



Department of
Agriculture and Food



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Grain yield & grain protein – varietal differences

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Key Messages

- Hindmarsh is the benchmark variety but there are alternatives at sites with:
 - potential yield is > 3 t/ha, or
 - sub-soil acidity, or
 - brome grass and barley grass.
- Varieties can differ in their grain protein due to:
 - yield dilution, or
 - genetic differences.



Profitability of malt vs. food

	REALISED MALTING PREMIUM (\$/t)				
	\$10	\$15	\$20	\$25	\$30
Feed price (\$/t)	Yield advantage of Hindmarsh barley (%) required to return the same profit as 1 t of malting barley				
\$160	6%	9%	13%	16%	19%
\$190	5%	8%	11%	13%	16%
\$220	5%	7%	9%	11%	14%
\$250	4%	6%	8%	10%	12%
\$280	4%	5%	7%	9%	11%

Premiums and costs	Example #1				Example #2			
	Grade	\$/t	malt or food %	\$/t	Grade	\$/t	malt or food %	\$/t
Premium MALT1 over FEED	Malt	\$40	50%	\$20	Malt	\$60	60%	\$36
Extra cost to grow for malt & deliver				\$5				\$11
Extra EPR for malt variety				\$2				\$2
Premium for Hindmarsh as BFOD1	Food	\$6	50%	\$3	Food	\$6	50%	\$3
	REALISED PREMIUM			\$10	REALISED PREMIUM			\$20

Target malt yield is >90-95% of Hindmarsh

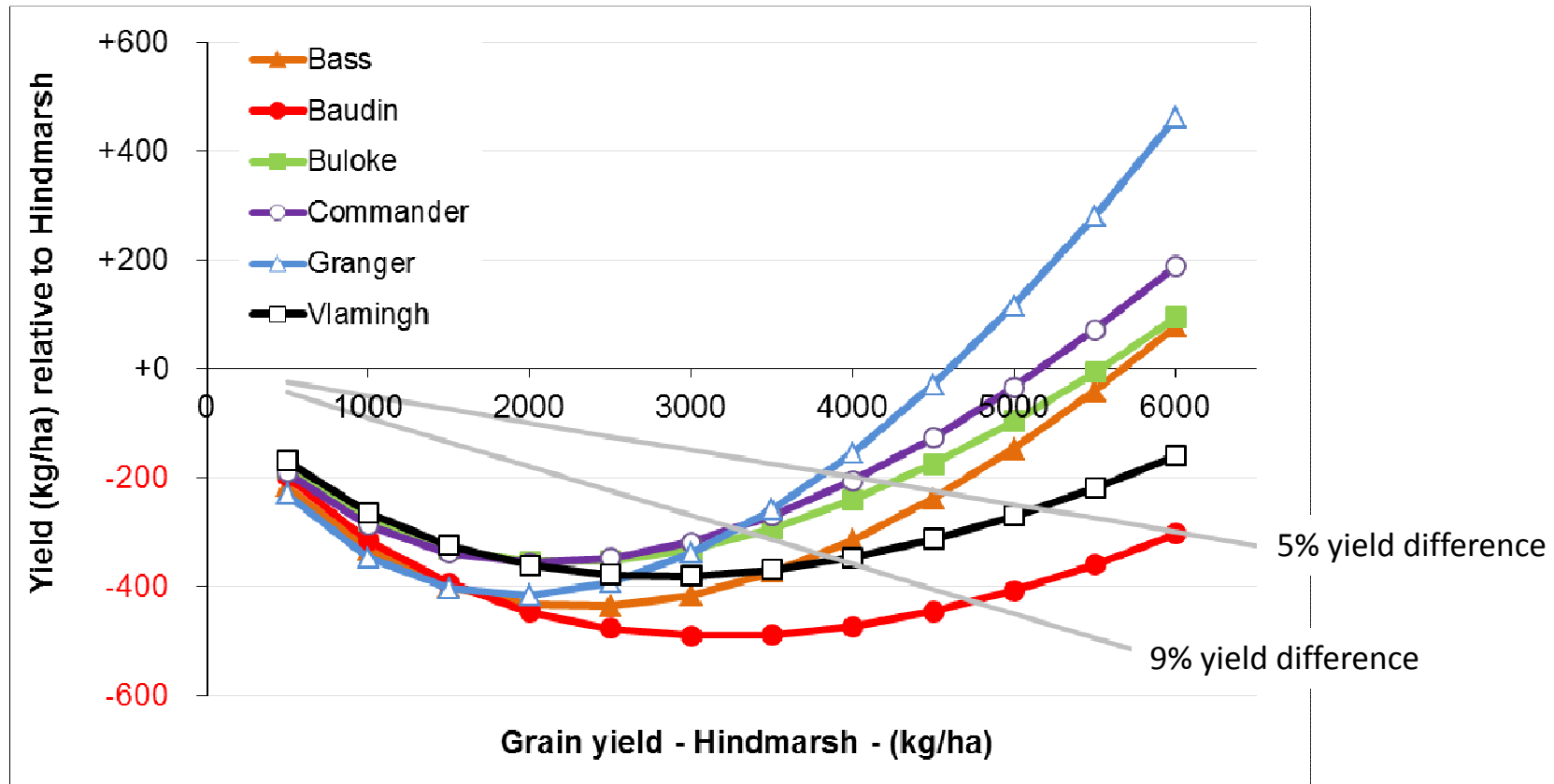
What does NVT data say?

