# Successful 2nd and 3rd wheat crops and the issue of Take-all

**Kim Hammond-Kosack**

# Facts and figures

**UK wheat crop 2010 – 1.94 M hectares**

**~ 25 – 30% is in 2nd wheat or more***

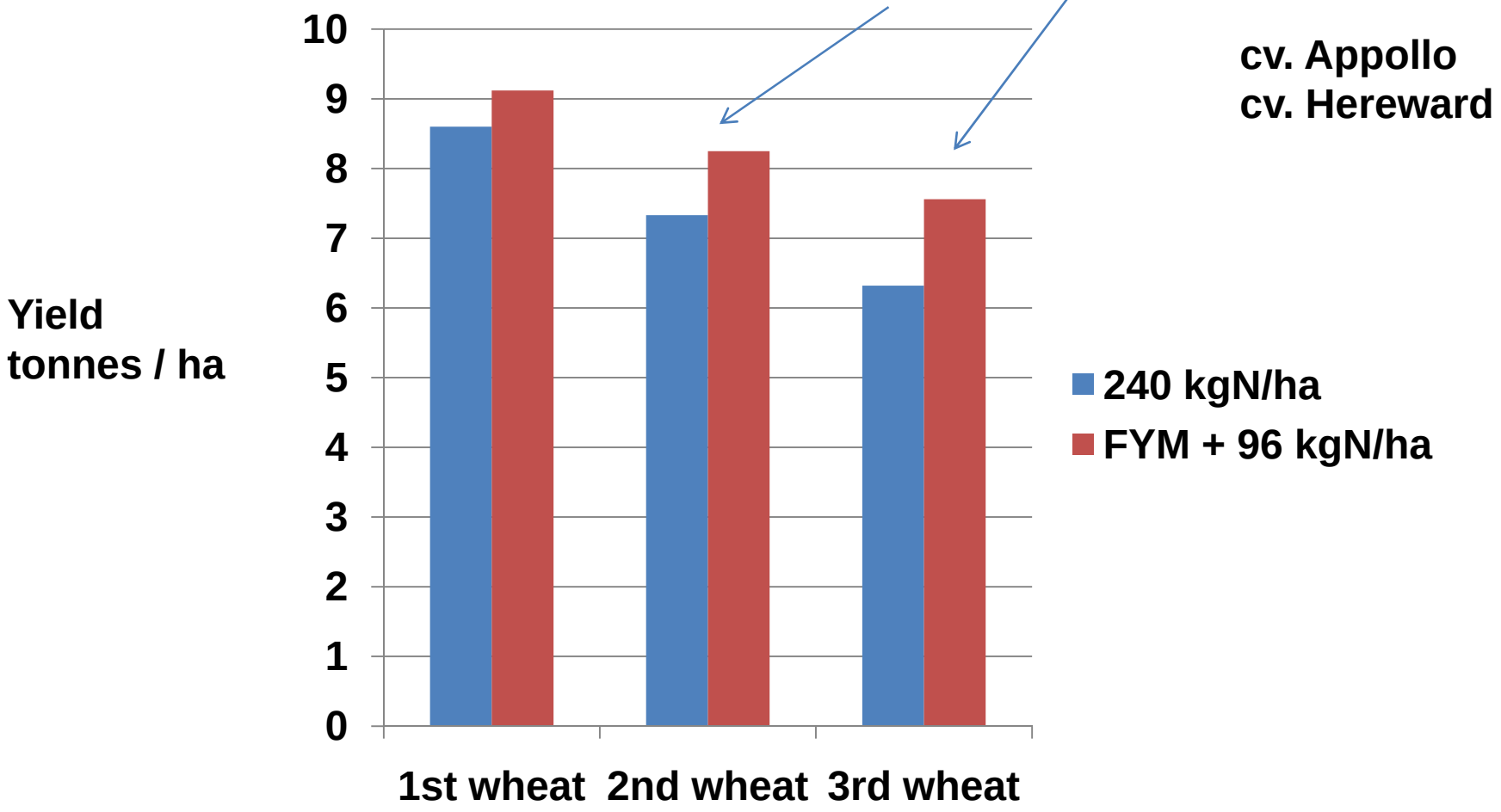
**485,000 – 582,000 hectares are in 2nd , 3rd wheat or more years**

