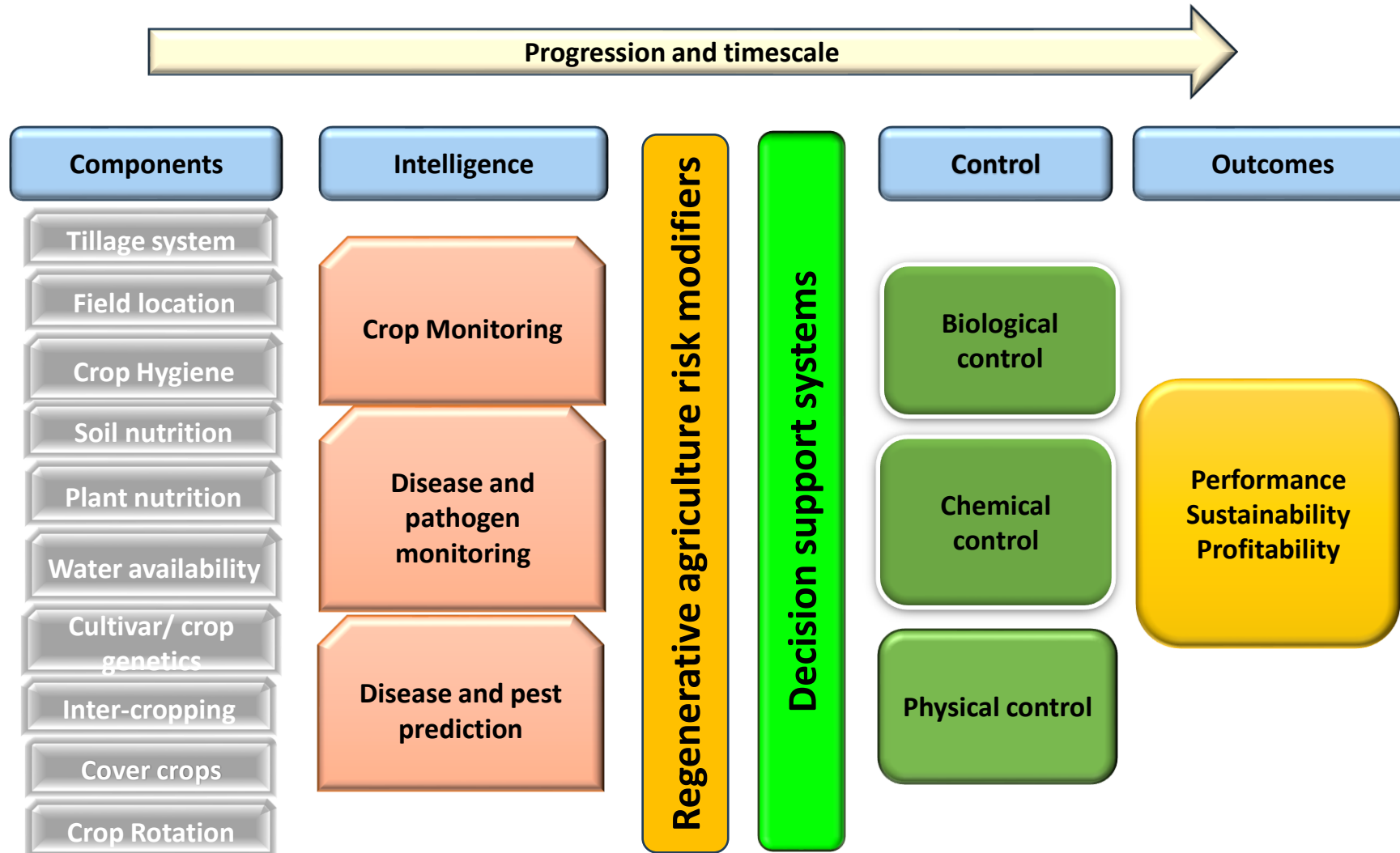




Adding innovation and evidence to integrated practices

Professor Neil Havis & Dr Henry Creissen
Plant and Soil Science Department
SRUC

System specific IPM



Why alternatives ?

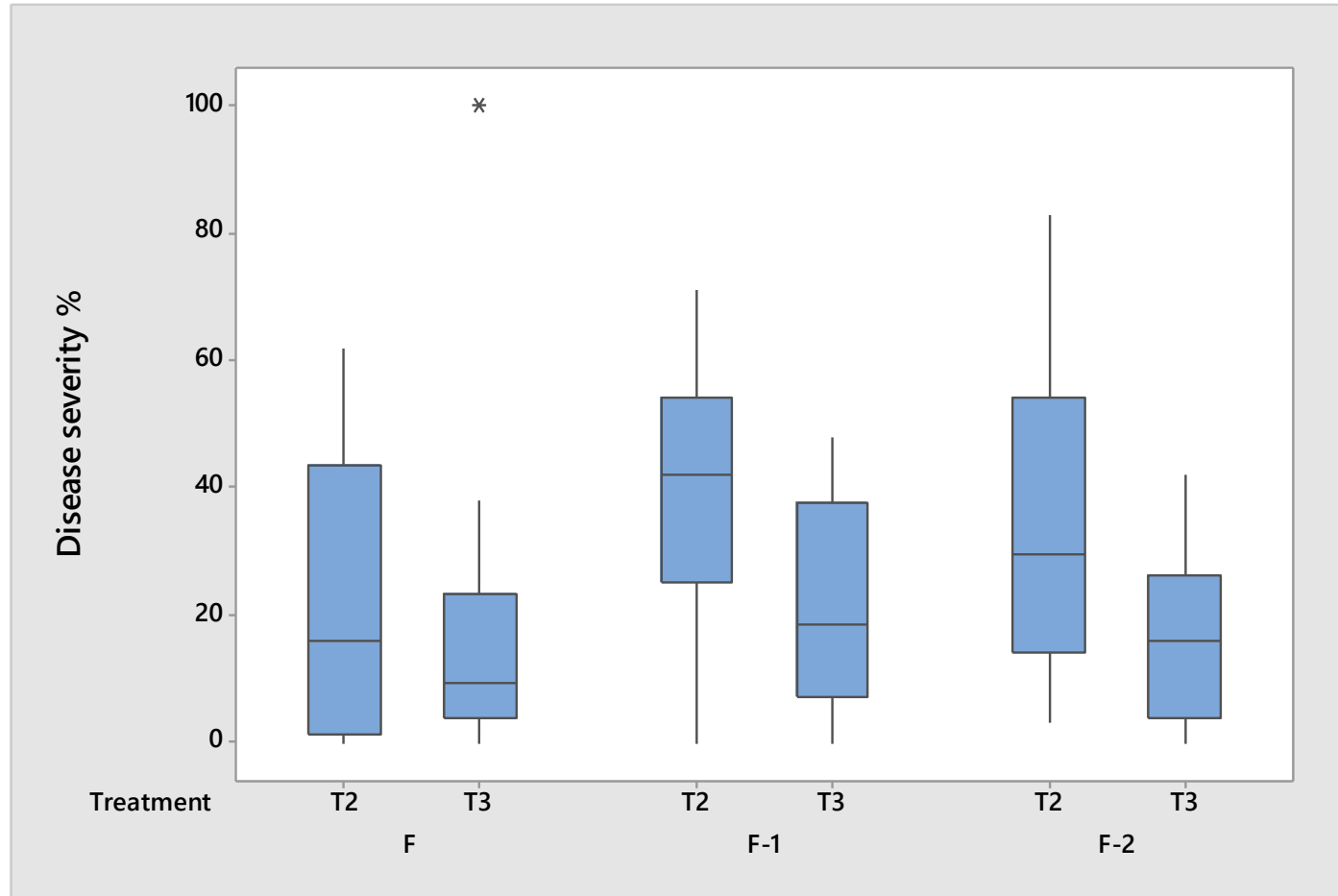
Biostimulant Market: Growth Rate, in %, Geography, 2021



