

Cereal disease control - How can we manage today's threats for future control?

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An ever-present problem in Irish cereals



With exception of rusts, fungicide resistance present to at least one MOA in all major fungal pathogens of Irish cereals

Outline

1. What is the threat?

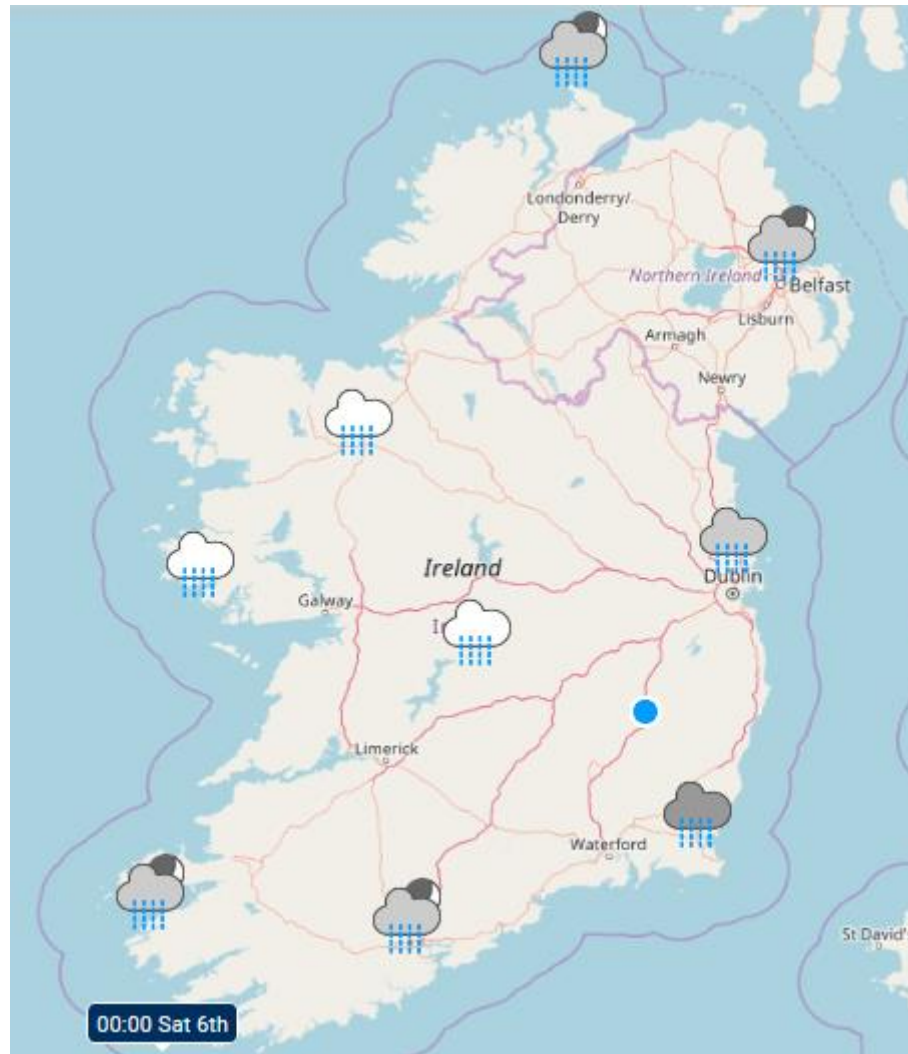
- Evolving diseases (resistance)
- Loss of actives (CTL)
- Changing climate (unpredictability)

2. What are the solutions?

- New fungicides
- Better varieties
- Changing systems (increase diversity)