***CropMonitor Previous Crop Survey - annual assessment by fera**

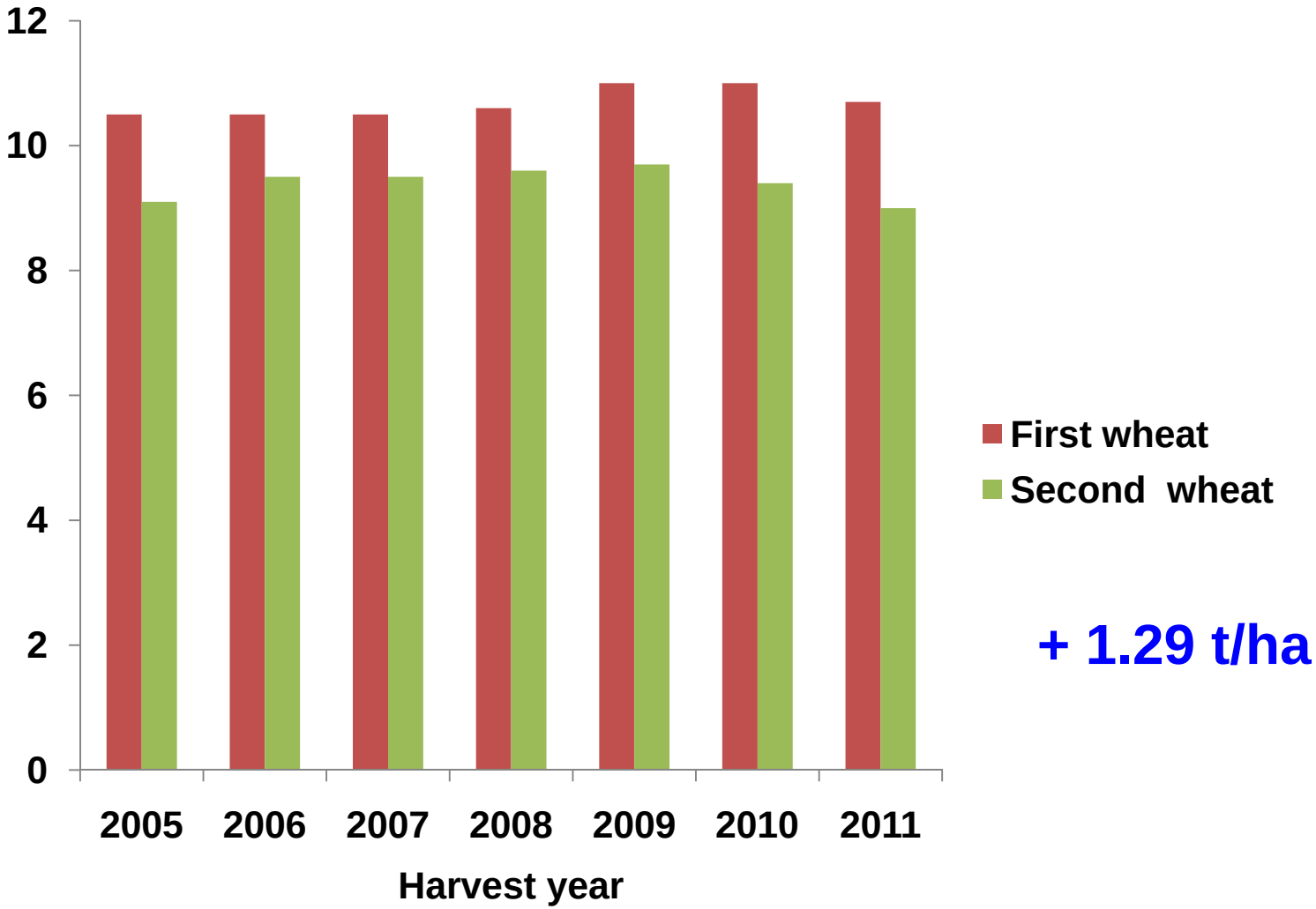
# Broadbalk long term experiment : 5 year rotation since 1988