Biopesticides Market : Market Share in %, Region, 2021

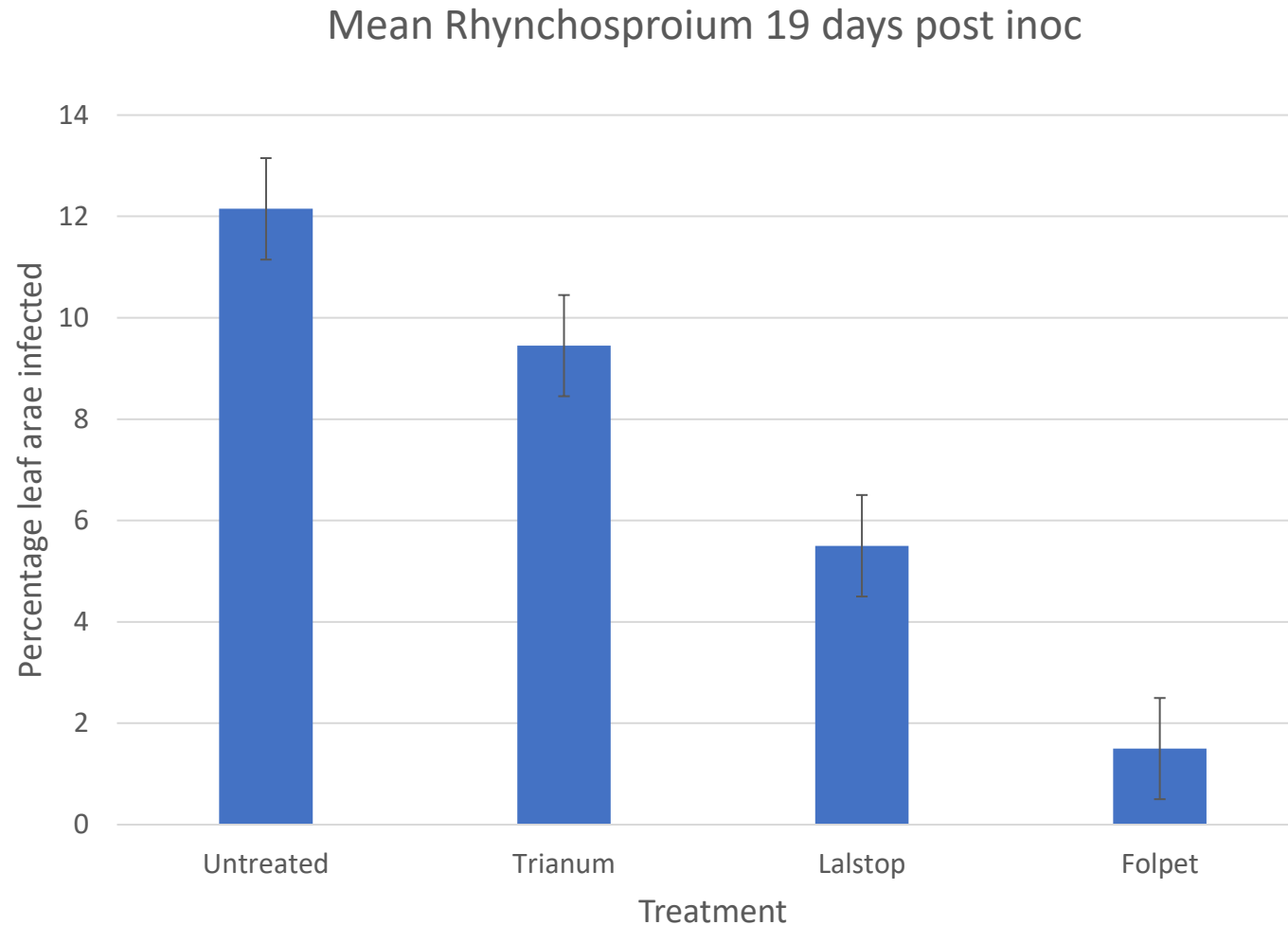


Alternatives in controlled environment experiments – Chitosan to control Rhynchosporium disease



—Comparing Rhynchosporium leaf scald severity of chitosan-treated (T3) and water-treated (T2) groups on Flag (F), F-1 and F-2 leaf layer at the start of the ear emergence

Alternatives in controlled conditions

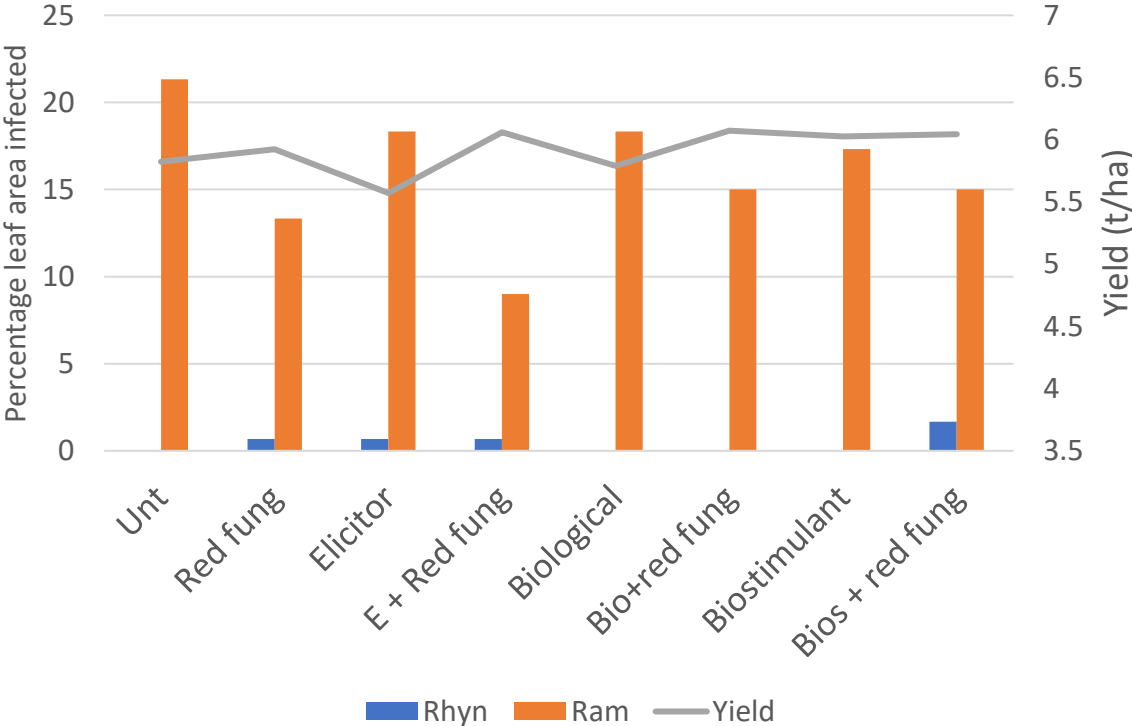


Alternatives in field conditions

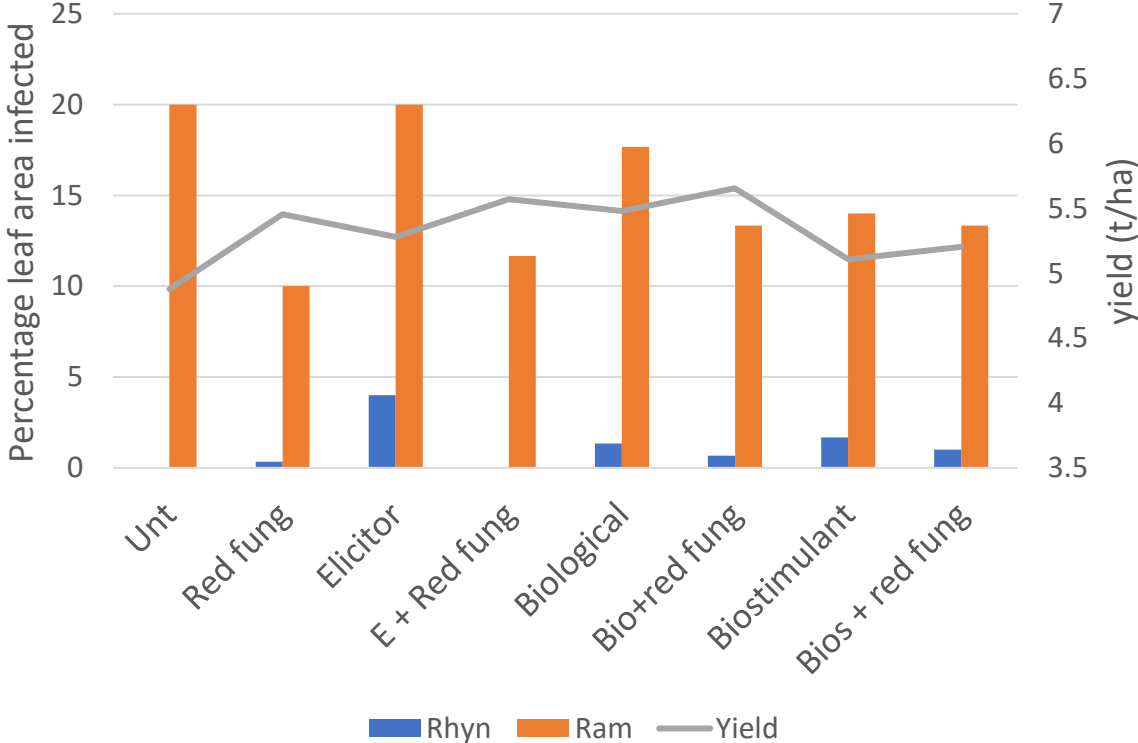
	T0 (GS 24)	T1 (GS 31)	T2 (GS45)
Treatment 1	Untreated	Untreated	Untreated
Treatment 2	Untreated	Amistar (0.25)	Revystar 0.4 + Folpet 0.5
Treatment 3	Laminarin (0.75)	Laminarin (0.75)	Untreated
Treatment 4	Laminarin (0.75)	Laminarin (0.75) + Amistar 0.25)	Revystar (0.4) + Folpet 0.5
Treatment 5	Serenade (1l)	Serenade (1l)	
Treatment 6	Serenade (1l)	Serenade (1l) + Amistar (0.25)	Revystar (0.4) + Folpet 0.5
Treatment 7	Amino Flo (2.5l)	Amino Flo (2.5)	Untreated
Treatment 8	Amino Flo (2.5l)	Amino Flo (2.5) + Amistar (0.25)	Revystar (0.4) + Folpet 0.5