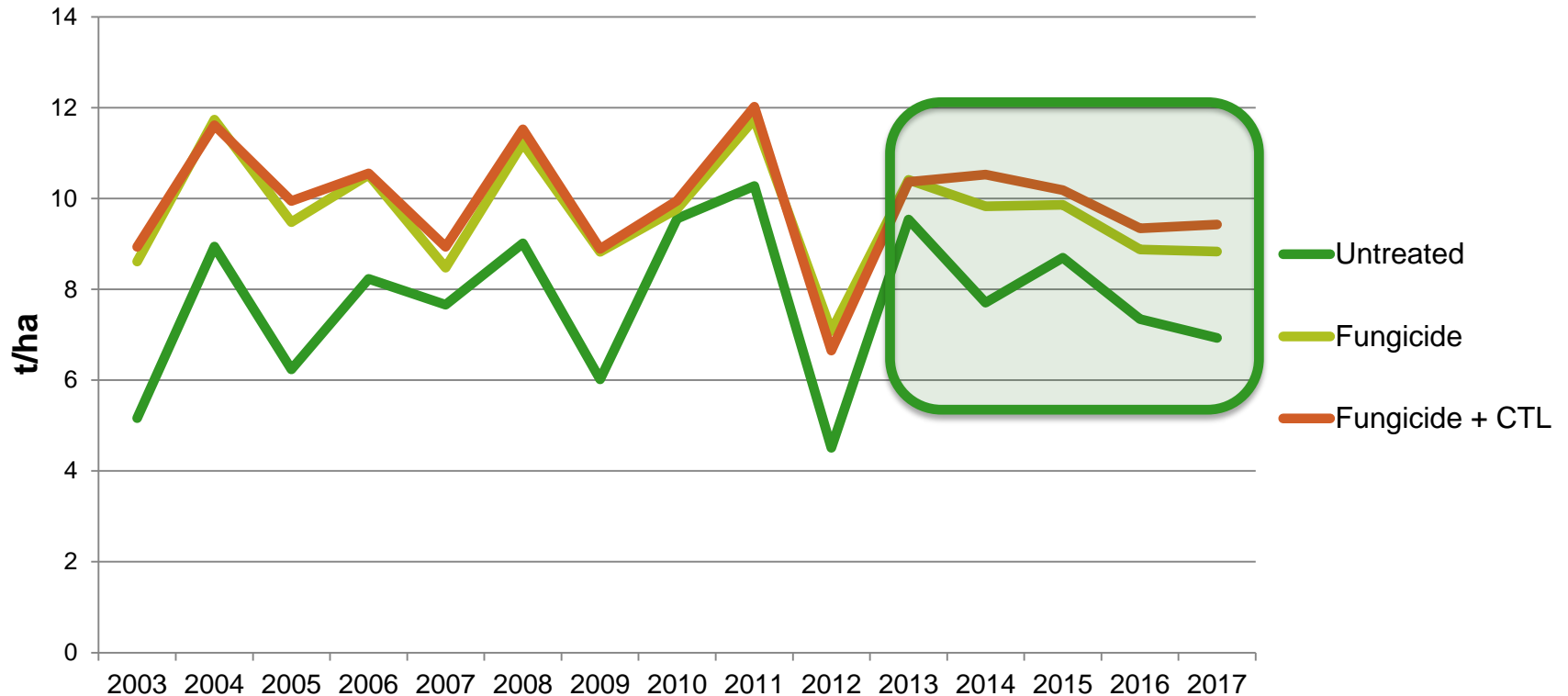
3. How to protect the solutions?

Why are foliar diseases a problem in Ireland?



A recent reliance on CTL

Yield responses (winter wheat) from fungicides 2003-2017



Teagasc Wheat Fungicide Trials 2003-2017

- 73 Trials
- 154 Direct comparisons
- Significant Year x CTL interaction ($P < 0.001$)

Septoria & Ramularia



Future post CTL?



Septoria tritici blotch

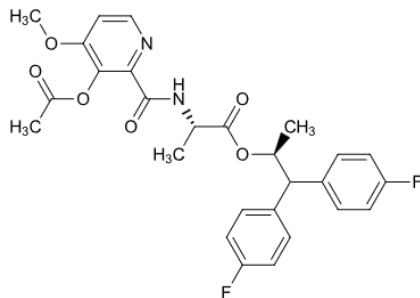
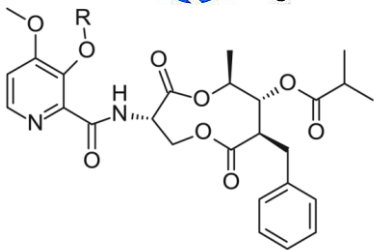
- Varietal Resistance
- Agronomic practises
- New fungicides
- Alternative multi-sites
- Quality of grain not important - feed



Ramularia leaf spot

- ~~Varietal Resistance~~
- ~~Agronomic practises~~
- New fungicides
- ~~Alternative multi-sites~~
- Quality of grain extremely important - malt

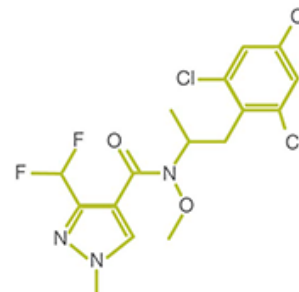
Managing future actives?



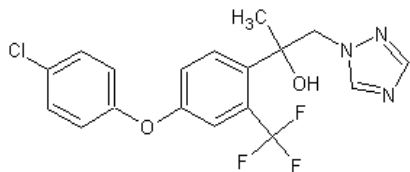
Fenpicoxamid: R = CH₂OC(O)CH(CH₃)₂
UK-2A: R = H

Inatreq™ (2020)

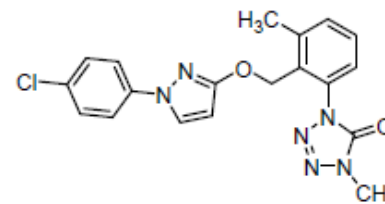
Adavelt™ (2024?)



