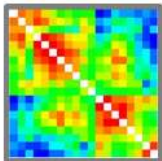


# Analysis and interpretation of co-located canola chemistry experiments in NVT

**GRDC**

Grains  
Research &  
Development  
Corporation



**SAGI**

Aanandini Ganesalingam, Daniel Tolhurst,  
Deborah Bud, Alison Smith & Brian Cullis

# Outline

- Recap of the analysis to date
- Highlight changes to the analysis
- Outline the new method of results presentation:  
Production Value – PLUS system



# Aim

*Provide growers with information for the selection of varieties for their particular growing environment*

- Multi-environment trial (MET) analysis of NVT provides this information

# Recap: the MET analysis

- MET analysis is accomplished using two stages:
  - **Stage 1:**
    - Analysis individual trials
    - Variety means & statistical weights
  - **Stage 2:**
    - Means combined across trials (locations & 5 years)
    - Subject to linear mixed model analysis

# New: Stage 2 approach

- Implemented last season for wheat, barley & canola
- Involves a factor analytic (FA) mixed model for variety by environment effects  
(Smith et al. 2014)
- Provides variety information at an individual environment level
- **NOT** individual trial results – better accuracy
  - More data
  - Genetically correlated environments

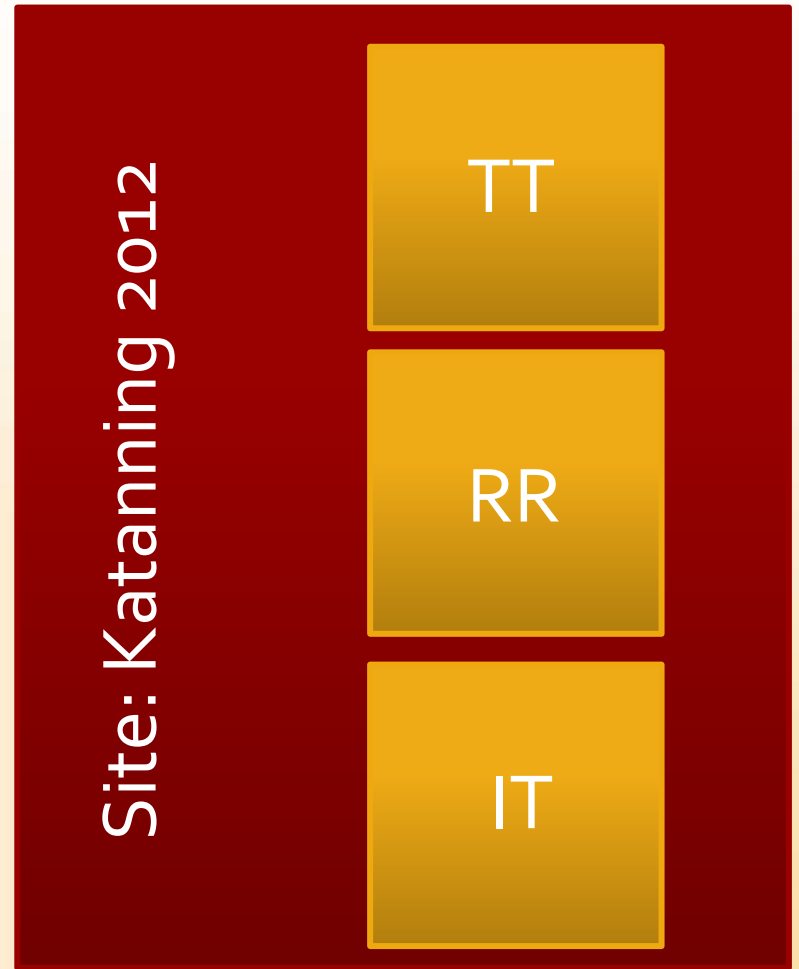


# Canola NVT

# Practical Considerations

- NVT canola includes varieties from the 3 tolerance groups
  - Round-up Ready - RR (since 2008)
  - Triazine Tolerant - TT
  - Imidazolinone Tolerant - IT
  - Conventional - CC
- Often more than 1 group is tested at the same NVT site & year

