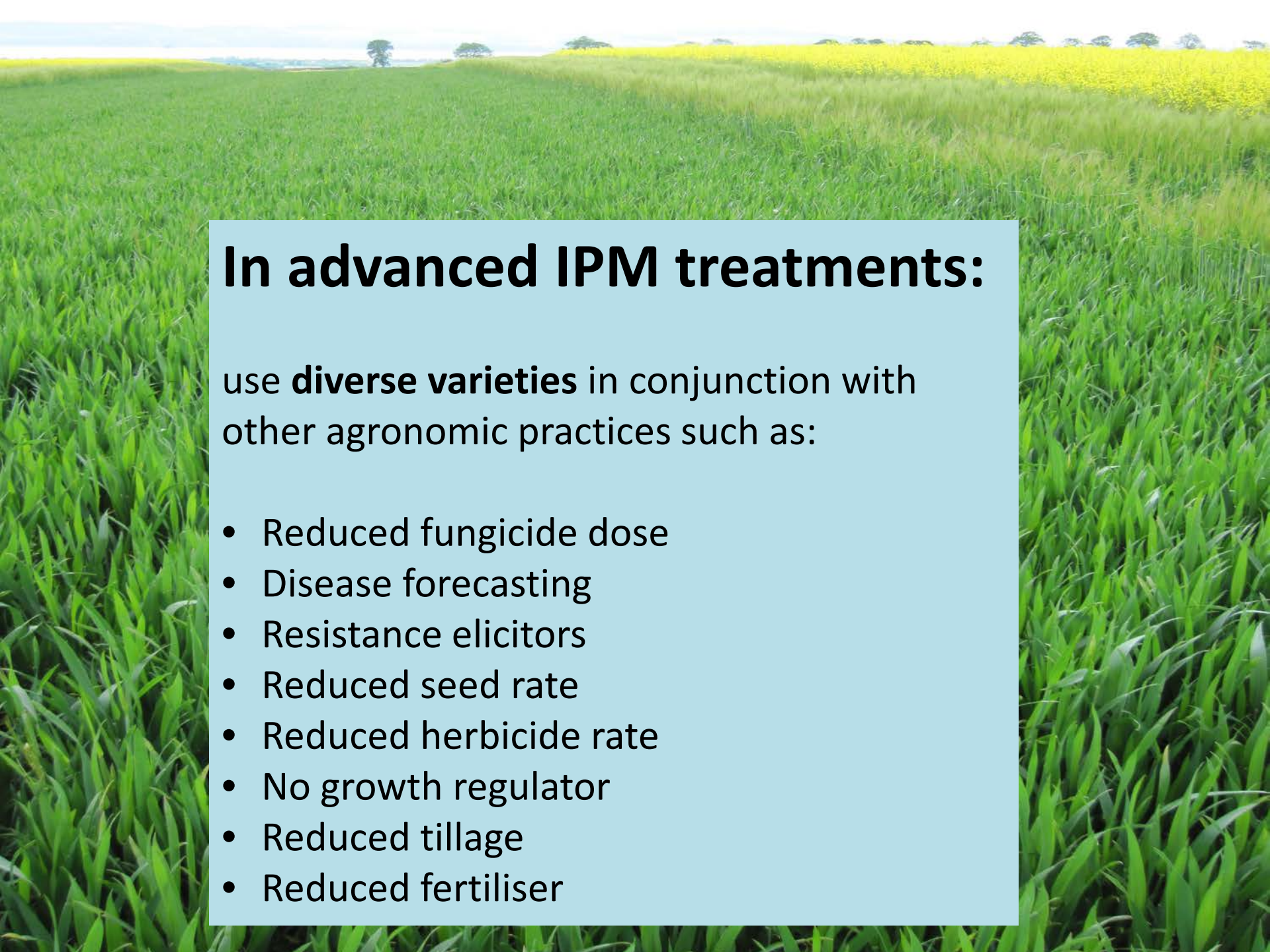
Use of variety mixtures to reduce disease, increase resource-use efficiency resulting and enhance profitability