Adepidyn™ (2022?)

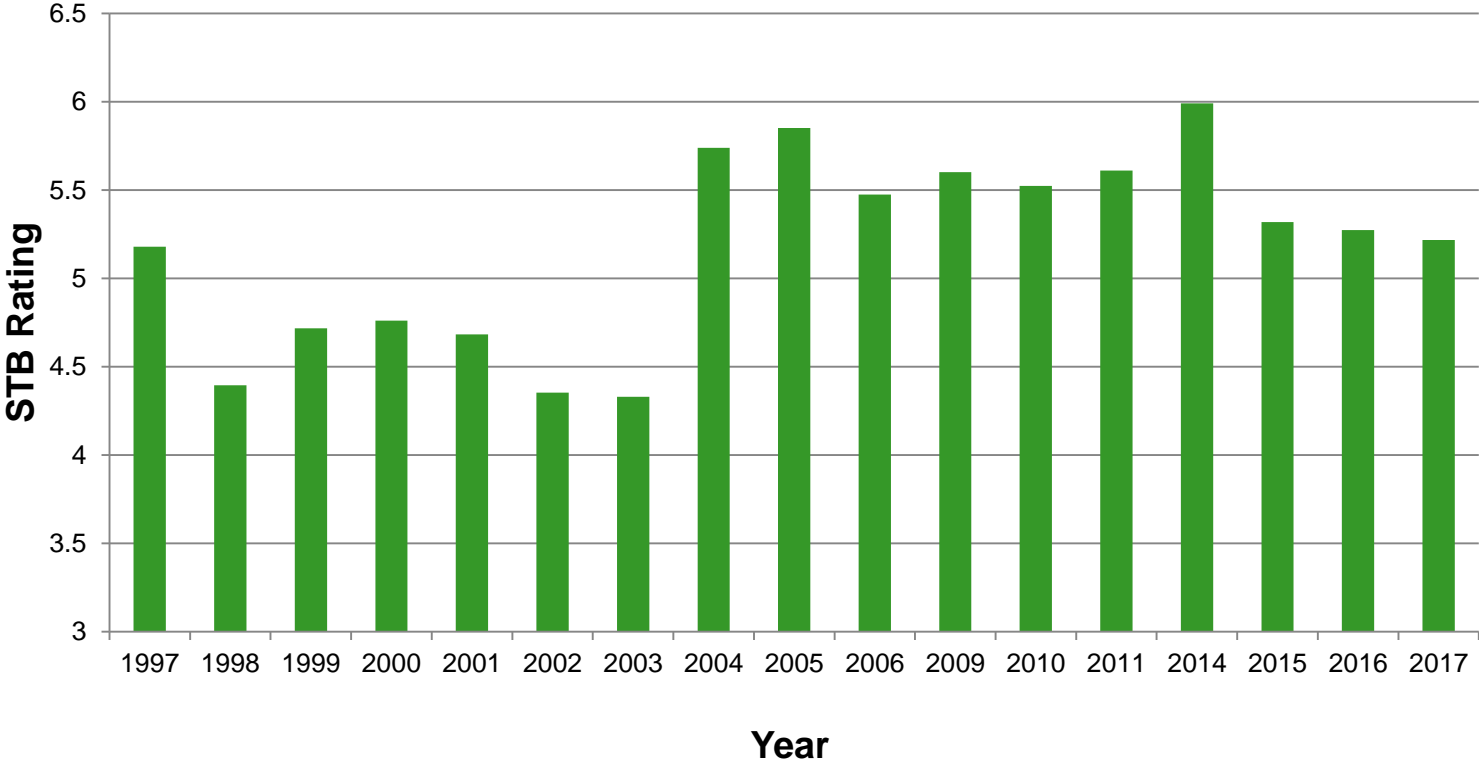


Revysol® (2020)



Pavecto® (2022)