- Trial split into “blocks”  
– each a tolerance type
- Within blocks, varieties assigned to plots using spatially efficient RCB





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11

ATR Snapper
Jackpot II
Hyola 555 II
Hyola 856 II
Crusher II
Monola 78 II
CB Atomic HT
CB Junee HT
Hyola 559 II
CB Jardee HT
Monola 516 II

ATR Cobbler
CB Sturt II
Monola 506 II
NL0606
Thumper II
Monola 805 II
NT0183
NT0174
Hyola 555 II
Hyola 556 II
TTB97

Pioneer01TT
ATR Gem
ATR Cobbler
NT0184
CB Jardee HT
ATR Stingray
T18097
Hyola 559 II
NL0606
Monola 78 II
NT0174
CB Sturt II
Crusher II
Monola 805 II
CB Junee HT
CB Atomic HT
Hyola 555 II
ATR Snapper
Thumper II
NT0183
ATR Cobbler
Monola 506 II
Hyola 656 II
Jackpot II



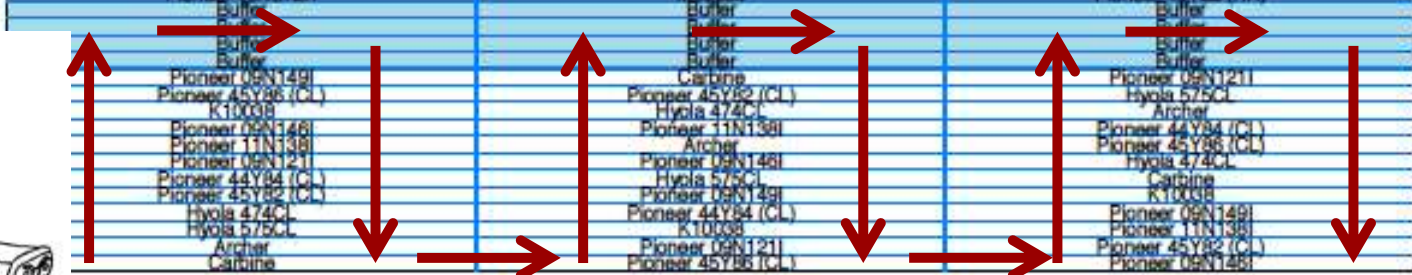
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AN11H5231
Pioneer 45Y23 (RR)
GT Viper
Pioneer 11N047H
M95027
Pioneer 10N523H
CB Status RR
NP0684
CHYB1120RR
M95030
CB Frontier RR
Pioneer 11N048R
NC0457
Pioneer 10N527H
Pioneer 10N524H
NP0482
Pioneer 10N572H
Hyola 505RH
HC1050
HC1085
JH50 RR
GI Cobra
Hyola 404RH
VT 835 G
VT 835 G
NHC1088
NP0539
CHYB-1297 RR
CB Eclipse RR
Pioneer 45Y22 (RR)

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Pioneer 11N049R
CHYB1120RR
Pioneer 45Y23 (RR)
Pioneer 10N524H
HC1050
M95027
GT Viper
NC0457
Pioneer 10N523H
Pioneer 10N572H
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NP0684
AN11H5231
Hyola 505RH
CB Status RR
NP0482
Pioneer 11N527R
CB Frontier RR
HC1085
Pioneer 11N047H
M95030
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Carbine

Pioneer 09N149I
Pioneer 45Y26 (CL)
K10038
Pioneer 09N148I
Pioneer 11N138I
Pioneer 09N121I
Pioneer 44Y84 (CL)
Pioneer 45Y82 (CL)
Hyola 474CL
Hyola 575CL
Archer
Carbine
K10038
Pioneer 09N149I
Pioneer 11N138I
Pioneer 45Y82 (CL)
Pioneer 09N148I



1

2

3

Range

# Spraying Regime

- Sowing date: 10 May 2012
- Harvest date: 9 November 2012

Chemical	Chemistry Group	Date of Application		
Glyphosate	RR	9/5	17/6	
Atrazine	TT	10/5		31/5
Intervix	IT		17/6	

# Statistical Considerations

## 1<sup>st</sup> Stage

- Historically - Stage 1 analyses involve the individual analyses of each block at a site
- Currently - analysis consists of all blocks together
  - Reflects the randomization process of the full site
  - Tolerance blocks are within proximity & managed similarly
  - See conference paper for further details....

