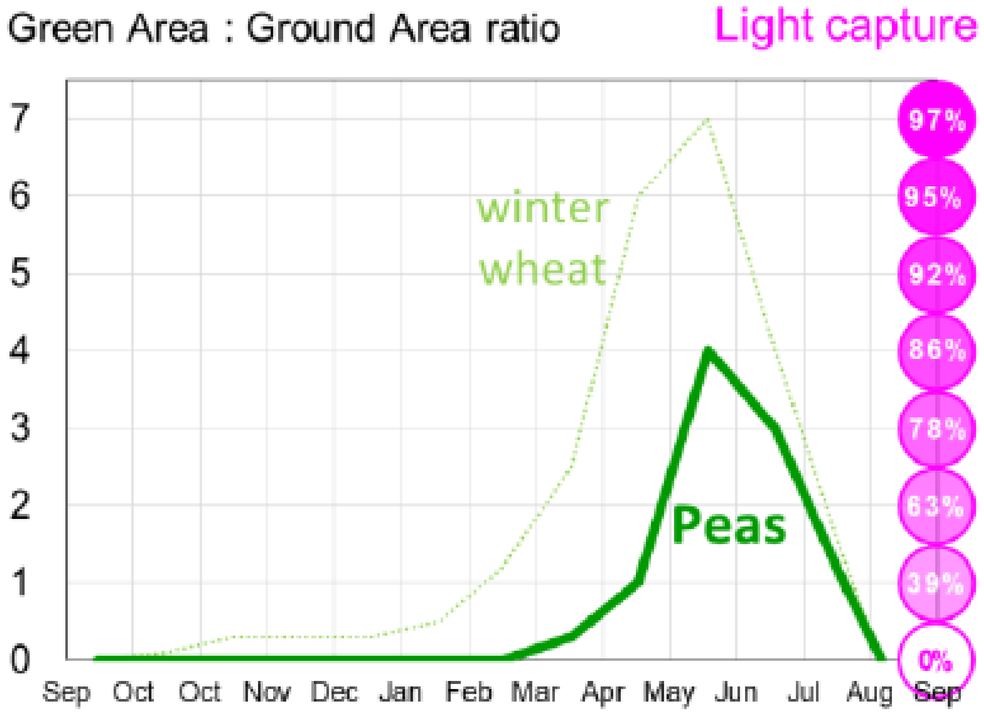
Ideas

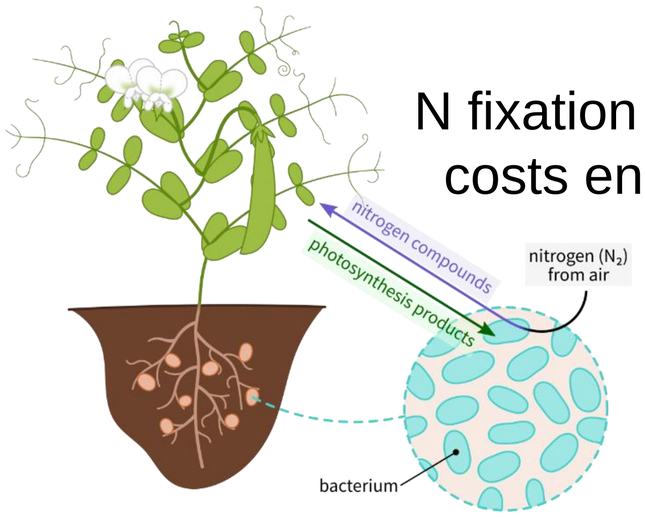
Sharing & developing ideas

Biophysical Potential Yields for Peas



- Maximum GAI & light interception
  - 55%-65% radiation by peas
    - *Compared to 60% for cereals*
- Radiation Use Efficiency 1 tonne/TJ
  - *Compared to 1.4 t/TJ cereals*
  - Accounts for costs of N fixation
- Max rooting depth to 1 m
  - *Compared to 1.5m in cereals*
  - Spring crops roots grow at 1cm per day
- Water Use efficiency 4g/litre (or 25 mm/t)
  - *Compared to 5 g/litre in cereals*
  - *Accounts for N fixation / lower RUE*
- Max harvest index 60%

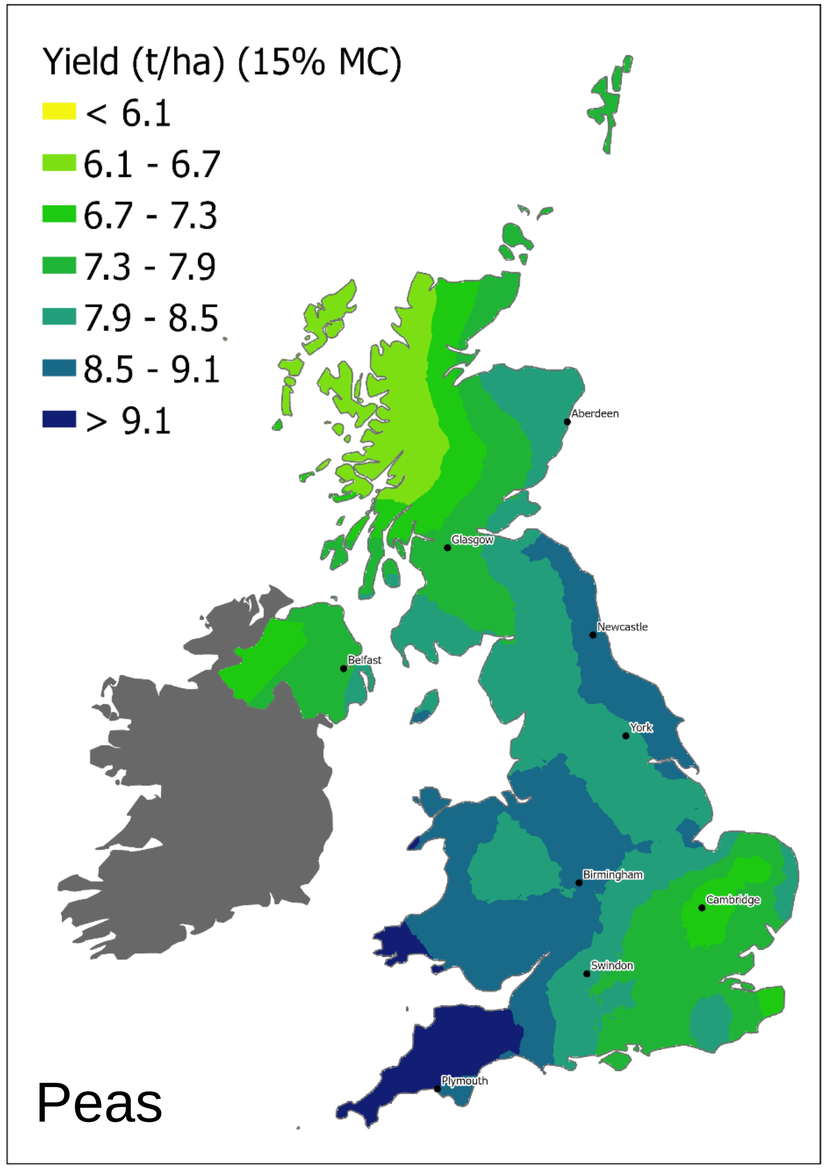




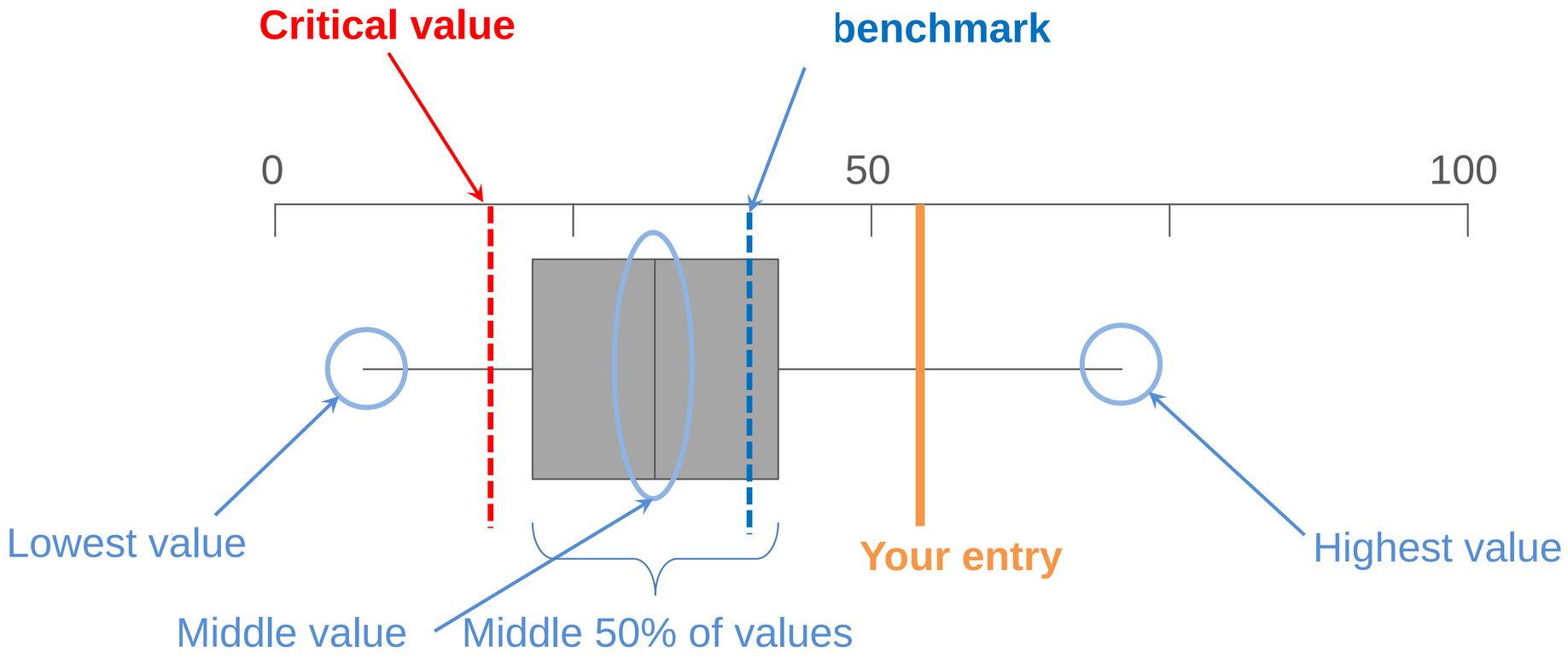
N fixation costs energy

Biophysical potential yield maps – 2022 Weather.

