



Oilseed rape varieties for sustainability and low input

Simon Kightley



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Two projects:

- Defra VS0128 – Desk study – winter wheat, spring barley, oilseed rape, potatoes and peas
- Follow-up project with Warwick HRI – field experiments with wheat and oilseed rape

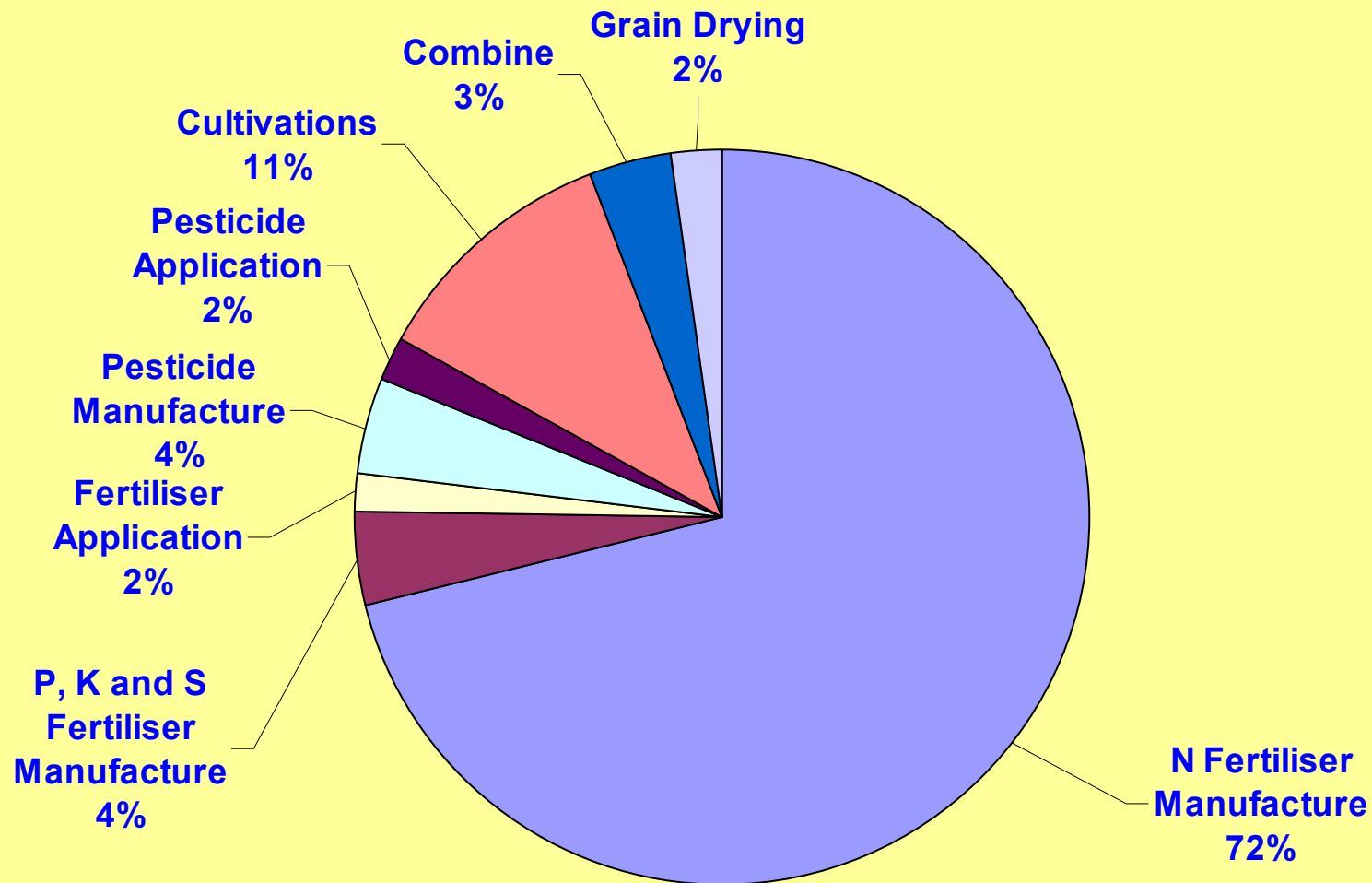
Winter Oilseed Rape: Potential of characters for savings per unit output