Alternatives in field conditions

Spring barley IPM prog Laureate Borders 2023

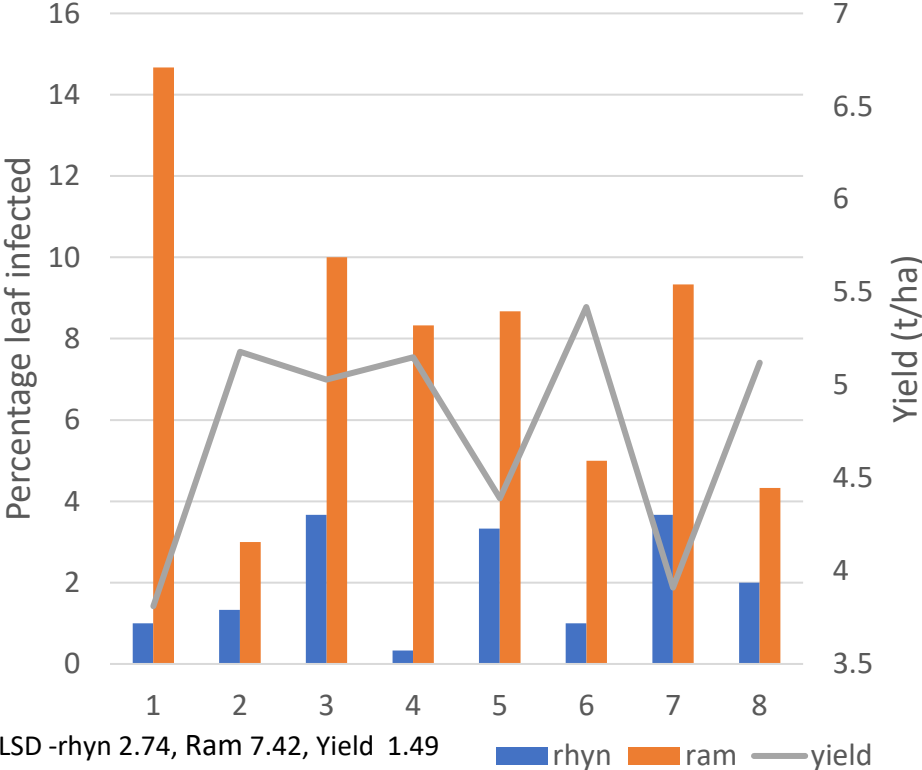


Spring barley IPM prog Fairing Borders 2023

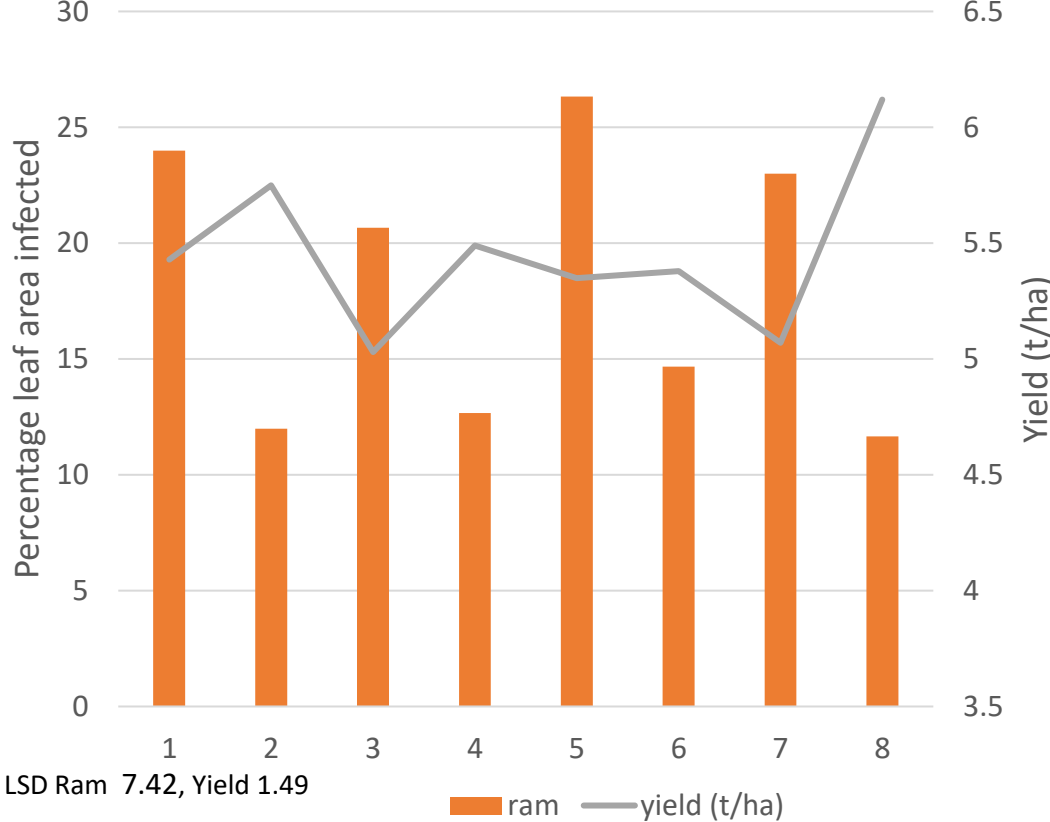


Alternatives in field conditions

Laureate Lanark 2023



Fairing Lanark 2023

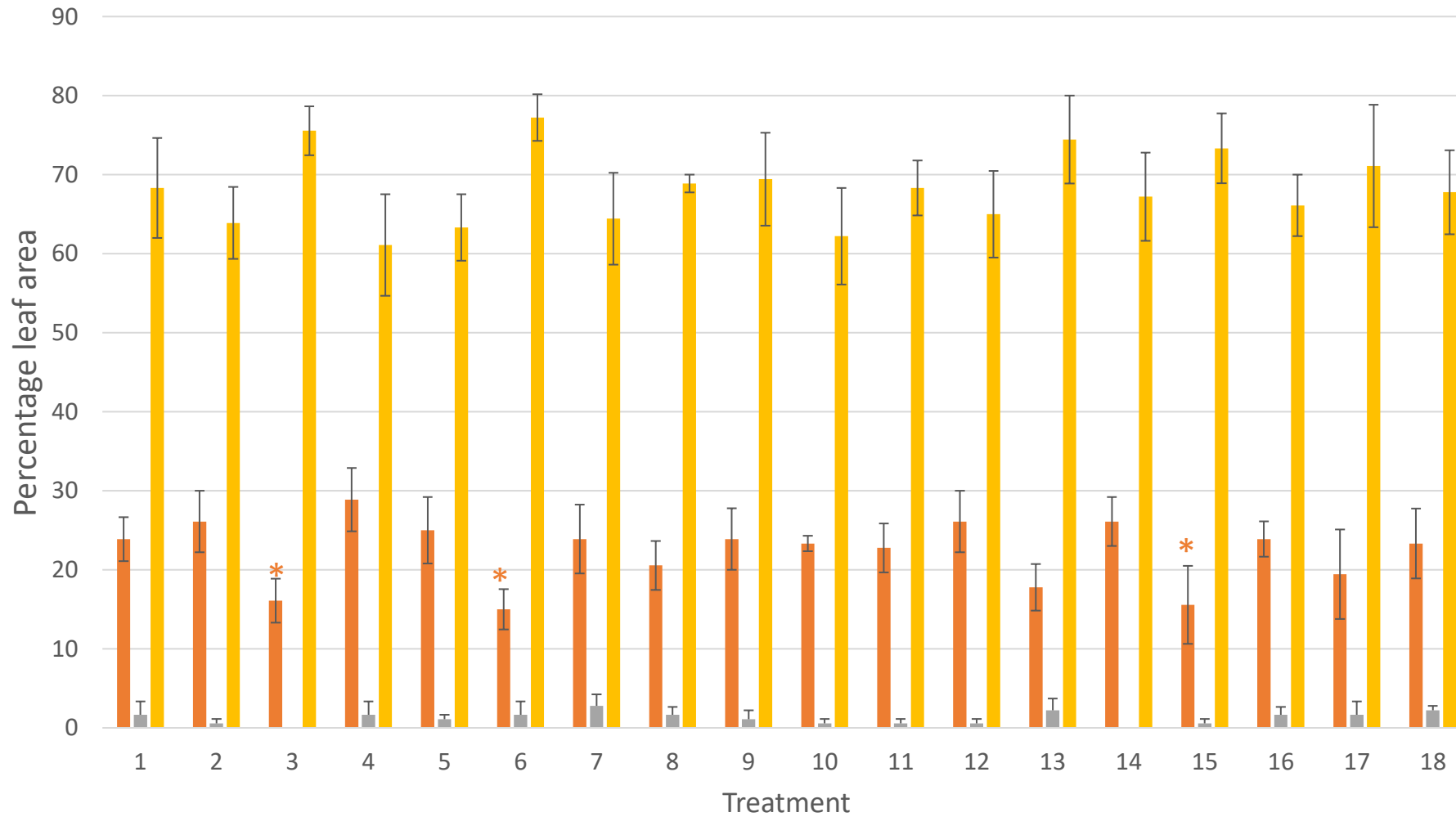


Alternatives in field conditions

Trt	T0 (GS 24)	T1 (GS 31)	T2 (GS45)
1	Untreated	Untreated	Untreated
2	Laminarin (0.75)	Laminarin (0.75)	Untreated
3	Amino Flo 2.5 l/ha	Amino Flo 2.5 l/ha	Untreated
4	Bion (0.175 g/litre)	Bion (0.175 g/litre)	Untreated
5	AQ10 (50g/ha)	AQ10 (50g/ha)	Untreated
6	Serenade (5.0 l/ha)	Serenade (5.0 l/ha)	Untreated
7	Microthiol (2.0 l/ha)	Microthiol 2.0 l/ha	Untreated
8	superphite plus 2.0 l/ha	superphite plus 2.0 l/ha	Untreated
9	Chitosan (1.67 g/ha)	Chitosan 1.67 g/ha	Untreated
10	Laminarin (0.75)	Laminarin + Amistar (0.25)	Revystar 0.4 + Folpet 0.5
11	Amino Flo 2.5 l/ha	Amino Flo 2.5 l/ha + Amistar 0.25	Revystar 0.4 + Folpet 0.5
12	Bion (0.175 g/litre)	Bion (0.175 g/l)+ Amistar 0.25	Revystar 0.4 + Folpet 0.5
13	AQ10 (50g/ha)	AQ10 (50g/ha) + Amistar 0.25	Revystar 0.4 + Folpet 0.5
14	Serenade (5.0 l/ha)	Serenade (5.0 l/ha) + Amistar 0.25	Revystar 0.4 + Folpet 0.5
15	Microthiol (2.0 l/ha)	Microthiol (2.0) + Amistar 0.25	Revystar 0.4 + Folpet 0.5
16	superphite plus 2.0 l/ha	superphite plus 2.0 l/ha + Amistar 0.25	Revystar 0.4 + Folpet 0.5
17	Chitosan (1.67 g/ha)	Chitosan (1.67 g/ha) + Amistar 0.25	Revystar 0.4 + Folpet 0.5
18	Untreated	Amistar 0.25	Revystar 0.4 + Folpet 0.5

