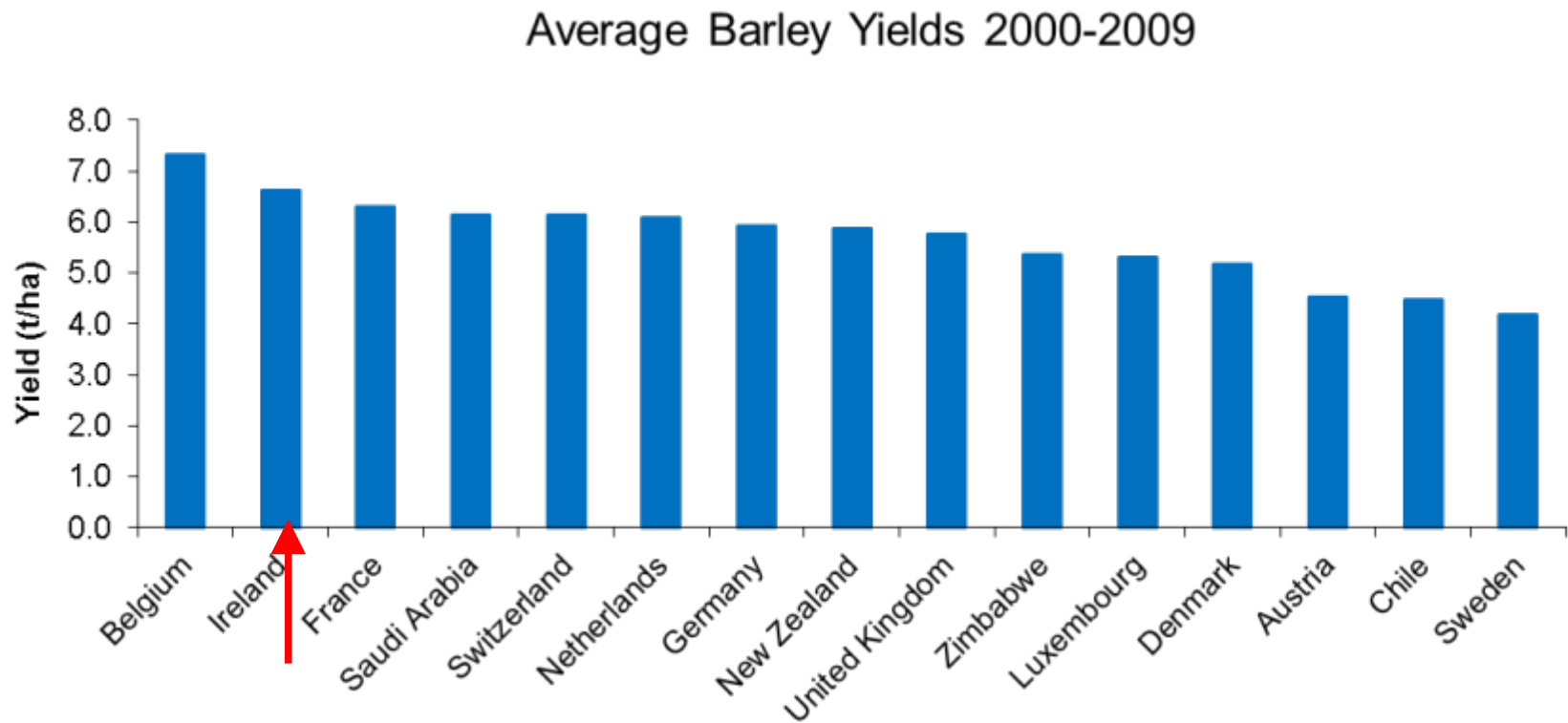


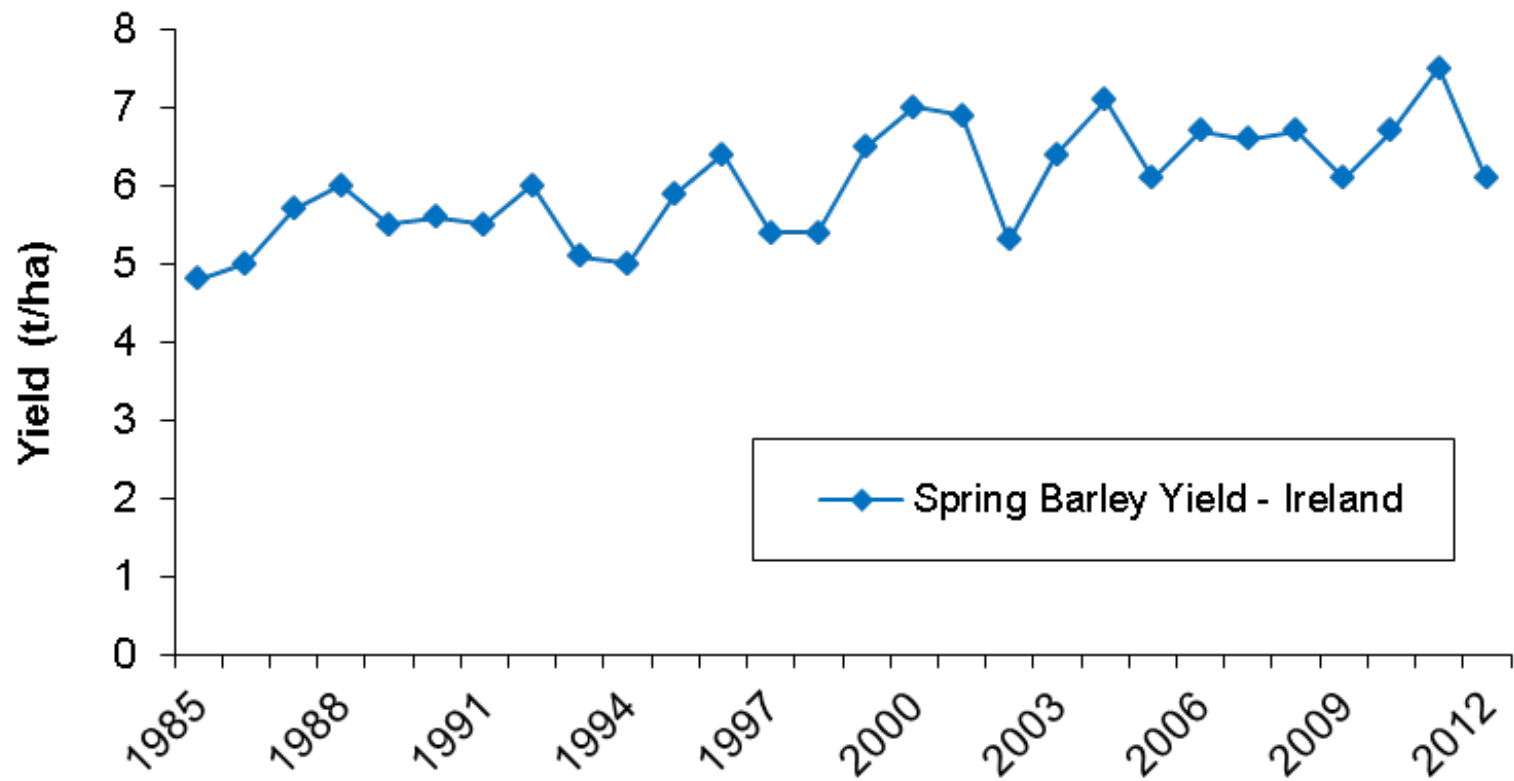
Spring Malting Barley Seminar

Ciaran Hickey
22nd February 2016

Yields of barley in Ireland are high....



