

Online Farm Trials Review and New Understandings

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13th Annual Ag Excellence Forum & Awards, April 6, 2018

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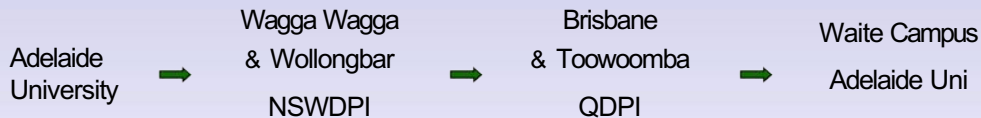
GRDC
GRANULE RESEARCH
& DEVELOPMENT
CORPORATION

Outline ...

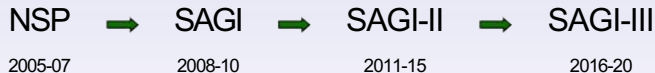
- a bit of background ...
- the **Online Farm Trials** system <https://www.farmtrials.com.au/> ...
 - what is it? ...
 - why a review? ...
 - why me? ...
- new understandings ...
- challenges but opportunities ...
- summary ...

A bit of background ...

- Biometrician working for Grains Industry ... *mostly* ... since 1998
- pathway



- at Waite from 2006



A bit of background ...

- mostly worked with ...
 - plant breeders ... sorghum (QDPI), faba beans (UA), Vetch (SARDI) ...
 - researchers ... LMA (UA), nematodes (SARDI)
 - ASReml-R software development team

- also done some fun things ...
 - *from the ground up* biometrics education materials ...
 - set of workshops with Ag Ex, 2014

The Ag Ex experience ...

- the Ag Ex experience a good one ✓
- focus on *design/analysis/interpretation* of small plot field trials
- presentation tailored to data examples provided by the participants
- some statistically robust
- others weren't so robust
- issues ranging from ...
 - research question / aim too complex ... *how to explain a 4-way interaction?*
 - pseudo replication of treatments ... *no true replication*
 - no re-randomisation of trts between reps ... *less information on treatment comparisons of interest*
 - seriously compromised extension claims ... *can't make statistical inference on demo trials*
 - trial too small to make valid inference ... *common issue*

The Ag Ex experience ...

... *so how did we fare in terms of participant feedback ...*

Objective **R**eflective **I**nterpretive **D**ecisional evaluation

- *in the nicest possible way* we apparently made people feel ...
 - daunted

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 - overwhelmed

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- *in the nicest possible way* we apparently made people feel ...
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 - challenged
 - overwhelmed
 - a range of emotions

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Objective Reflective Interpretive Decisional evaluation

- *in the nicest possible way* we apparently made people feel ...
 - daunted
 - challenged
 - overwhelmed
 - a range of emotions
 - ... *'reminded me of going to the headmasters office when I was in school'*
- has lead to practice change for some Grower Groups (GG) ... ✓
- *on the spot* practice change ... ✓
- positive about opportunities ... ✓

The Ag Ex experience ...

... *so why and I telling you all this stuff...*



- wasn't taken up at that time as such
- did ...
 - get us an invite to an **RCSN** port zone meeting in WA ... *good insight to the decision making process*
 - provide the framework for the SAGI-III Southern Node tender
 - position me well to cover the 1-3 space in that project
 - make me a logical candidate to review the Online Farm Trial (**OFT**) project
 - great opportunity to gain corporate knowledge

The Online Farm Trials (OFT) system...

- what is it?
- why a review of it?

The Online Farm Trials (OFT) system...

- what is it?
- why a review of it?
 - every GRDC project can expect to undergo a review
 - often get people from overseas to do reviews
 - good timing for me to do the review

... *one of the best opportunities I've had professionally* ...

What is the Online Farm Trials (OFT) system ...

- developed by Centre of eResearch and Digital Innovation (**CeRDI**) team at Federation Uni
- initiative of the GRDC to ...
 - ... *help improve the productivity and sustainability of farming enterprises by improving access to trial research information* Murphy (2016)
- system offers web-tools to ...
 - upload trial results ... *trial means, LSDs, no raw data*
 - search/filter information for trials conducted on-farm in Australia
- **Phase 1:** 2013 - 2016
 - pilot project with three Farming Systems Groups (FSG)/GG
 - general upload stage ... *8 GG in each region given \$ incentives ...*
 - 4500+ trial projects by 57 collaborators uploaded to the system by July 2017
- **Phase 2:** May 2017 for 12 months
 - engage additional trial research providers in using the system

Review of the Online Farm Trials (OFT) system ...

- as a part of the review spoken to lots of people ...
 - members of FSG/GG
 - GG support organisations ... *Ag Ex, GGA, ...*
 - private consultants
 - researchers
 - other industry experts
 - CeRDI team
- feedback
 - generally positive re: concept ...
 - there are issues with the search mechanisms currently ...
 - system going to need to present a *genuine value proposition* for uptake ... *need to iron out issues ...*
 - potential to expand the functionality to embrace other opportunities ...

New understandings ...