Alternatives in field conditions

Laureate 2023



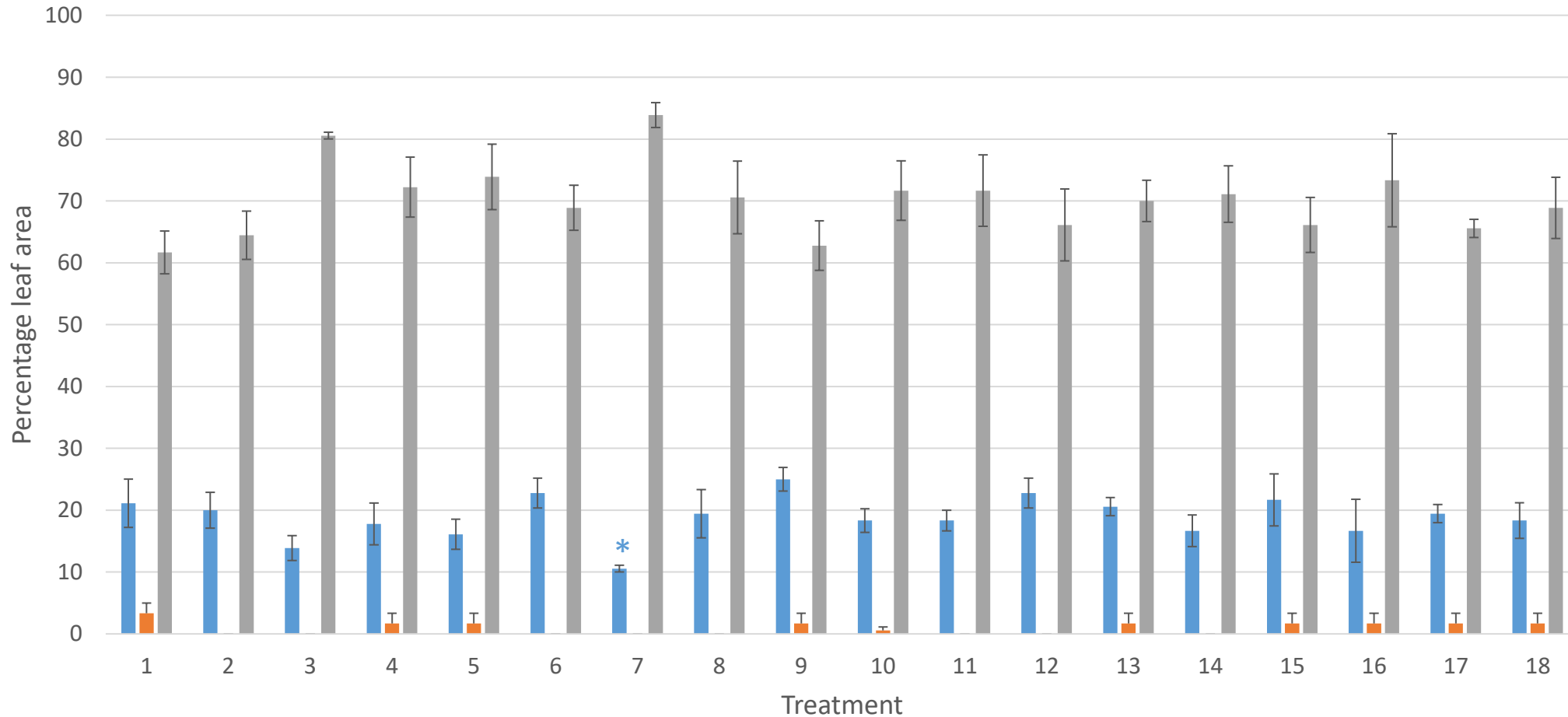
LSD (P=0.05) Rust 9.23, Ram 3.4, GLA 12.95

■ B rust ■ ram ■ GLA



Alternatives in field conditions

Skyway 2023



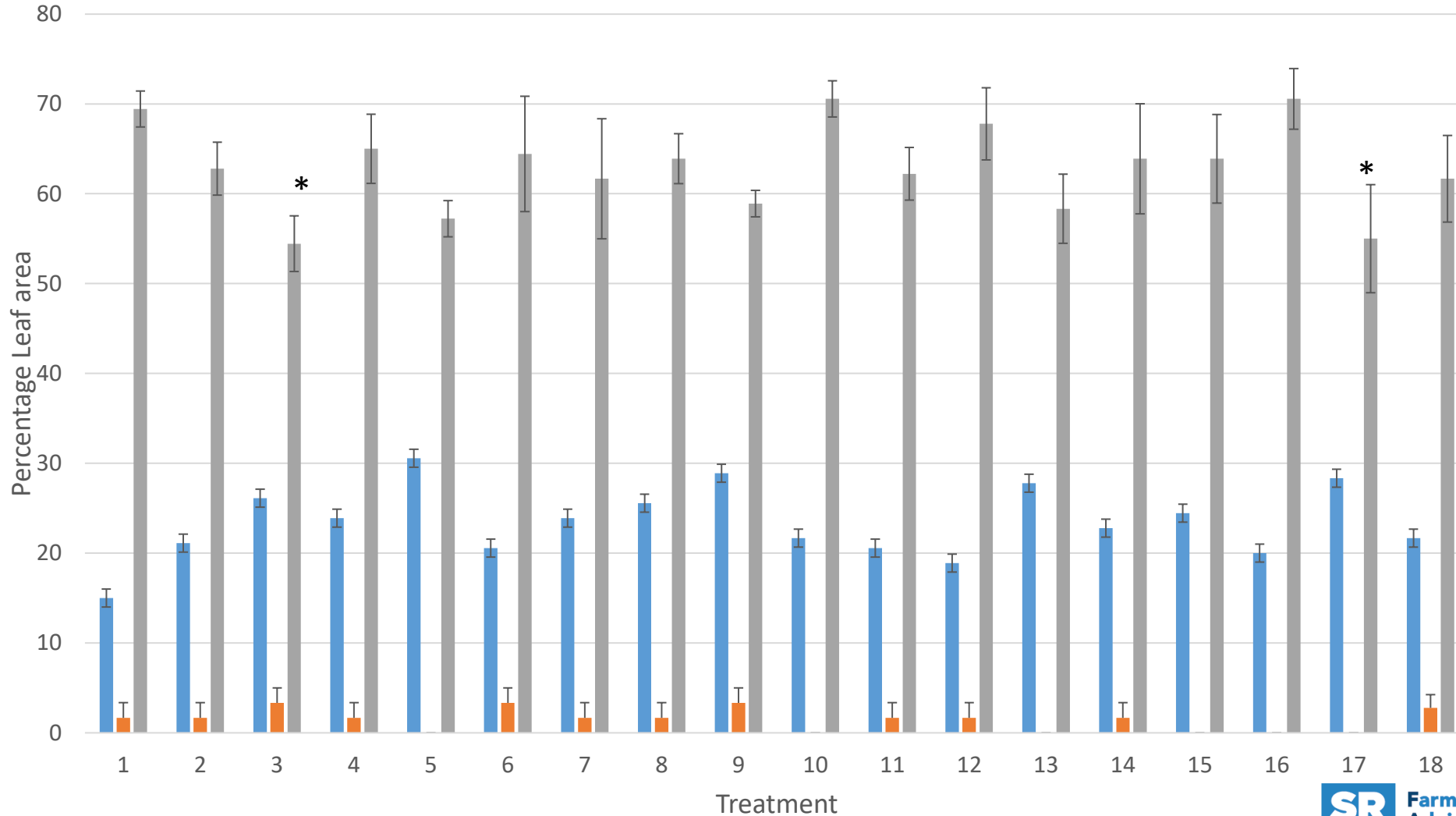
LSD (P=0.05) Rust 9.23, Ram 3.41, GLA 12.95

■ rust ■ ram ■ gla



Alternatives in field conditions

Fairing 2023



LSD (P=0.05) Rust 9.23, Ram 3.41, GLA 12.95

■ rust ■ ram ■ gla



IPM for reduced tillage systems



IPM under non-inversion tillage

- ◆ Which diseases increase/decrease?
 - ◆ Variety choice?
 - ◆ Fungicides?

Variety and fungicide decisions based on the pathogens and level of risk present in each tillage system?