Soil available water:
260 mm to 1.5 m depth



Benchmarking important metrics



Methods of analysing YEN data

- **Partition analysis** - partitioned the data set into the top and bottom 25 % of yields and tested whether crop characteristics differed between the high and low yielding groups
  - Note that this cannot disentangle cause and effect (cannot say what is *driving* yield) but combined with expert judgement we should be able to develop practical messages
  - Just because a factor is not highlighted in the analysis does not mean it is unimportant.
  - Most data is from 2019-2022

Methods of analysing YEN data

- **REML**
  - more sophisticated analysis that allows ‘effect sizes’ to be applied, including on categorical data. This helps explain the average variation of an average yield, but it should be remembered that many factors will be influencing yield.
  - Note that this cannot disentangle cause and effect (cannot say what is *driving* yield) but combined with expert judgement we should be able to develop practical messages
  - A straight line is fit to give the REML effect size above the average, but in reality, effects will level off eventually
  - Just because a factor is not highlighted in the analysis does not mean it is unimportant.

Summary – Site, Soil and nutrition

- Some association between yield and location, although most of the data is tightly centralised around the east of England
- Yields not limited by yield potential
- Silty soils tend to see higher yields – suggesting water retention is important
- Most growers within target range for soil pH and soil nutrient indices. No association with fert applications, but note only bagged fert applied within season accounted for

Summary – Establishment & Agronomy

- Higher yields associated with earlier sowing (-0.021 t/ha per day delay)
- Generally, marrowfats are lower yielding
- Fields with manure history associated with higher yields
- Higher yields associated with herbicide and fungicide use but not insecticide use (*remember to not assume cause and effect!)*

Summary – Yield Components

- Across all variety types, higher yields positively associated with:
  - pods/shoot, seeds/m^2
  - Plant height, individual shoot biomass, crop biomass and Harvest Index

- In addition, when split out into variety types reveals
  - TSW (seed filling) important within variety types
  - Higher plant population associated with increased yields in non-marrowfats
    - *Note that most marrowfat entries above economic optimum plant popn*

- High yields coming from large well podded plants
  - Maximise light capture and avoid stress through flowering to increase sink size

- Seed filling important for seed size
  - Avoid stress during seed fill and maximise canopy duration

Post vining pea cover crops

Kate Smith, ADAS

HMC Technical Meeting 10th February 2023

Objectives: Post vining peas cover crop

To determine the impact of contrasting over-winter ground cover on nitrate leaching losses in the winter after vining peas.

Post vining peas catch crop & companion cropping

- North Lincolnshire, sandy loam soil
- Ground cover (both catch crop and companion crop): Buckwheat, Linseed, phacelia, sunflower, crimson clover & red clover.

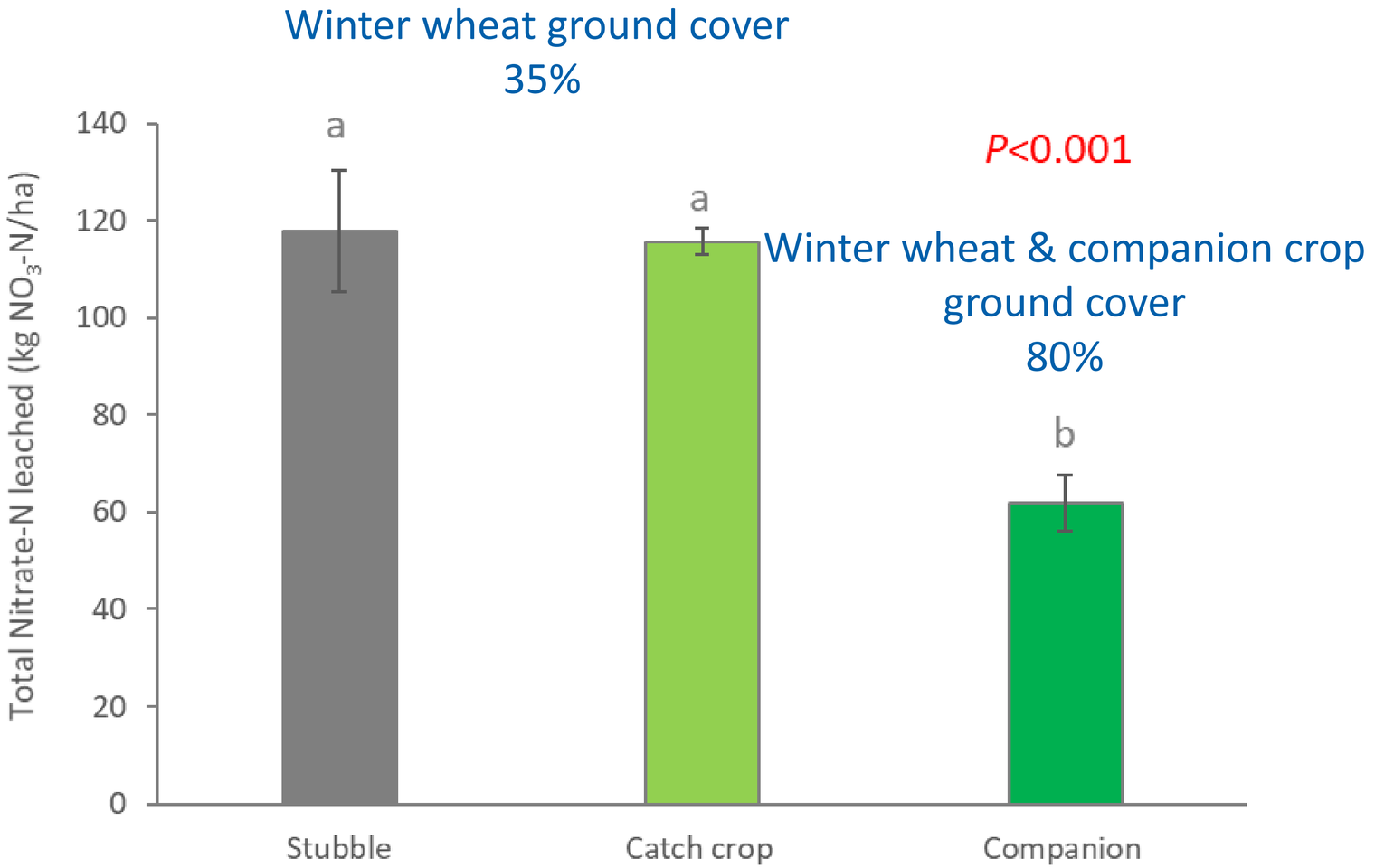
Ground cover Management:

1. Stubble
2. Catch crop (destroyed 1 October)
3. ‘Companion crop’ (destroyed 1 March)

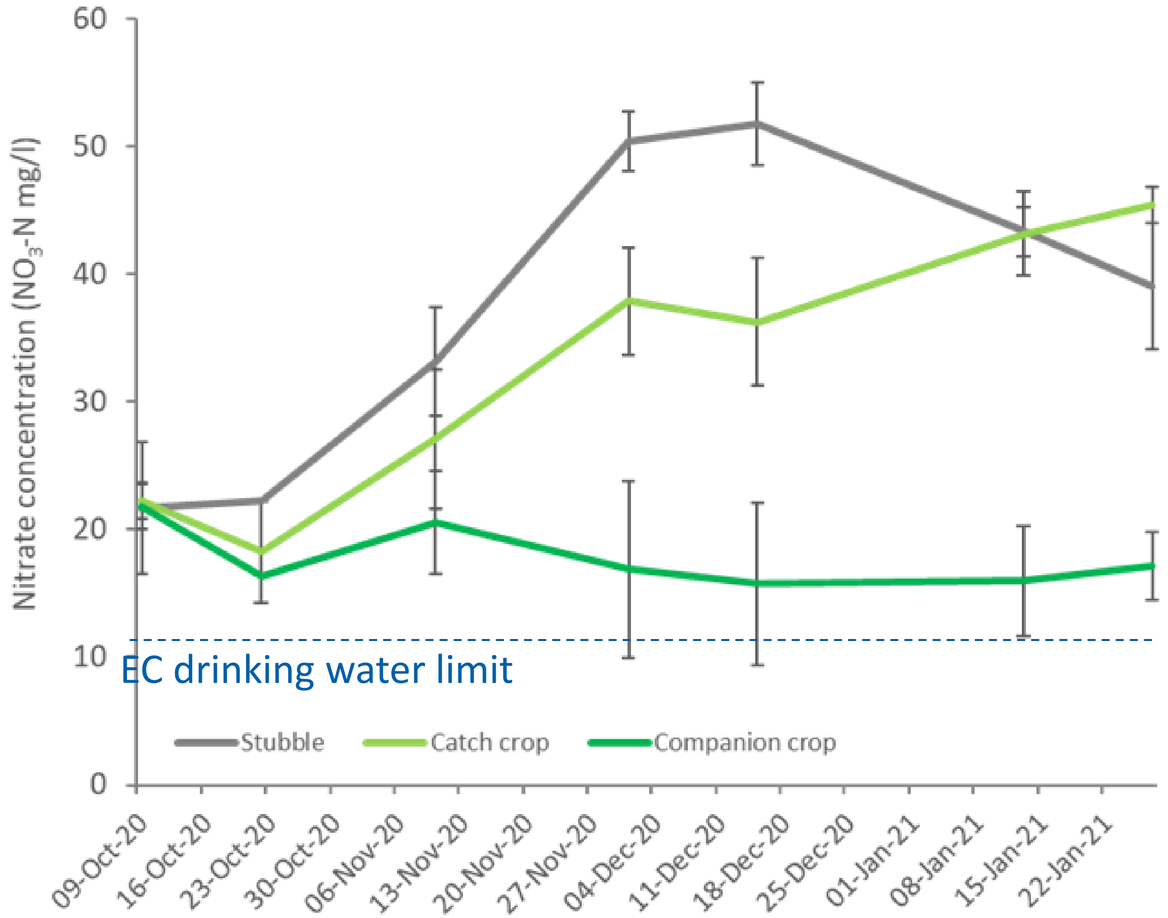
Measured nitrate leaching, winter wheat yield & total N-uptake.

15 kg/ha and consisted of: Buckwheat (30%), Linseed (31 %), Phacelia (15 %), Sunflower (10%), Crimson clover (4%) and red clover (2%).

Post peas catch crop & companion cropping



Post peas catch crop & companion cropping



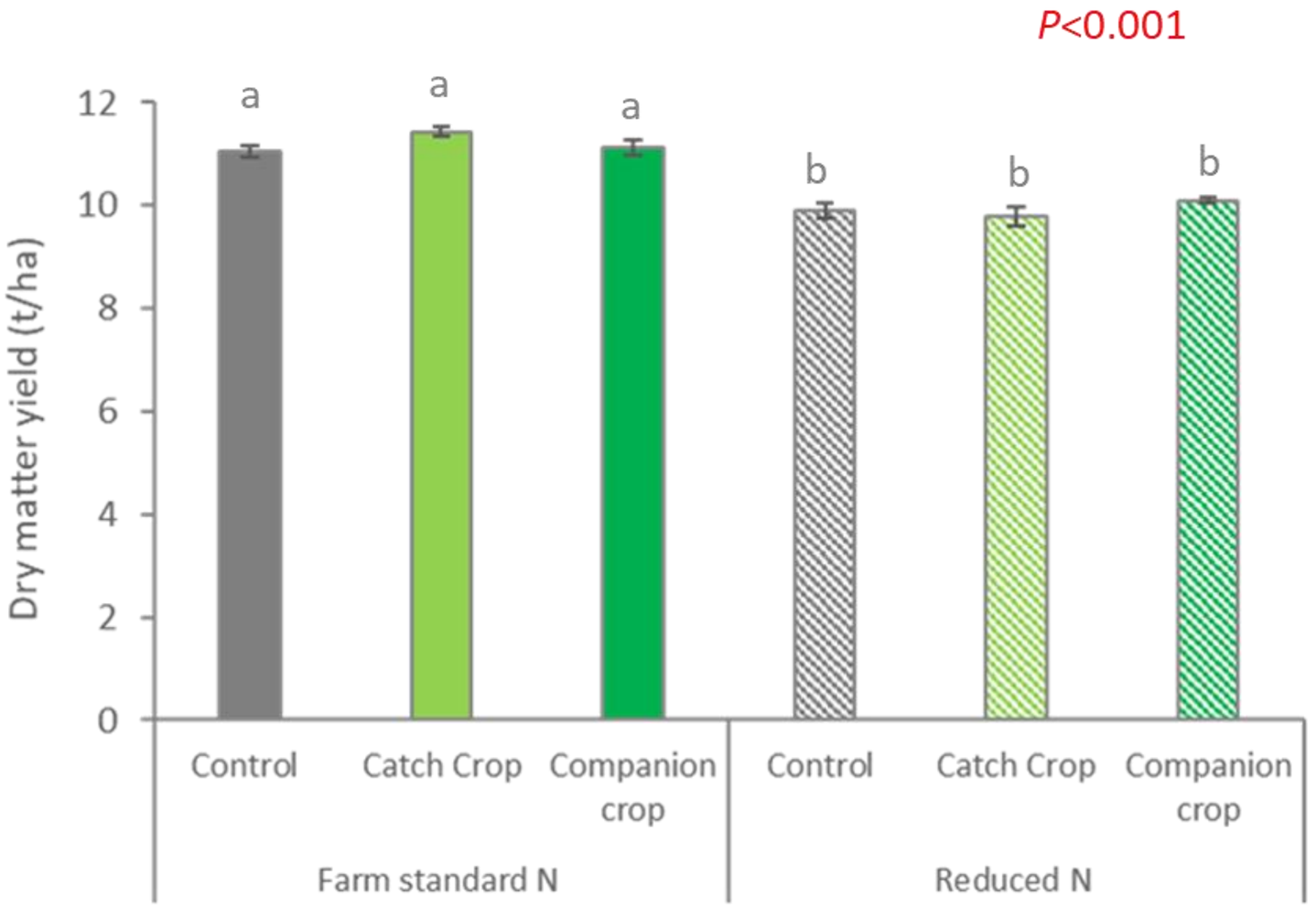
Winter Wheat Yields

Farm Standard

280 kg N/ha

Reduced N

195 kg N/ha



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

Framework conditions for innovation

INNO-VEG project update

HMC Technical Meeting 9th February 2023

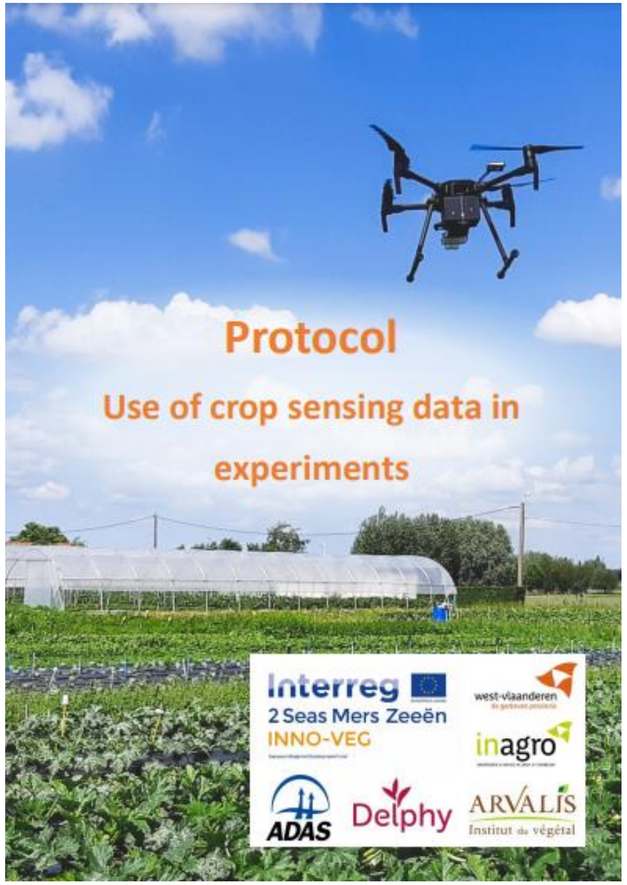
@InnoVeg

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

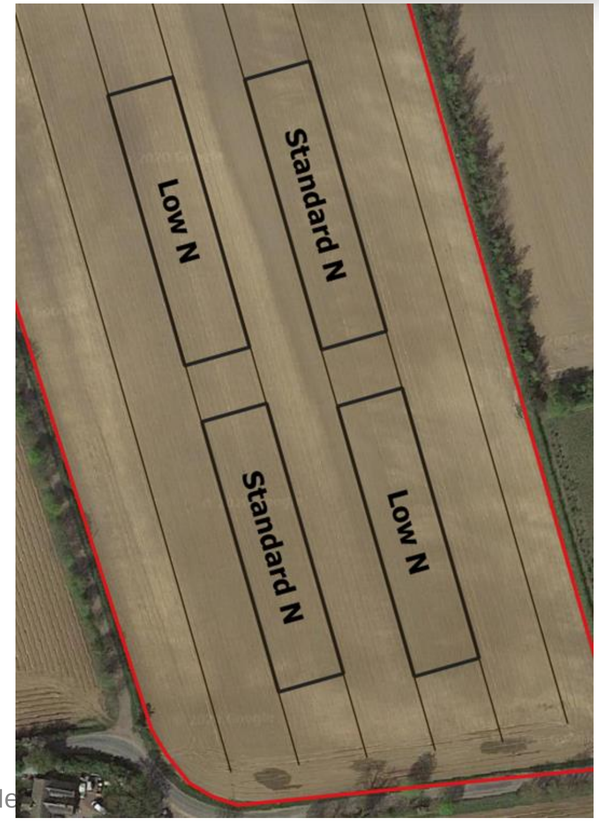
- 2019 - 47 small plot field experiments in UK, FR, BE & NL
  - Range of crops
  - Use crop sensors to measure reflectance
  - Calculate range of vegetation indices & correlate to crop yield