Varietal Resistance not up to the task



Resistance to fungicides & varieties will emerge



Usage = Resistance

Fungicides/varieties have a limited life span

Almost inevitable resistance will emerge

Need to minimise exposure as much as possible

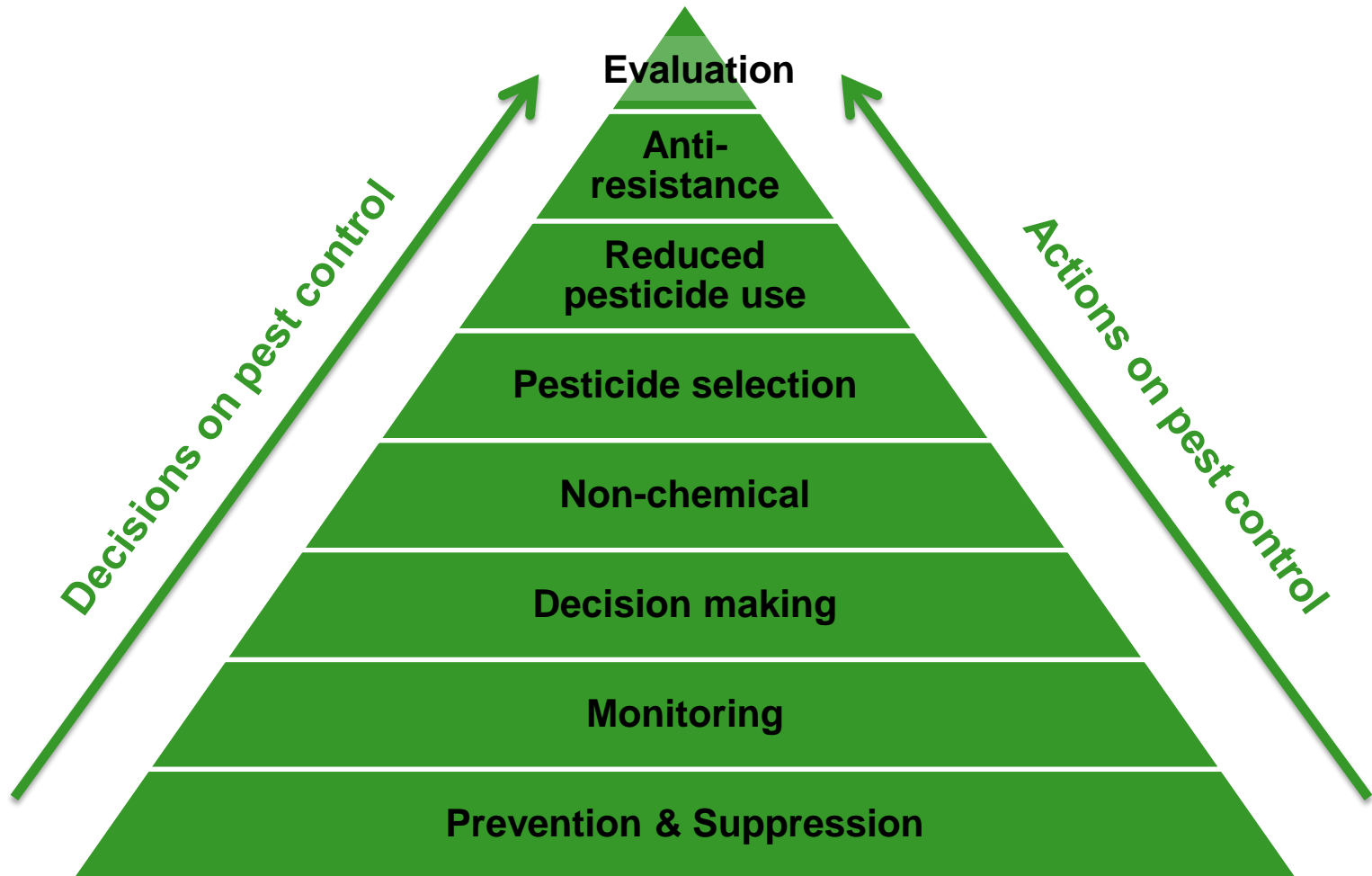
Resistance management is your responsibility

Integrated Pest Management

“Integrated pest management (IPM) means **careful consideration of all available plant protection methods and sub-sequent integration of appropriate measures** that discourage the development of populations of harmful organisms (including weeds, diseases, insect and other animal pests), and keep the use of plant protection products and other forms of **intervention to levels that are economically and ecologically justified, and reduce or minimise risks to human health and the environment.** IPM emphasises the growth of a healthy crop with the least possible disruption to agroecosystems and encourages natural (non-chemical) pest control mechanisms”