- the OFT review has given us new understandings for our profession ...
- we have come to understand better ...
 - the important role of GG and their networks ...
 - *technology meets adoption through the GG interface*
 - the mix of trials run on-farm in Australia currently ...
 - *who's running them, who's funding them, what types, how they all fit together*
 - how we might be able to partner with GG and their networks to enhance industry outcomes ...
 - *in an arrangement that compliments the framework in place in SAGI-III*
 - fundamental role of communication and extension ...

The important role of GG and their networks ...

- the OFT review has helped us to understand GG and their networks better ... *non-trivial*
- what we've learned ...
 - while there's diversity in the way groups operate ... *staffing & membership structures, decision making processes, way trial results communicated, ...*
 - their aim is the same ... *to develop sustainable and profitable farm practices through their strong links with RDC's, research providers, other industry stakeholders ...*
 - GG and their networks play a critical role in facilitating ...
 - grower engagement
 - the transfer of new technologies
 - feedback to researchers
 - achieve through a range of communication methods ... *w/shops, field days, trial results books*
 - but while the role of communication and extension is crucial it has not been given the respect it deserves to date ...

The mix of trials run on-farm ...

- three (main) types of trial are conducted on-farm in Australia currently ...
 1. research trials (**RT**) ...
 2. local validation/evaluation trials (**VT**) ...
 3. demonstration trials (**DT**) ...

The mix of trials run on-farm ...

- three (main) types of trial are conducted on-farm in Australia currently ...
 1. research trials (**RT**) ...
 2. local validation/evaluation trials (**VT**) ...
 3. demonstration trials (**DT**) ...
 4. monitoring/observational studies ...

The mix of trials run on-farm ...

1. research trials ...

- small (or large)-plot replicated field trials
- conducted on-farm by government funded research agencies ... *CSIRO/state based R&D providers/Unis*
- in partnership with GG and their networks
- as a part of bigger research projects *to fill knowledge gaps ...*

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2. local validation/evaluation trials ...

- also small-plot field trials
- conducted by
 - farming systems groups - eg. look at agronomic issues/practices
 - re-sellers - eg. for local validation of products
 - private consultants - eg. to look at issues that are relevant to their farmer base
- primarily about *validation and feedback to researchers*

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3. demonstration trials ...

- single-plot per treatment/product
- conducted by FSG/GG/re-sellers for demonstration to members/clients
- primarily about *grower engagement and extension*

The mix of trials run on-farm ...

- in thinking about the *purpose of the different types of trials*, we've found it helpful to delineate between ...

Research (**R**) trials = 1. research trials

2. local validation trials

Development & Extension (**D&E**) trials =

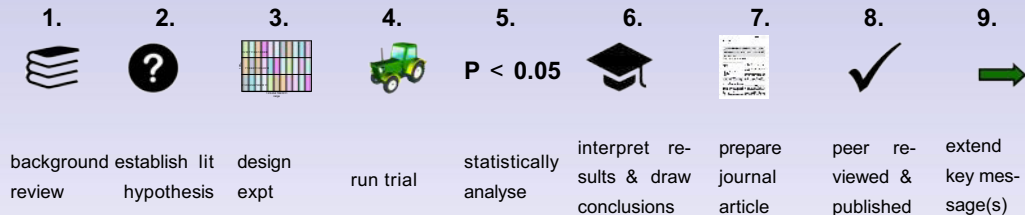
3. demonstration trials

- makes it clear that
 - purpose of 1. is **R** not **D&E**
 - purpose of 2. and 3. is **D&E** not **R**
- helps in understanding that the series of steps required to conduct trials of different trial types are different...

Research trials run on-farm ...

1. research (R) trials ...

- we consider the complete set of steps that need to be undertaken to conduct an R trial to span the 9 steps ...

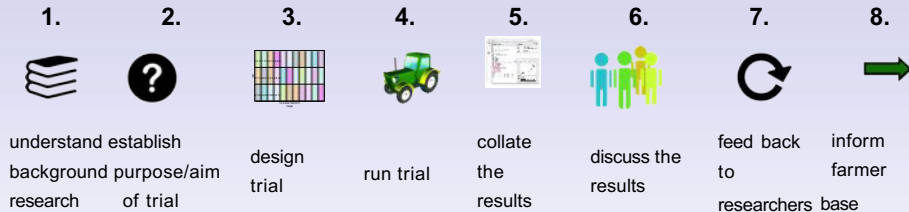


- in keeping with Black et al. (2015) ...
 - outline the key tasks that need to be undertaken in conducting comparative experiments - the **scientific method**
 - concerned at the potentially serious reduction in return on investment for not sticking to this method
- context is animal science but direct parallels to on-farm trialling
- we will call this the **research method**

D&E trials run on-farm...

2. local validation trials ...

- since local validation trials have a local knowledge and feedback focus ... *they're not research trials as such* ... we consider the complete set of (8) steps in this case to be ...