# Statistical Considerations

## 2<sup>nd</sup> Stage

- New FA approach involves estimation of
  - a genetic variance for each environment and
  - a genetic correlation for each pair of environments
- Number of varieties in some tolerance groups can be very small

Katanning 2012

Chemistry Type	No. Varieties
IT	12
RR	30
TT	23

Keith 2013

Chemistry Type	No. Varieties
IT	12
CC	9
TT	20

# Statistical Considerations

## 2<sup>nd</sup> Stage

- Reliable estimates of genetic variances & correlations –  
If all tolerance groups should be analyzed together in Stage 2 analysis
- So that “environment” encompasses the NVT site as a whole
- Note that this provides another important reason for new Stage 1 analyses of all blocks together
  - (See conference paper for details)

# The Results

- All tolerance groups are analyzed together
- Results (Production Values) are reported separately for each group due to chemistry
- Blocked designs do not allow valid comparisons of varieties in different chemistry blocks
  - See conference paper for further details

# Further Considerations

- SAGI has always believed that growers may want variety comparisons across tolerance groups –
  - Received mixed feed-back
- SAGI has worked towards implementing experimental designs & analysis that would allow such comparisons
- Split plot – like design:
  - 2008 - 5 in Vic & NSW
  - 2009 - 5 in Vic, NSW & WA
  - 2010 - 8 in WA, 5 in NSW & Vic

(data courtesy of ACAS 2014)

# Further Considerations

- Split-plot designs were statistically valid *but*
  - Practically inflexible - required alterations to standard trial operator spraying practices
  - Proved too difficult - so split-plot designs not implemented again
- New designs are not as statistically efficient as split-plot designs but still allow valid comparisons between tolerance groups and practically more flexible





# Results – Production Values

# Production Value PLUS System

- Method previously outlined = Production Value PLUS System
- Produces “Production Values” (PVs) in t/ha for all varieties for each environment (year & site combination)