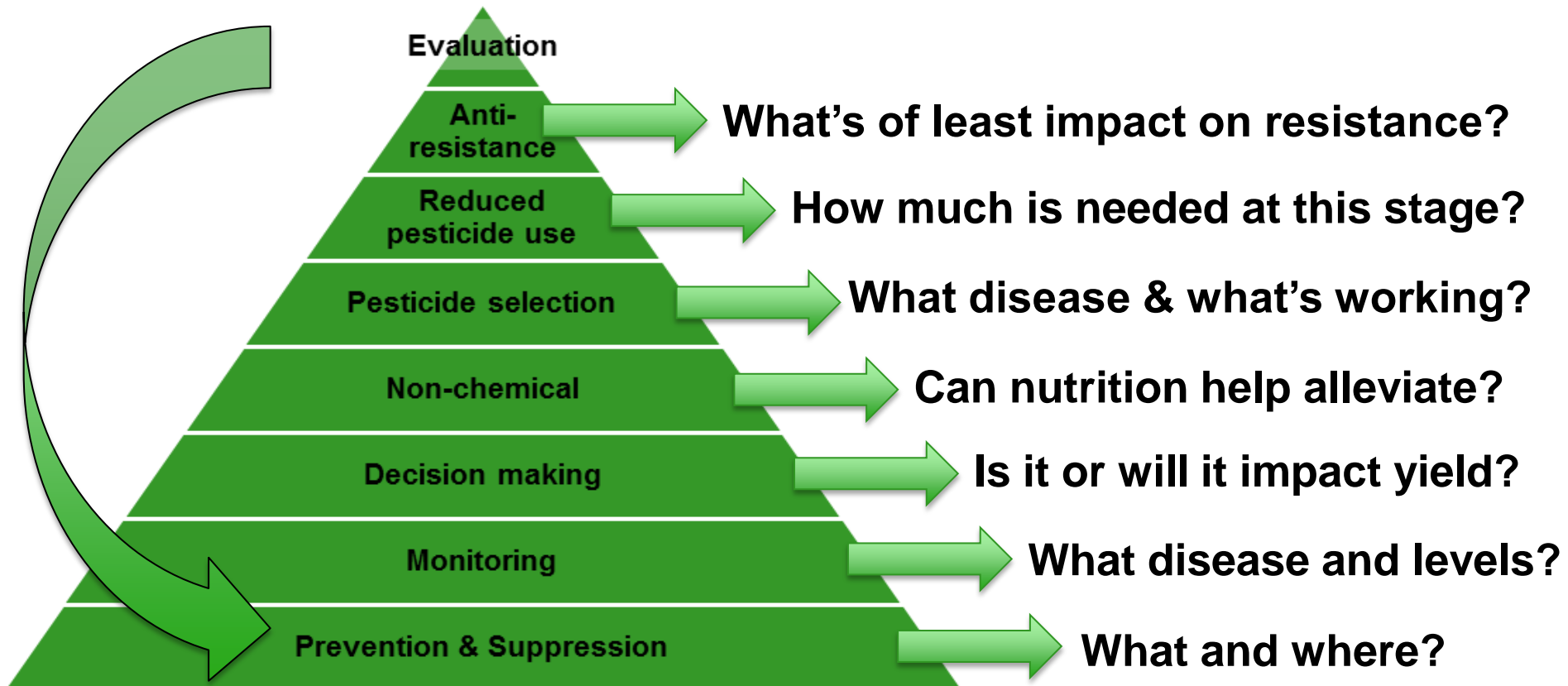
(The Sustainable Use Directive 2009/128/ EC).