DIFFERENCE IN GRAIN YIELD RELATIVE TO HINDMARSH (%)						
Variety	Agzone 1	Agzone 2	Agzone 3	Agzone 4	Agzone 5	Agzone 6
MALTING VARIETIES						
Bass	-1	-16	-9	-15	-16	-6
Baudin	-14	-17	-22	-17	-17	-17
Buloke	-7	-10	-7	-7	-12	-10
Commander	-4	-13	-11	-12	-14	-7
Gairdner	-19	-14	-16	-16	-15	-17
Granger	-	-6	-5	-	-11	0
Scope	-6	-9	-7	-7	-13	-10
Vlamingh	-5	-10	-11	-13	-14	-9

- No malt variety out-yields Hindmarsh
- Very few within 5%, some within 10%

SOURCE: 2009-2013 NVT MET analysis

Can a malt out yield Hindmarsh?



SOURCE: 2009-2013 DAFWA barley agronomy and NVT, n = 220 site-years

Matching Hindmarsh for profitability

YIELD (t/ha) TARGETS TO EQUAL OR BETTER HINDMARSH FOR PROFITABILITY (\$/ha)				
Assumption:	Feed @ \$220/t			
Realised premium over Hindmarsh	\$0/t	\$10/t	\$20/t	\$30/t
Yield target relative to Hindmarsh	100%	95%	91%	86%
Bass	≥ 5.6	≥ 4.3		≥ 2.5
Baudin	≥ 7.9	≥ 5.7	≥ 4.3	
Buloke / Scope	≥ 5.5	≥ 4.0		≥ 2.1
Commander	≥ 5.1	≥ 3.8		≥ 2.1
Granger		≥ 3.6	≥ 3.0	≥ 2.3
Vlamingh	≥ 7.1		≥ 3.5	≥ 2.3

Malt barley segregations in 2014?

GIWA Barley Council Malt and Food Barley Variety Update – February 2014

The GIWA Barley Council is one of seven councils of the Grains Industry Association of Western Australia (GIWA) that represent the interests of those in the grain supply chain in Western Australia. GIWA's key focus is to provide industry leadership, improve communications and nurture capacity building within the grains industry. The vision of the GIWA Barley Council is to lead the continued sustainability of the Western Australian barley industry.

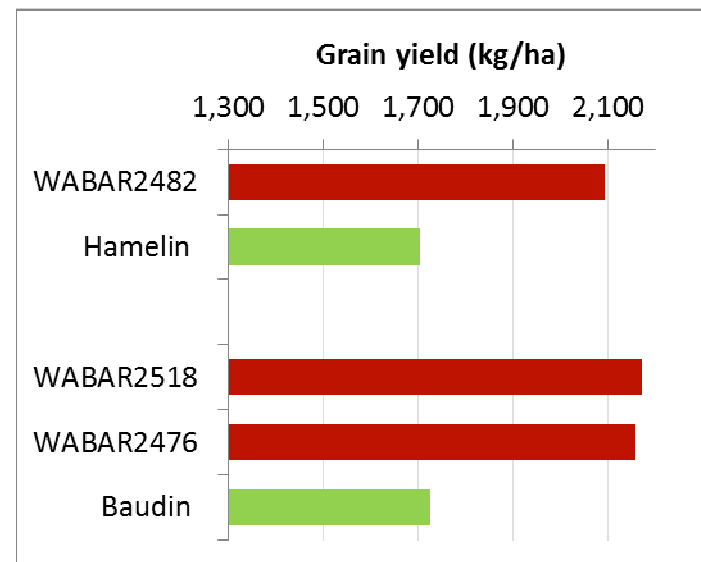
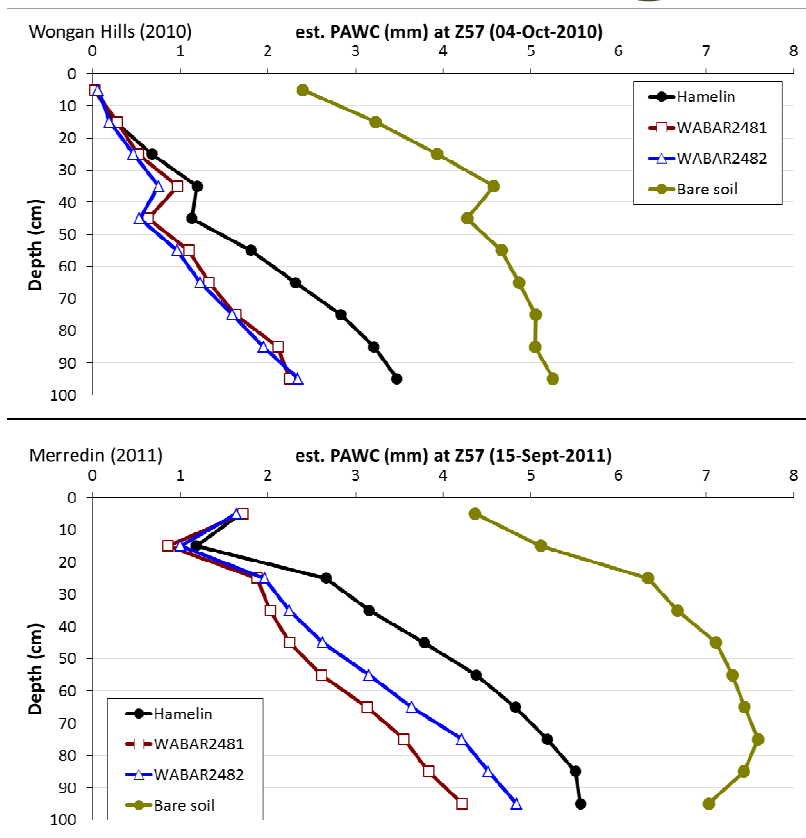
The GIWA feedback from Western Australia are keen to grow and This sentiment well. There segregating ease of log trade who small, unsa