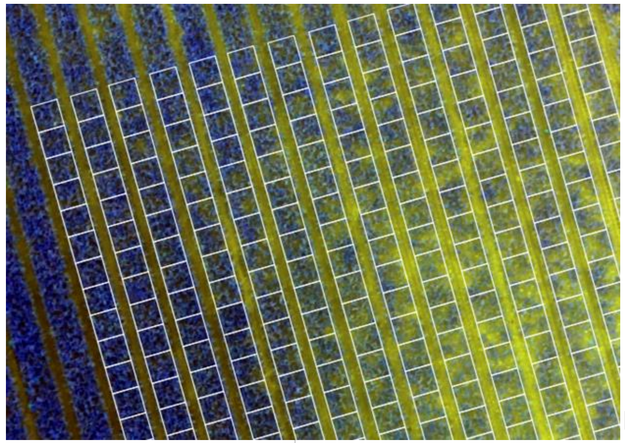


www.inno-veg.org

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’





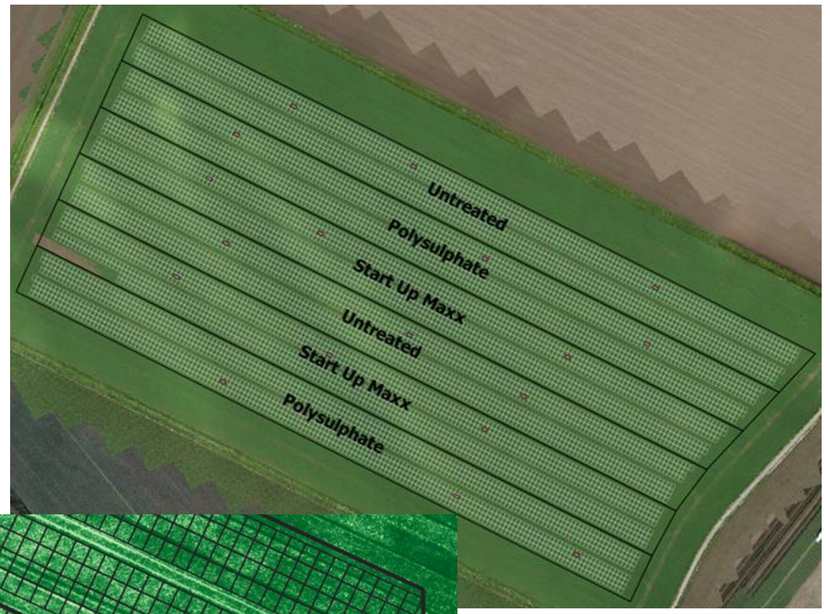
Interreg
2 Seas Mers Zeeën
INNO-VEC

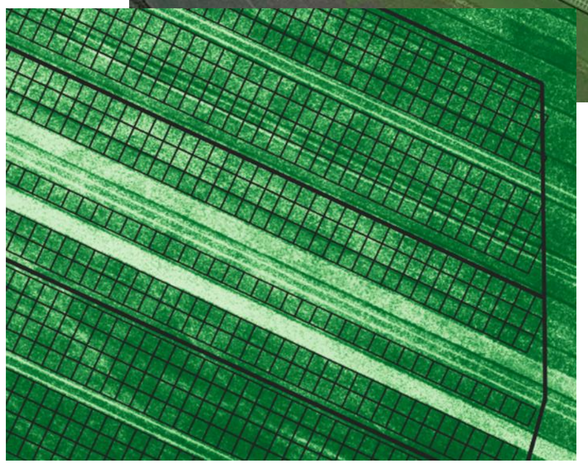
Agronomics spatial data analysis

Agronomics

Innovate UK
Technology Strategy Board

- Spatial statistics to model treatment effects, after accounting for underlying spatial variation
- Drone imagery converted to point data
- Grid cells 3.5 x 3 m long
- Good relationship between VIs & yield – produced predicted yield map
- Enables calculation of Least Significant Differences (LSDs) to assess significance of treatment effects





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2 Seas Mers Zeeën
INNO-VEG

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 available to download from project website www.inno-veg.org

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)

Application process

Three stage application process:

- Activity Pitch Questionnaire
  - Pitch session to UK Space Agency & ESA
  - Outline proposal
  - Full proposal

GREATSOILS

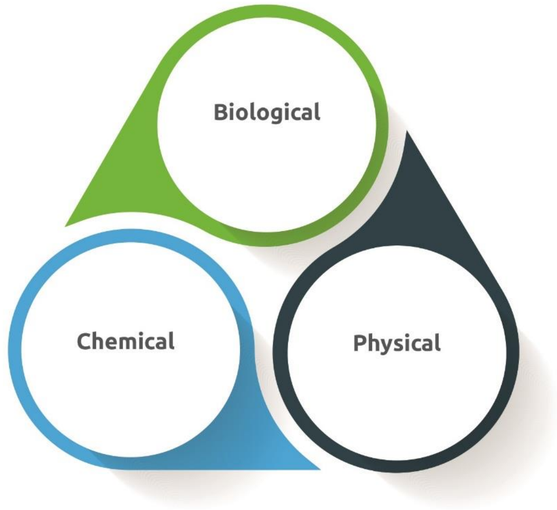
AHDB

AHDB Soil health scorecard

Soil Biology and Soil Health Partnership

Aims:

- Develop and validate indicators of soil health for routine on-farm monitoring
- Improve understanding of soil biology in relation to soil health management



Soil Biology and Soil Health Partnership | AHDB

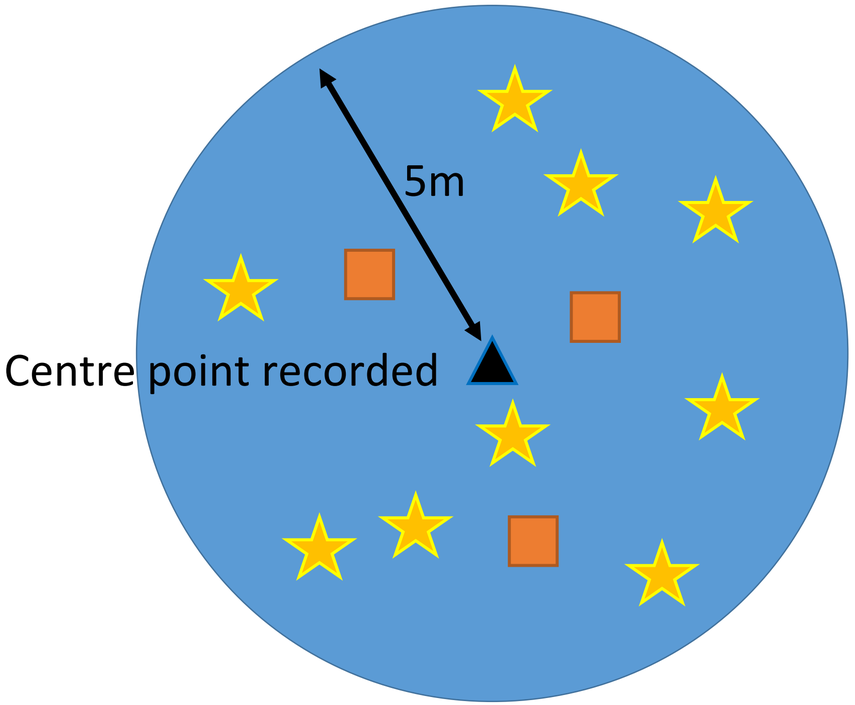
What's on the soil health scorecard?

