

# Exploring New Possibilities for Reduced Lodging in Wheat

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# The current cost of lodging for UK farming

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- Lodging is predicted to affect as much as 20% of the UK winter wheat area every few (three to four) years.
- Lodging around ear emergence may result in yield losses of up to 75%.
- Lodging also adversely affects quality characteristics, such as Hagberg Falling Number and specific weight.
- Lodged crops often require extra drying.

# Future increases in lodging risk?

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- Intense wind and rain.
- Failure to apply plant growth regulators.
- Increased yield.

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- Failure to apply plant growth regulators.
- Increased yield.
- Met office predicts hotter drier summers but also more intense summer storms (eg Spanish plumes) particularly in south and south east.
- Possibility that the use of PGRs becomes more highly regulated.
- As breeders push the yield of new varieties the existing tools for lodging prevention might become less effective.

# Commercial breeding for lodging resistance in the UK

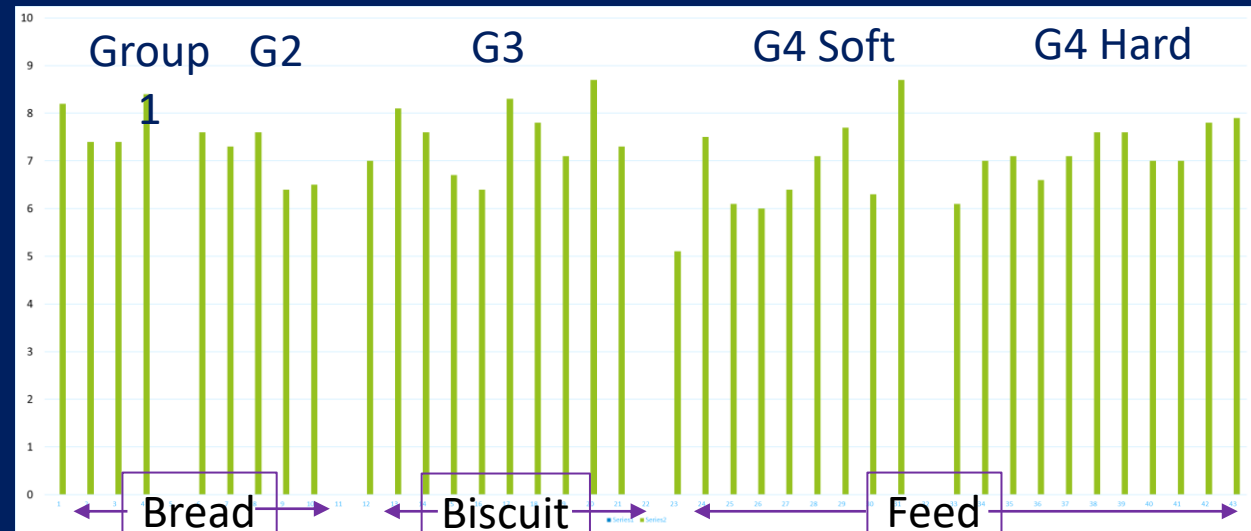
Standing power shown on Recommended List

A 1-9 scale (susceptible to resistant)

Resistance to lodging without PGR (1-9)	5.1
Resistance to lodging with PGR (1-9)	5
Straw length without PGR (cm)	0.4

Table showing Recommended List data for wheat varieties, including columns for variety names, regions (E, S, W, N, UK), and various agronomic traits like grain yield and lodging resistance.

The average standing power of current RL varieties is 7.2



Lowest is 5.1

# WGIN Aims for Lodging Research

1. Identify improved standing power traits
2. Deliver these traits to breeders to develop new lodging resistant wheat varieties for the UK
3. Develop affordable high throughput tools to measure lodging characteristics



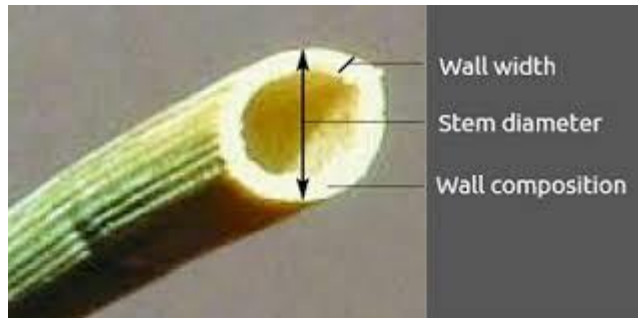
Pulling ← Root lodging      Stem lodging → Pushing