TARGET PRODUCTION / SEGREGATION ZONES IN 2014				
Variety	PORT ZONE			
	Geraldton	Kwinana	Albany	Esperance
MALTING VARIETIES				
Bass	-	✓	✓	✓
Baudin	-	✓	✓	✓
Buloke	-	✓	✓	-
Commander	-	✓	-	-
Gairdner	-	-	✓	✓
Granger	-	-	-	-
Scope	-	✓	✓	-
Vlamingh	-	✓	-	-
FOOD VARIETIES				
Hindmarsh	✓	✓	✓	✓

Why Litmus barley?

- Litmus contains the *Alt1* gene
- The *Alt1* gene ↑ 10 fold the extrusion of citrate
- Citrate reduces the toxicity of Al around root apex
- Effect:
 - ↑ root growth,
 - ↑ water extraction from the soil, and
 - ↑ grain yield

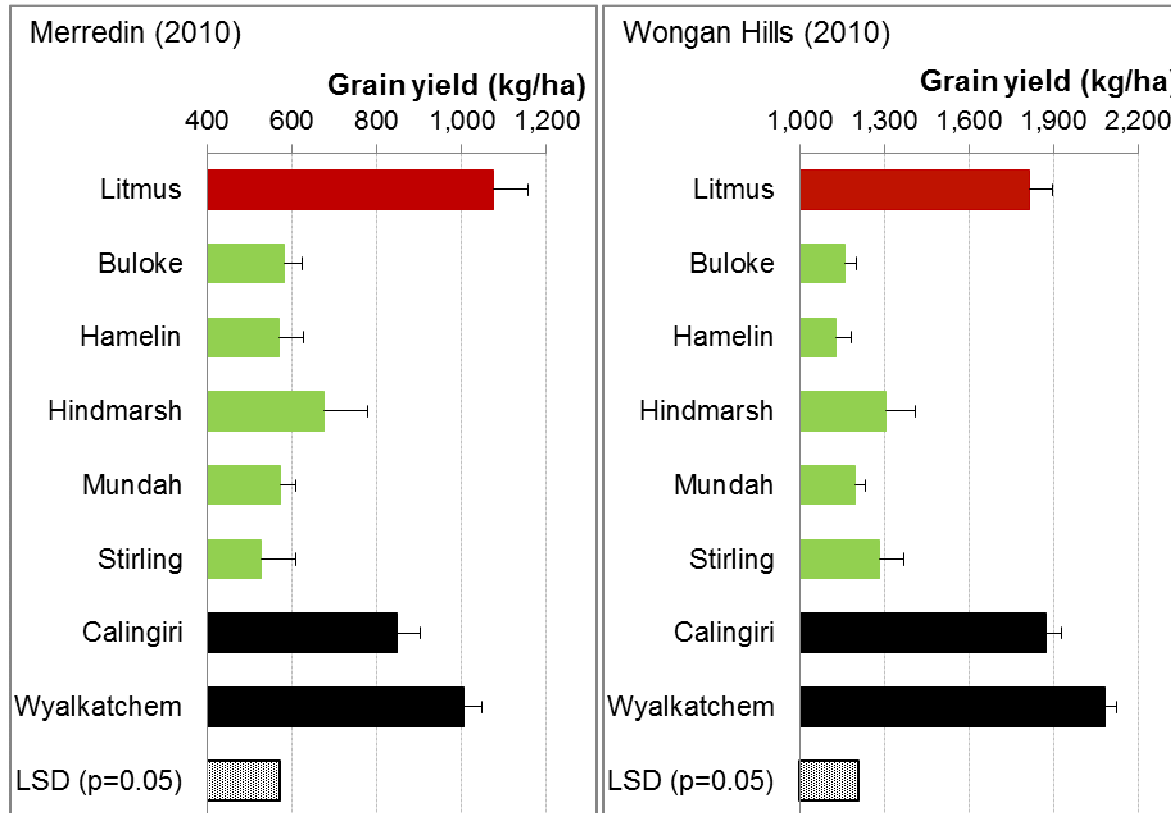
Benefit of *Alt1* gene



Hamelin with *Alt1* gene and Baudin with *Alt1* gene out yielded Hamelin and Baudin by 25%.

SOURCE: 2009-2011 DAFWA barley agronomy, n = 6 site-years. Average pH (20-30 cm) = 3.9, Al = 12 ppm.