- ◆ Other factors to consider:
 - ◆ Rotational effect on diseases
 - ◆ Previous / cover crop management
 - ◆ Tillage / system stage
 - ◆ Local disease pressure



System specific IPM: Winter barley IPM

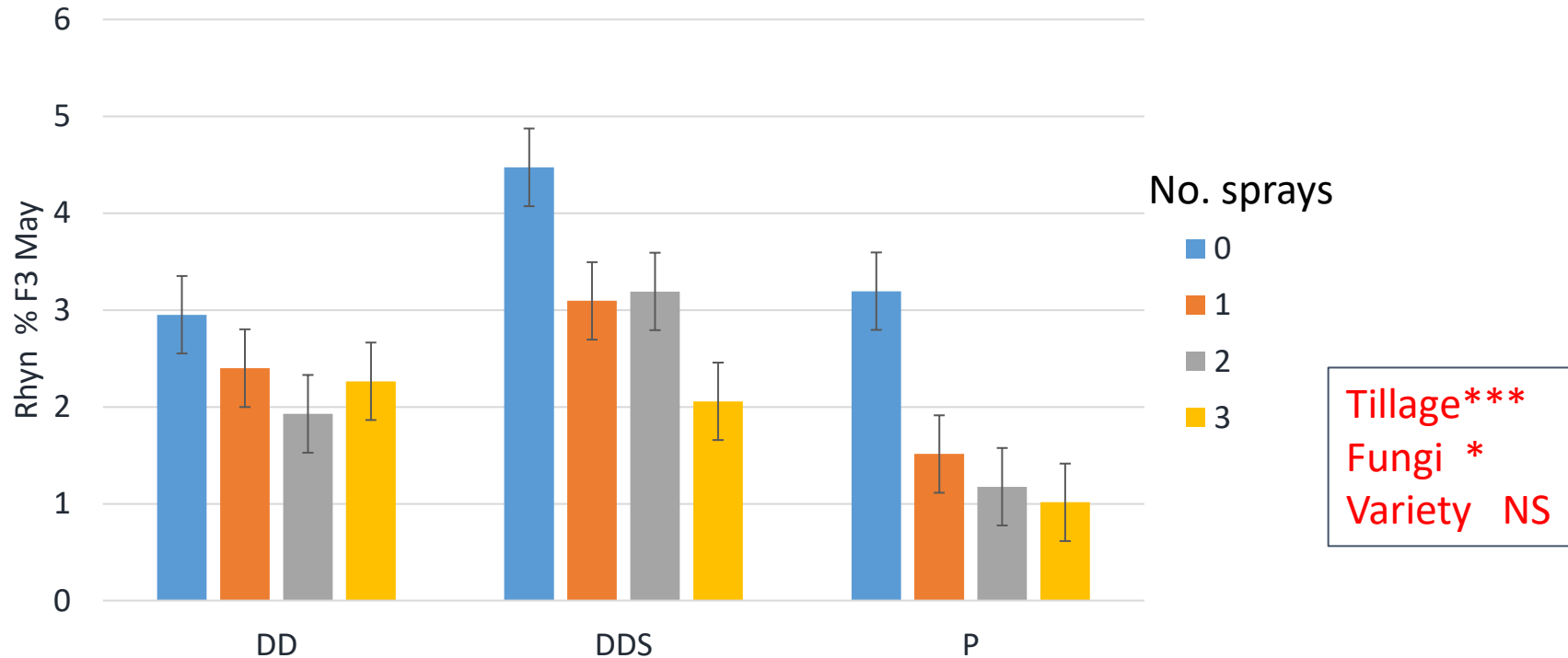
- 3 Tillage type
 - Direct Drill (+straw)
 - Direct Drill (-straw)
 - Plough
- 2 Varieties
 - Surge (res)
 - KWS Tower (sus)
- 4 fungicide programmes:
 - 0/1/2/3 sprays
- 3 harvest years
 - 2021-2023
- 2 sites:
 - Durie farm (Leven)
 - Mylnefield (Dundee)



<u>Trts</u>	T0 GS 25-30	T1 GS 31	T2 GS 39-45
0	Untreated	Untreated	Untreated
1	Untreated	<u>Siltra Xpro 0.6l/Ha</u>	Untreated
2	Untreated	<u>Siltra Xpro 0.6l/Ha</u>	<u>Siltra Xpro 0.4l/Ha</u>
3	<u>Cyflamid 0.3l/Ha + Comet 0.4l/Ha</u>	<u>Siltra Xpro 0.6l/Ha</u>	<u>Siltra Xpro 0.4l/Ha</u>

System specific IPM: Winter barley IPM

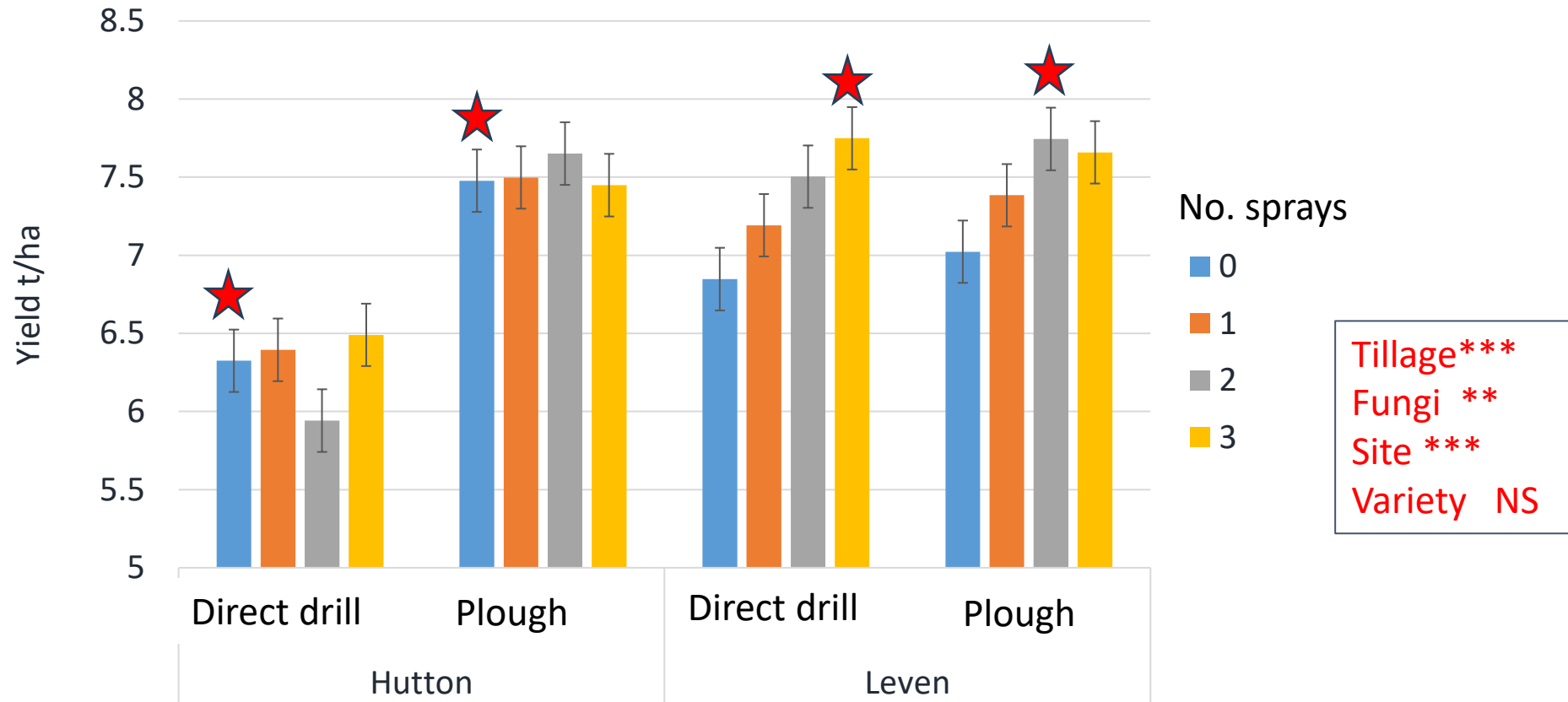
- More trash borne disease (Rhynchosporium) in direct drilled + crop residue plots
- More initial inoculum