Character conferring sustainable advantage	Cost reduction £	Energy reduction 100mj	Eco-rating reduction	Water pollution reduction
Flea beetle resistance	13	0	60	5
Good early vigour	43	6	48	5
Sclerotinia resistance	26	2	27	3
10% increase in yield	49	13	26	3
Slug resistance	13	1	22	3
Competitive ability of adult plants	19	1	20	2
Stem canker resistance	12	1	18	5
Uniform pod maturity	14	4	16	3
Pod shatter resistance	20	8	12	2
Seed weevil resistance	4	1	12	2
Pollen beetle resistance	30	0	9	1
Bladder pod midge resistance	3	0	9	2
Light leaf spot resistance	12	1	4	2
Straw stiffness	6	0	2	1
Lodging resistance	7	1	0	0
Reduced N requirement	20	19	0	0
Reduced aerial mass	20	2	0	0
Total expenditure	564	152	288	37
Potential total savings from variety	311	60	285	39

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Energy analysis for rape cultivation



Since VS0128 things have changed:

- Fuel prices up
- Fertiliser prices up
- Roundup prices up
- Crop values up

So:

- Short, easy harvest varieties more attractive
- Nitrogen efficiency much more attractive

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Conclusions - based on environmental impact, value to grower and potential for improvement

Major characters

Intermediate characters

Minor characters

Areas of interest

Major characters:

Flea beetle res.	Screening test
Good early vigour	Assess in more detail
Stem canker res.	Existing assessments
Reduced N requirement	Variety interactions
10% yield increase	Existing assessments
Sclerotinia res.	New T/UT screening

Intermediate characters (1):

Slug resistance	<i>Develop screening</i>
Competitive growth (in spring)	<i>Measure weed suppression</i>
Uniform pod maturity	<i>Special obs. plots</i>
Seed weevil res.	<i>Develop tests if claims made by breeders</i>
Pollen beetle res.	

Intermediate characters (2):

Light leaf spot res.	<i>Continue current tests</i>
Pod shatter res.	<i>Special test for claims</i>
Bladder pod midge res.	<i>Special test for claims</i>
Reduced aerial mass (low biomass)	<i>Investigate value and develop assessment</i>

Minor character

Lodging resistance/Straw stiffness

Very important to growers, but:

- *good varieties already exist*
- *few implications for the environment from further improvement*

Areas of interest

- Depth and speed of rooting

Competition for water and nutrients

- Allegenic factors

Important if crop is to expand

- Green tissue glucosinolate

Improved pest and disease resistance?

A new Low Input project

- Lead by University of Warwick
- NIAB working on wheat and rape
- Pilot year - autumn 2007
- Extended - autumn 2008

Oilseed rape: eight varieties, chosen to express maximum commercial diversity:

- Castille
- Catana
- Es Astrid
- Excalibur
- Excel
- Hearty
- PR45D03
- Winner

CLASSIFIED LIST OF WINTER OILSEED RAPE VARIETIES - 2008

Variety	Type	Seed yield (%)	Plant Height (cm)	Earliness of flowering (1-9)	Stem stiffness (1-9)	Earliness of maturity (1-9)	Light leaf spot (% infection)	Stem canker (infection index)
Excel	RH	103	166	5.3	6.2	5.4	4.4	6.6
Winner		99	157	7.7	6.3	5.5	4.0	34.1
Excalibur	RH	104	156	7.6	6.9	6.5	3.3	25.3
Catana		104	151	6.4	6.8	4.7	0.1	34.3
Hearty	HE	86	151	4.5	6.8	6.6	20.4	6.9
Castille		103	143	7.5	7.0	5.8	8.3	17.7
ES Astrid		102	141	4.2	7.4	5.7	6.3	10.8
PR45D03	SD RH	99	122	5.2	8.4	4.7	6.3	34.8

Varieties ranked in order of descending plant height

Year-1 protocol aimed at developing techniques for assessing young plant growth and disease interaction with N inputs:

- Nitrogen: 150kg/ha; 225 kg/ha
- Fungicide rates - Nil
- Herbicides - Yes
- Insecticides - Yes
- Seed treatment - Yes
- Seed rates: NL/RL rates – Conventional = 100; hybrids = 70