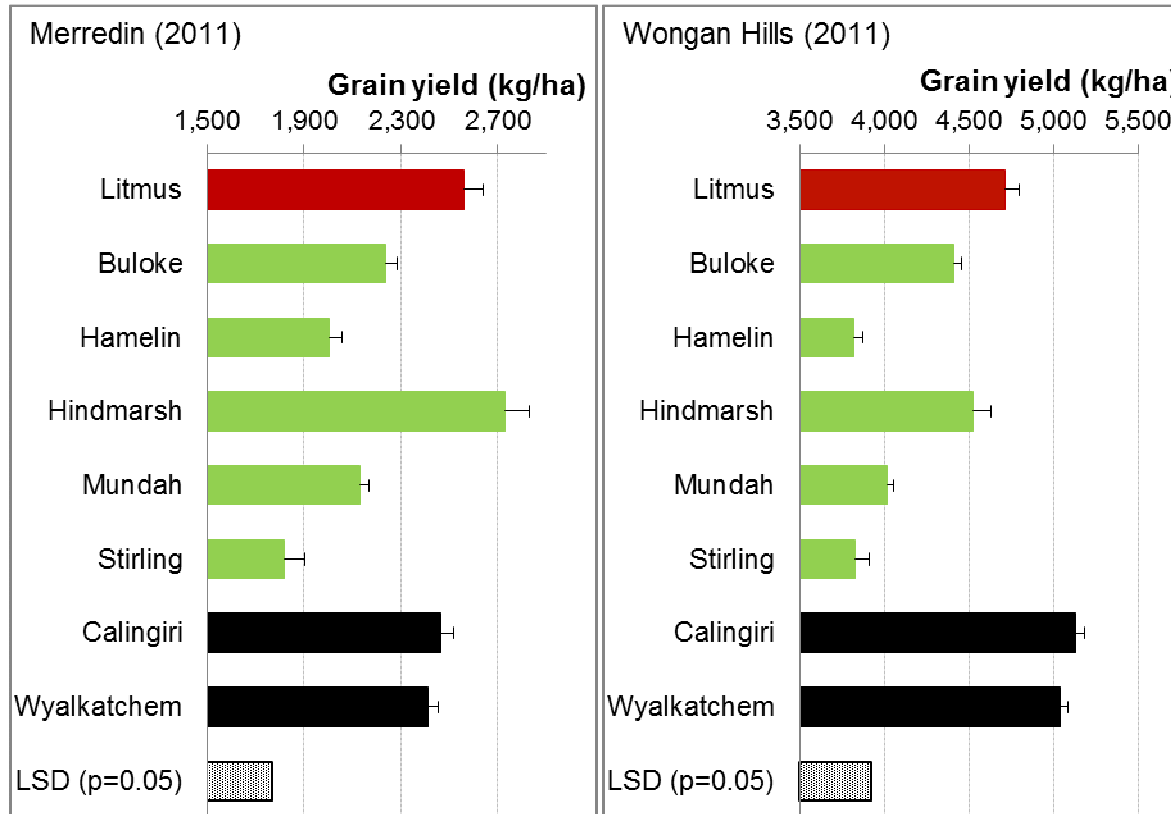
Why Litmus – benefit in a dry year?



- In a Decile 3 year Litmus was:
- 40% > than Buloke, Hamelin, Mundah and Stirling
- 30% > than Hindmarsh
- Same yield as wheat

SOURCE: 2010-2011 DAFWA barley agronomy. Average pH (20-30 cm) = 3.9, Al = 12 ppm.

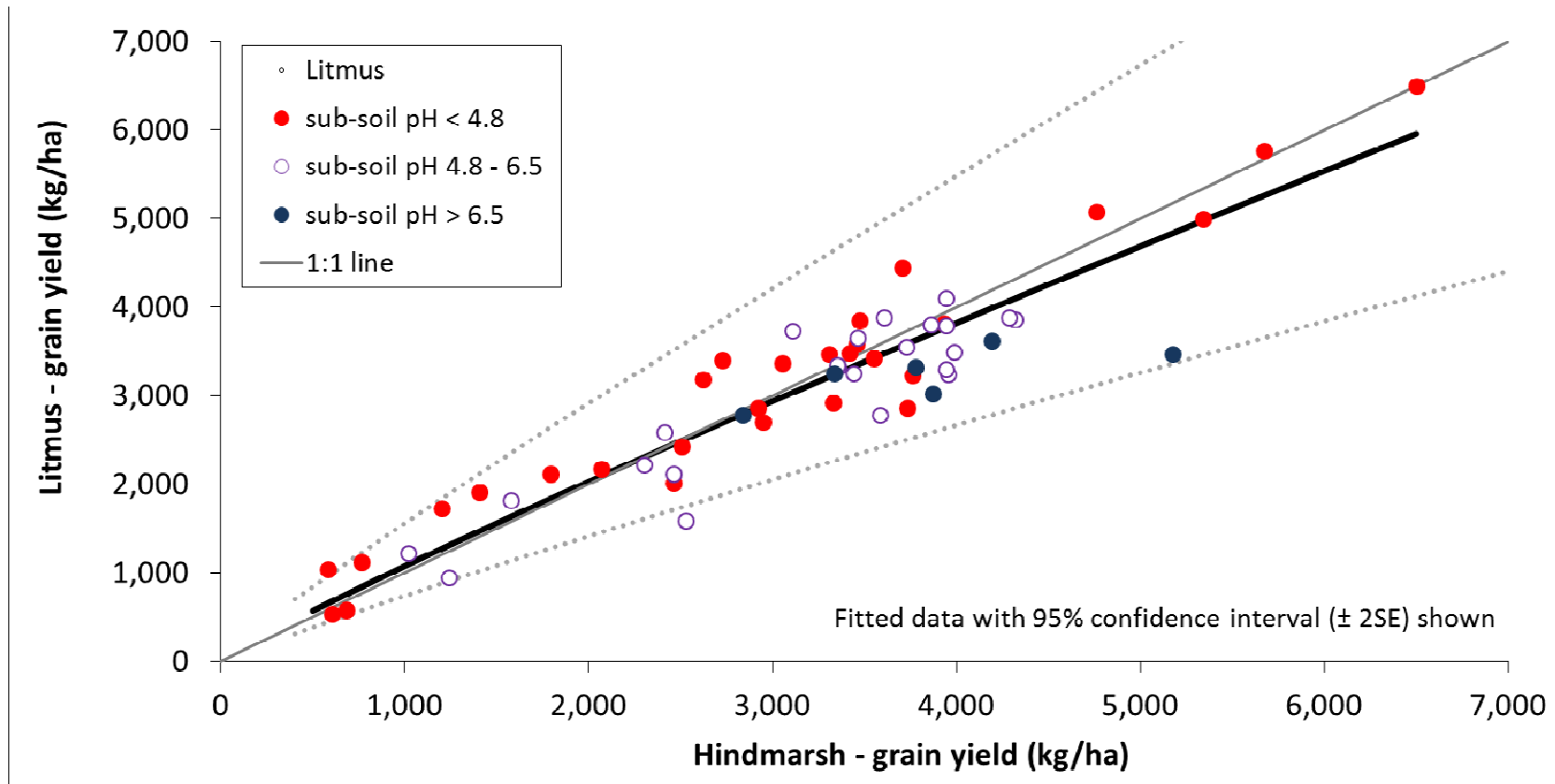
Why Litmus – benefit in a wet year?