## 5 year rotation oats, maize, wheat, wheat, wheat

| Yield difference compared with 1st wheat (t/ha) | | | |
|---|---|---|---|
| 240kgN/ha | | 1.27 | 2.28 |
| FYM + 96 kgN/ha | | 0.88 | 1.57 |



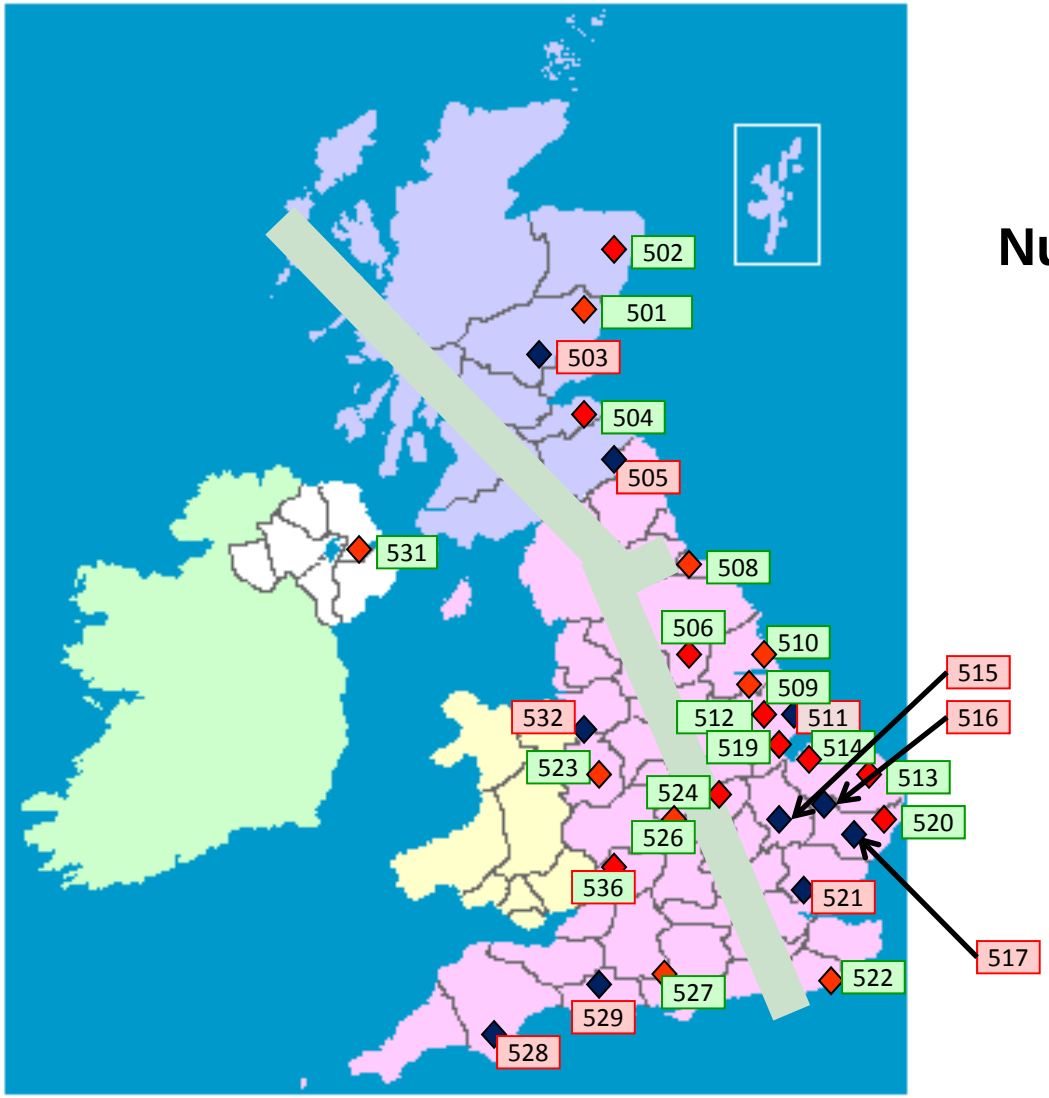
# Seven years of Recommended List data




**+ 1.29 t/ha**

| GRAIN YIELD (t/ha) | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| First wheat | 10.5 | 10.5 | 10.5 | 10.6 | 11 | 11 | 10.7 |
| Second wheat | 9.1 | 9.5 | 9.5 | 9.6 | 9.7 | 9.4 | 9 |