IPM

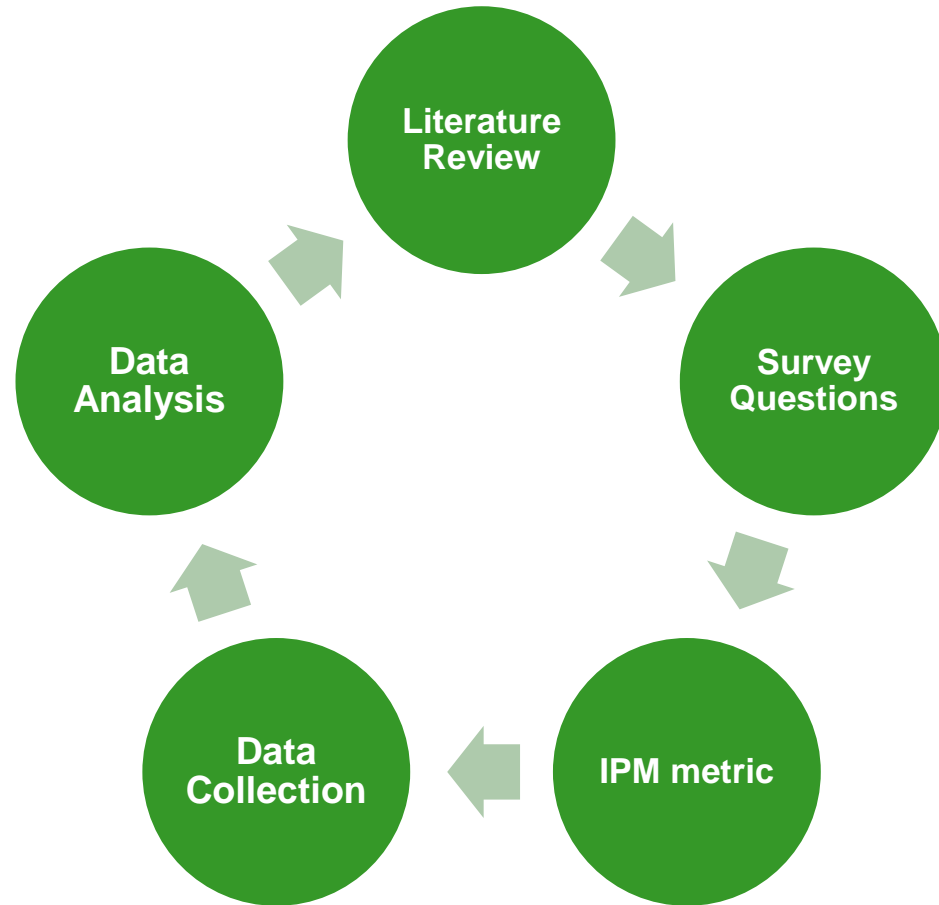


Managing Cereal Diseases

Must adopt concept of IPM



Accurately capturing IPM on arable farms



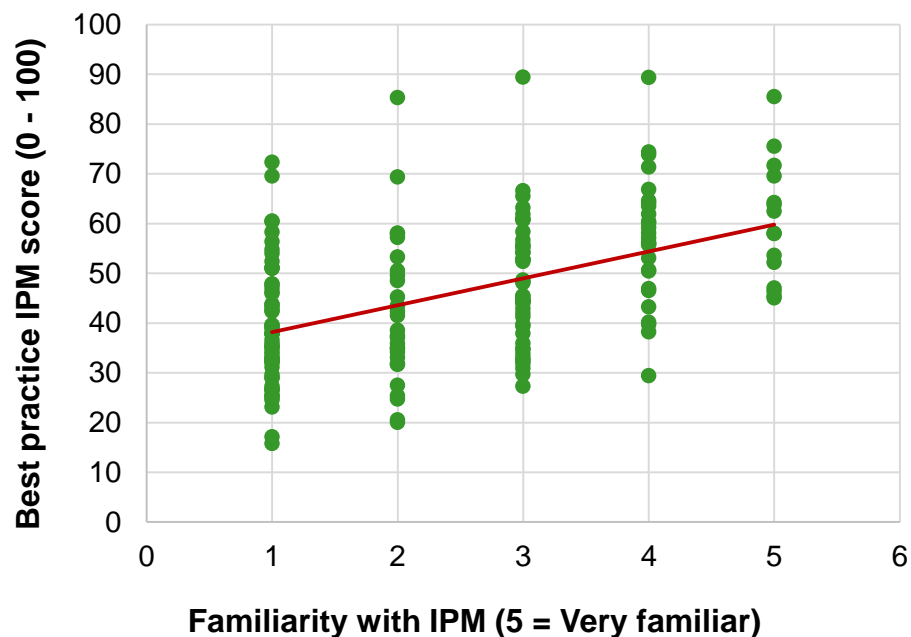
Consensus amongst stakeholders?

Question	Differences
Q: Proportion of land in continuous cereals?	No Differences
Q: Why you use an arable rotation?	No Differences
Q: What influences variety choice?	Farmers/Agronomists rate higher
Q: Preventive measures are used to control pests?	No Differences
Q: Factors considered in pest management plan?	No Differences
Q: Membership of discussion group?	Farmers/Agronomists rate higher

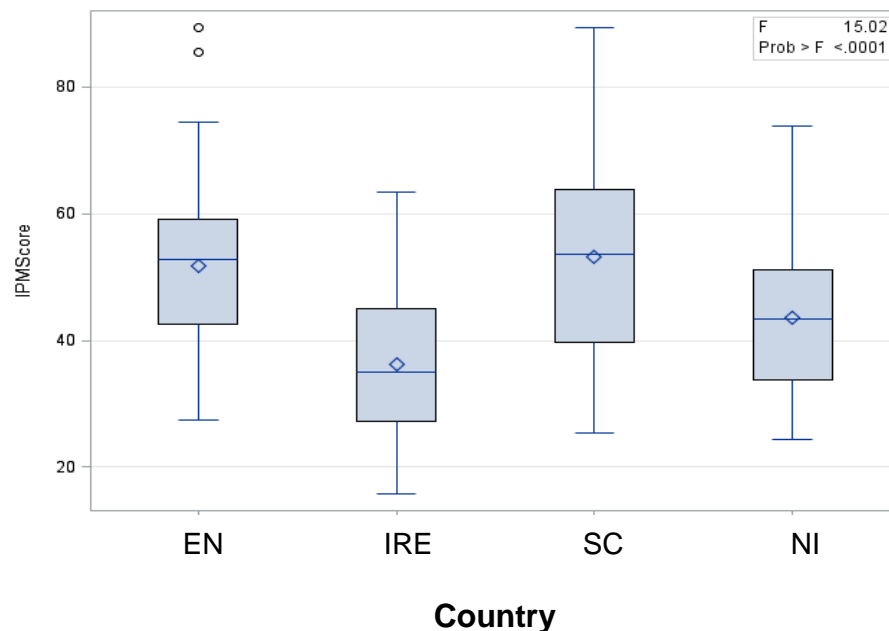
Both questions contribute lowest amount to final score