- In a Decile 9 year Litmus was:
- 20% > than Hamelin, Mundah and Stirling
- 10% > than Buloke
- Same as Hindmarsh
- Same yield as wheat

SOURCE: 2010-2011 DAFWA barley agronomy. Average pH (20-30 cm) = 3.9, Al = 12 ppm.

Litmus vs Hindmarsh



SOURCE: 2010-2013 DAFWA barley agronomy, 2012-2013 NVT, n = 63 site-years.

Litmus vs Hindmarsh

pH _{Ca} of sub-soil	LITMUS YIELD (% Hindmarsh)	% SITES HIGHER, SAME OR LOWER YIELDING THAN HINDMARSH		
		higher	same	lower
< 4.8	106 ± 4%	30%	47%	23%
4.8 - 6.5	95 ± 3%	9%	56%	35%
> 6.5	86 ± 5%	0%	33%	67%
All sites	100 ± 3%	19%	49%	32%

- Acid sub-soils – same or better in 77% trials
- Neutral sub-soils – same or better in 65% trials
- Alkaline sub-soils – same or better in 33% trials

SOURCE: 2010-2013 DAFWA barley agronomy, 2012-2013 NVT, n = 63 site-years.

What did well in 2012 and 2013 NVT?

% SITES HIGHER, SAME OR LOWER YIELDING THAN HINDMARSH			
POTENTIAL TO OUT YIELD HINDMARSH			
Variety	higher	same	lower
Compass*	20%	60%	20%
Lockyer	20%	60%	20%
Oxford	14%	43%	43%
Litmus	12%	58%	30%
Flinders*	11%	66%	23%

OFTEN YIELDED THE SAME AS HINDMARSH			
Variety	higher	same	lower
La Trobe	0%	97%	3%
Roe	3%	77%	20%
Fathom	3%	71%	26%
Skipper*	0%	69%	31%

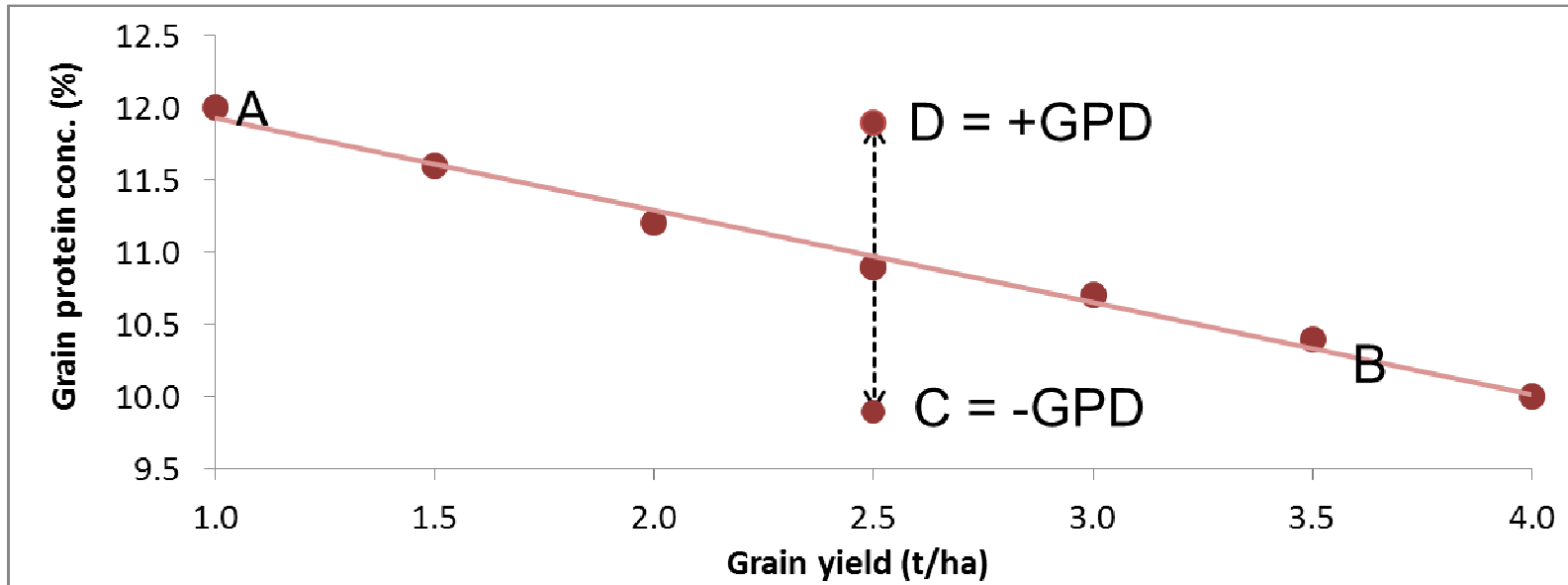
*Variety is not yet available.

