



Australia's National Science Agency

Valuing plant and soil testing information for agronomic decisions

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Review

Big Data in Smart Farming – A review

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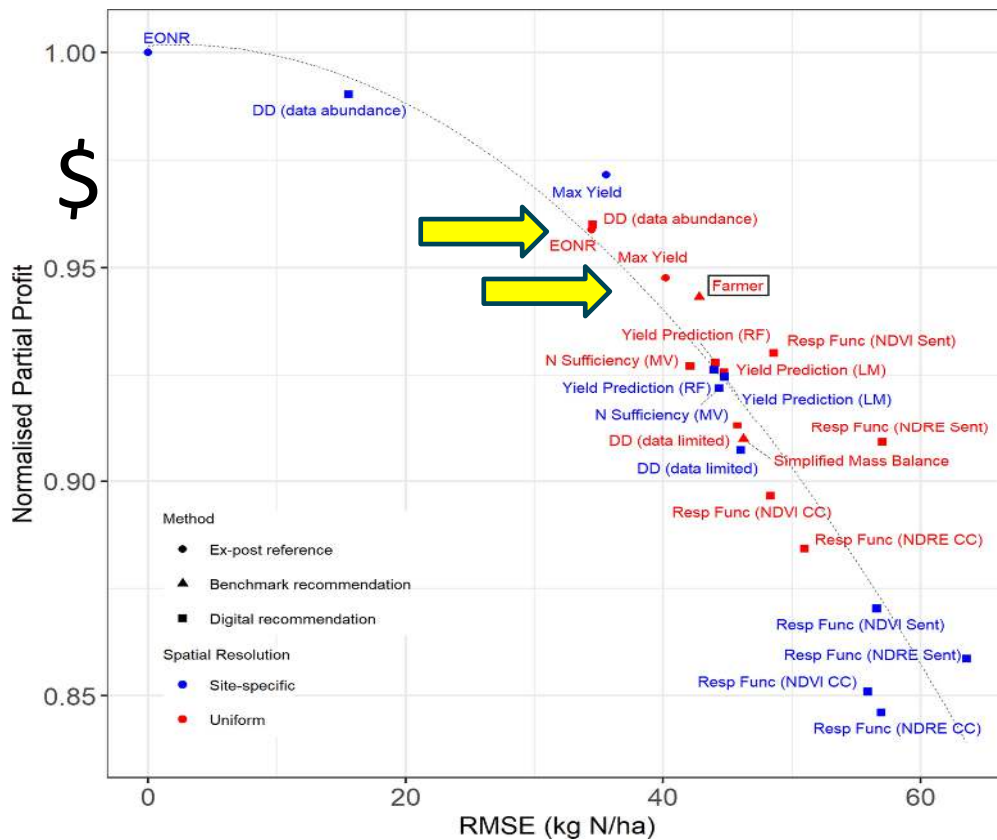
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Data-driven N recommendations Vs grower practice

Digital strategies for nitrogen management in grain production systems: lessons from multi-method assessment using on-farm experimentation

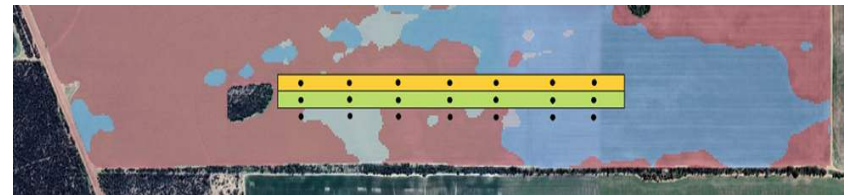
A. F. Colaço¹ · B. M. Whelan² · R. G. V. Bramley¹ · J. Richetti³ · M. Fajardo² · A. C. McCarthy⁴ · E. M. Perry⁵ · A. Bender² · S. Leo⁶ · G. J. Fitzgerald⁵ · R. A. Lawes²



The profit difference between the farmer application rates and the economical paddock optimum was 2%

A 'hypothetical best-case' spatial empirical data-driven (data abundant) method led to a 5% gain