Newton & Creissen 2024 *unpublished*

System specific IPM: Winter barley IPM

- Most profitable PPP programme= ★



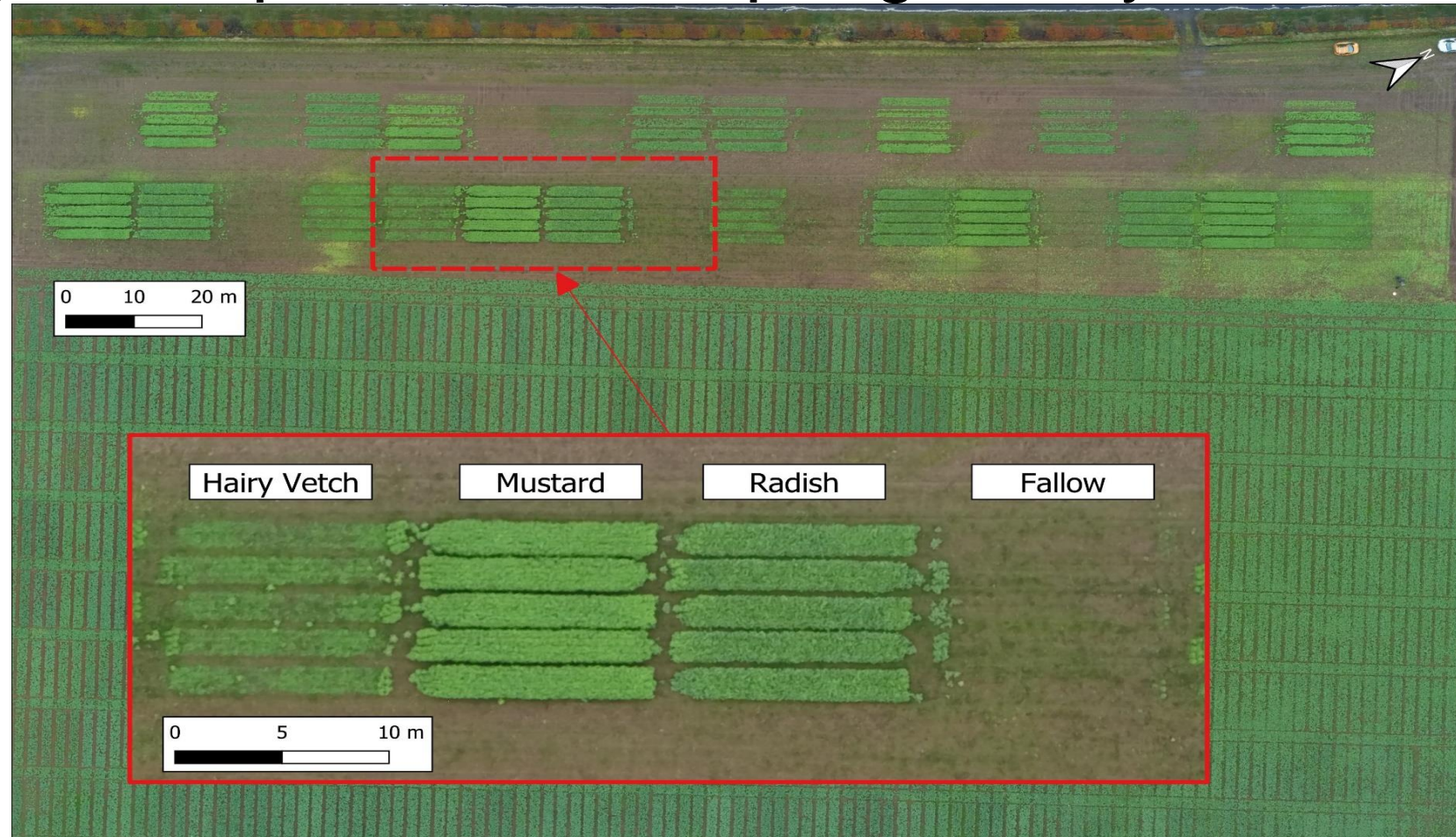




System specific IPM : Spring Barley

Min till

Plough



Untreated – no fungicide

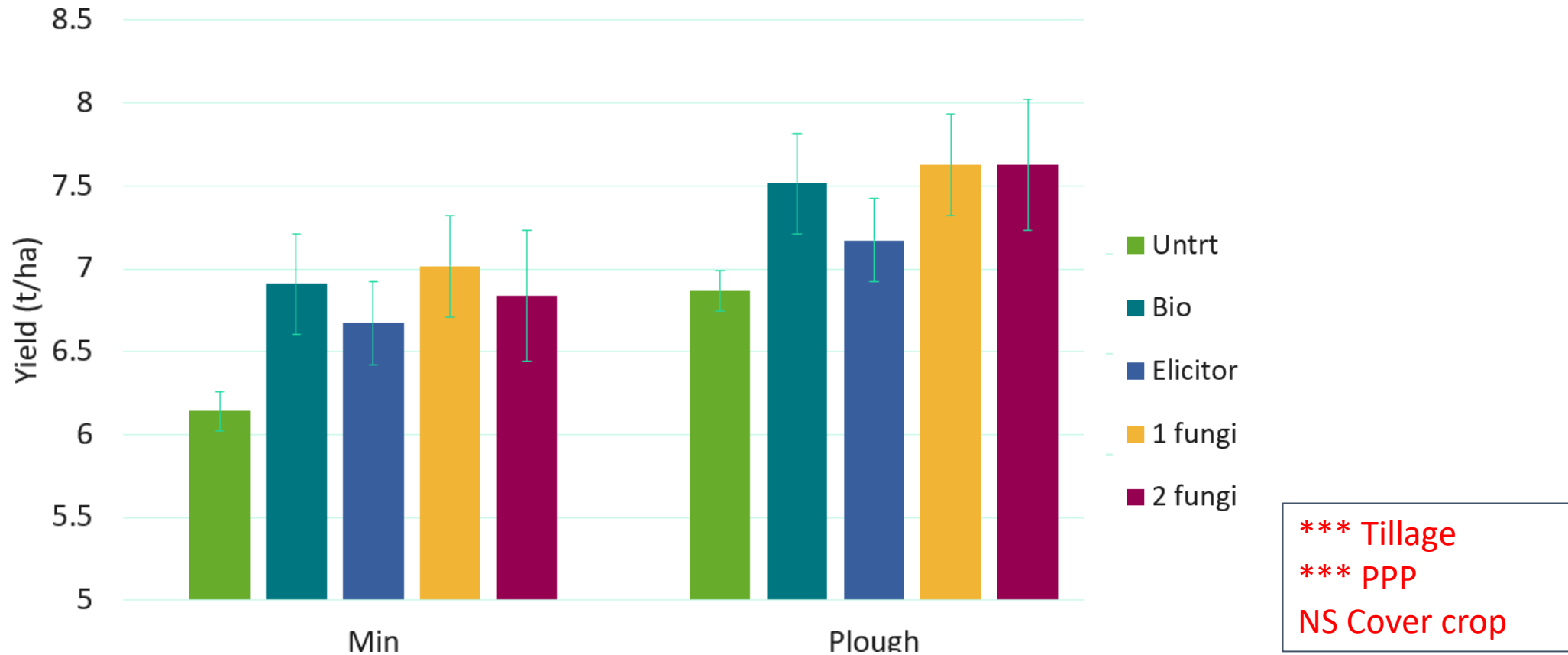
Biological – Serenade (1.0 L/ha) @GS 30. Revystar (0.5 L/ha) + Folpet (0.5L/ha) @GS 45

Elicitor - Laminarin (0.75 L/ha) @GS 30. Revystar (0.5L/ha) +Folpet (0.5L/ha) @GS 45

T2 fungicide only – Revystar XE (1.0 L/ha) + Folpet (1.0L/ha) @GS 45

T1+T2 fungicides – Ascra X Pro (0.6 L/ha) + Folpet (0.75L/jha) at GS 30. Revystar (0.75L/ha)+folpet (0.75L/ha) @GS45

System specific IPM: Spring Barley 2023 - Yields



System specific IPM: Spring Barley 2023 - Fusariums

Fusarium detected in stem base tissue of barley
 No symptoms of infection/disease
 Not detected in corresponding soil samples



Non-inversion tillage =
 increased Fusarium risk?

D= direct drill
 P= plough

F=Fallow
 M=Mustard
 R=Radish
 V=Vetch

Sample	F. aven	F. culm	F. gram	F. poae
DF1				
DF2				
DF3				
DF4				
DM1				
DM2				
DM3				
DM4				
DR1				
DR2				
DR3				
DR4				
DV1				
DV2				
DV3				
DV4				
PF1				
PF2				
PF3				
PF4				
PM1				
PM2				
PM3				
PM4				
PR1				
PR2				
PR3				
PR4				
PV1				
PV2				
PV3				
PV4				

Take home messages

- Consider all the factors that will influence plant health when you design your IPM programme
- Variety choice and cultivation and rotation will all influence your IPM strategy
- More alternatives to conventional fungicides are coming to market and this will not just be a passing fashion
- Justify all your inputs into the crop and evaluate their success at the end of each season



National Advice Hub
T: 0300 323 0161
E: advice@fas.scot
W: www.fas.scot



Thank you



Farm
Advisory
Service



AHDB
CEREALS & OILSEEDS



Incentivising IPM

Dr Henry Creissen

Research Fellow, Scotland's Rural College
Impact Officer, Plant Health Centre

Industry and Government support



Scottish Government
Riaghaltas na h-Alba
gov.scot

Rural Payments and Services

[Home](#) / [Agricultural Reform Programme](#)

Agricultural Reform List of Measures

Date published: 10 February, 2023

Measure: Efficient / Reduced use of synthetic pesticides

Descriptor:

Using an Integrated Management approach, you will only apply synthetic pesticides if economic threshold of pest/disease is reached or extenuating circumstances require a dispensation. To protect soil health and water quality and protect habitat conditions for pollinating insects, wild birds and small mammals. Implementation could be further extended by use of GPS enabled technology, where available, to apply variable rates.

The screenshot shows the Farmers Weekly website. At the top, there is a navigation bar with 'Learning', 'Classified', 'Property', and 'More'. Below this is a sub-navigation bar with 'LATEST', 'KNOW HOW', and 'MORE'. The main article is titled 'Carlsberg signs up 23 farmers to grow 'regenerative' barley' by Debbie James, dated 07 March 2023. There are social media icons for Twitter, Facebook, and LinkedIn. Below the article title, there are two tags: 'Business' and 'Crops markets and prices'. A photograph of a field of barley is visible on the right side of the article.