In 63% of NVTs no variety out yielded Hindmarsh

Key Messages – variety

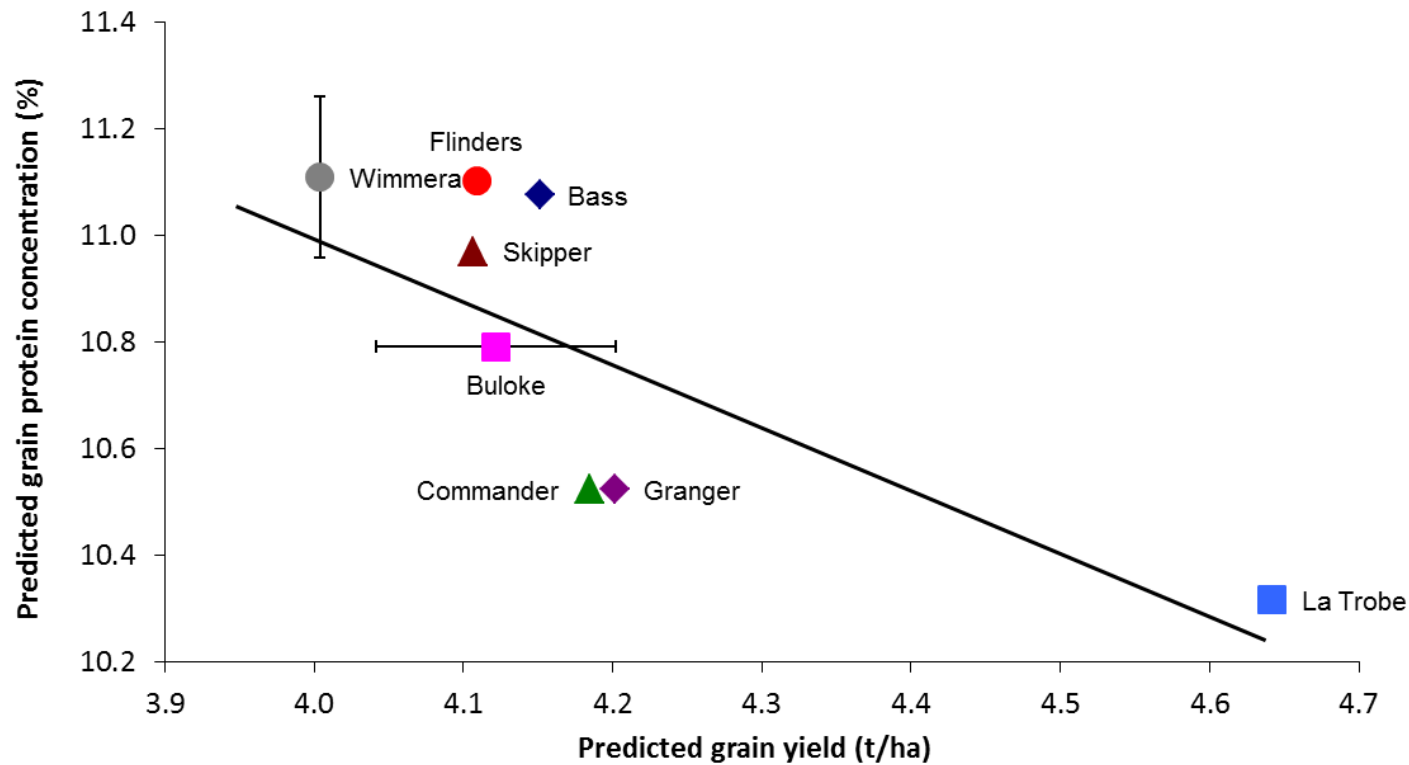
- Hindmarsh is the benchmark variety but consider:
 - Bass (> 3 t/ha environments)
 - Baudin (> 3 t/ha environments with low mildew risk)
 - Buloke (> 3 t/ha environments)
 - Commander (> 3 t/ha and in Kwinana Port Zone)
 - Granger (areas of high mildew risk, but as a feed in 2014)
 - Litmus (in paddocks with an acidic profile)
 - Lockyer and Oxford (for early planting)
 - Scope (where an imi-herbicide is used or needed)