Comparison categories	Soil health scorecard indicators		
	Physical	Chemical	Biological
Region (rainfall class)	Visual assessment of soil structure (VESS) most limiting layer	pH	Earthworm count
Rotational cropping		P	SOM
Topsoil character		K	(Microbial activity)
		Mg	

Field measure	Measured in a soil sample

Scorecard protocol and benchmarking documents

Sampling site within field



Spade assessment of structure

Randomly located multiple cores (use numbers advised) consolidated into sample sent for analysis

INVESTIGATE
REVIEW
CONTINUE ROTATIONAL MONITORING

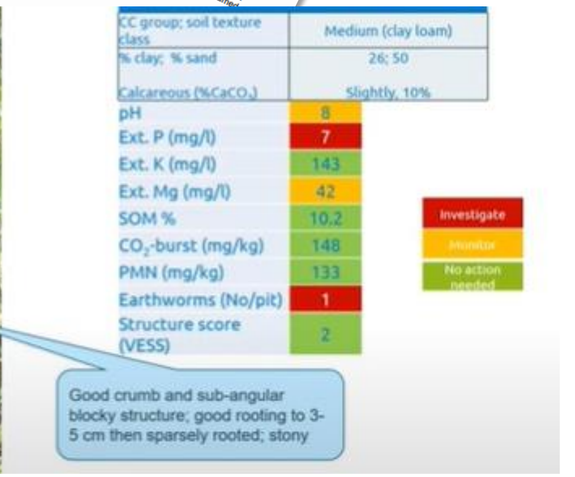
Notes are given together with the traffic light result

Soil health scorecard approach to measure and monitor soil health on-farm

Field name	Workshop	Pylon - heavy	Pylon - medium
Texture	medium	medium	light
SOM (%LOI)	4.2	4	4
pH	8.4	8.1	7.4
Ext. P (mg/l)	16	8.6	15.8
Ext. K (mg/l)	198	153	173
Ext. Mg (mg/l)	52	58.2	72
VESS score	2	2	1
Earthworms (No./pit)	11	3	3
PMN (mg/kg)	68.49	91.85	108.39
CO_2-C (mg/kg)	111	99	119

Investigate Review Continue rotational monitoring

Monitoring soil health on farm



Thank you

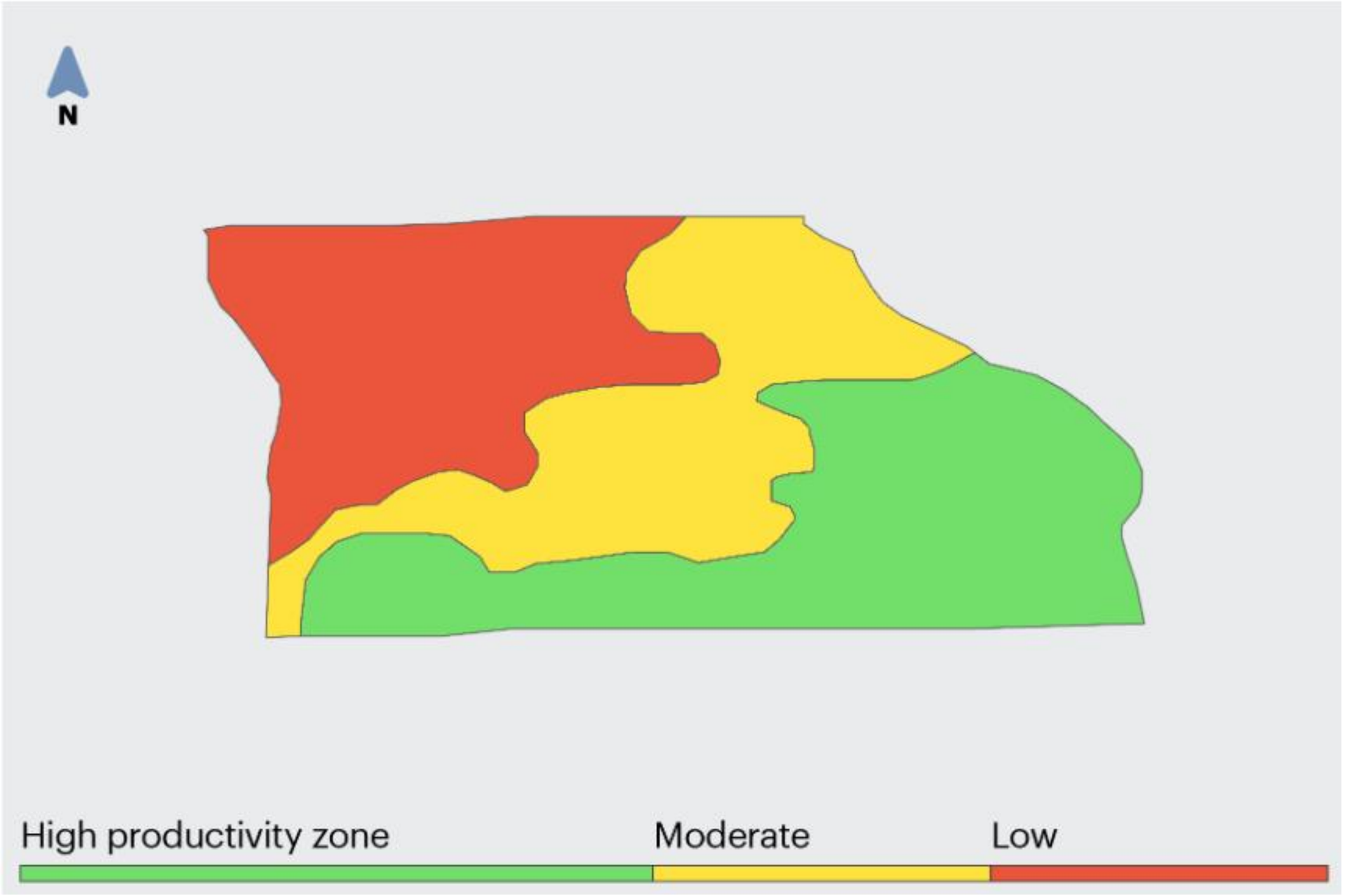
Lizzie.Sagoo@adas.co.uk

@LizzieSagoo

Jack & Allen

Seed Rate Trials

- Comments made about seed rates have been listened to
- Will investigate with 4 fields this year trying different flat rates
- Tomahawk/Amalfi/Trophee/Oasis
- Single trial done by OneSoil in combinable peas suggests that it can be more economically viable to increase seed rates in more productive areas of land over lower productive areas.
- Can this be achieved with vining peas?
- 1st year seed rate trial
- 2nd year look at drill depth trials along with seed rate



OneSoil

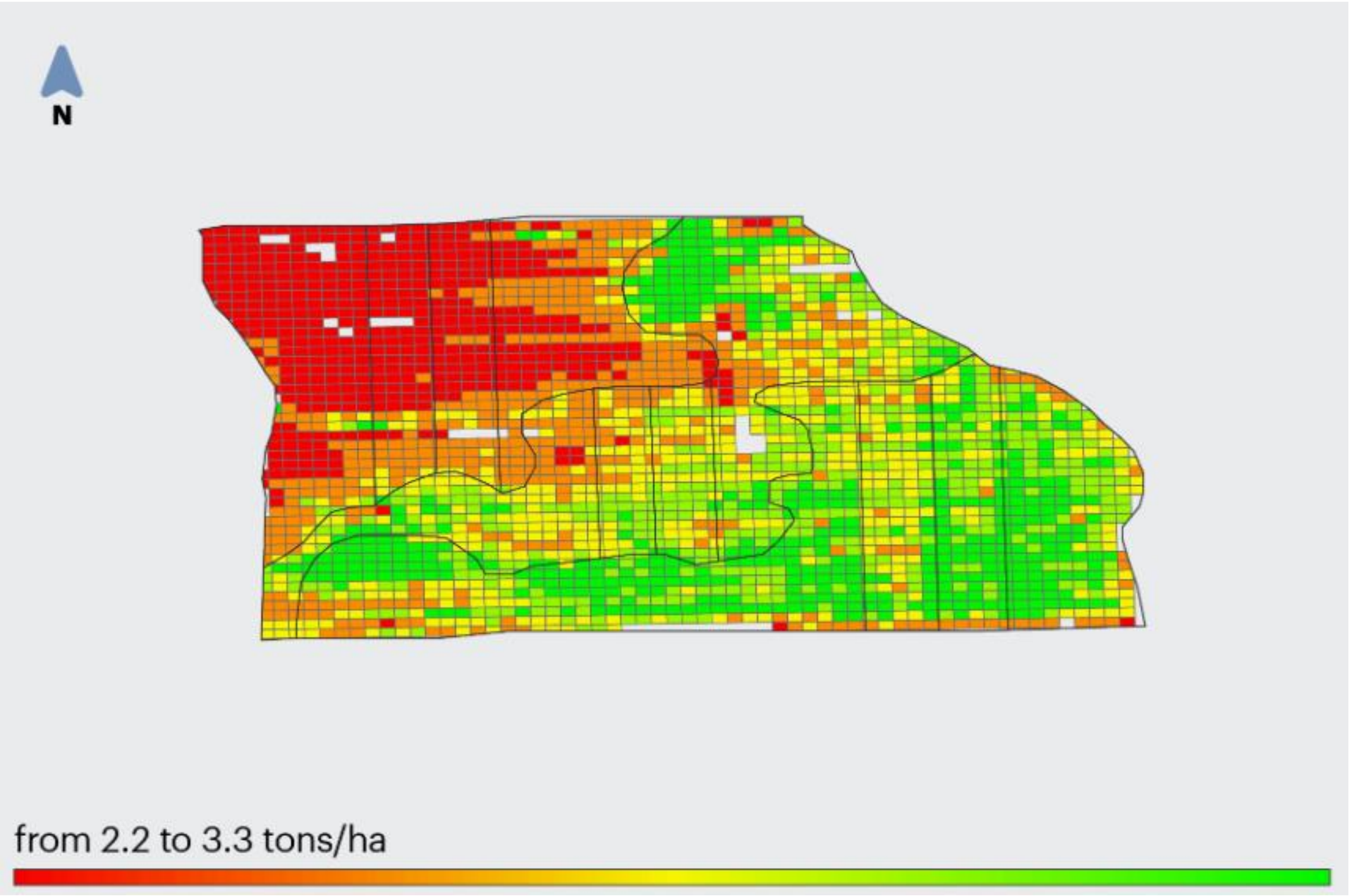
Source: Usevald Henin, OneSoil

HMC

OneSoil

Source: Usevald Henin, OneSoil

HMC



OneSoil

Source: Usevald Henin, OneSoil

HMC

Seeding rate, kg/ha	High-productivity zone	Moderate	Low
230	2.93	2.72	2.41
300	3.07	2.86	2.44
370	3.25	2.84	2.37