.....but variable



Research questions

1. Why are yields so variable?
2. Can we increase yields further and if so, how?

Yield = grain number x grain weight





Spring barley monitoring

3 sites (Carlow, Wexford, Cork)

3 seasons (2011-2013)

Variety: Quench

Sowing date: mid-March to
early-April

Seedrate: 350 seeds/m²



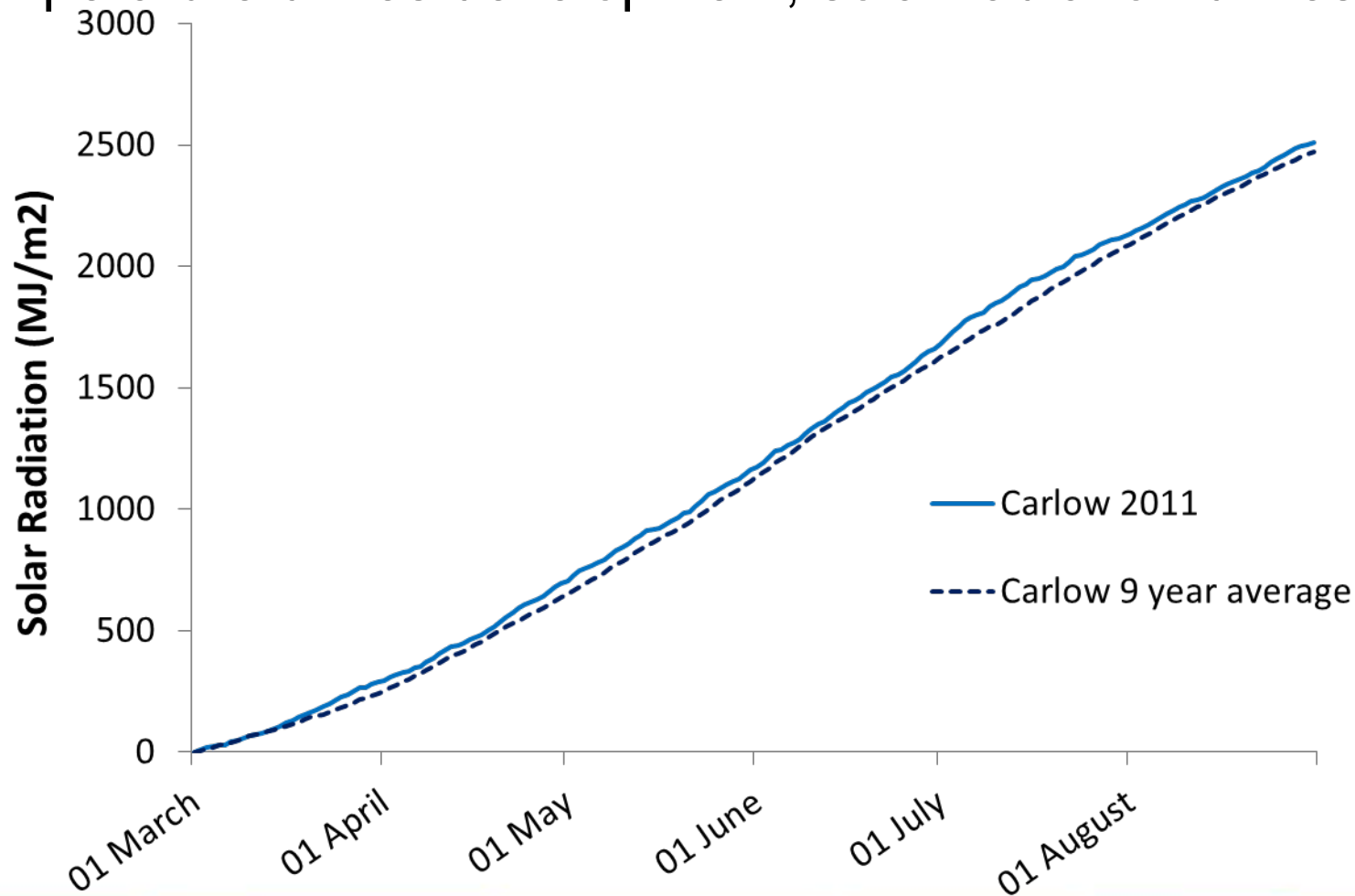
- N \approx 135 kg/ha split @ tramlines visible and during tillering
- Fungicides: pre-stem extension and ear emergence
- Weed control, aphicide, P & K as required

Yield data (average of all 3 sites)

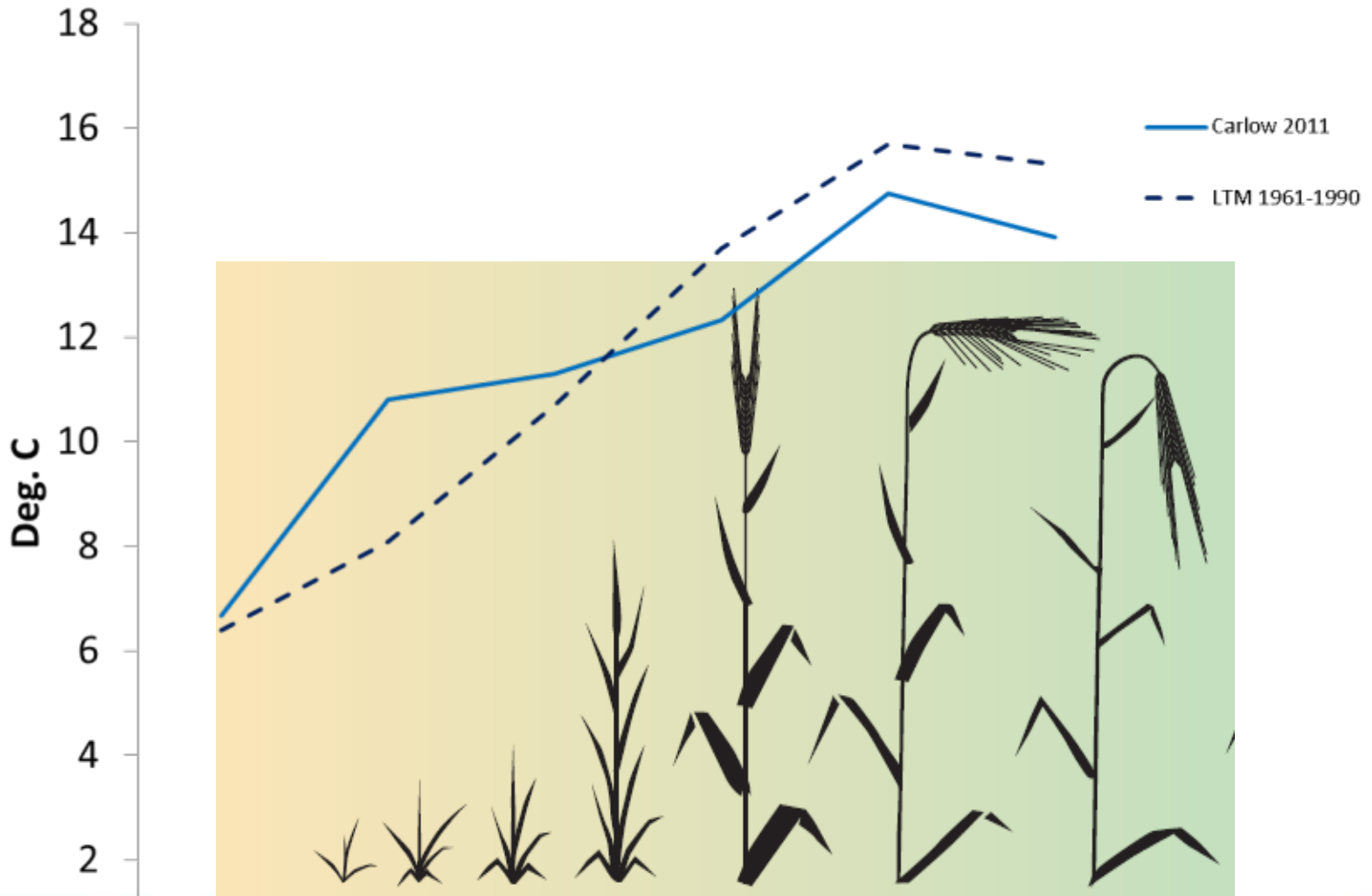
	2011	2012	2013
Grain Yield (t/ha)	9.9	7.9	7.5
Grain Number/m ²	20,423	18,559	15,310
Grain weight (mg)	48.8	42.4	49.0