Needing: NDVI and ratios from in-field N 'rich', 'zero' and 'field' areas and N rate and; the current field and season factors for the particular treatment areas are used to train the model



What can we learn from current use of field-specific data and grower assumptions

- Soil nutrient testing
- Herbicide resistant weed testing

The potential for new soil and plant testing data to reduce uncertainty and inform management decisions

The value of testing information

Factors:

- **The degree to which the new information can reduce uncertainty**
 - Prior level of information held e.g. how much is already known
 - Accuracy or confidence in the new information
- **‘Competing’ sources** of information – availability and quality
 - E.g. local field observation or past observation/data
- **Cost** of acquiring the data
 - Including inconvenience, opportunity cost, sampling and testing
- **Actionability** and timing

The case of soil testing: why not more?

- 61% of growers did some testing
- Most tested <10% of farm area in a year and < 5 samples per tested paddock
- Testing frequency for a paddock was approx. every 5 years

Reasons:

Cost 72%

- *Cost of sampling 24 %*
- *Time required for sampling 30 %*
- *Lab costs 18%*

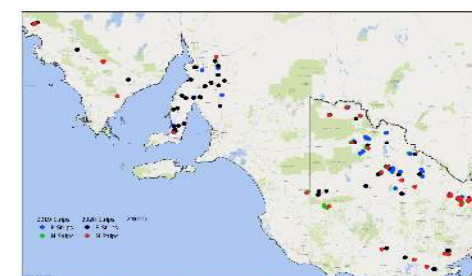
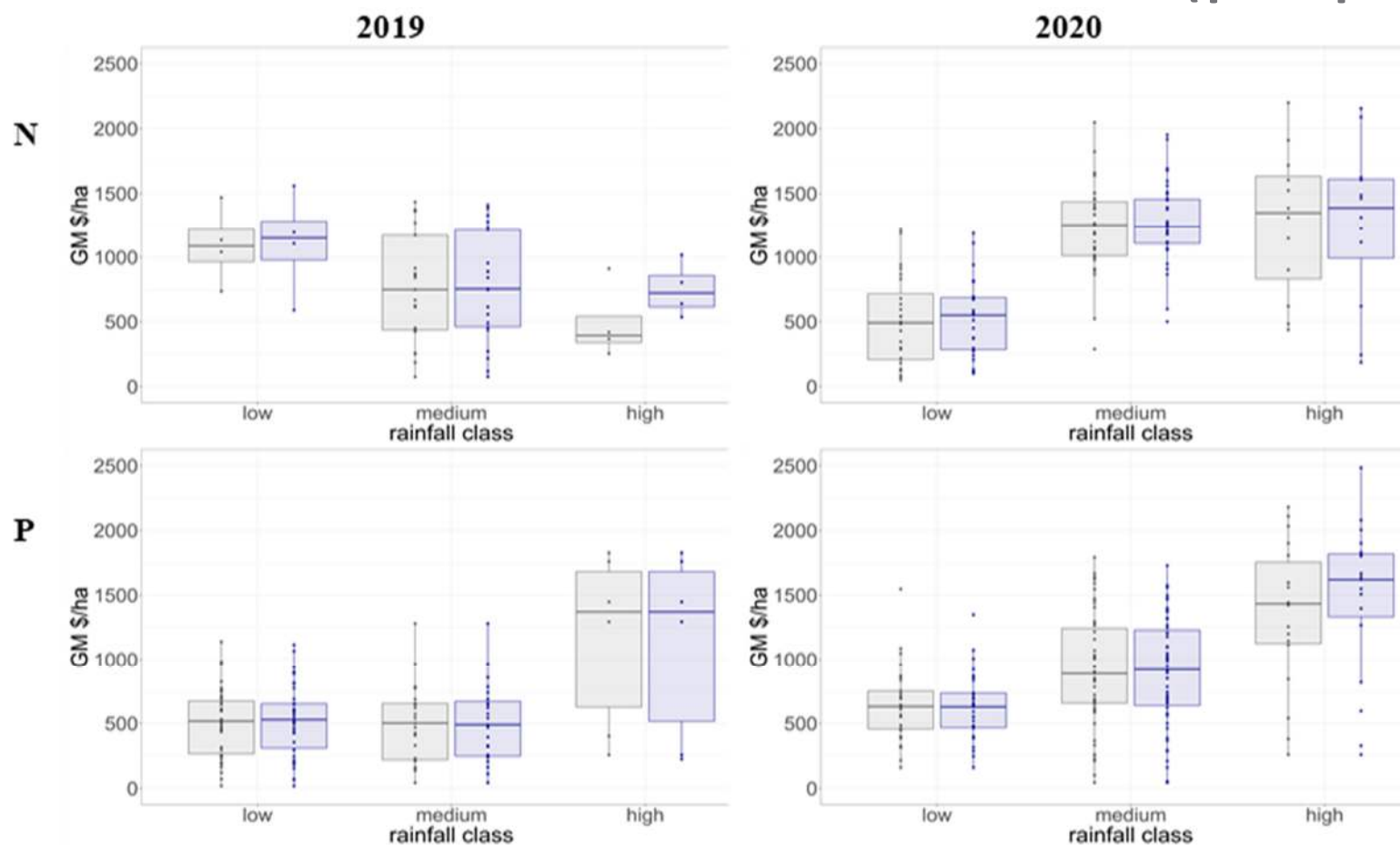
Ability to translate into decision 13%