Measuring components of lodging resistance

# Measuring more lodging components



UAV gives a good record of the progression of lodging



**AHDB**

Electronic calipers allow us to understand differences in stem strength



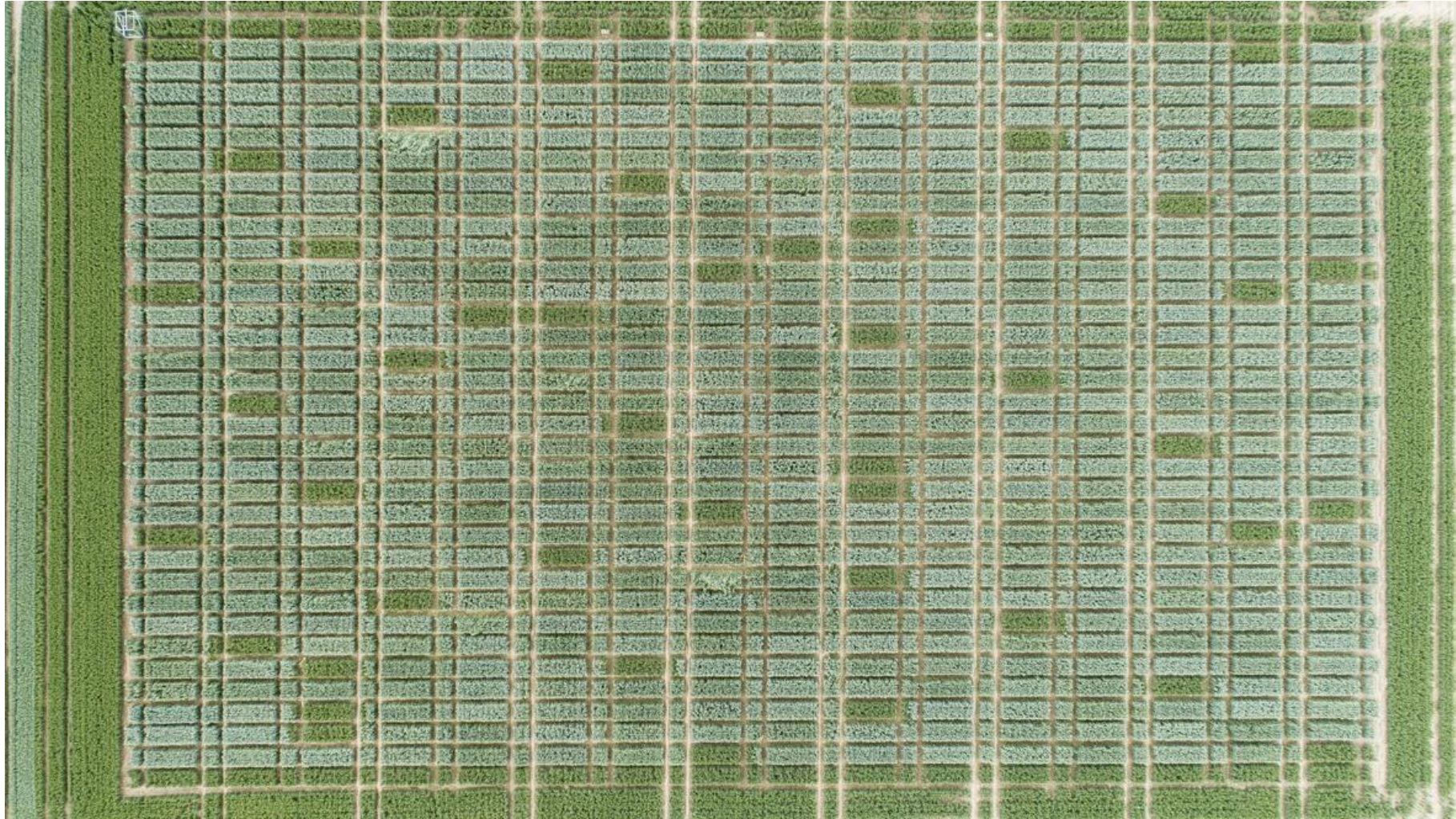


# The Earlier the Lodging, the Worse the Effect

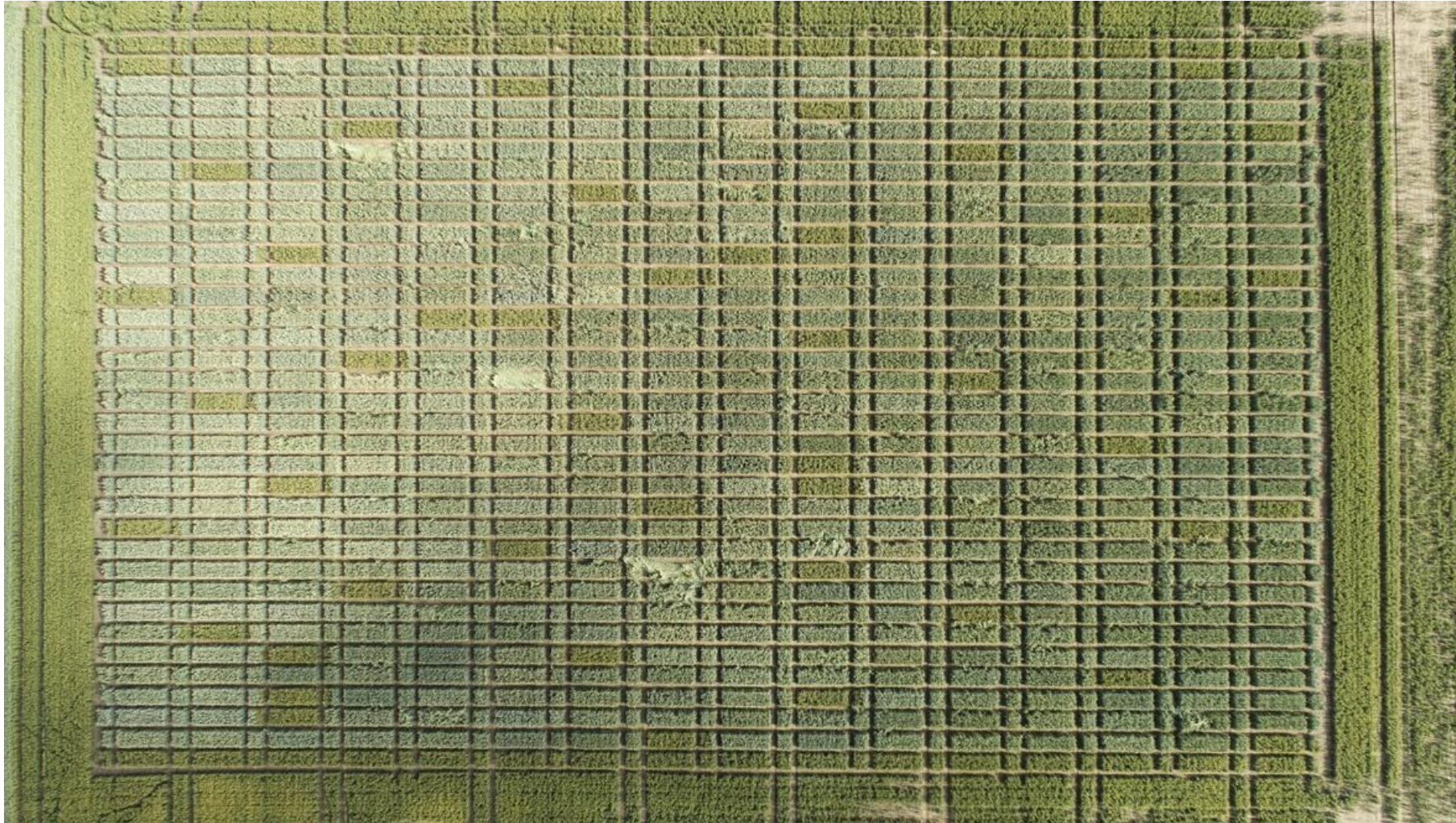