Solar radiation Carlow 2011

Temperature drives development; solar radiation drives growth

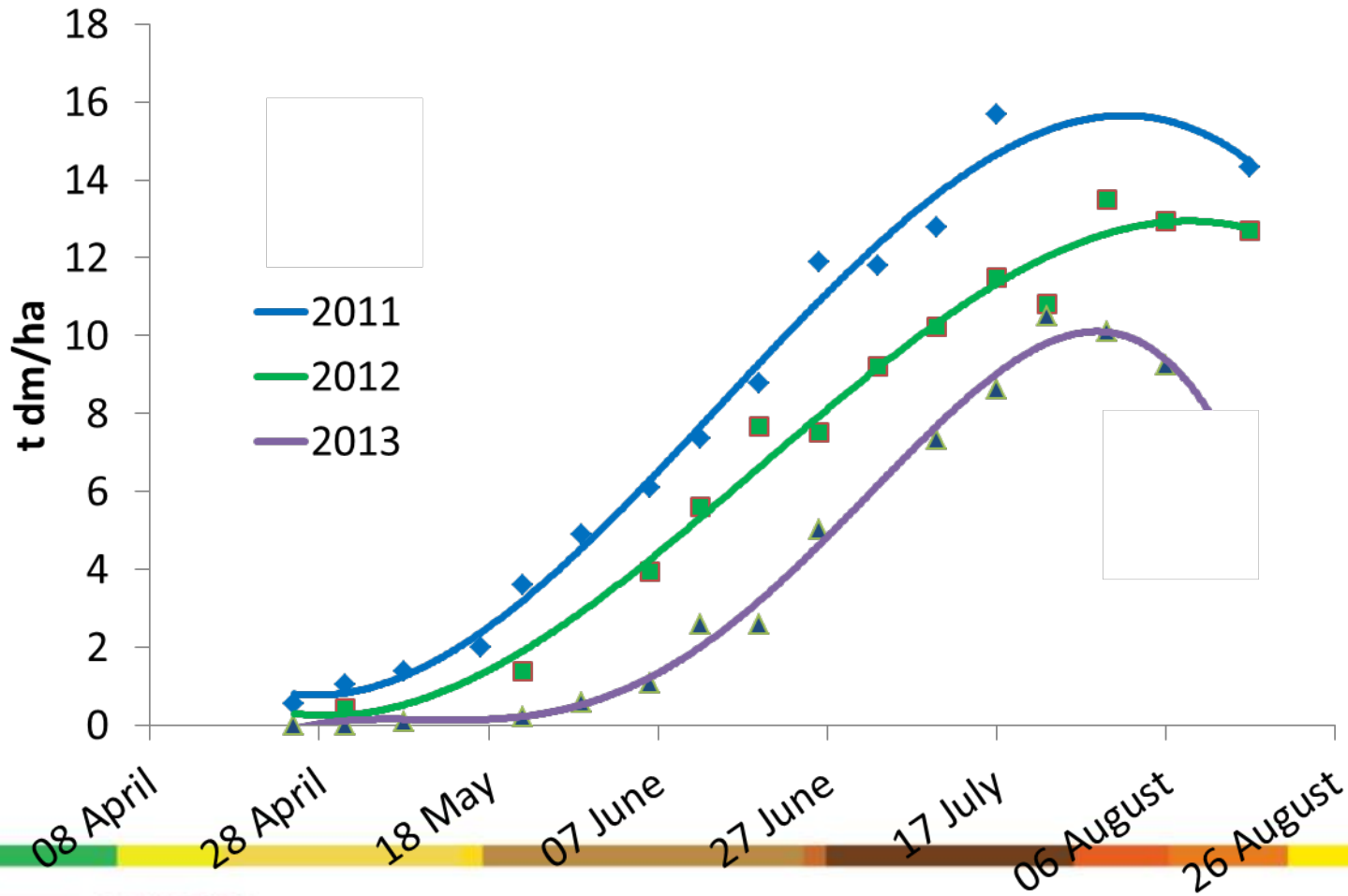


Temperature Carlow 2011



HGCA 2006

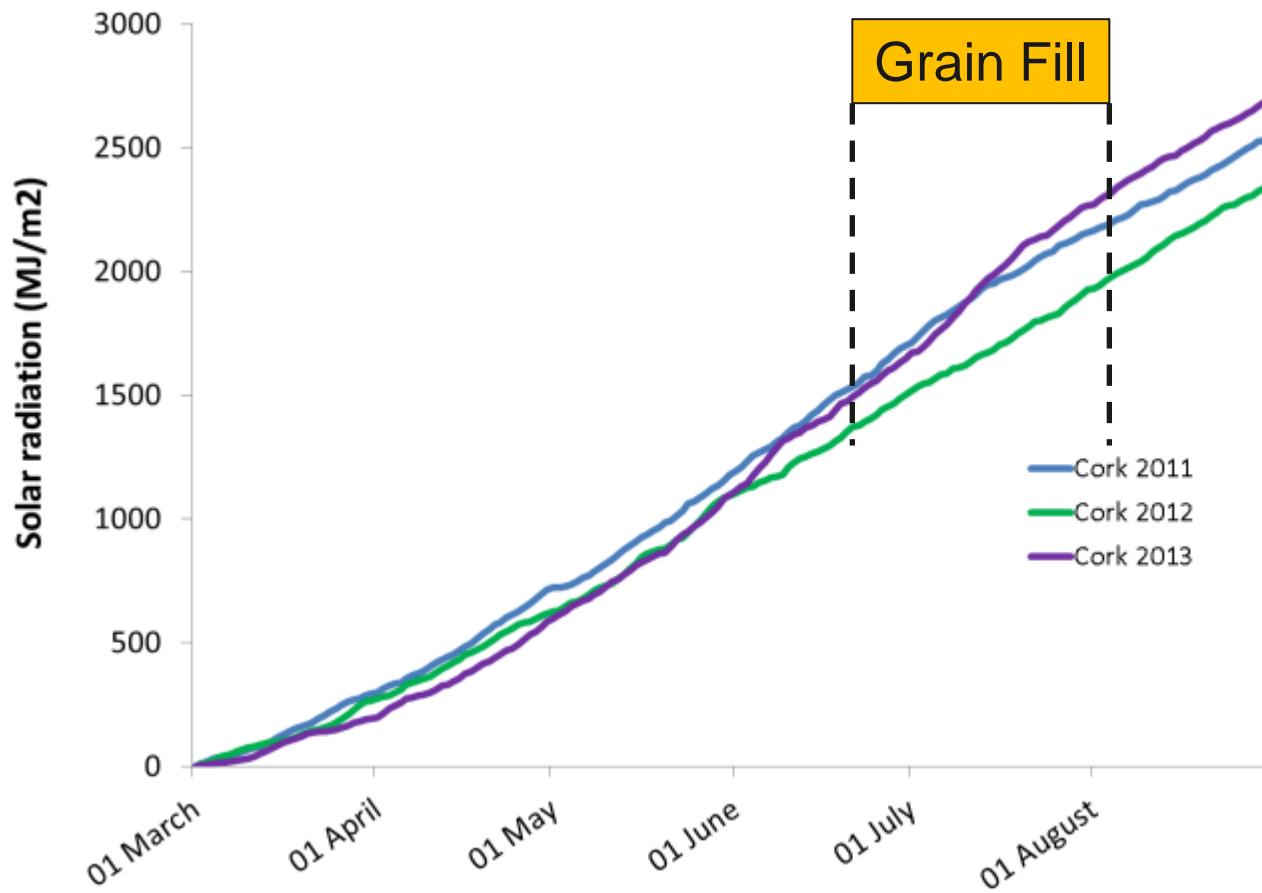
Total biomass Carlow 2011



Yield data (average of all 3 sites)

	2011	2012	2013
Grain Yield (t/ha)	9.9	7.9	7.5
Grain Number/m ²	20,423	18,559	15,310
Grain weight (mg)	48.8	42.4	49.0

Low solar radiation in 2012



Low stem reserves (sugars) 2012

t/ha of sugar pre grain-filling

	2012
Average of all three sites	0.42 (t/ha)

Effects of fusarium/ear blight 2012



Across all sites...

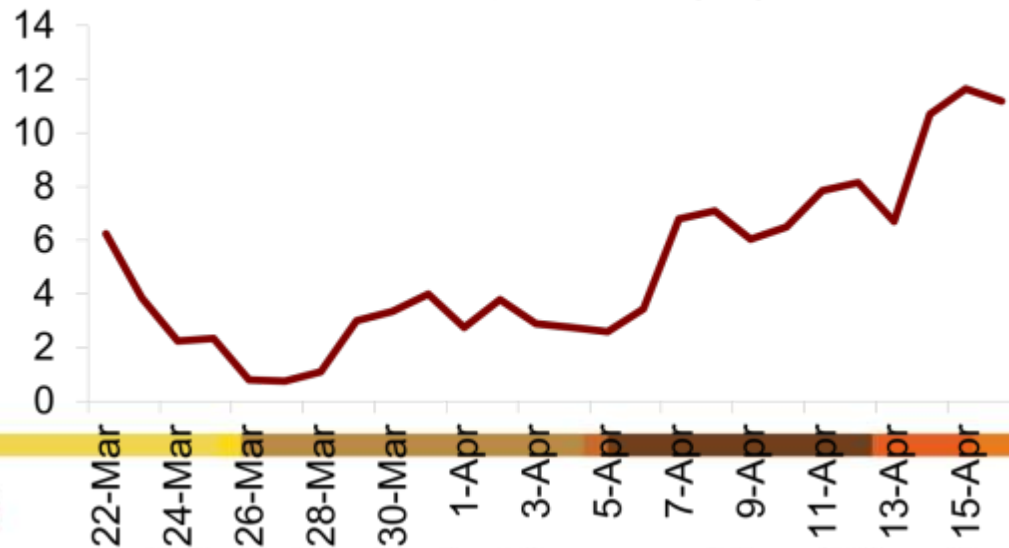
- 92% of ears
- 2.7 grains/ear

Establishment 2013

Sowing rate: 350

seeds/m ²	Sowing Date
Carlow 2013	20 th March
Wexford 2013	3 rd April
Cork 2013	4 th April

Mean Temperature (°C)



**Early sown crops are generally higher yielding
– but wait for spring!**



What is the optimum seed rate?

Across 3 sites and 3 seasons.....

Seed rate/m ²	% establishment	Plant number/m ²
347	78	270

Is pushing grain number a sound strategy?

Will the extra grains abort?

Shading after ear emergence



Effect of shading (2011 and 2012)

No abortion of grains, mechanism doesn't exist – growth buffered by stem reserves

Will higher grain numbers = smaller grains?

- Grain number generally doesn't have a big influence on grain weight.
- Usually there is an excess of resource for grain filling

Carlow & Kilkenny 2013

40 seeds/m²



80 seeds/m²



160 seeds/m²



320 seeds/m²



640 seeds/m²



1280 seeds/m²



Crops can sustain high grain numbers

How can a grower actually increase grain number?

Shoot number.....

4 ton crops had 1000 to 1200 heads pre-harvest



Path to increasing yield in barley

Weather variation = yield variation - consider issues over several seasons

Grain number determines yield

Crops have the energy to sustain high grain numbers

Shoot number has the most powerful influence on grain number

Early season development (pre stem-extension) crucial for shoot number

Optimum shoot number of 1000/m² *at harvest*

A seedrate of 350 seeds/m² has achieved 1000 shoots/m² (3 sites, 3 seasons)

Future: high grains/ear in conjunction with high shoots/m²???