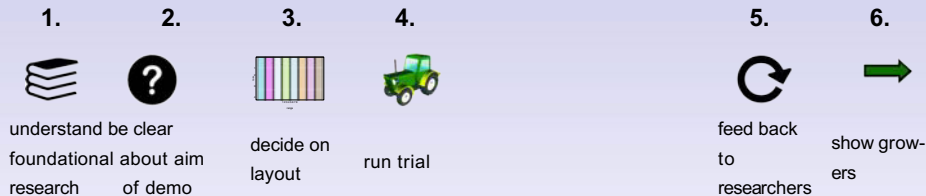


- could perhaps call this the **local validation method**

D&E trials run on-farm...

3. demonstration trials ...

- since demonstration trials have a *look and see* focus ... *they're definitely not research trials* ... We consider the complete set of (6) steps in this case to be ...



- could perhaps call this the **demonstration method**
- blank spaces indicate the **demonstration method** closely parallels/is a simplification of the **local validation method**

Some comments ...

- prior to this review we (as biometricians) haven't thought too much of *demonstration trials*
- good reasons
 - we're statisticians so we *quantify variation* so when we can't do that ... *get a bit titchy/skeptical* ...
 - lots of instances of abuse of DT in terms of people making inference when *there's no framework for inference* ...
- some groups are clearly across it ...

Seeder demonstration, Southern Farming Systems, 2015 ...

CONCLUSIONS

While no statistical conclusions can be drawn from the demonstration, it has been a valuable exercise in alerting growers to the range of seeders available and the pros and cons of each in a range of sowing conditions. Growers were able to evaluate and discuss each seeder's potential for use in their system.

Some comments ...

- now that we have a better understanding of the mix of trials run on-farm and their purpose perhaps there's room to *introduce some efficiencies* ...
 - could a *4-rep trial at 1 site* be run as *4 1-rep trials at 4 sites*? ... *meta-analysis* to  ... *logistics*?
 - depending on the purpose, could a **VT** be run as a **DT**?
- there's certainly room for improvement in some of the trial design/analysis/interpretation practices being used on-farm in Australia currently ... *RQ too complex, pseudo replication, no re-randomisation, ...*

... *perhaps what we need is some sort of national information, awareness*

and partnering initiative ...

The fundamental role of communication and extension

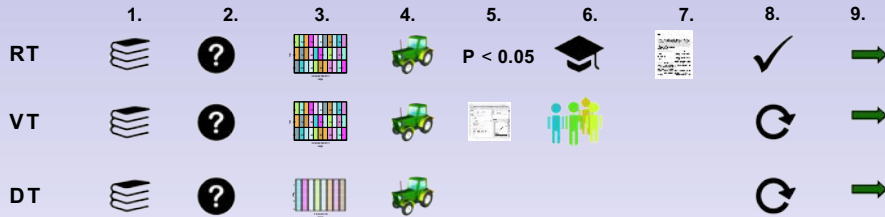
- in agriculture ... *technology meets adoption largely through the communication and extension efforts of GG and their networks*
- could naively think that one-size-fits-all in terms of extending results to growers
- need different strategies for different situations ... *one-size definitely doesn't fit all*
- **Extension** needs to be *an equal partner* in **Research, Development and Extension** complex
- my understanding is that we currently have **RD& 'e'** not **RD& 'E'**
- into the future ...
 - communication & extension needs to be *given the recognition and respect it deserves* ...
 - extension strategies need to be *well thought through* and *context driven* to achieve the outcomes they are targeted to achieve...
 - the industry needs to *build capacity in GG and their networks* toward effective and successful delivery mechanisms ...

Opportunities ...

- the OFT review project has prompted us to think about ways in which we might be able to *partner with GG and their networks toward improved practices on-farm and enhanced industry outcomes ...*

Opportunities ...

1. An *upload-as-you-go* active trial management workflow arrangement ...



- would upload key information throughout the season ... *trial type, links to research, purpose, design,*
- if it could, for example ...
 - capture pre-defined and appropriate extension plans
 - incorporate effective mechanisms to feed back to researchers
 - capture key information in a trial report template to download/edit at the end of the season
- it could perhaps offer a genuine value proposition for GG ...
 - target a pain, introduce national consistencies, ... *positive response*

Opportunities ...

2. A *one-on-one* statistical advice pilot ...

- some groups have suggested that to discuss their game plan for the coming year with a statistician *one-on-one* for a day say, would be most beneficial for them ...
- this initiative would be distinct from but complementary to the work being undertaken/ support being offered by the SAGI-III project ...

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3. A national information, awareness and partnering initiative ...

- to clearly articulate the distinction between **RT/VT/DT** and their related trial methods ...
- set the record straight re: mis-understandings to new understandings ... *the important role of DT*
- promote positive practice change for trials run on-farm and introduce other efficiencies ...

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2. Other opportunities that we've not yet thought of ...

Some comments ...

- with some of these opportunities come huge challenges ...
- any initiative will need to be undertaken by *teams of people who have the knowledge, skills and expertise that is required to ensure that the outcomes are meaningful for industry ...*

Summary ...

- big challenge(s) but great opportunities ...
- hoping this is the start of some partnering and positive outcomes in this space ...
- would love to hear your thoughts ...

Acknowledgments and References...



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Simon Diffey

FSG/GG/advisors/consultants/researchers/other
industry experts/...



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Grains Research and Development Corporation

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Thanks ...