[Home](#) > [Environment](#) > [Food and fa](#)
> [Environmental Land Management](#)



Department
for Environment
Food & Rural Affairs

- Overview of SFI actions for integrated pest management
- IPM1: Assess integrated pest management and produce a plan
- IPM2: Flower-rich grass margins, blocks, or in-field strips
- IPM3: Companion crop on arable and horticultural land
- IPM4: No use of insecticide on arable crops and permanent crops

- New: No-till farming £73/ha
- SAM2: Multi-species winter cover crops £129/ha



Support for IPM – Workshops with Crop Producers

- Increasing the number of **crop types in rotation** was popular. Not relevant to all horticulture.
- **Companion cropping** was the least popular. High failure rate, complex agronomy and high management costs.
- **Not using insecticides** perceived to be high risk in some crops.
- **Decision support systems** adoption is higher in horticulture.
- **Bioprotectants** more widely used/available in horticulture.
- **Variety choice** can be dictated by market esp. horticulture.
- **Habitat for natural enemies**, largely supported under other schemes. High costs and limited/delayed returns
- **IPM planning** was widely accepted as valuable IPM action.

Support payments for IPM – SFI England

Flexibility within the standard is key to ensuring wide scale uptake.

Some of the options may not be applicable to certain groups of growers e.g. non arable rotations, those renting land on a short-term basis.

1. *Assess integrated pest management and produce a plan* £1129
2. *Flower-rich grass margins, blocks, or in-field strips* £798/ha
3. *Companion crop on arable and horticultural land* £55/ha
4. *No use of insecticide on arable crops and permanent crops* £45/ha



(Credit: Alison Day)

Sustainable Farming Incentive (SFI)

Support payments for IPM in Scotland?

1. **Reduced use of pesticides** - thresholds, precision application, robotic weeding.
2. **Diverse rotations** - diverse crop types
3. **Pest/disease resistant varieties**
4. **Diverse cropping** –intercropping, companion cropping.
5. **Using Decision support systems**
6. **Bioprotectants**
7. **Habitat for natural enemies**
8. **IPM planning**



Farm
Advisory
Service





Agronomy Roadshow 2024

AHDB Strategic Cereal Farms

Henny Lowth/Joe Martlew



- Part of the AHDB FE research and innovation

Large practical

- How do they differ from Monitor Farms: Longer term, formalised trials with contracted partners.

- Run for 6 years



Short and long-term field and farm-scale demonstrations.

- Why SF's? 'Resilience in the Farm Ex'

- Monitor Farm
- Strategic Farm
- Monitor Farm Scotland Managed in partnership with QMS

... throughout the ... walks and webinars.

*Approximate locations shown

Strategic Cereal Farms



2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Scotland – David Aglen, Fife									
South – David Miller, Hampshire									
North – David Blacker, Yorkshire									
East – David Jones, Norfolk									



2017-2023
East – Brian Barker, Suffolk



2018-2021
West – Rob Fox, Warwickshire



For more information, visit:
ahdb.org.uk/strategic-cereal-farms

Strategic cereal farms: Harvest '23 trials



Strategic Cereal Farm East (ending 2023)	Strategic Cereal Farm Scotland	Strategic Cereal Farm South	Strategic Cereal Farm North
<ul style="list-style-type: none"> • Flowering strips for IPM • Cover crops & water quality • Managed lower inputs • Managing marginal land 	<ul style="list-style-type: none"> • Nitrogen application: Foliar vs. conventional • Cover crop destruction • Direct drilling spring barley establishment • Amending crop nutrition in response to crop testing 	<ul style="list-style-type: none"> • Cover crops & water quality • Soil health under different management activities • Investigating biological amendments • Nutritional quality 	<ul style="list-style-type: none"> • Analysis of historic data. • Baselineing of soils & crop performance • Drainage trials and crop performance



For more information, visit: ahdb.org.uk/strategic-cereal-farms

Some Results So Far...



Strategic cereal farms: Harvest '23 trials

Strategic Cereal Farm East (ending 2023)	Strategic Cereal Farm Scotland	Strategic Cereal Farm South	Strategic Cereal Farm North
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Measuring and Monitoring

- 1) Not yet enough confidence in BRIX or sap analysis to guide in-season nitrogen management.
- 2) Yield map data is largely undervalued – comparing multiple seasons can provide valuable information on the drivers of yield and where to collect samples.
- 3) Although robust data analysis is the gold standard, ‘eyeballing’ past yield maps is a good place to start understanding yield variation



Strategic cereal farms: Harvest '23 trials

Strategic Cereal Farm East <small>(ending 2023)</small>	Strategic Cereal Farm Scotland	Strategic Cereal Farm South	Strategic Cereal Farm North
<ul style="list-style-type: none"> Flowering strips for IPM Cover crops & water quality Managed lower inputs Managing marginal land 	<ul style="list-style-type: none"> Nitrogen application: Foliar vs. conventional Cover crop destruction Direct drilling spring barley establishment Amending crop nutrition in response to crop testing 	<ul style="list-style-type: none"> Cover crops & water quality Soil health under different management activities Investigating biological amendments Nutritional quality 	<ul style="list-style-type: none"> Analysis of historic data. Baselining of soils & crop performance Drainage trials and crop performance

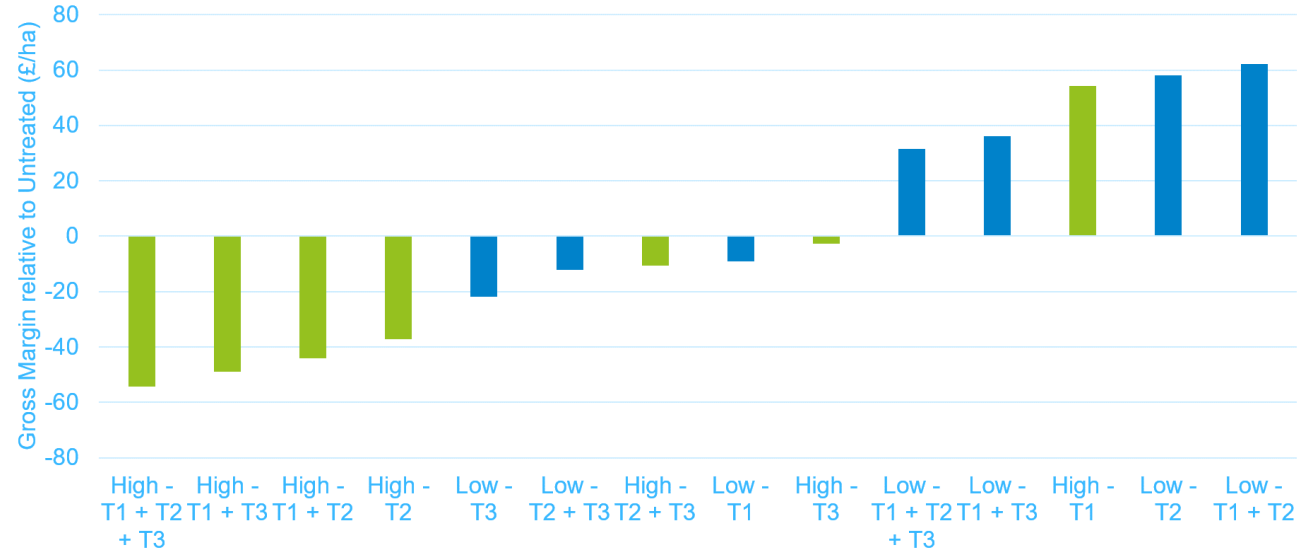


Integrated Pest Management

1) Possible to significantly moderate fungicide use and retain net margin, provided the other elements of a robust IPM strategy were maximised

- Genetics
- Drilling date
- Economics

2) Simple flower margins have significant potential to contribute to greater farmland biodiversity



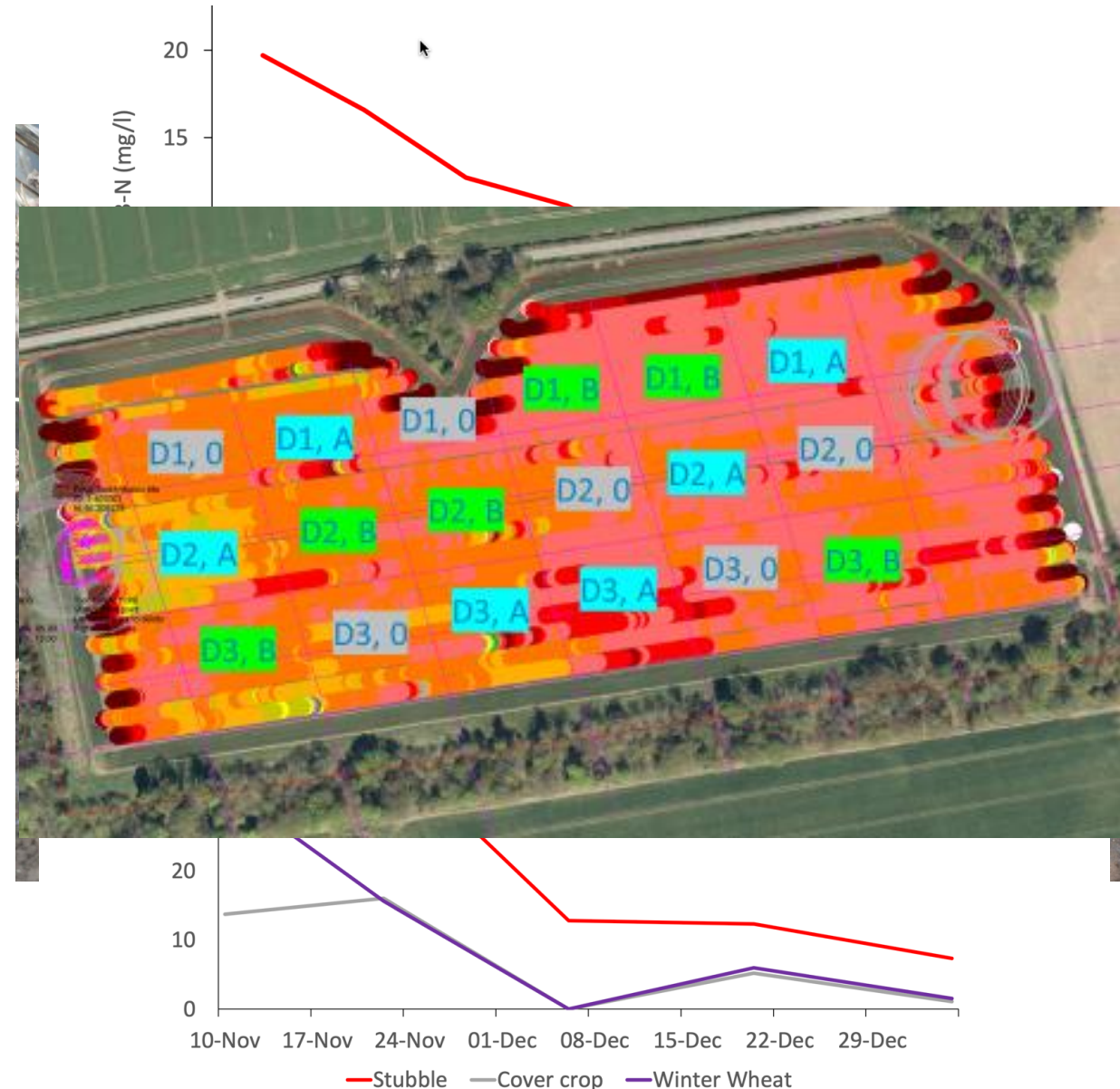
Strategic cereal farms: Harvest '23 trials