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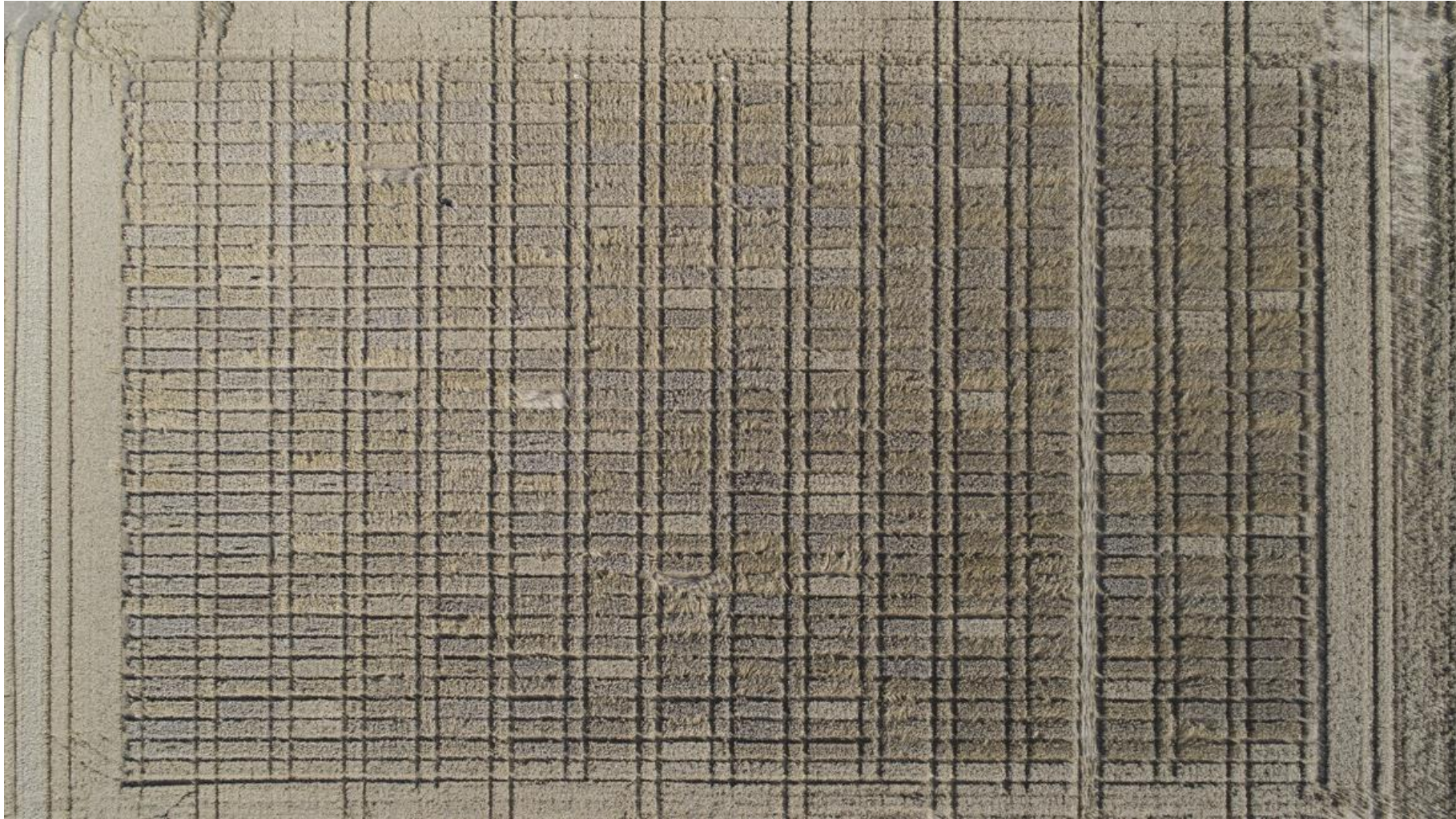
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11/08/2021