Differences in grain protein – theory



Deviations away from the regression line identify varieties with lower or higher grain protein than expected from their grain yield

Differences in grain protein – example



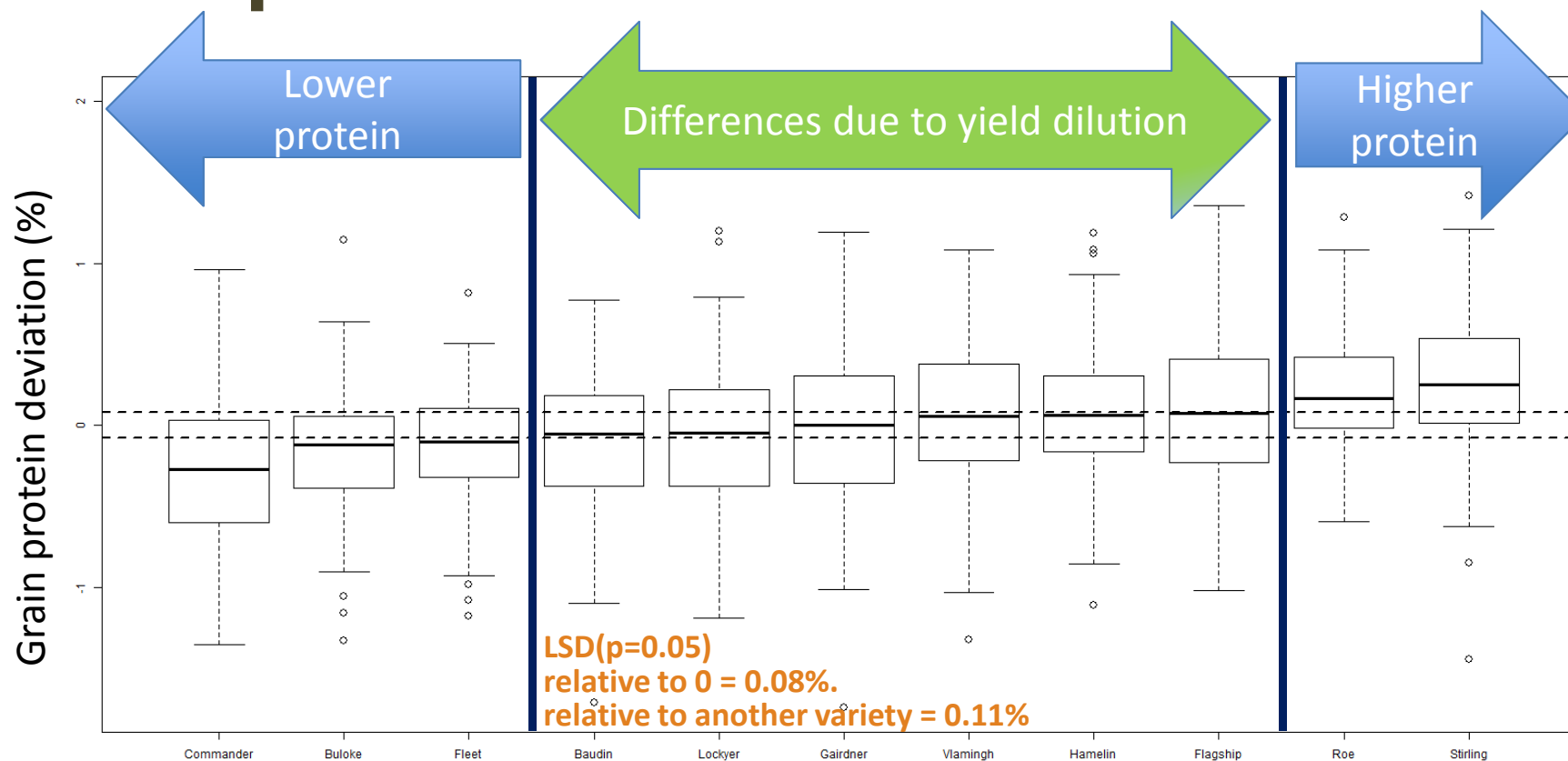
SOURCE: Graham et al. (2013). 16th ABTS using 2012 DAFWA barley agronomy, 2012 NSW barley agronomy, n = 5 site-years.

Data and analysis

- Data - DAFWA barley agronomy time of sowing and NVT.
- Deviation (residual) of each variety from fitted GPC / GY regression from *each site* used to test significance of the variety effect on GPD.