Ability to represent variability 6%

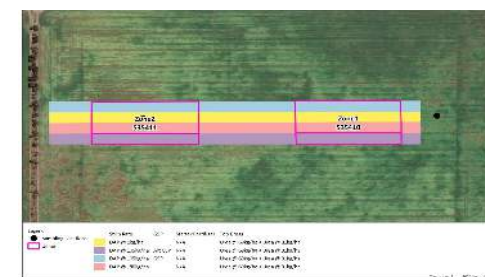
Getting results in time 6%

Lab accuracy 3 %

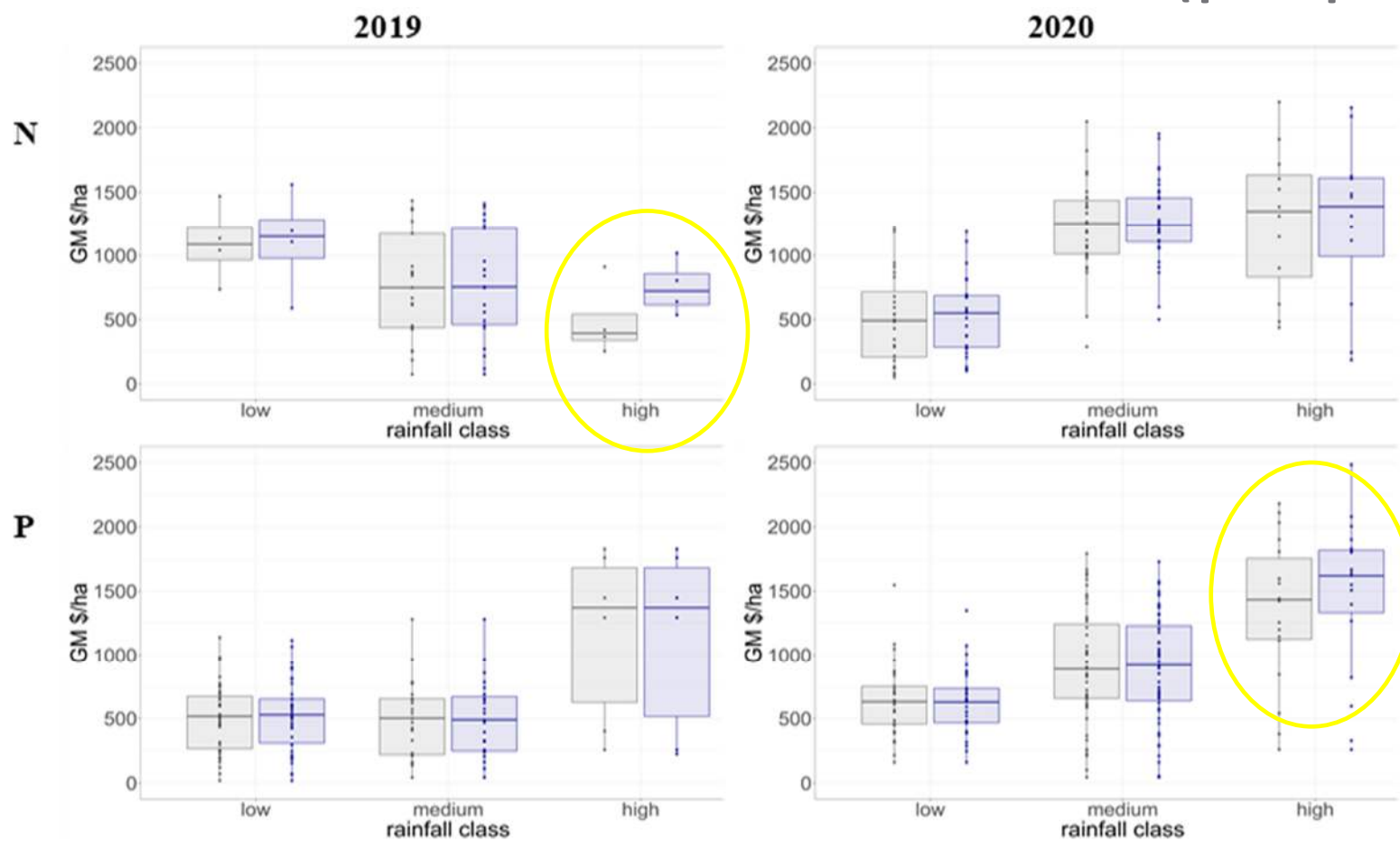
Gross margin results for grower practice (grey) and test-based recommended rates (purple)