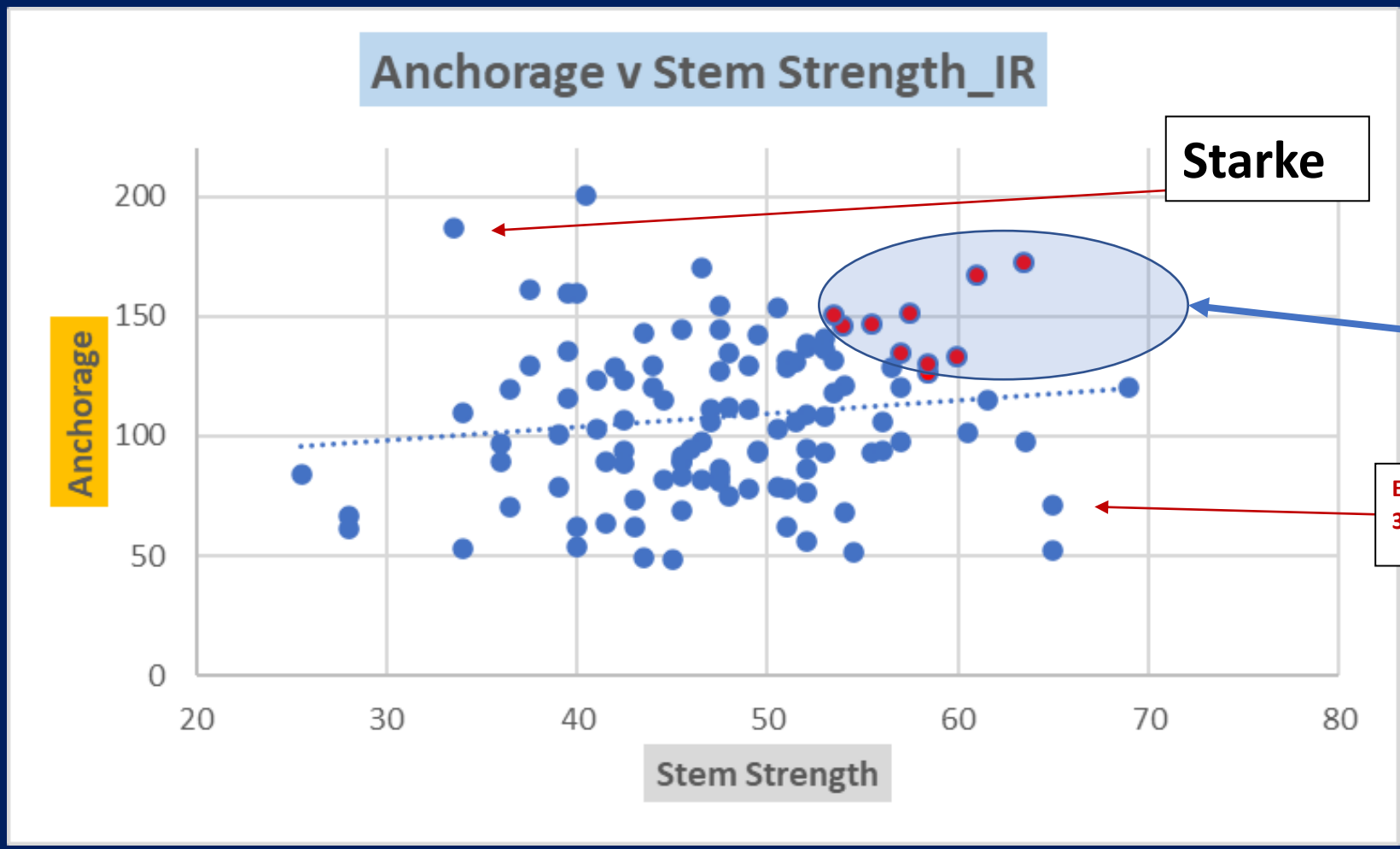


~ ¼ of lines lodged in 2-3 reps by harvest

# The Drought Anchorage and Lodging Panel

- 177 diverse lines
- 6m<sup>2</sup> plots
- With and without irrigation
- Landraces, representatives of RL, historical varieties, elite lines not adapted to UK eg CIMMYT, mutant lines
- In many cases the parents of mapping populations
- Lodging component traits measured using the methods described- push, pull, photograph