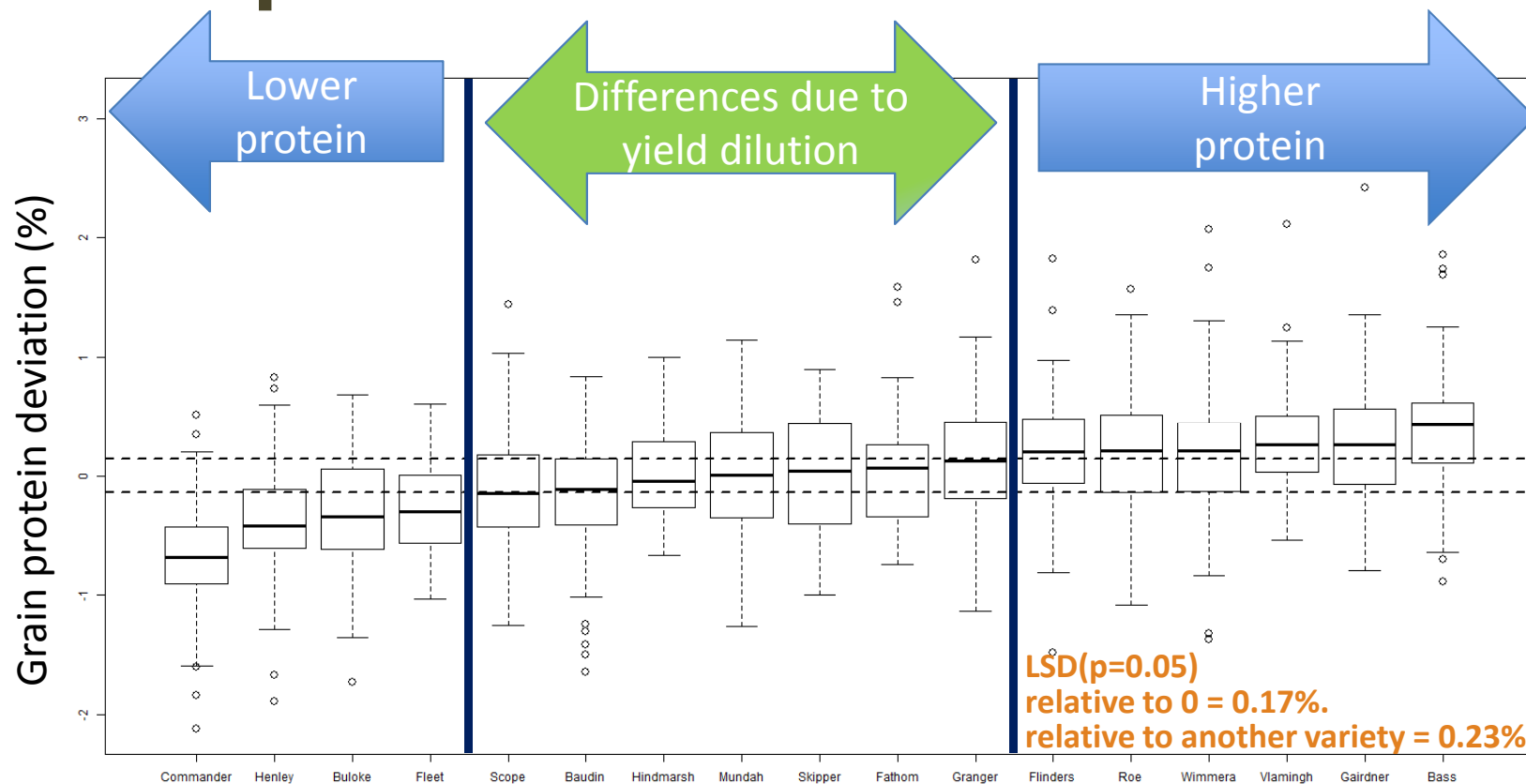
Data set	Years in data set	No. varieties	No. sites
1	2005-2009	11	114
2	2005-2009	13	69
3	2006-2013	11	137
4	2007-2013	12	124
5	2009-2013	15	63
6	2009-2013	15	67
7	2010-2013	17	59
8	2010-2013	16	71
9	2011-2013	20	45

Box plots of residuals – 2005-2009



SOURCE: 2005-2009 DAFWA barley agronomy and CVT, varieties = 11, sites = 114.

Box plots of residuals – 2010-2013



SOURCE: 2010-2013 DAFWA barley agronomy and NVT, varieties = 17, sites = 59.

Varieties differ in their grain protein

RANKING VARIETIES FOR THEIR GRAIN PROTEIN DEVIATION				
Commander Henley	Baudin Buloke	Flagship Gairdner Granger Hindmarsh La Trobe Scope Skipper*	Flinders* Hamelin Vlamingh Wimmera*	Bass Stirling
-0.6 to -0.3% LOWER	-0.3 to -0.1% SLIGHTLY LOWER	-0.1 to +0.1% NORMAL	+0.1 to +0.3% SLIGHTLY HIGHER	+0.3 to +0.6% HIGHER

*Variety is not yet available

SOURCE: Analysis based on regression from 9 data sets covering 2005-2013 with between 11 to 20 varieties and presenting only malt or food varieties.

Key Messages – grain protein

- For some varieties differences in their GPC is not explained by differences in their GY alone.
- Low and high protein varieties may differ in their nitrogen management strategies.
- Possible strategies for Bass include:
 - promote tillering with early N
 - target 10.3% not 10.5% on N fertiliser calculator
- Possible strategies for Commander include:
 - delay N closer to stem elongation
 - early sowing onto higher fertility paddocks

Key Messages – summary

- Hindmarsh is the benchmark variety but there are options:
 - Litmus for soils with an acidic profile (= wheat).
 - Malt barley if yield potential > 3 t/ha, subject to realised premium.
 - Scope where an imi herbicide is useful or being used in the rotation.
- New “malt” options coming that match Hindmarsh:
 - Compass, Flinders, La Trobe and Skipper (subject to accreditation).
- Varieties can differ in their grain protein concentration:
 - It is only those varieties classed as low or high GPD that will need their N management strategy reviewed.
 - Commander and Bass are likely to have different N strategies.



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Questions?

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