# Winter wheat: RL trial sites H 2012




**Number of trials = 29**

**1st = 19 trials**
**2nd = 10 trials**

First cereal

Second cereal

**Slide from Bill Handley (HGCA, RL technical manager)**

# Estimation of losses to the UK's annual wheat production

**UK wheat production area** **~ 1. 94 M hectares**

**25% - 30% in 2nd or more wheat crops** **485 - 582 K hectares**

**1 tonnes / hectare yield loss** **485 – 582 K tonnes of grain**

**1.25 tonnes / hectare yield loss** **606 – 728 K tonnes of grain**

**Value to UK rural economy**

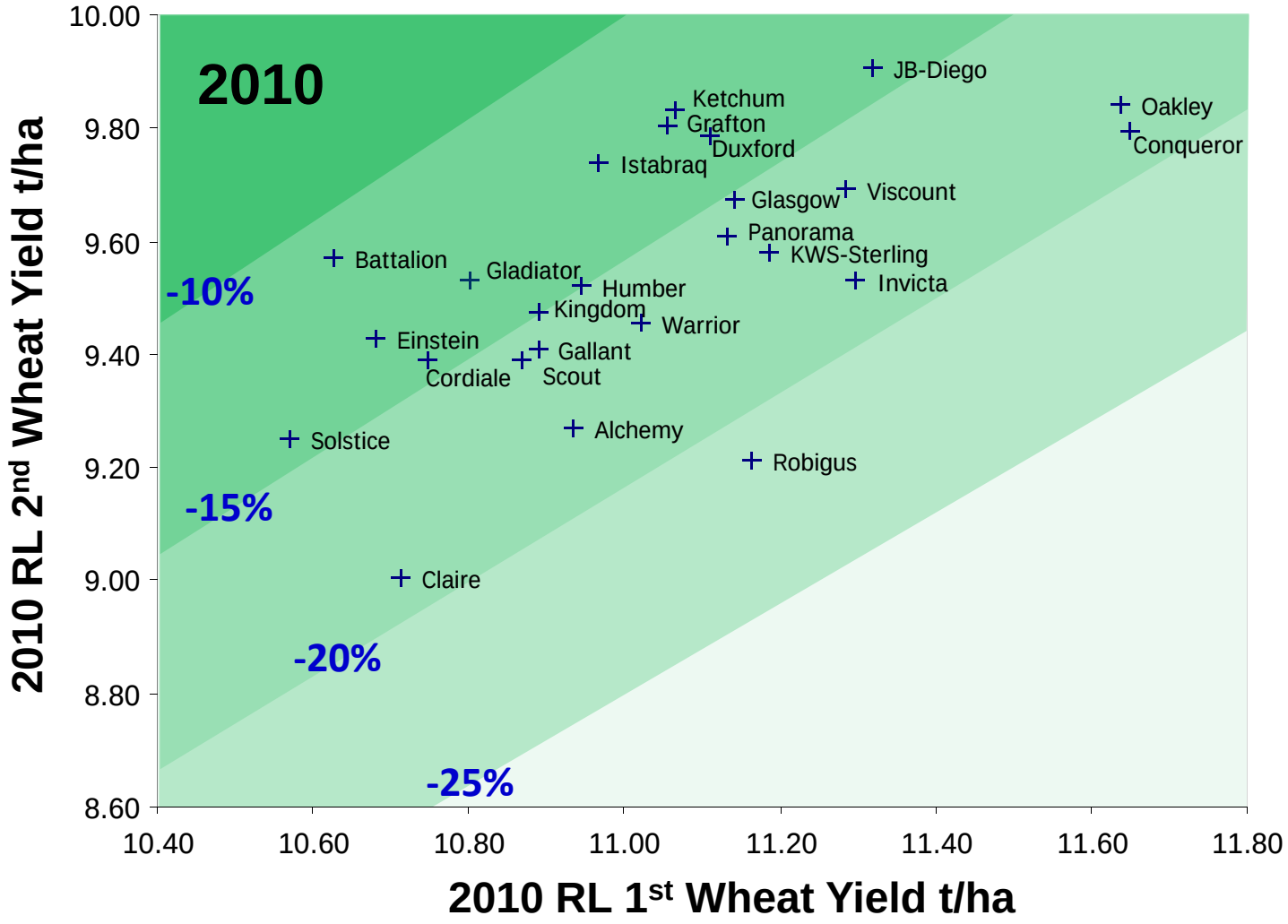
**£142 / tonne (Nov 11)***

**1 t/ha loss - £69 M to £83 M**

**1.25 t/ha loss - £86 M to £104 M**

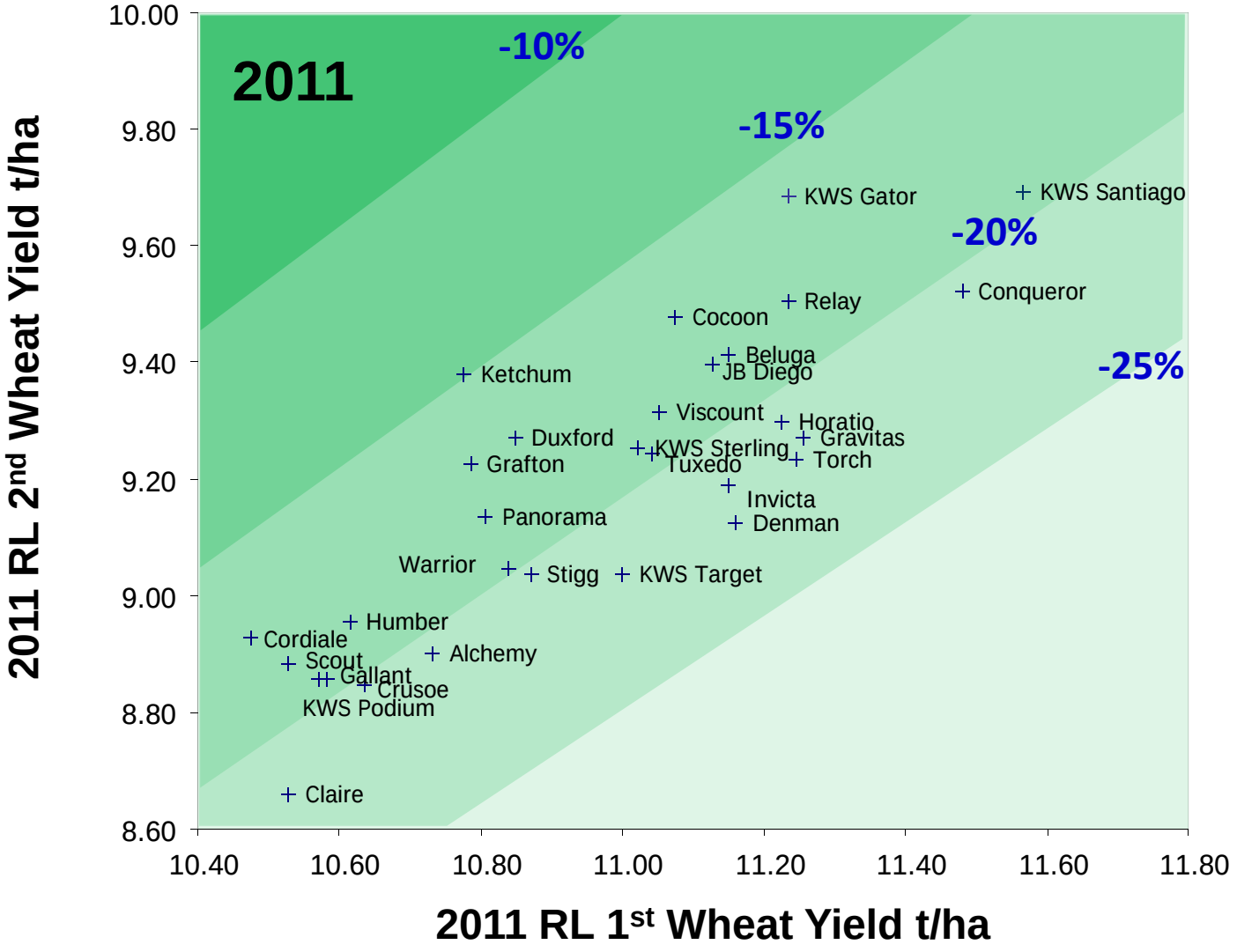
***LIFFE wheat price**

# RL 1st vs 2nd wheat yield differences




Slide from Ed Flatman (RAGT, commercial wheat breeder)

# RL 1st vs 2nd wheat yield differences




**Slide from Ed Flatman (RAGT, commercial wheat breeder)**

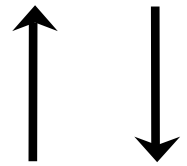