37 growers in 2019; 63 in 2020)
Low, Medium and High rainfall zones



Gross margin results for grower practice (grey) and test-based recommended rates (purple)



Potential for information to modify initial fertiliser rate decisions – actionability & timing?

In **February** we asked growers for their initial planned N & P rates for specific paddocks.

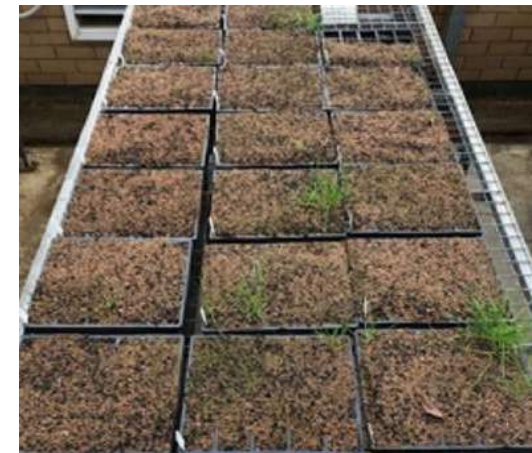
We also asked for the very highest and very lowest rates they might possibly end up applying around seeding time – even with additional information:

Result:

Initial planned P rate +/- 5kg P
Initial planned N rate +/- 11kg N

Herbicide resistance testing

- In 2020 agronomists collected weed seed samples from mature crops
- 128 paddocks belonging to 51 growers across the WA wheatbelt
- A total of 25 growers reported on their 'prior' perceived herbicide resistance status
 - 12 herbicides for 97 paddocks across each weed seed sample they had tested