Applying it to Irish & U.K. farms

Positive relationship between practise and familiarity of IPM



Differences do exist between different countries

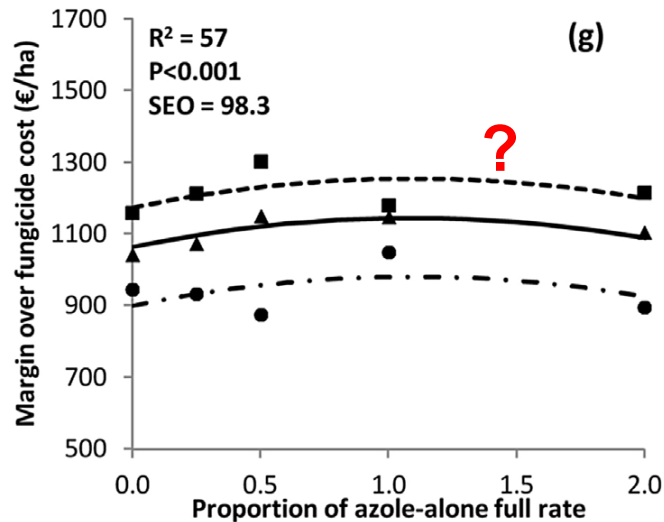
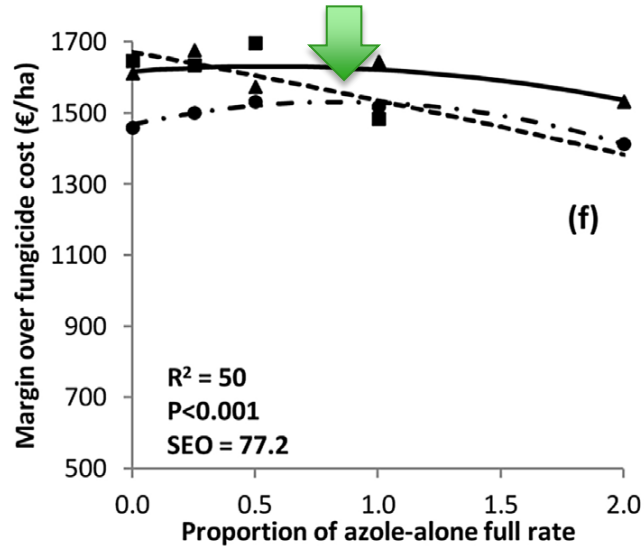
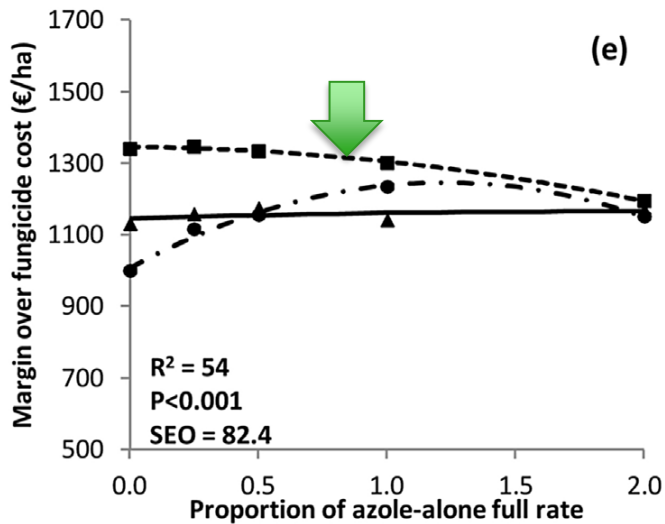


Spearman Correlation Coefficient = 0.49521,
P<0.0001

Conclusions & Questions

- Combination of 6 questions and metric allows a simple means of measuring IPM on arable farms
- Combining with questions on perception & farm enterprise information will aid identification of potential means to improve IPM
- Can we determine what an acceptable level of IPM is?
- Does IPM relate to profitability of the enterprise?
- Can we identify why differences in IPM levels may occur?