# What are the most likely underlying reasons ?

**Agronomy**
**Soil fertility, soil structure**
**Pathology**
**The wheat breeding strategy**

**Yield / yield quality**
**Why the impact on yield ?**
**Is grain quality affected ?**

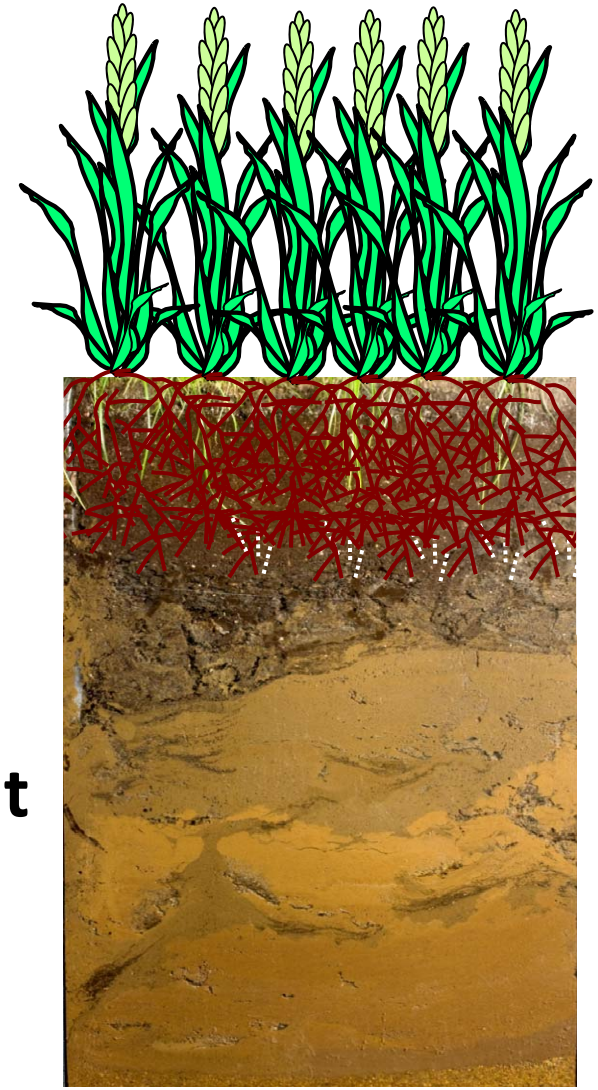
# Importance of soil microbes

gaseous fluxes



soil gene pool

pesticide/pollutant decomposition



plant nutrition

plant health/disease

bioindicators

nutrient cycling

soil fertility

Slide from Ian Clark (RRes)