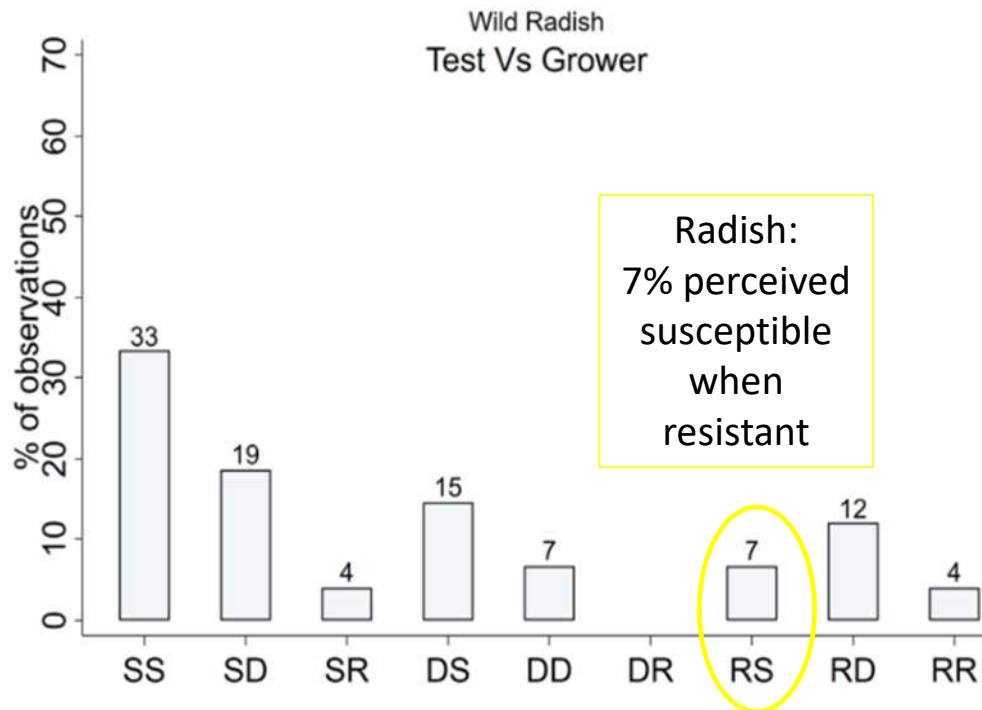


The use of herbicide resistance testing

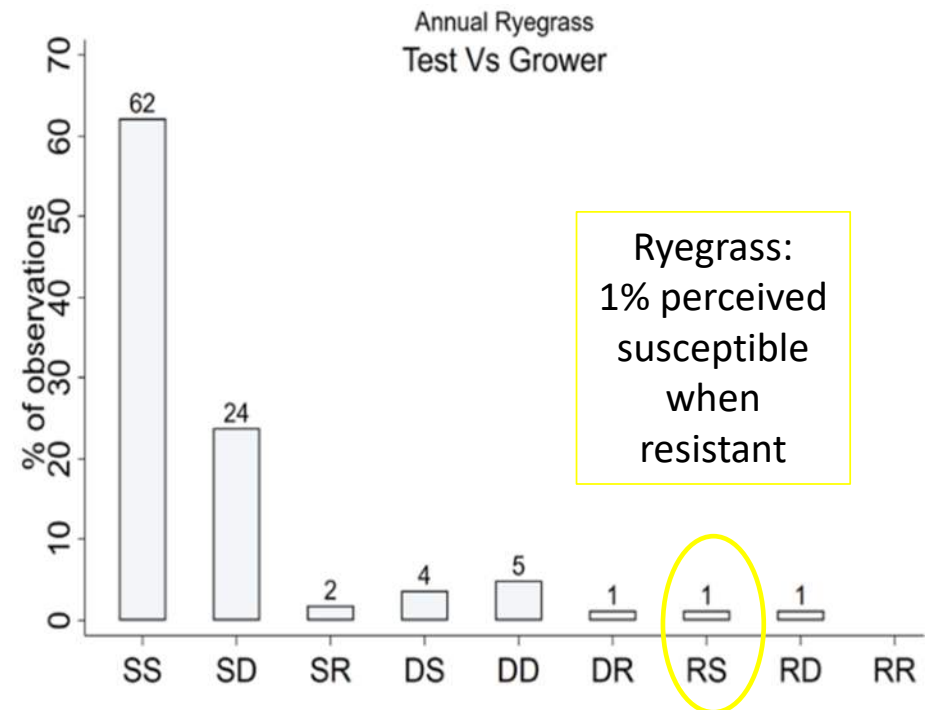
- 60% growers had done some herbicide resistance testing before
- <8 paddocks per testing grower tested in past 10 yrs
- 88% growers relied on visual observation for determining resistance status
- 68% of growers said previous test results had **no or minor influence** on weed decisions
- **Only 13% of growers initiated their herbicide resistance testing (47% advisers)**