# Anchorage x stem strength profile of DALP

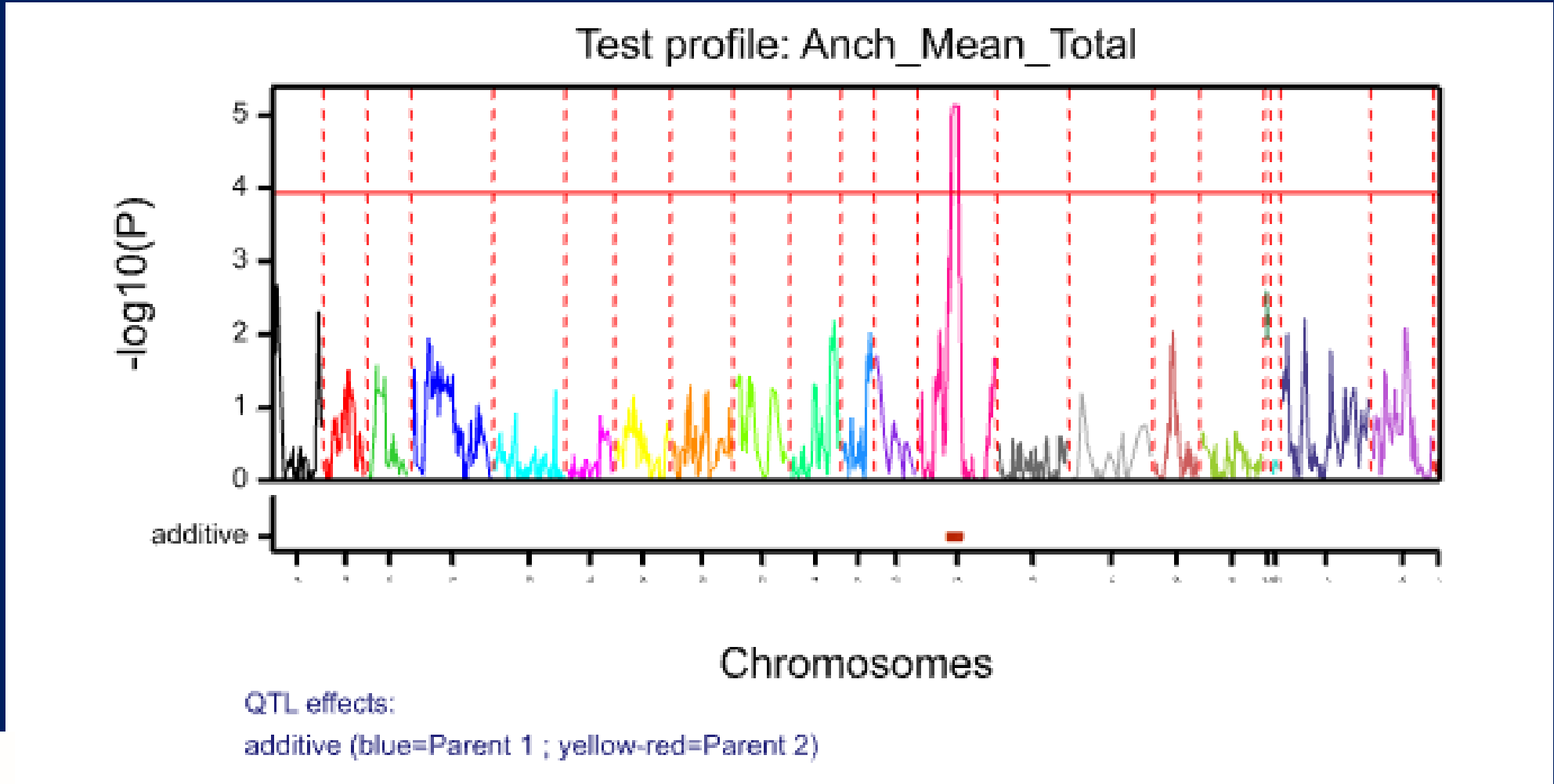


UK elite checks

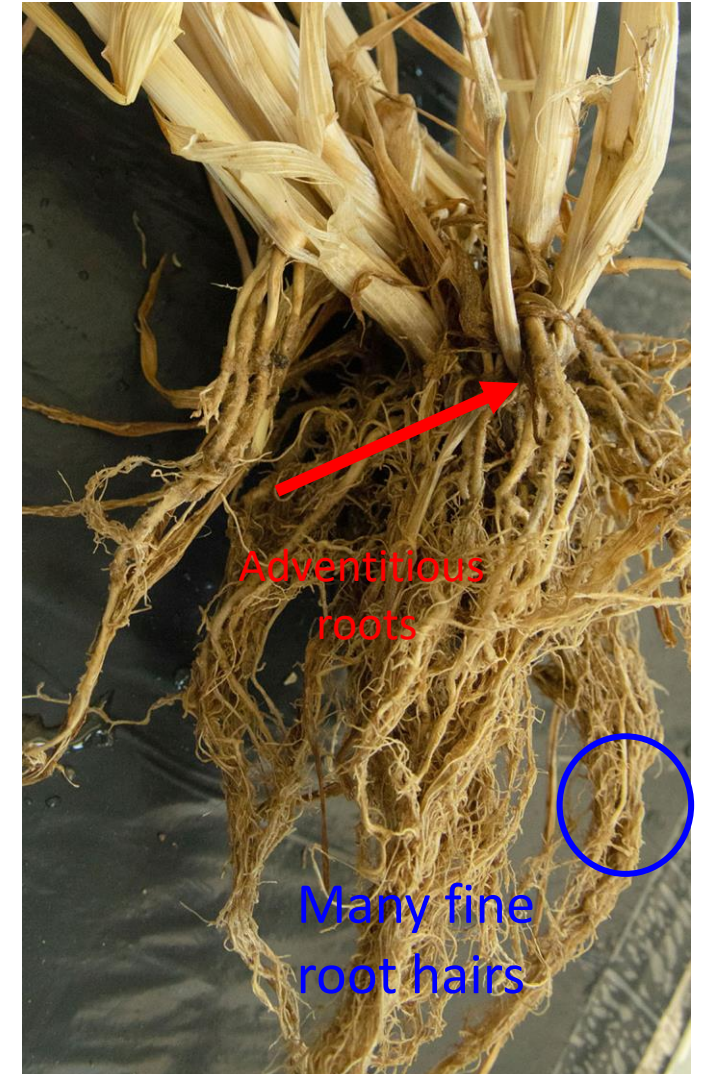
Starke

EMS 3084

# Quantitative Trait Locus mapping in Paragon x Starke

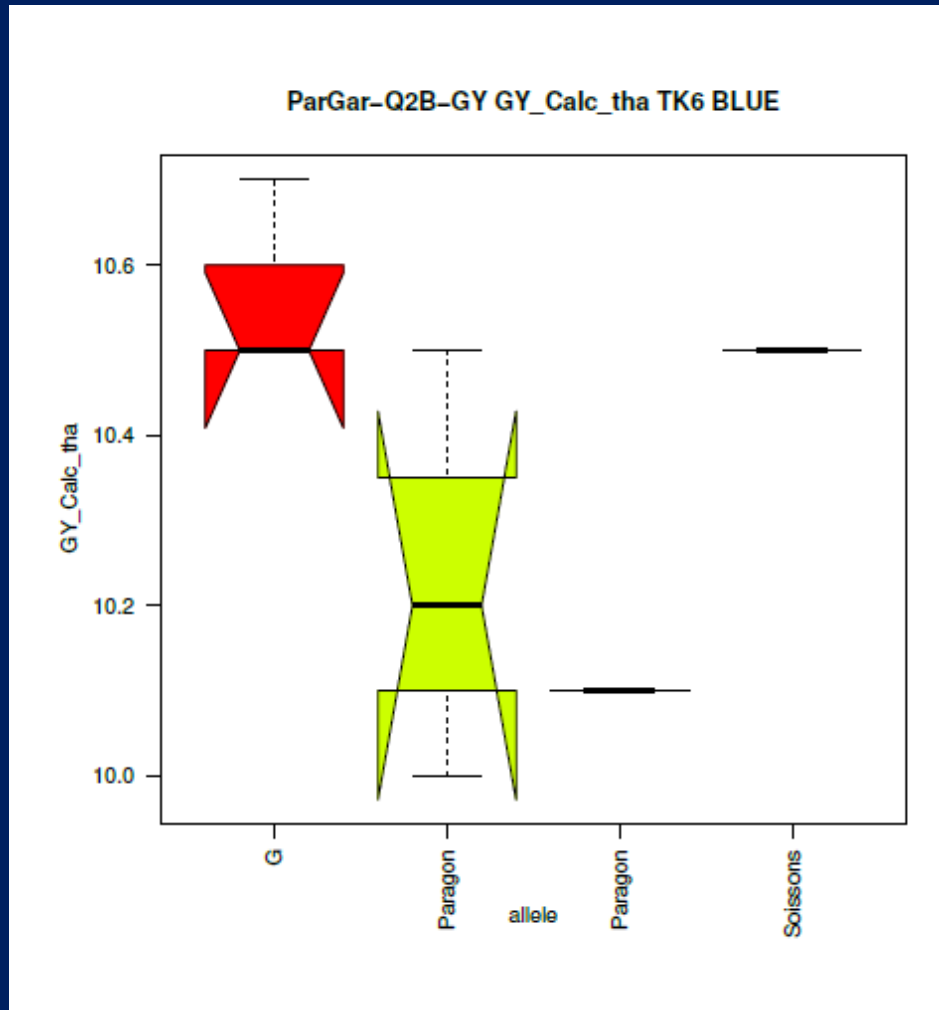


# Examination of Paragon and Starke Roots





# How can WGIN QTL make it into breeding?



- 2B yield effect from the Spanish variety Garcia