Acknowledgements

Shane Kennedy

Supervision from John Spink (Teagasc) and Ian Bingham (SRUC)

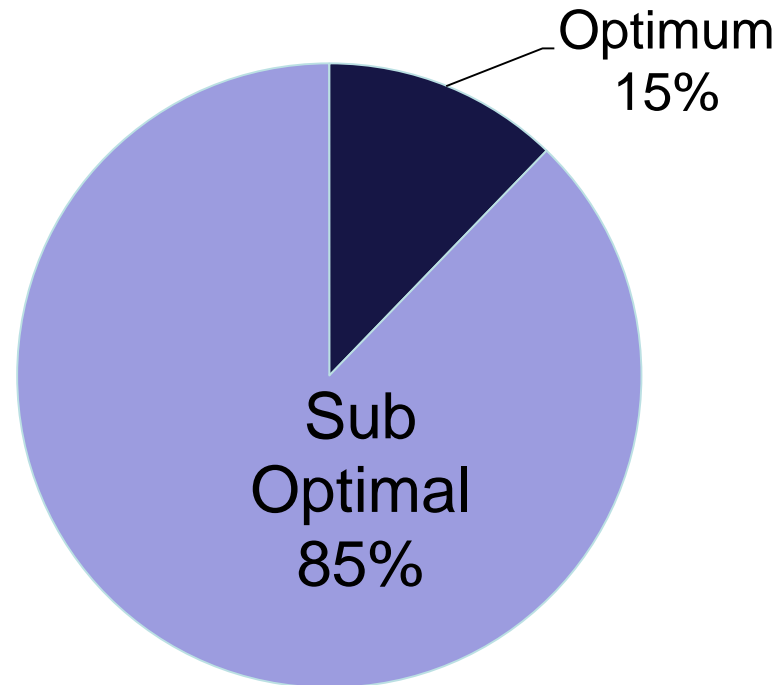
Growers: George & Ken Williamson Wexford, Seamus Kearney (DAFM) Cork, John Hogan (Teagasc) Carlow, Damien Fewer (Teagasc) and Elizabeth Hyland (DAFM) Kilkenny

Technical, student, admin. and other support.

Optimum tillage soils - pH, P & K

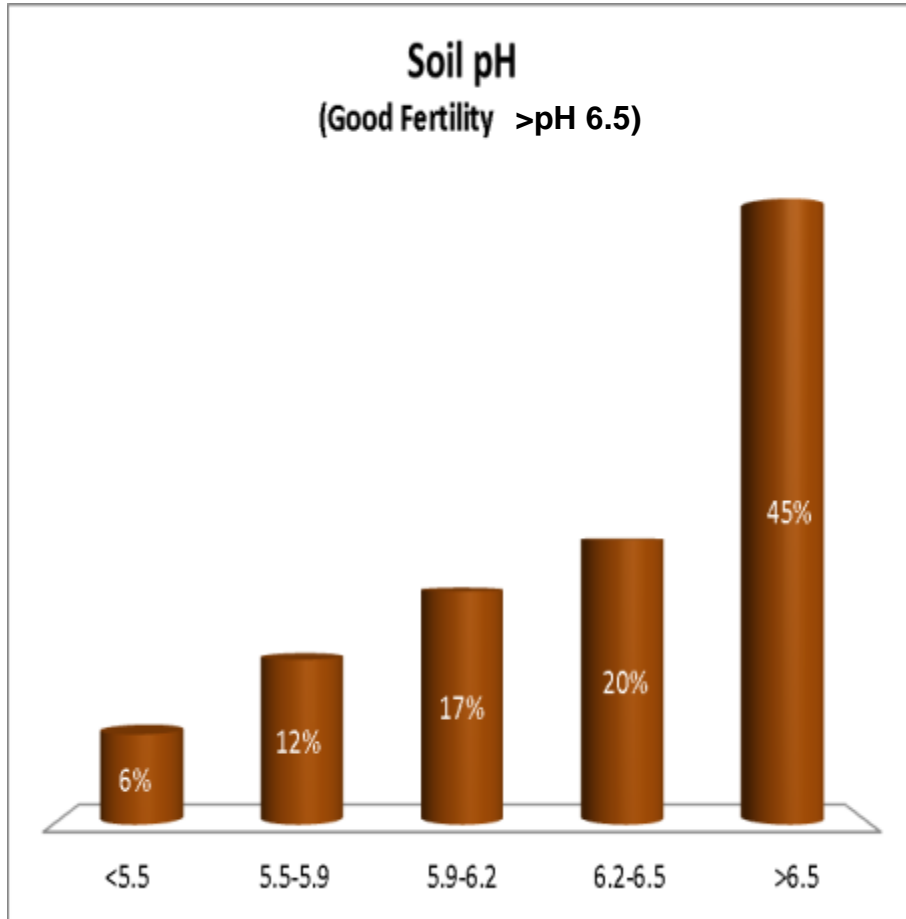
Good Overall Fertility - Tillage:

Soil pH > 6.5; Soil P and K Index 3 or 4



Soil pH Status in 2015

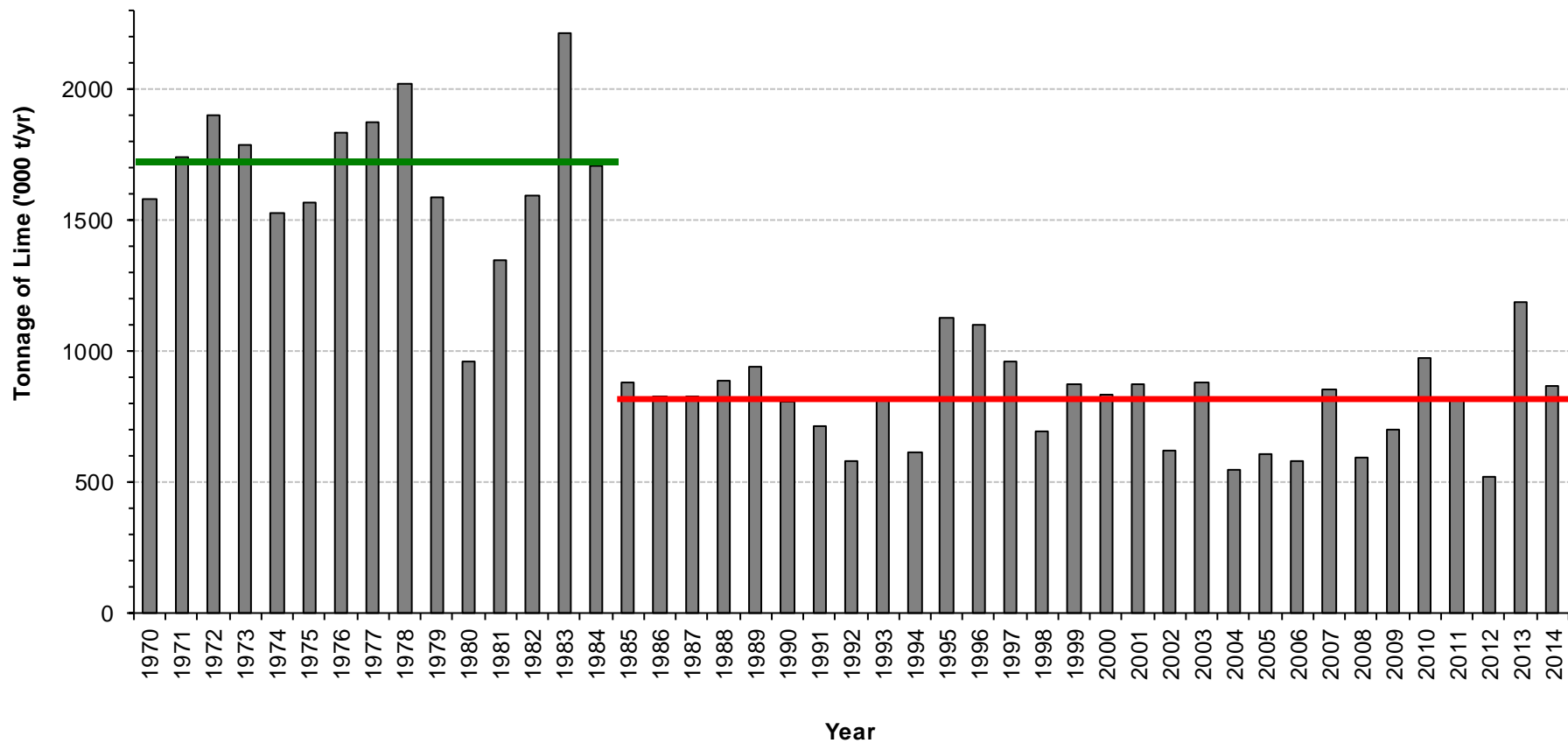
3600 tillage samples



- ✓ 35% of soils <5.5 to 6.2
 - ✓ Down 7%
- ✓ 45% > pH 6.5
 - ✓ Up 7%
- ✓ Lime is essential for N, P & K availability
- ✓ Lime a priority

Lime Usage in Ireland

Lime usage 1970 - 2014

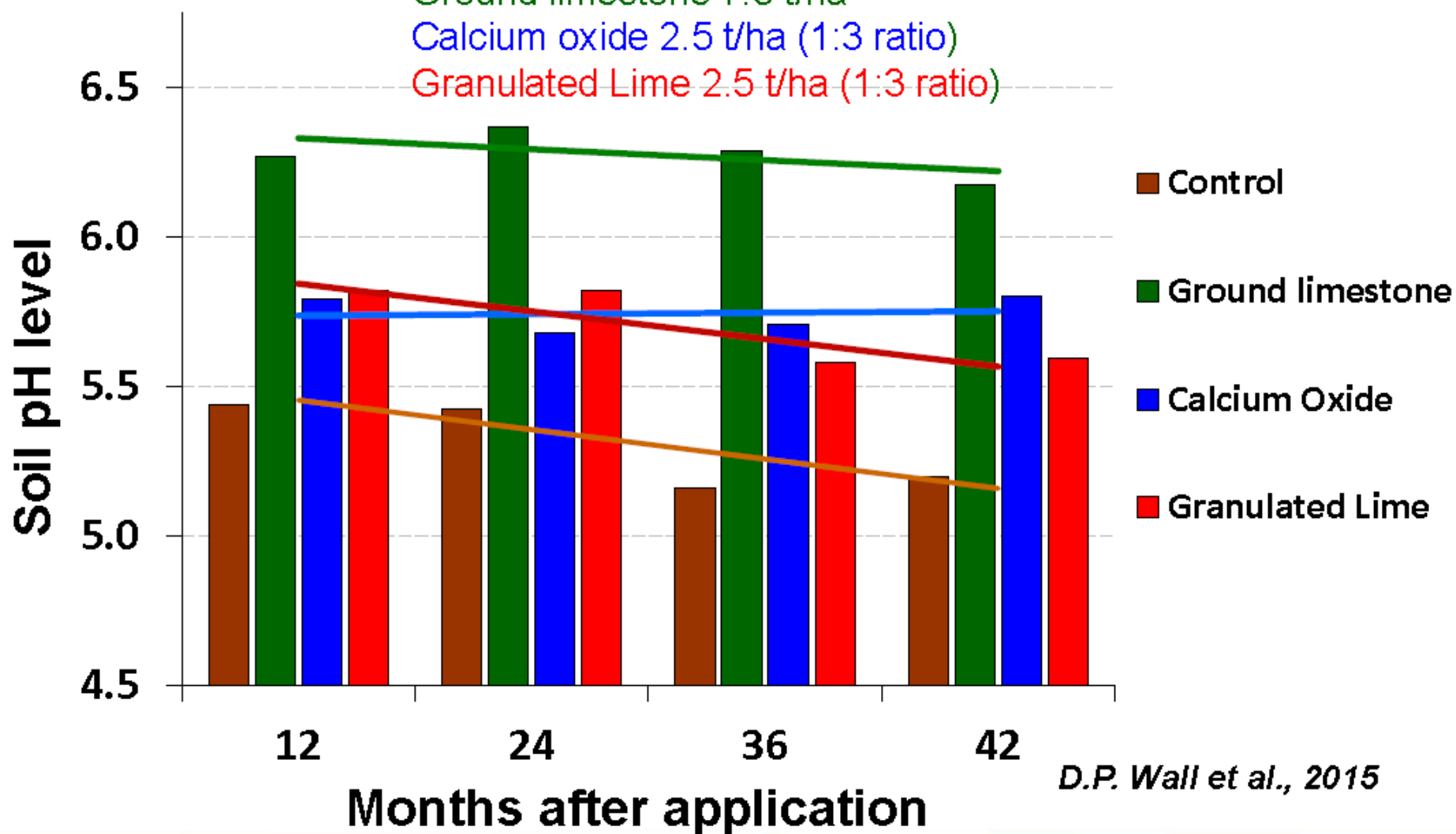


Efficiency of Bag Lime Products

Ground limestone 7.5 t/ha

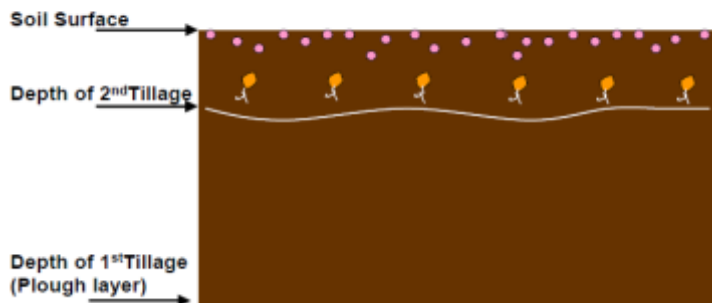
Calcium oxide 2.5 t/ha (1:3 ratio)

Granulated Lime 2.5 t/ha (1:3 ratio)