Grower assumptions Vs test results

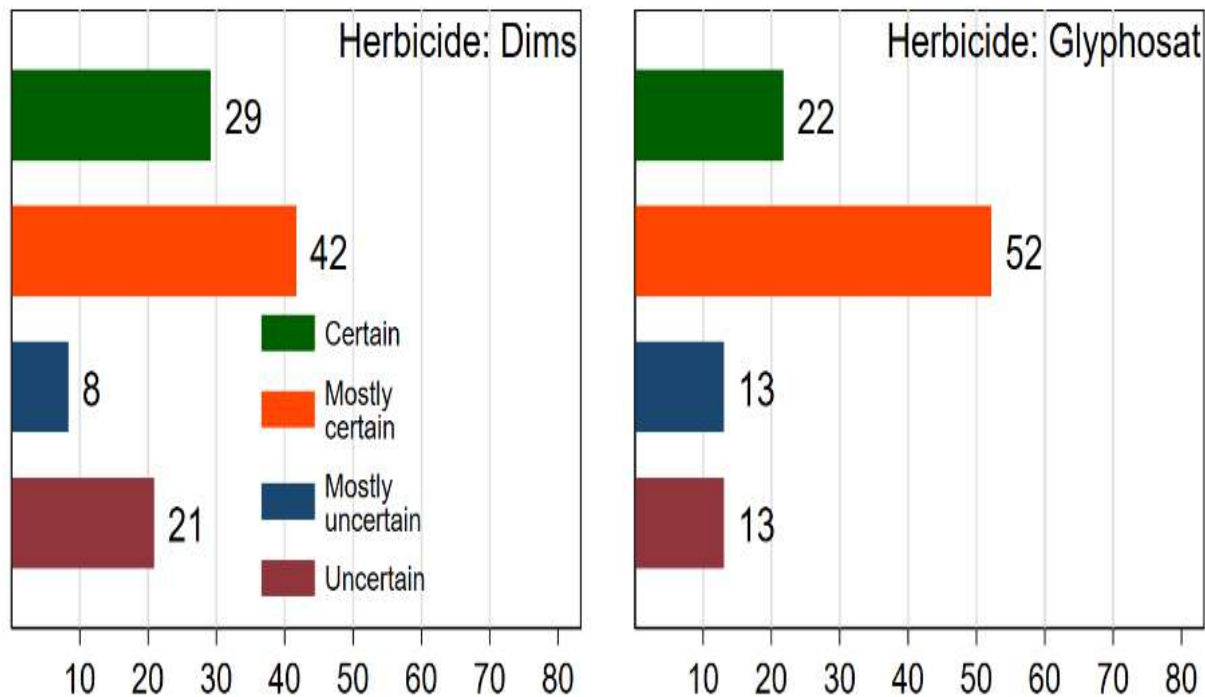


44% of wild radish tests aligned with prior grower expectations



67% of ryegrass tests aligned with prior grower expectations

Grower 'certainty' around assumed resistance status



>70% were certain of ryegrass resistance status for key herbicides

“Decision makers can satisfice either by finding optimum solutions for a simplified world,

....or by finding satisfactory solutions for a more realistic world”

Herbert Simon



Finally

- It is not easy to 'beat' current farmer practice
- Often sound prior assumptions and/or ready observations
- But forms of uncertainty existed and some misperceptions
- Sampling and logistical costs are high and a major barrier for resistance testing
- Testing data used as an infrequent check on 'fast' assumptions and decision approaches
- A long way from data-driven
- Informational demands Vs **satisficing innovations supporting simpler decisions**



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THANK YOU

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RiskWi\$e

– the National Risk Management Initiative