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Rotational Diversity

- 1) Cover crops can provide benefits to soil health and biodiversity without compromising cash-crop performance
- 2) Cover crops (alongside appropriate cultivation choice) can reduce nitrate leaching
- 3) Establishing cover crops early and destroying early appears to be best for spring-crop performance –however, retaining cover crops for longer in the spring boosted beneficials



Strategic cereal farms: Harvest '23 trials

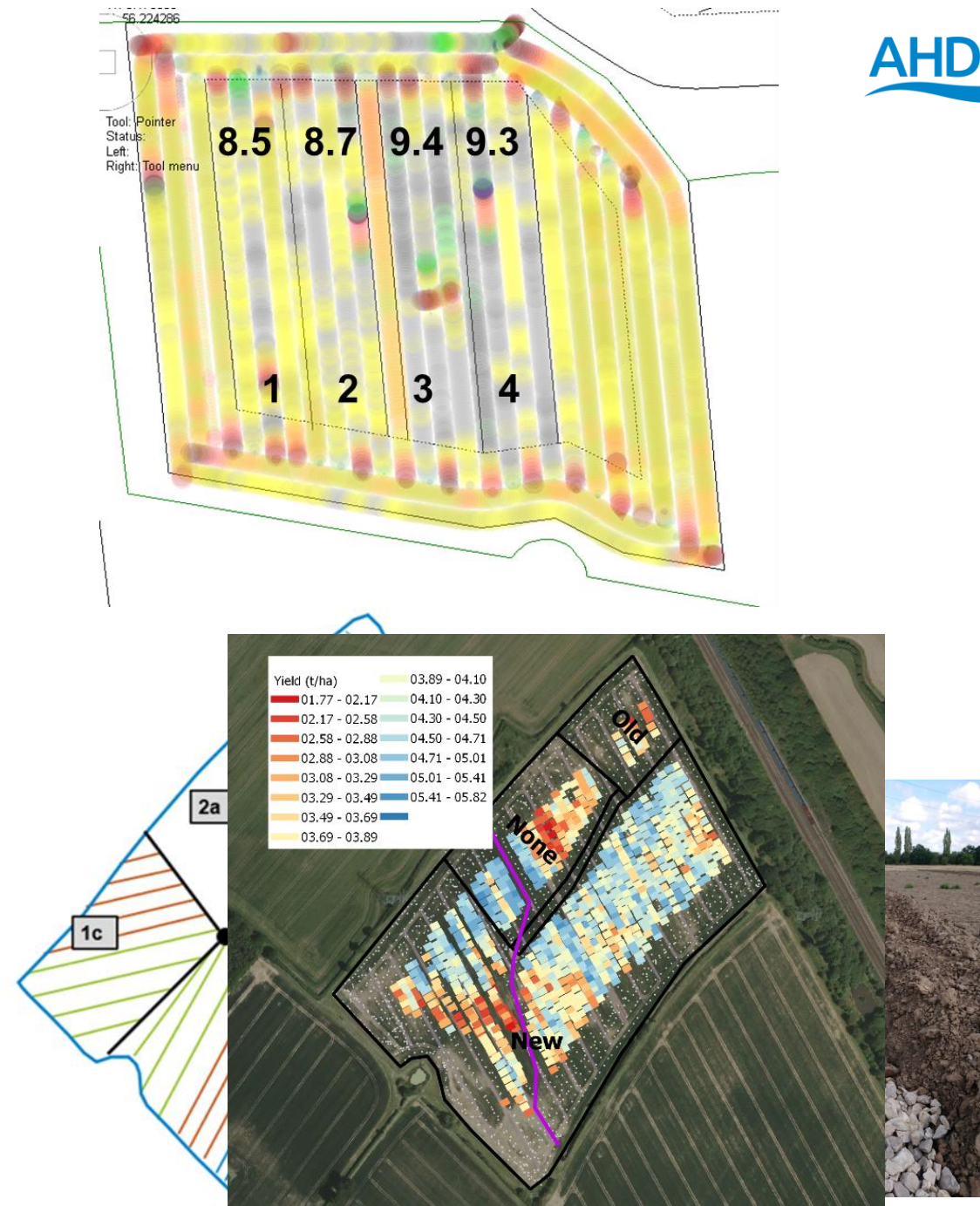


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Nutrient Use Efficiency

- Use simple measures to understand how nitrogen use efficiency varies on your farm
- Making general improvements to soil health may be better than pinning hopes on biological supplements
- Improving drainage in problematic fields can boost yields (even in the first season)



What have we learnt from the SF network?

- ▶ Knowledge Exchange (KE) platform as a MF and SF -> huge engagement with wider farming.
- ▶ Helped improve as a farmer and as a business. Better contacts to find answers to questions.

- ▶ MF & SF network needs to be more linked and needs more close communication
- ▶ Collaboration in using on farm experience

- ▶ More 'how-to' guides from SF trials
- ▶ Contextualising trials



- Strategic Farm Conference

- Results webinars

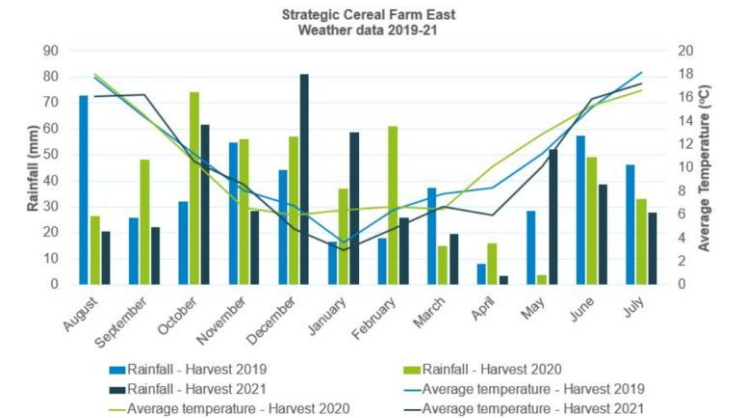


What are the plans going forward?

- SF East Final Report



- Improve results dissemination



Strategic cereal farms: Harvest '24 trials

Strategic Cereal Farm East <small>(New)</small>	Strategic Cereal Farm Scotland	Strategic Cereal Farm South	Strategic Cereal Farm North
<ul style="list-style-type: none"> • Cultural weed control strategies • IPM – Using varietal resistance and DSS to control BYDV • NUE – spatial variation and slow-release N 	<ul style="list-style-type: none"> • Nitrogen application: Foliar vs. conventional • Cover crop termination and spring barley establishment • Biodiversity monitoring • Amending crop nutrition in response to crop testing 	<ul style="list-style-type: none"> • Cover crops & cash crops performance • Soil health under different management activities • Companion cropping • Grain nutritional quality 	<ul style="list-style-type: none"> • Foliar N: Impact on NUE and disease • Boosting earthworms: Clover understory & compost • Drainage and crop performance



A vibrant landscape of a green field at sunset. The sun is low on the horizon, casting a warm glow over the scene. The sky is filled with colorful clouds, and the field is lush and green. A path leads from the foreground towards the horizon. In the foreground, there are several thin, white, wavy lines that appear to be part of a design or graphic element.

**‘Inspiring our farmers, growers
and industry to succeed in a
rapidly changing world’**

Afternoon session

Business and Policy

13.30 Market Update, Julian Bell, SAC

14.00 Scottish Agricultural Policy update, Eleanor Kay, Scottish Land and Estates

Biodiversity Workshop

14:30 Practices to enhance biodiversity - what are the benefits of different agroecological approaches and what are you trying to improve with Lorna Cole, SAC

15.30 Final questions, event summary and chairs closing message

15.45 Close