Average yield, t/ha

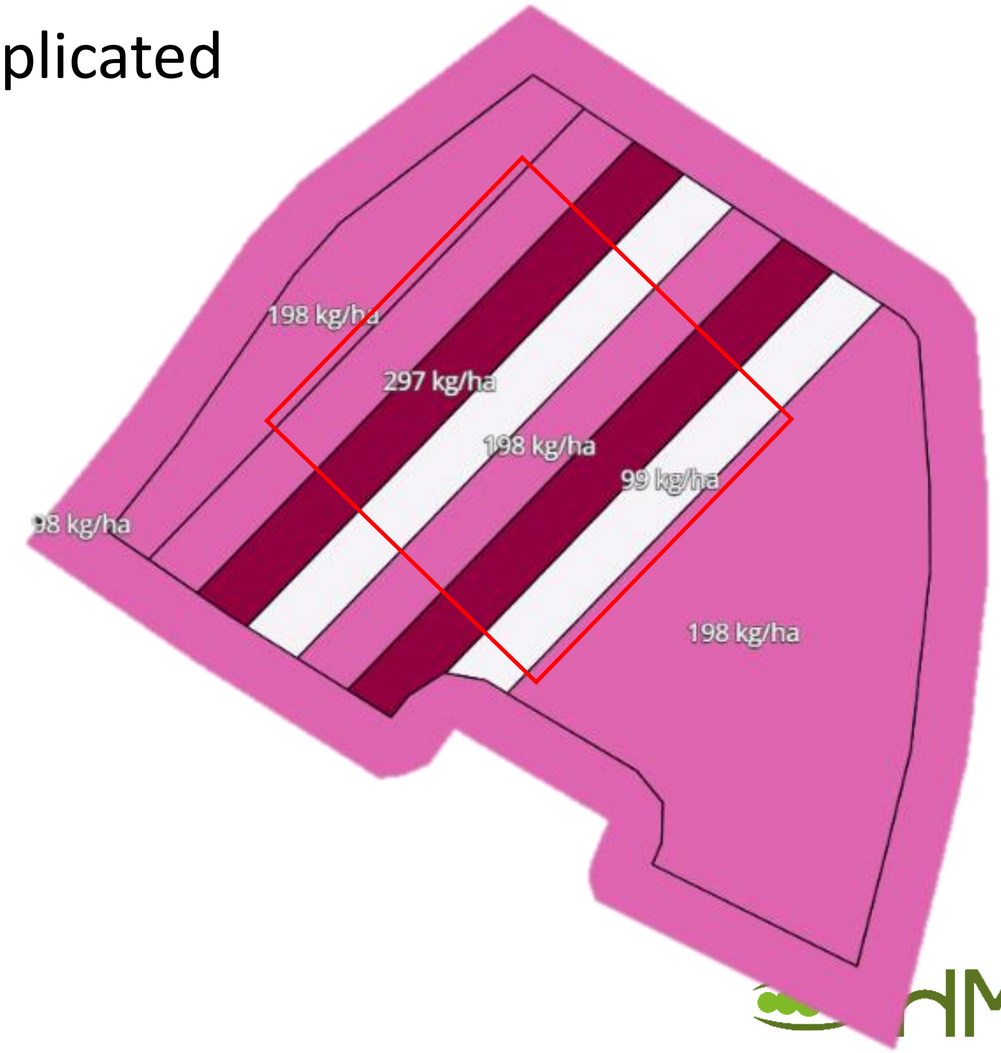
0.32 t/ha increase
£160/ha increase
£113/ha seed increase

0.12 t/ha increase
£60/ha increase
£113/ha seed increase

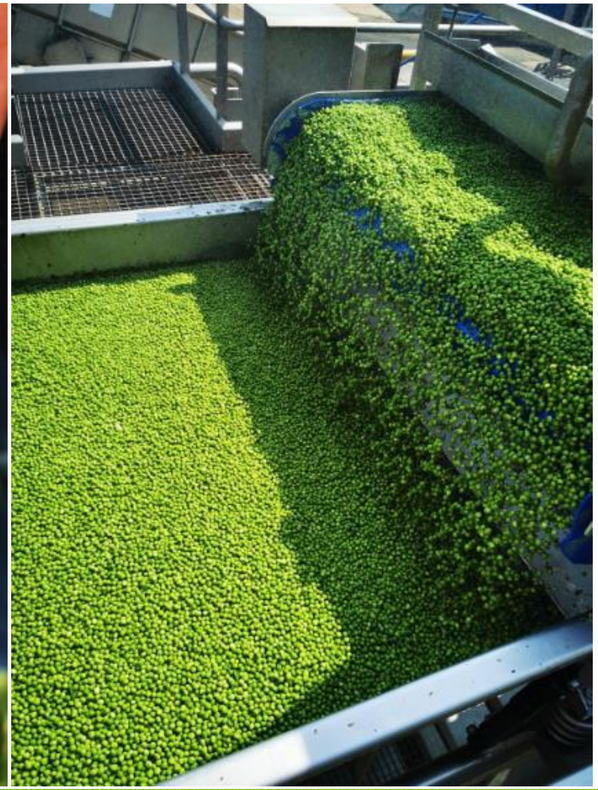
-0.04 t/ha increase
£20/ha decrease
£113/ha seed increase

Source: Usevald Henin, OneSoil

- We hope to replicate this work in vining peas and see how it works in UK conditions with our seed rates
- Fields to be scanned with Terra Map to give underlying zones
- Trial will go through different zones and be replicated
- Simplified zones to make drilling a lot easier
- Plant counts at emergence
- TR samples before harvest
- Weights at harvest



Stuart Ashton & Jasmine Collins



HMC 2022 Pea Season

Friday 10th February 2023

GREENYARD

for a healthier future

Overview – Key numbers

FROZEN

Boston

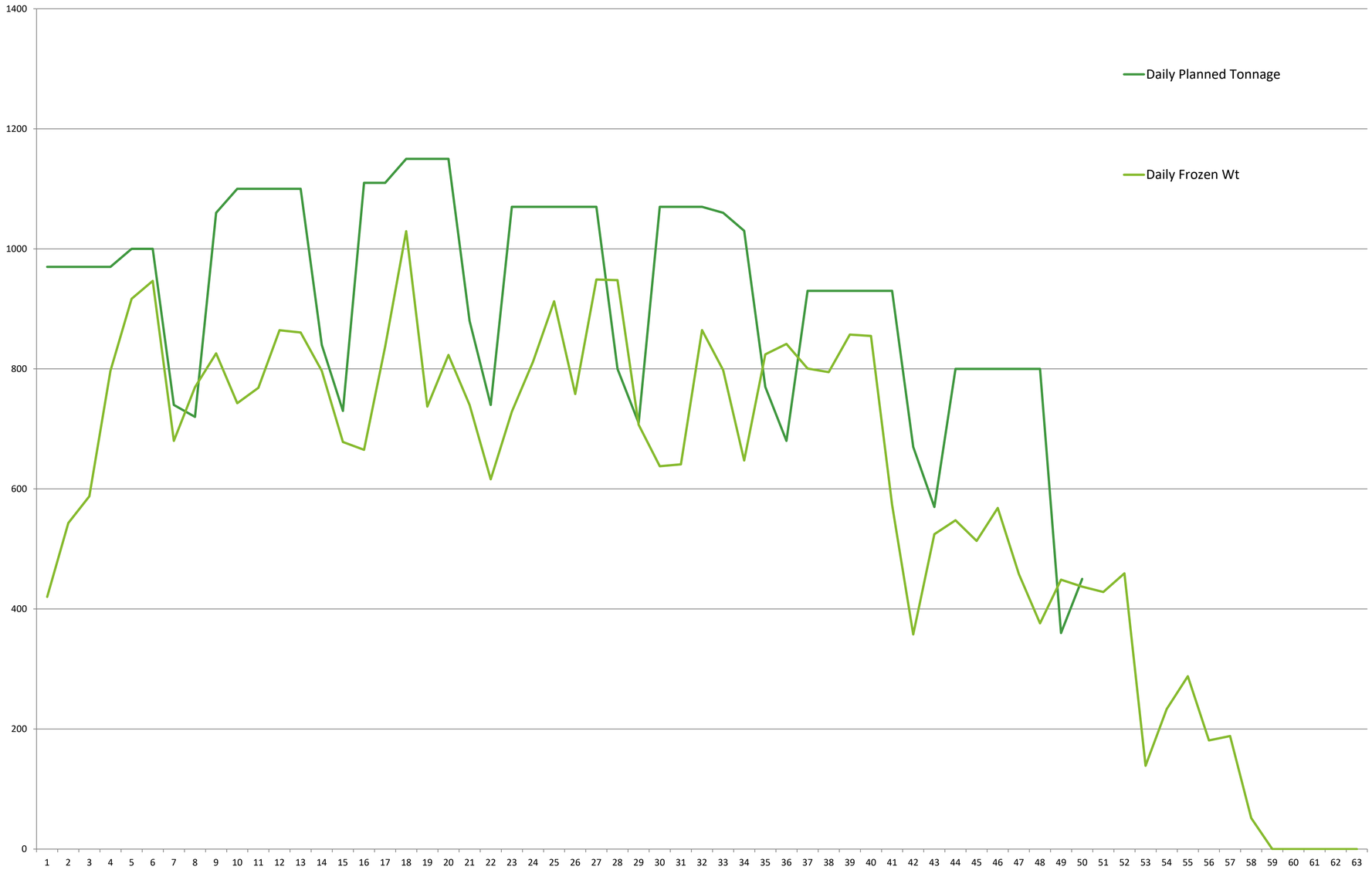
Planned	Delivered	Frozen
21,414	18,061	13,825