Workpackage 2:
wheat-based rotations

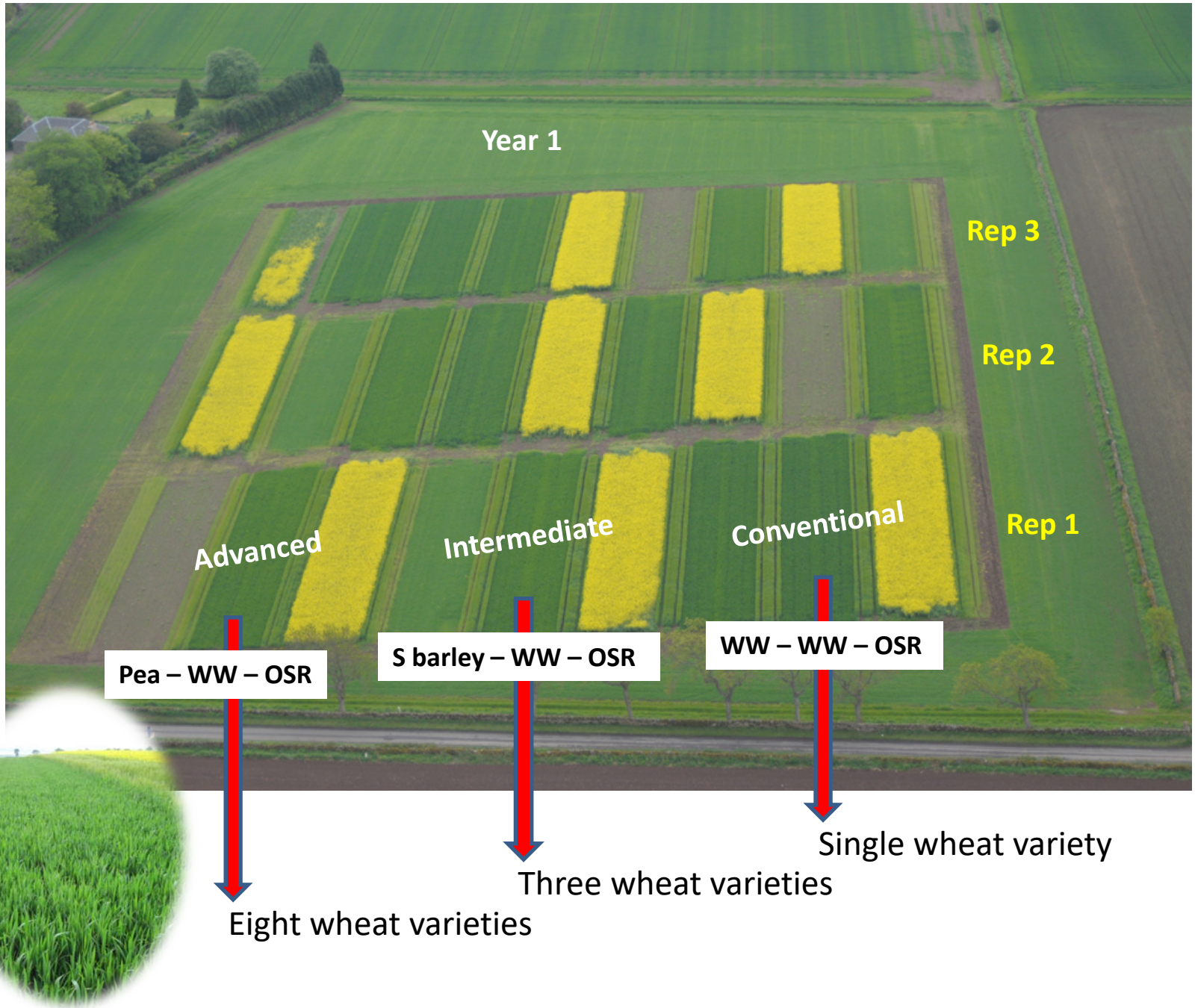
Adrian C Newton



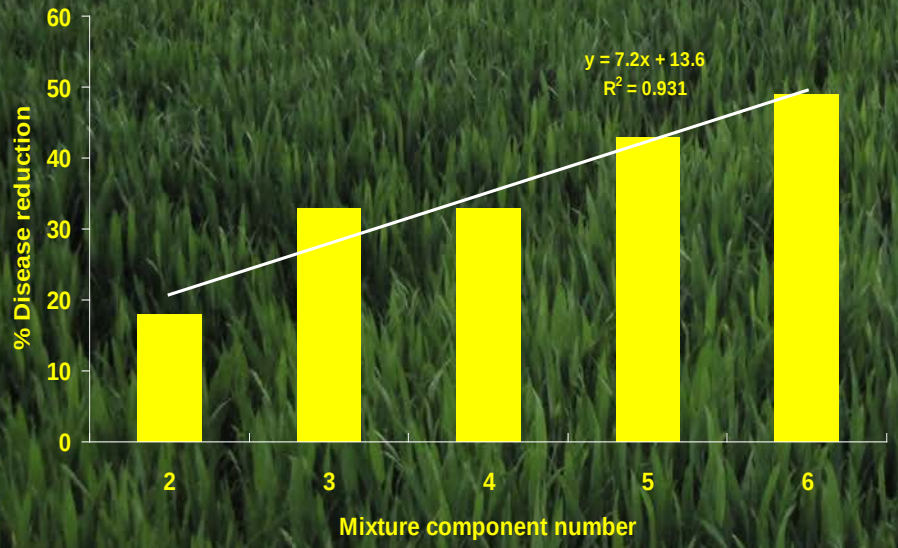
In advanced IPM treatments:

use **diverse varieties** in conjunction with other agronomic practices such as:

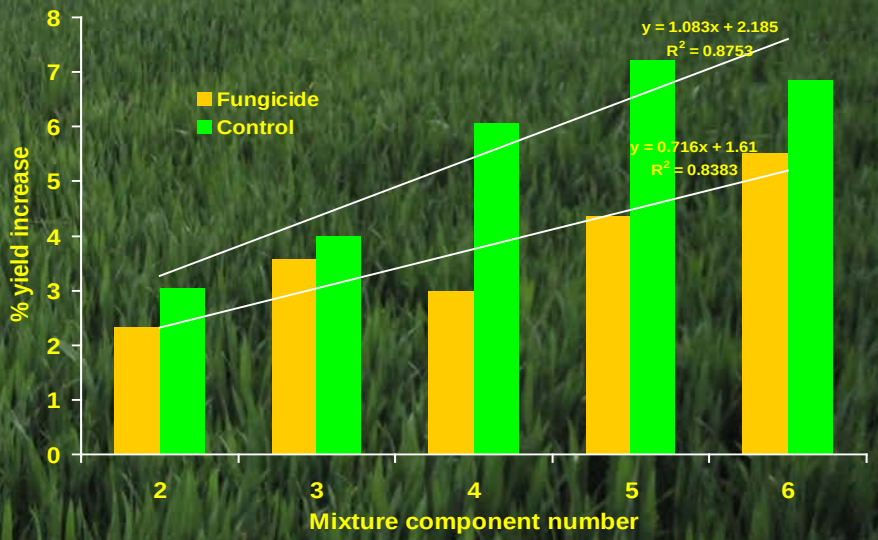
- Reduced fungicide dose
- Disease forecasting
- Resistance elicitors
- Reduced seed rate
- Reduced herbicide rate
- No growth regulator
- Reduced tillage
- Reduced fertiliser


Year 1
Rep 3
Rep 2
Rep 1
Advanced
Intermediate
Conventional
Pea – WW – OSR
S barley – WW – OSR
WW – WW – OSR
Eight wheat varieties
Three wheat varieties
Single wheat variety