Phosphorus fertilizer application methods

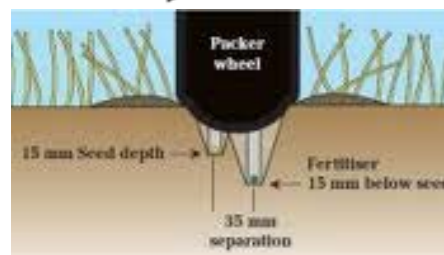
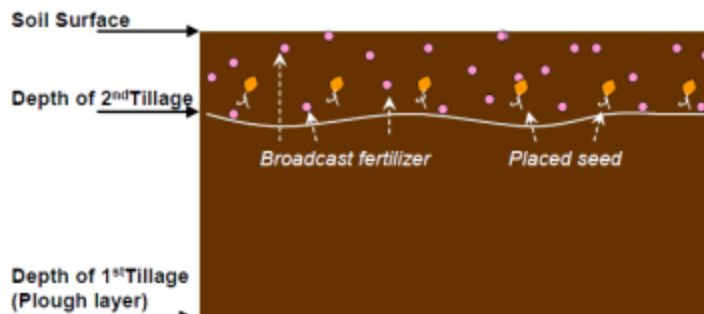
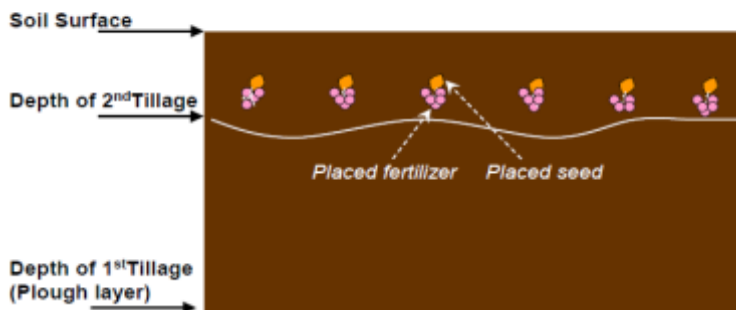
Surface Broadcast P fertilizer