KL

Planned	Delivered	Frozen
33,968	29,431	23,293

Green	81%
Amber	6%
Red	9%
Brown	4%

Overall Program vs Actual



FROZEN

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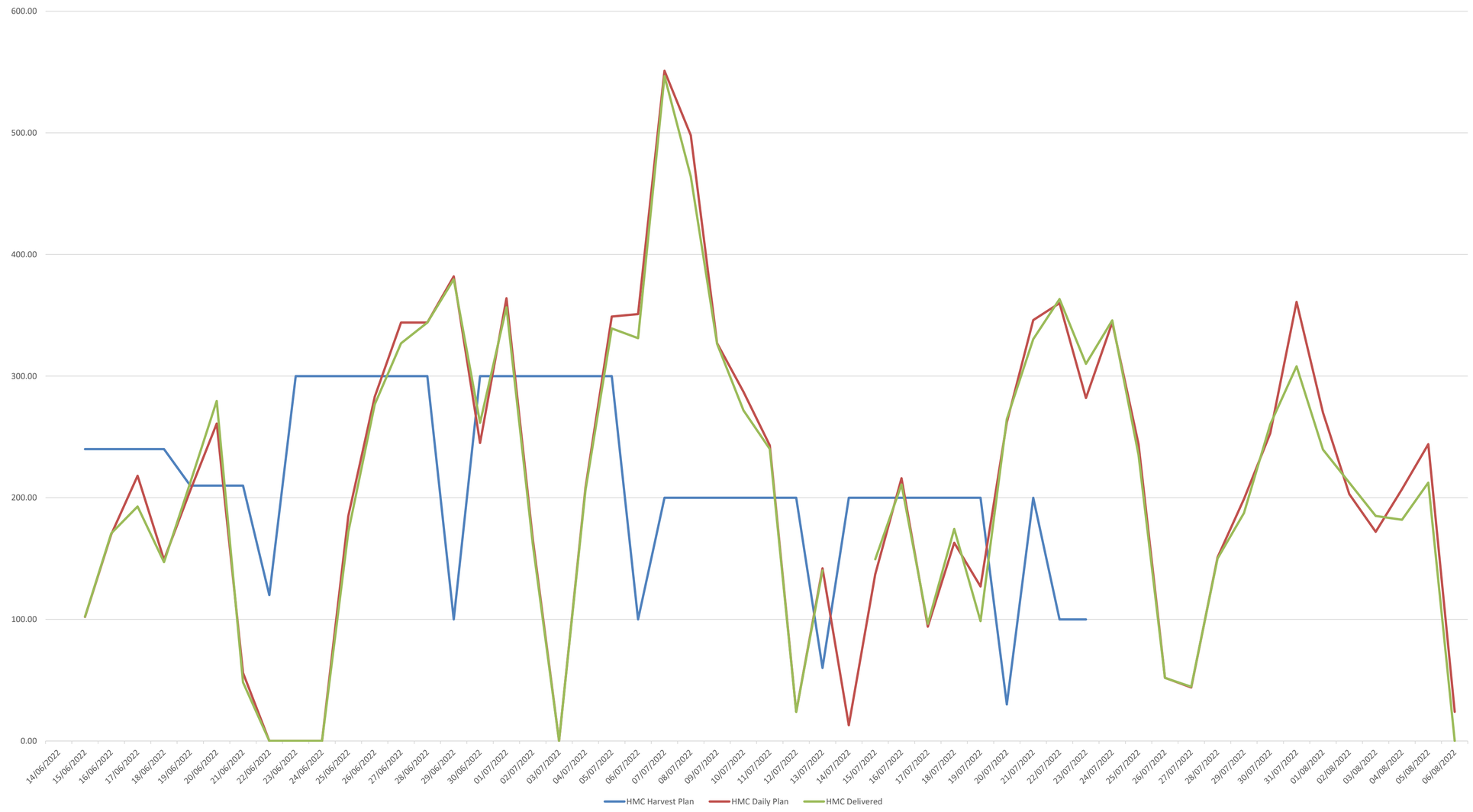
Programmed Tonnage vs Planned vs Delivered

FROZEN



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Pros	Cons
Low bypass	Long season 53 day
Growers covering each other/More of a team approach in 2022	Tonnes lost each day - £100k in efficiency
Flexibility with hygienes	Hygiene room for improvement in BN
Labour availability	Grower hitting plan? Five lines open – not filled
Communication	Communication - night, weekend cover for Field- Agro-Factory
Whatsapp	Peas to petits new way of working
Transport despite bridge	High pressure in M3 - slower tonnage
Low number of breakdowns	High EVM (due to drought/season) and bird droppings - percentage of red pallets
Weighbridge	Ramps initially at BN
Grower Relationship	Weather???
New hoppers at BN - no spillage	Agrim reports for load times
Communication improved, certainly in turnaround of lorries	Need to know the plan earlier in the day
Factory walkround with field operatives to understand what each side is looking to achieve and vice versa	

Learnings to take into the 2023 Season

FROZEN

- Keep What's App groups
- Keep Red/Yellow card system (with increased coms on this)
- Implement new way of working for changes between pea and petits
- Continue to improve hygienes at Boston
- Invite field guys in pre-season to run through tipping, delivery times, red & yellow cards, etc
- Ensure controlled tipping at Boston
- Improve communication from field to factory on yield and deliveries
- Get field team into factory, and factory team into field
- Produce graph to track dashboard prediction, requested tonnage, delivered tonnage and frozen tonnage on daily basis

Red Tractor – MRL

FROZEN

- We highlighted to Simon Thorpe (Red Tractor) the low risk nature of peas – sharing our own data and PRiF to back this up (see appendix).

- Simon has agreed with our assessment that peas are a low risk crop and has gone back to Red Tractor to formulate a policy to cover peas as a stand alone testing regime. Currently this looks to be a trial for the 2022 season, with us at Greenyard sharing our MRL data via Food Experts.

- Testing frequency will be upped from twice to three times per grower group over the season

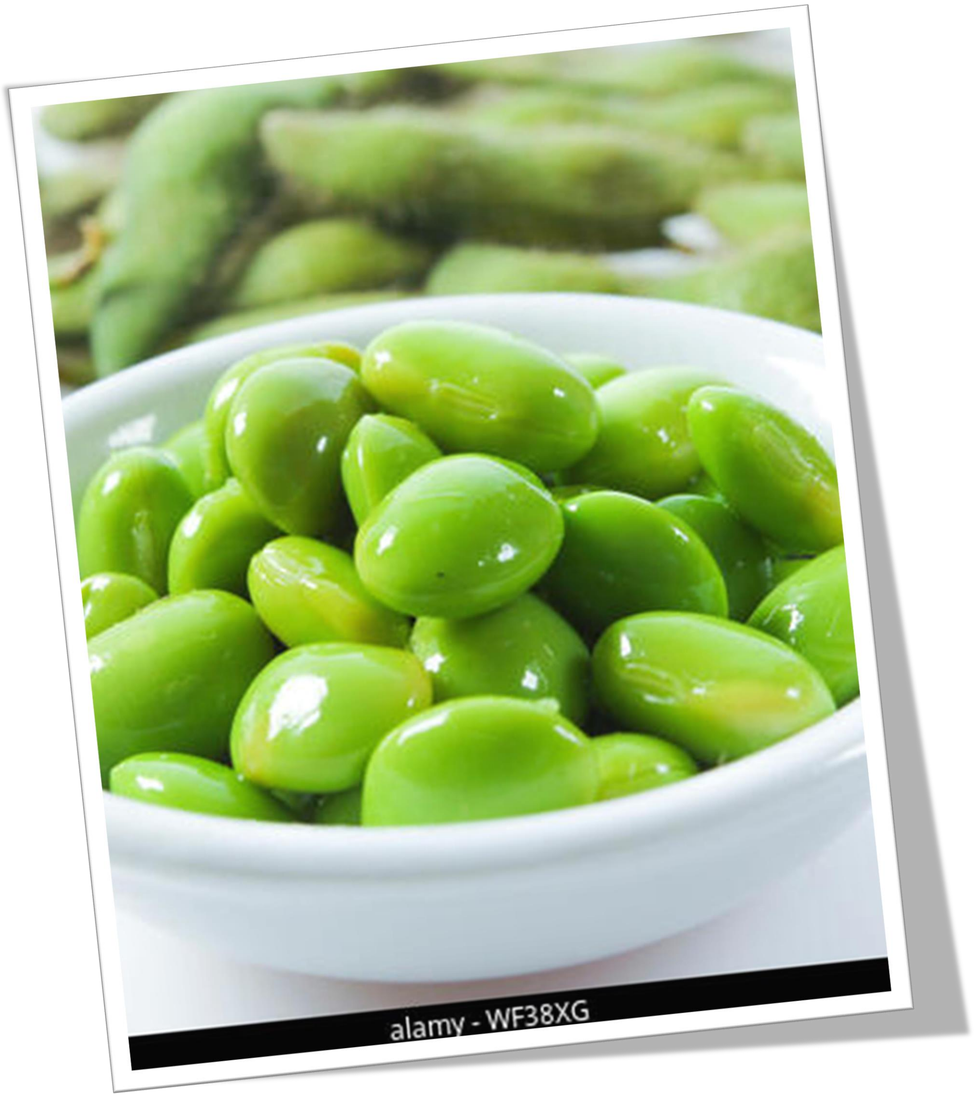
- Testing will be targeted, to hit a wider number of growers going forward