Prevention & Suppression



Varieties with high septoria resistance don't require same fungicide protection

Monitor & Decision making



Understanding the crop

1. How is yield created?
2. How can this yield be protected?
3. When should interventions be made?

<https://m.youtube.com/watch?v=C1NTqQJ-HS8%26t%3D64s>

; <https://www.youtube.com/watch?v=xUqKEVtXTts&t=5s>

Simple tools



Spray painting leaves at application

Getting fungicide timing right (IPM)

Treatment combinations

Trt	Leaf 4	Leaf 3	Leaf 2	Leaf 1	Ear
1	+	+	+	+	+
2	+	+	+	-	+
3	+	+	-	+	+
4	+	+	-	-	+
5	+	-	+	+	+
6	+	-	+	-	+
7	+	-	-	+	+
8	+	-	-	-	+
9	-	+	+	+	+
10	-	+	+	-	+
11	-	+	-	+	+
12	-	+	-	-	+
13	-	-	+	+	+
14	-	-	+	-	+
15	-	-	-	+	+
16	-	-	-	-	+
17	-	-	-	-	-

Objective

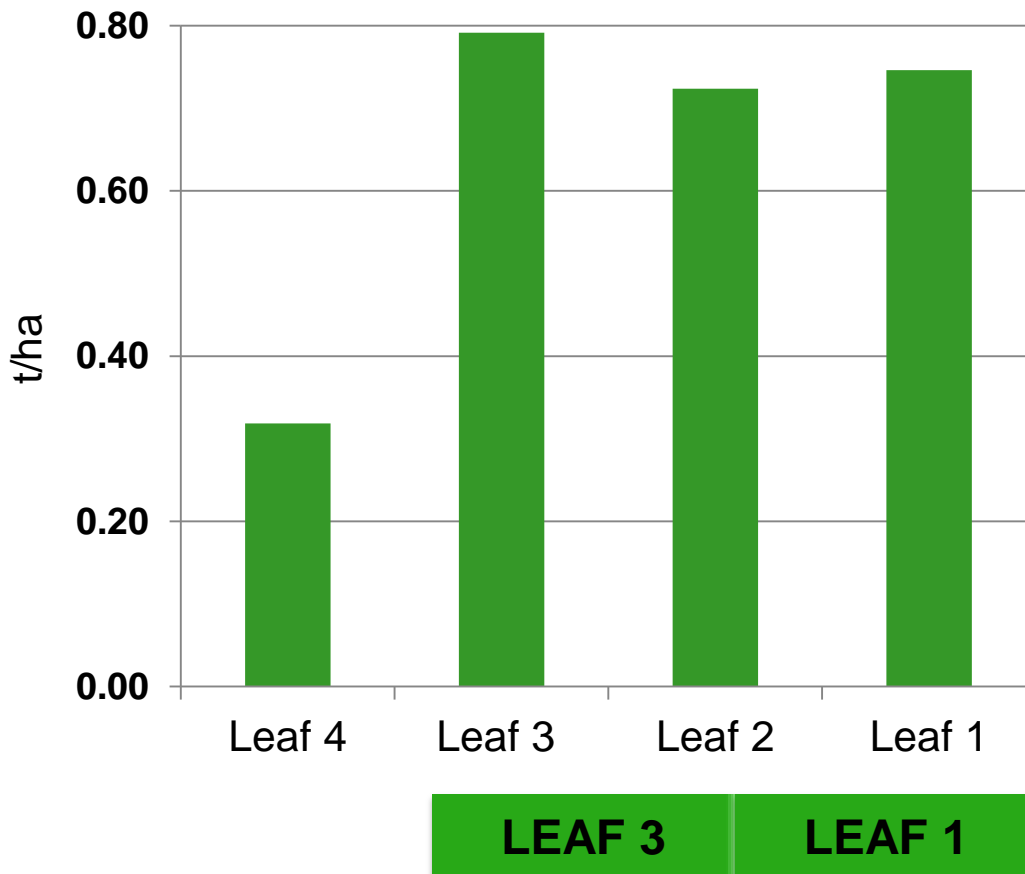
- What leaf layers important for yield?
- How best to achieve disease control on these leaves?

Methods

- 6 site seasons in 2016 & 2017
- Combinations of leaf applications
- 2016: CTL 1.0 l/ha
- 2017: Elatus Era 0.8 & CTL1.0 l/ha

Optimising application timing

Yield response of each leaf layer



- Contribution of L1, 2 & 3 similar when in “programme”
- L4 showed lowest contribution
- Variation between sites due to infection events

Normal Programme

Conclusions

- Loss of CTL has potential to cause havoc
 - Disease control issues
 - Increased development of resistance
- New actives (fungicides) are on the horizon
 - Resistance management will be essential
 - Reduced tools to achieve this??
- **Must increase attention and adoption of IPM practices across all arable systems - collective approach needed!**

Acknowledgements



Teagasc Crops Research

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Pesticides Registration and Control Division