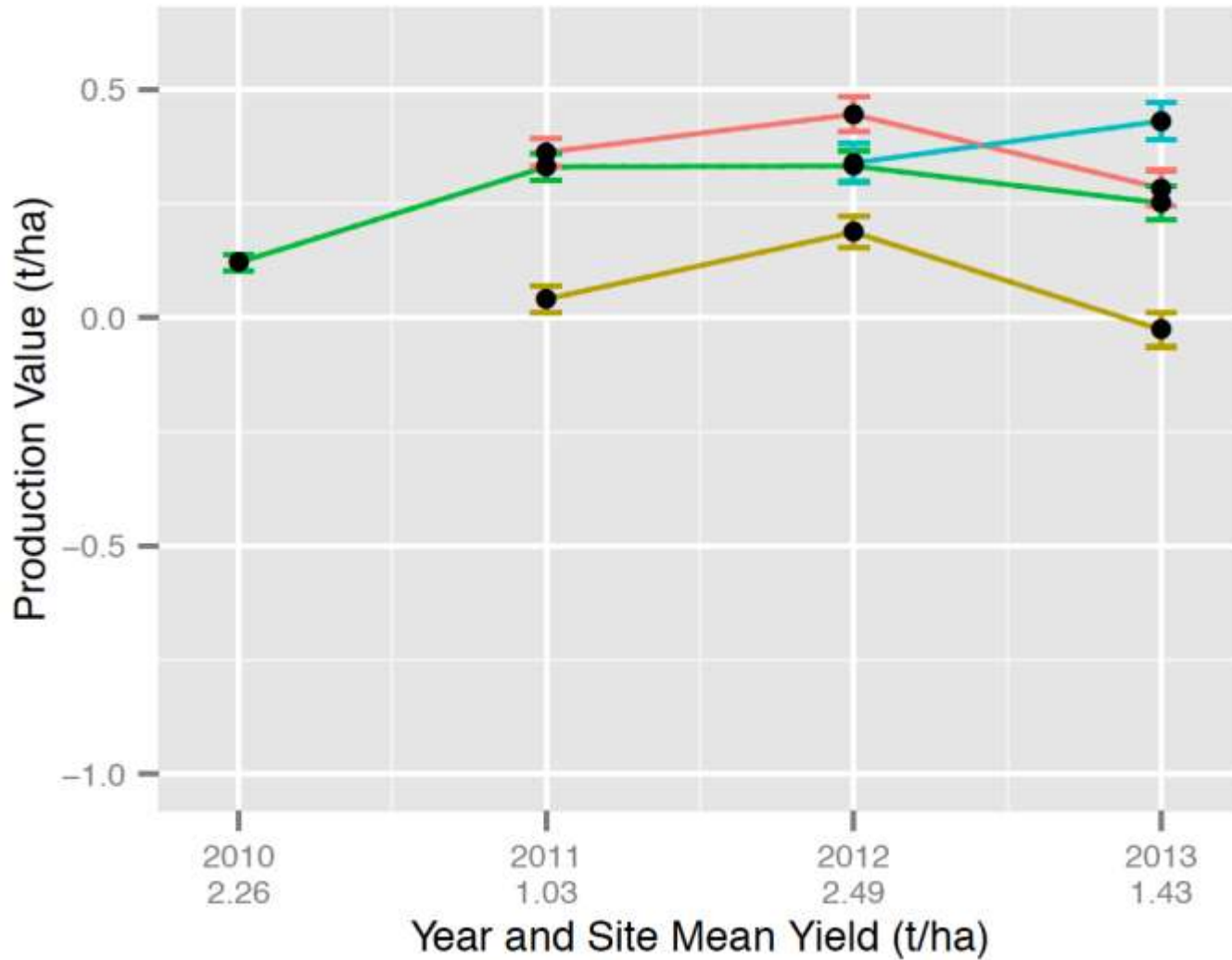
Basic definitions:

- Variety PVs: are **positive** or **negative** differences relative to a base-line ( $PV = 0$ )
- $PV = 0$  Reflects the average expected yield of all the varieties in the current NVT data set, if grown in that particular environment