“pea growers within co-operatives supplying Greenyard may cite their involvement in this project as their plan for future compliance with IM.5 / IM.5.g”

Edamame Beans

FROZEN

- Growing market
- Currently cornered by the Chinese and USA
- Feasible to harvest with existing machinery for vining peas (beans out of pod)
- Similar agronomy to vining peas
- Fits with our freezing program



GREENYARD

AOB

FROZEN

Any questions?

GREENYARD

Thank you
Any question please contact:

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Appendix – PRiF Data

2020

FROZEN

Results by food type 2020

Food sampled	Number of samples tested	Number of samples containing residues at or below MRL	Number of samples containing residues above the MRL	Number of samples containing more than one pesticide
Avocado	72	19	0	3
Beans with pods	72	34	7	25
Carrot	82	36	0	14
Cauliflower	78	26	1	0
Courgette	66	18	0	6
Grapes	78	73	1	68
Herbs	32	28	3	26
Kiwi Fruit	72	24	2	8
Lettuce	72	30	0	17
Mango	66	28	0	10
Okra	73	21	11	18
Onions	72	19	0	7
Oranges	75	66	1	65
Pea without edible pods	60	17	0	1
Pears	72	56	1	53
Peas with edible pods	31	25	2	16
Potatoes	123	54	1	15
Pumpkin and squash	24	2	2	1
Sweet Potatoes	48	16	0	2

GREENYARD

2018 Results by food type

Food	Number of samples tested	Number of samples containing residues at or below MRL	Number of samples containing residues above the MRL	Number of samples containing more than one pesticide
Apples	96	59	0	42
Aubergine	96	56	0	26
Banana	71	41	0	35
Beans with pods	96	40	21	43
Berries and small fruits	96	60	6	40
Broccoli	96	27	1	9
Chinese cabbage	48	25	1	11
Frozen fruit and smoothie mixes	72	0	2	0
Frozen vegetables	24	0	0	0
Ginger	25	6	10	7
Grapefruit	96	95	1	95
Grapes	120	111	2	93
Lettuce	72	32	0	21
Melon	120	82	1	36
Mushrooms (cultivated)	71	12	1	5
Mushrooms (speciality)	24	6	2	1
Okra	90	24	18	22
Pears	95	68	1	63
Peas without pods	72	14	0	2
Peppers	96	54	3	35
Pineapple	96	53	0	20
Potato	157	76	1	18
Soft citrus	72	70	2	69
Speciality vegetables	61	33	1	14

FROZEN

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2015

Results by food type

Food	Number of samples tested	Number of samples oontaining residues at or below the MRL	Number of samples oontaining residues above the MRL	Number of samples oontaining more than one pestioide residue
Apples	96	65	0	57
Aubergine	96	42	0	20
Banana	85	61	0	50
Bean Sprouts	48	14	5	5
Beans with pods	120	46	28	44
Berries	96	52	3	38
Broccoli	96	31	0	13
Brussels sprouts	54	41	0	9
Celery	48	29	0	17
Chilli peppers	48	19	7	15
Courgette	48	21	0	9
Curry leaves	22	0	6	3
Ginger	24	4	5	3
Grapes	120	105	4	95
Lettuce	72	45	0	21
Mango	48	35	0	13
Melon	60	30	2	16
Okra	90	37	9	22
Pears	96	90	0	84
Peas without pods	96	23	0	5
Peppers	72	42	1	22
Pineapple	48	44	1	25
Plantain	12	7	0	3
Potatoes	156	83	0	31
Prepared fresh fruit	96	25	22	26
Radish	54	29	0	2
Speciality fruit	60	26	6	13

FROZEN

GREENYARD

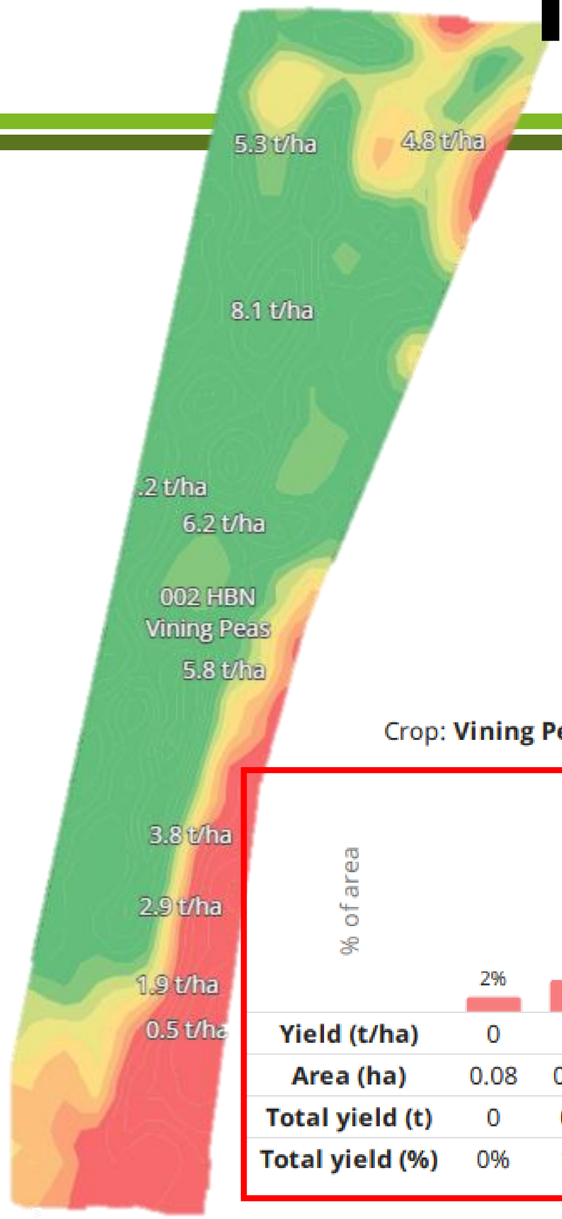
Allen Giles

Back to Basics

- Long Rotation
- Previous Cropping
- Suitable and Best Land
- Cultivations
- Pest Control and Pigeon Control

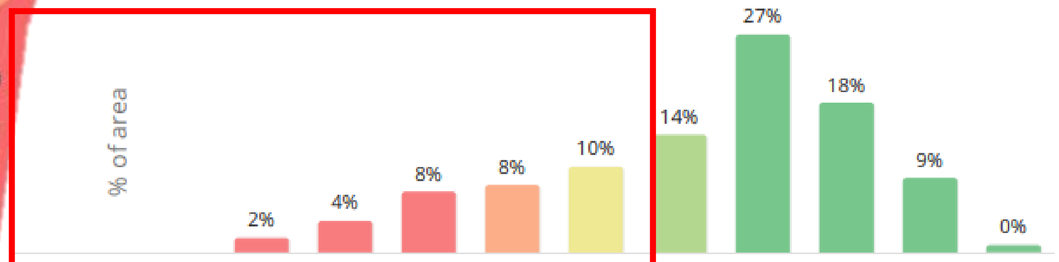
HMC

Pigeon Damage



Yield summary - 2022

Crop: **Vining Peas** Total yield: **22.62 t** Average yield: **5.1 t/ha**



Yield (t/ha)	0	1	2	3	4	5	6	7	8	9
Area (ha)	0.08	0.15	0.28	0.31	0.39	0.53	0.97	0.67	0.34	0.00
Total yield (t)	0	0.2	0.6	1	1.6	2.7	5.8	4.6	2.6	0
Total yield (%)	0%	1%	3%	5%	8%	14%	31%	24%	14%	0%

- AA - £1,300
- A - £1,235
- B - £1,014

- 14% more return

Pigeon Control

- HMC looking into whether it is possible to get match funding from the PO for Pigeon control equipment

This could include

- Banger ropes
- Gas guns
- Kites
- Bird scarers

THANK YOU