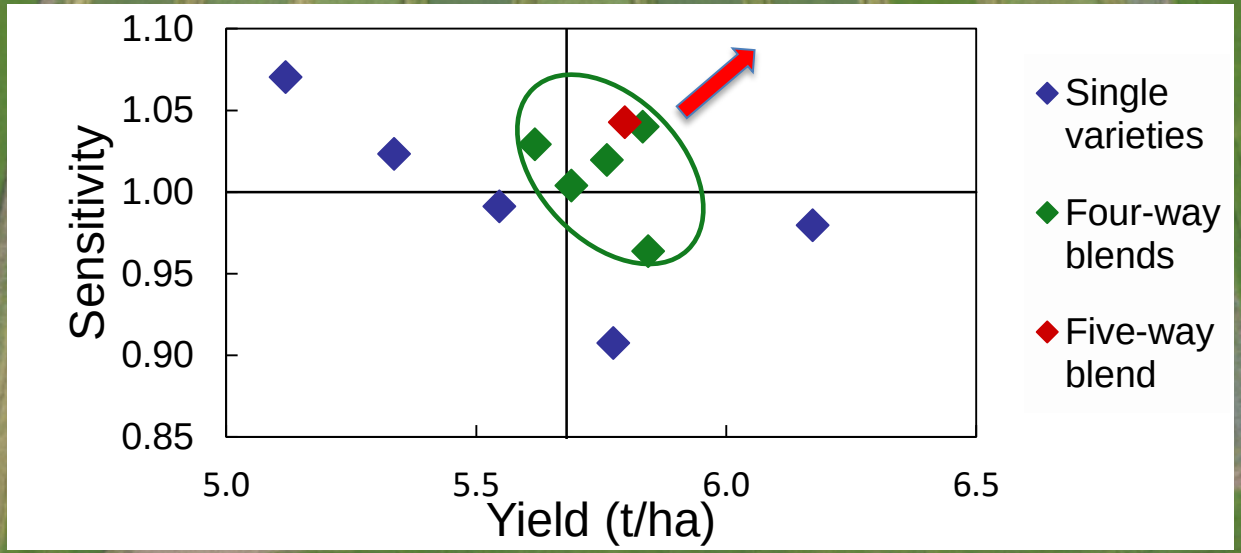
Increased diversity = less disease



Increased diversity = more yield

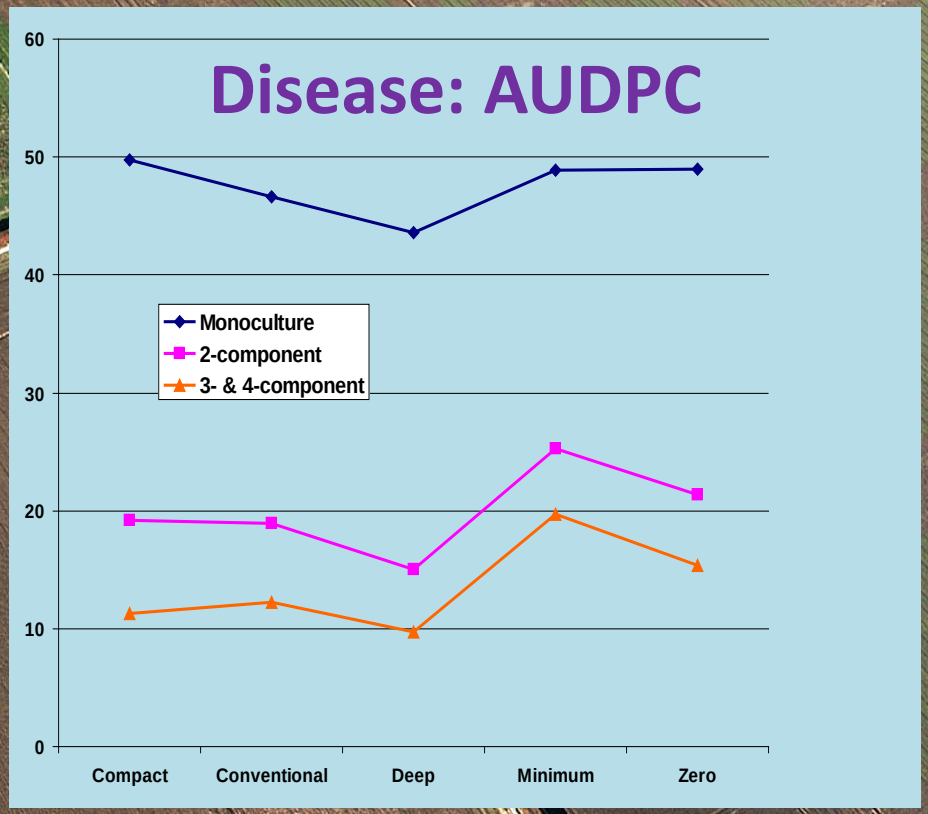


Increased diversity = greater yield sensitivity (responds more to fertility)