# Katanning

RR Variety

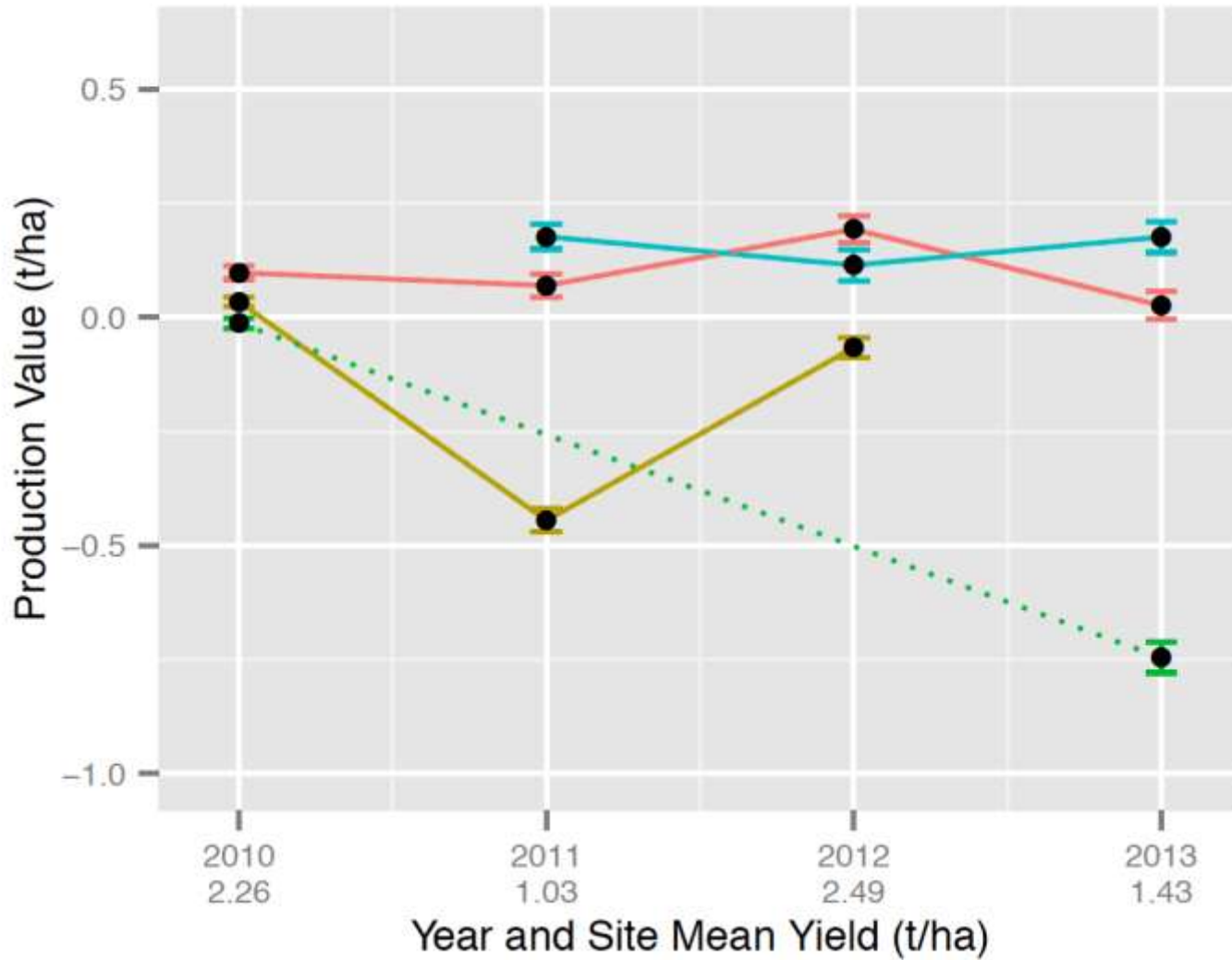
- GT Cobra
- Hyola 404RR
- Nuseed GT-50
- Pioneer 43Y23 (RR)



# Katanning

**TT Variety**

- ATR Cobbler
- Crusher TT
- CB Telfer
- Hyola 559TT





**Conclusion**

# In Summary

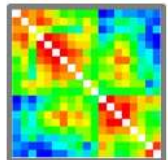
- Current designs do not allow for valid comparisons of varieties in different tolerance groups
- Experimental designs that will allow such comparisons are available on request
  - Easy to generate and should be easy to implement.
- PVs produced for all varieties, irrespective of tolerance group
  - Currently, graphical displays are produced for each group
  - We would like to implement the new designs so that varieties from different tolerance groups can be compared on the same graph

# Reference

- Smith, A., Ganesalingam, A., Kuchel, H. and Cullis, B. (2014). Factor analytic mixed models for the provision of grower information from national crop variety testing programmes. *Theoretical and Applied Genetics*. Accepted.

# Acknowledgements

- Grains Research and Development Corporation (GRDC) of Australia
- GRDC and ACAS for use of the NVT data



SAGI



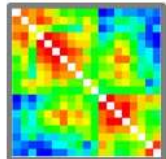
National  
Variety  
Trials  
A GRDC INITIATIVE





# Take home messages

- No valid comparison of varieties in different tolerance groups with current designs
- Experimental designs that enable this are available on request
- PVs produced for all varieties, irrespective of tolerance group
  - We would like to implement the new designs so that varieties from different tolerance groups can be compared on the same graph



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Variety  
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