# Pathology issue and particularly Take-all disease


# Take - all risk situation

Autumn infected 2nd wheat crop

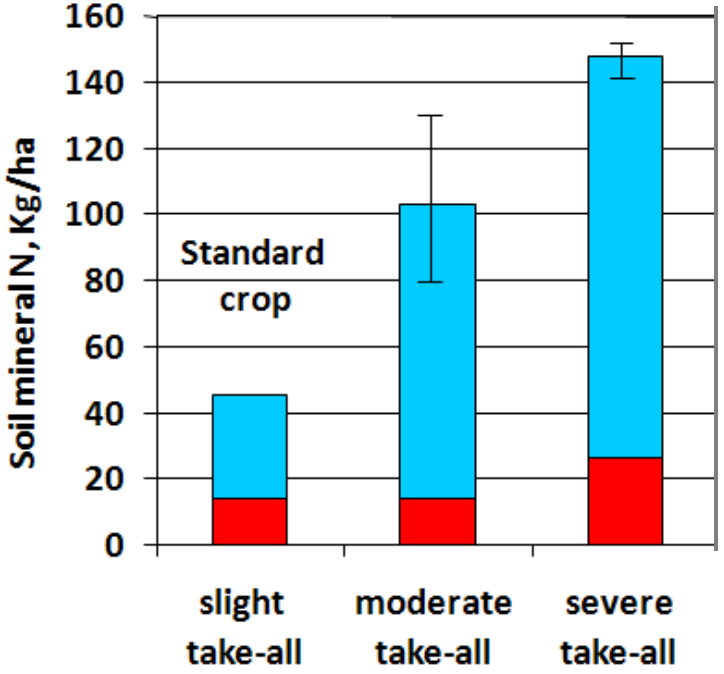
Severely infected older plants

Poor water and nutrient uptake

# Typical take-all patch showing stunting and premature ripening of the crop

**Grain: small shrivelled not plump**

**Effects of Take-all on soil mineral N at harvest**




MacDonald & Gutteridge (2011) Plant and Soil

# What can be done to improve the chances of success ?

**Agronomy**
**Soil fertility, soil structure**
**Pathology**
**The wheat breeding strategy**

**Yield / yield quality**

**Sustainable intensification**

**to meet the rising global food, feed, fuel demands from the same land, with the same inputs whilst maintaining biodiversity**

# Extra slide set

# Cropmonitor Previous Crop Survey (fera)

| Year | Winter wheat % | Other cereal % |
|---|---|---|
| 2000 | 22.3 | 5.3 |
| 2001 | 27.3 | 6.1 |
| 2002 | 23.6 | 6.9 |
| 2003 | 30.4 | 4.7 |
| 2004 | 26.4 | 5.3 |
| 2005 | 22.4 | 5.1 |

# RL trials – average LSD values (5%) always higher for the 2nd wheat or more sites

| Average LSD (5%) | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|
| First wheat | 2.5 | 1.5 | 1.7 | 3.6 | 2.9 | 2.7 | 2.6 |
| Second wheat or more | 2.9 | 2.5 | 2.8 | 4 | 4.1 | 4 | 3.4 |
| No of 2nd trials lost | na | na | 3 | 2 | 1 | 1 | 1 |

# Calculating the Take-all Rating – TAR

**The take-all rating categories are**

**Slight (1-25%), Moderate (26-75%) and Severe (76-100%).**

**The rating is then calculated from**

**% plants with slight disease + (2 x % moderate) + (3 x % severe).**

**The maximum rating is 300.**