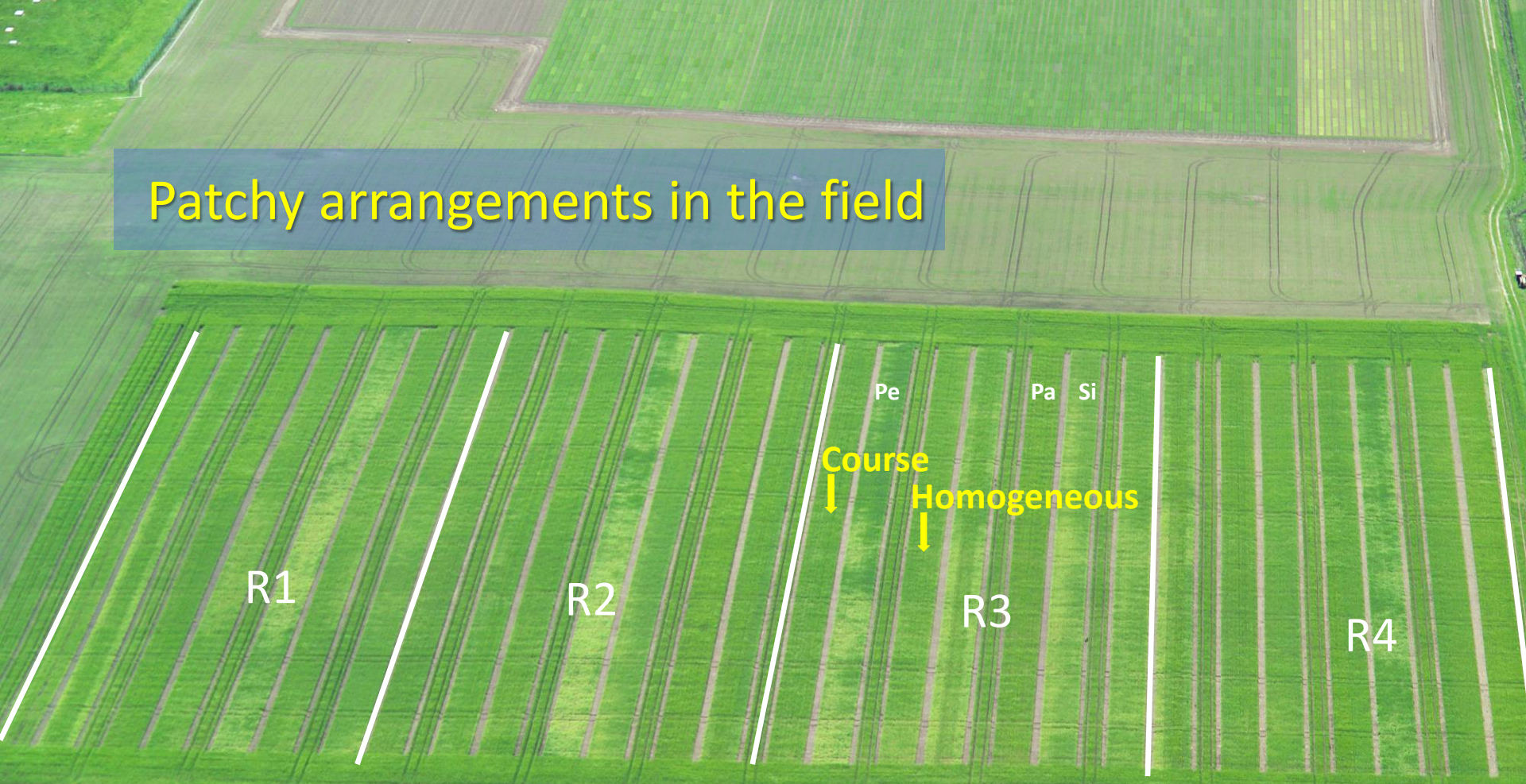


Suitable for all tillage systems

- Zero
- Minimum tillage
- Conventional
- Compaction
- Deep plough

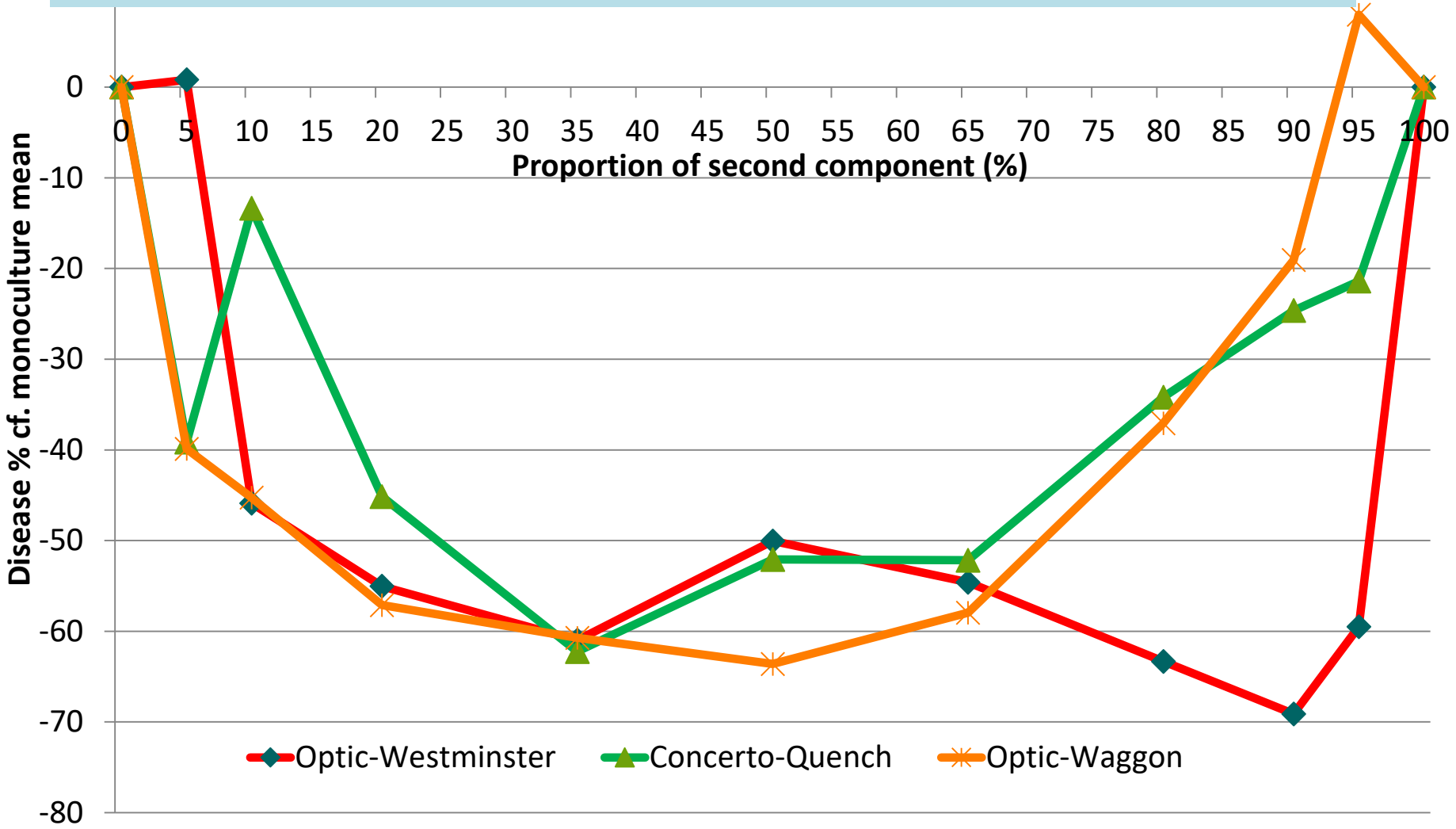


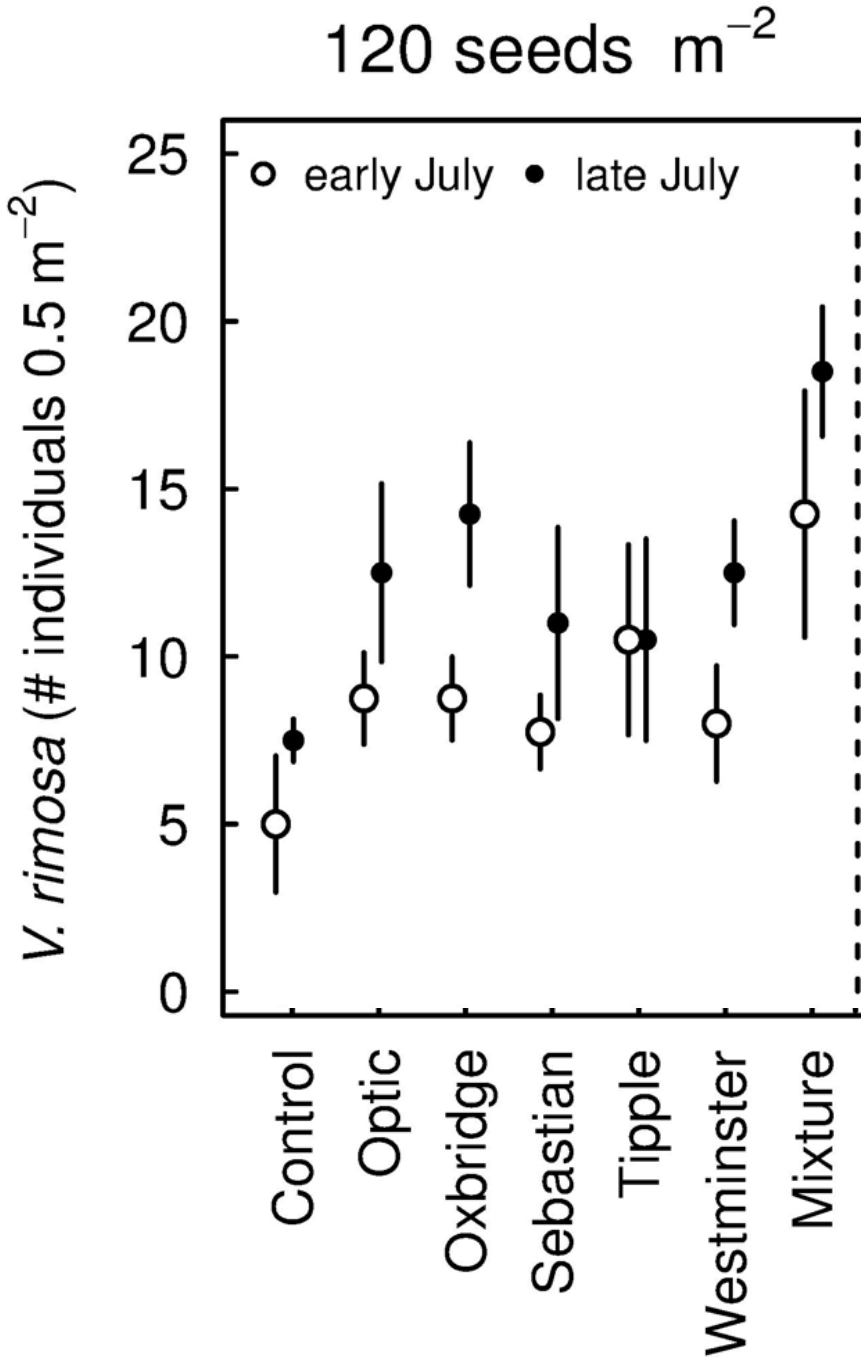
Patchy arrangements in the field



Yield		**Coarse mix**	**Homogeneous mix**
Mixtures advantage:	**2005**	**+13% *****	**ns**
	2006	**+17% *****	**ns**
Disease			
Mixtures advantage:	**2005**	**-34% *****	**ns**
	2007	**-58% *****	**ns**

Small proportions of a resistant variety have disproportionately large effect on disease reduction (barley data)





Impact of cultivars and mixtures on a rare weed species

Average number of *Valerianella rimosa* individuals for the different combinations of barley variety cultivar (including unsown controls and mixtures as cultivars) at 120 seed m^{-2}.

Conclusions

- Variety mixtures are an important agronomic method that can contribute to Integrated Pest Management
- Mixtures contribute to stability and increased resource use efficiency
- Mixtures to 76% disease reduction and 17% increase in yield (winter barley data)
- The greater the number of components the more disease is reduced
- The spatial arrangement, patch size and distribution can affect their efficacy
- Resistance components can contribute disproportionately, a 10% proportion of a resistant component accounting for up to 50% disease reduction
- Mixtures can help maintain functional diversity amongst weeds