- Increases yield under conditions of agricultural drought
- Nominated by WGIN for the Designing Future Wheat Breeder Toolkit
- First trials of new lines confirmed the beneficial yield effect in 21-22 season
- We will pursue the same route for lodging component traits

# Thanks

Clare Lister- leading JIC WGIN activities

Alfie Kidner- developing phenotyping methods

Rhoslyn Griffiths- phenotyping

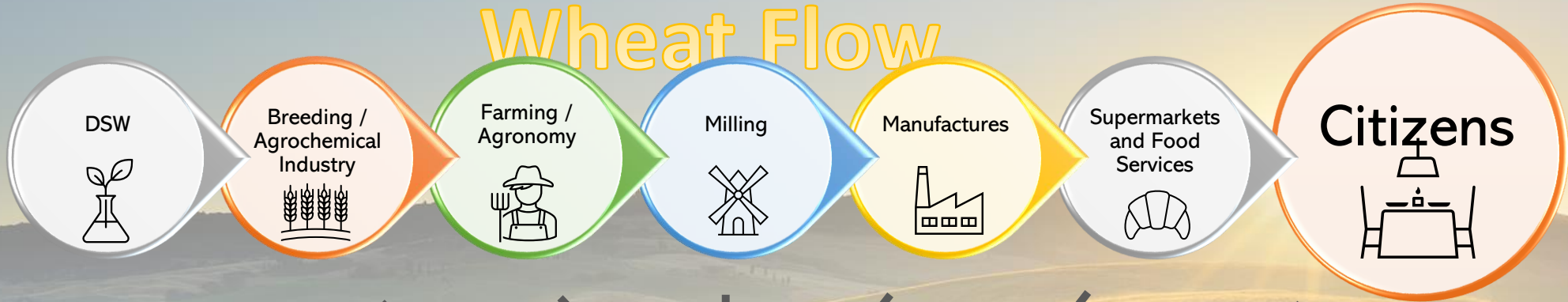
Emma Pluchard - phenotyping

Pol-Emilie Demars – phenotyping

Hannah Carthy - phenotyping

JIC Field Experimentation Team- delivering field experiments

# Wheat Flow



Interested in discussing topics to put forward?