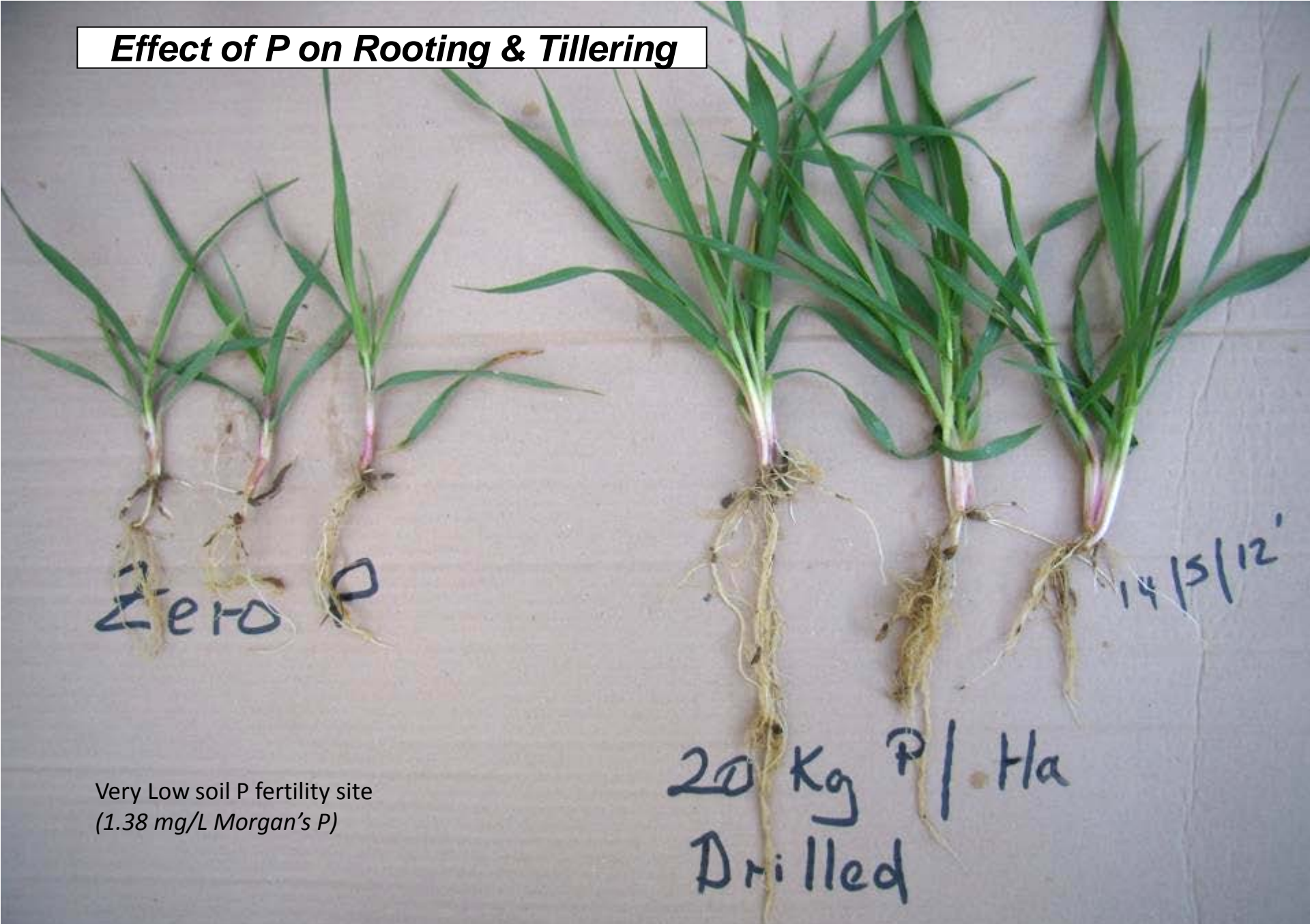
Incorporated P fertilizer



Combined Drilled P fertilizer



Effect of P on Rooting & Tillering

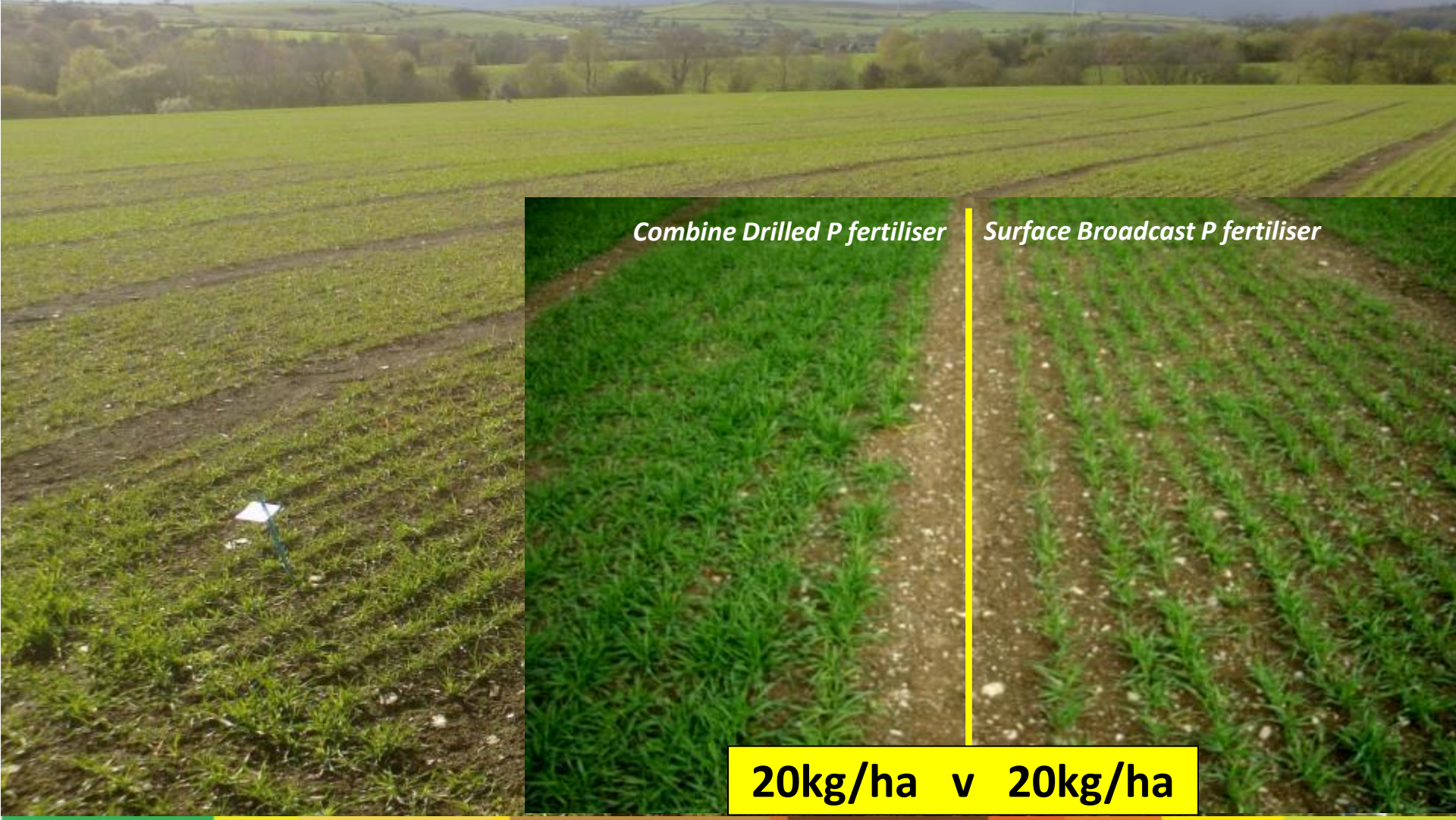


Very Low soil P fertility site
(1.38 mg/L Morgan's P)

20 Kg P / Ha
Drilled

14/5/12

Phosphorus fertiliser application method



Combine Drilled P fertiliser

Surface Broadcast P fertiliser

20kg/ha v 20kg/ha

Grain yield response to P fertiliser application methods

◆ Combine Drilled P □ Surface Broadcast P ✕ Incorporated

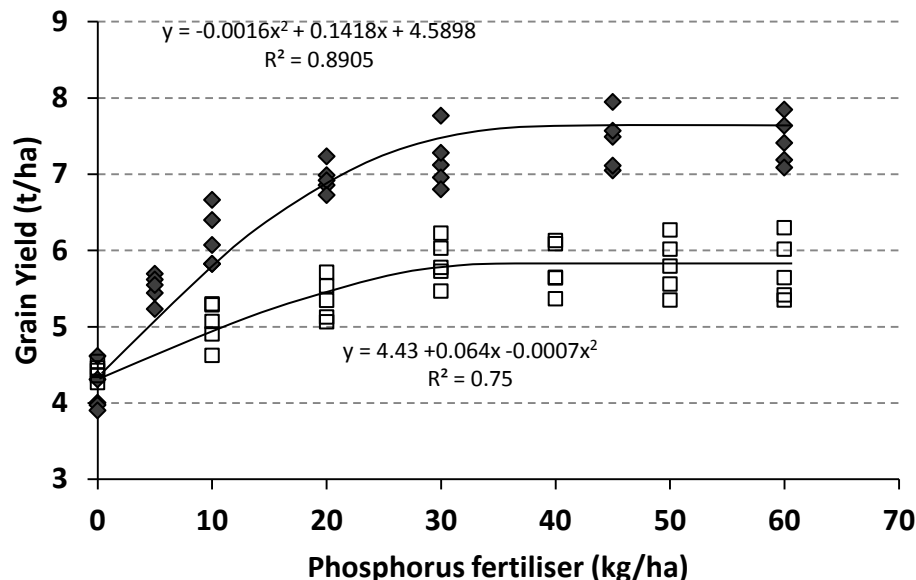


Figure 4. Spring barley grain yield response to P fertiliser rate and application method. Initial STP 1.38 mg/L Morgan's P
 - Ballycarney site, medium soil, clonroche series, soil more responsive to P placement so a big response to P being combine drilled.

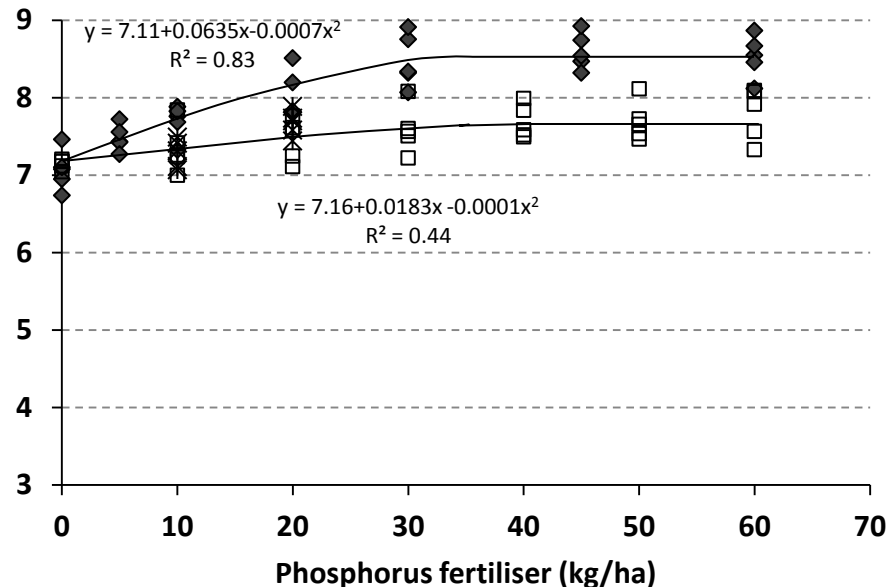


Figure 5. Spring barley grain yield response to P fertiliser rate and application method. Initial STP 2.36 mg/L Morgan's P
 - Duncormick, a heavier soil with a higher yield potential and a better capacity to supply P.
 - Both Sites are a very Low P index.

Conclusions

1. Knowledge of the different soil types and their P dynamics would help to improve P advice and to target P fertiliser management appropriately.
2. Soil P testing is a good indicator of P availability and crop response to P fertiliser
3. In general the apparent P fertiliser recovery of surface broadcast P fertiliser was low (<20%). Placing P fertilisers close to or with the seed on low P fertility soils was the most efficient method of applying fertiliser P.

Ploughing Wet land ??



Break That Down ??



It all starts with the ploughing !!



Good ploughing makes all the difference !



Working wet soil, how to make cloddy seedbeds !!!



The soil does not forget !!



Seed bed Consolidation, different to compaction !



A Good Tilth



Wait for the soil to come right , rather than the date !!



How to avoid compaction, Don't put it in !





The seed went in, but ????







“Well sown is Half Grown”



The Target !!



Thank you for your attention