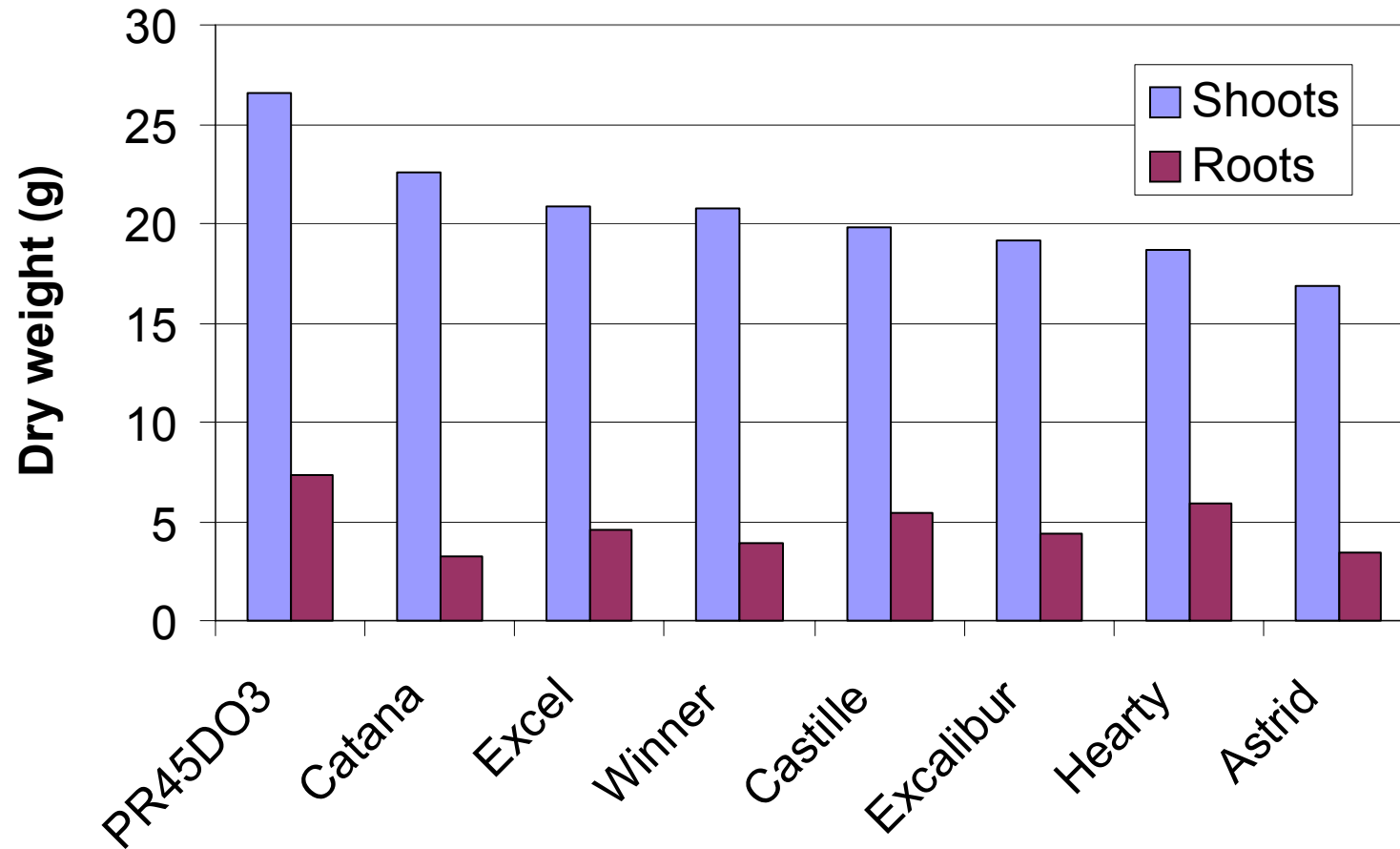
Year-1 recording

- Speed of development of above ground material: 1-9 and/or sequential removal sampling for dry weight gain and/or leaf area index
- Root measurement
- Plant competition
- Insect damage
- Foliar disease

Best laid schemes.....

- Autumn 2007 drought
- Late, staggered emergence
- Plants too uneven in size for autumn assessments
- Protocol adjusted and additional characters introduced

Oven dry weights for shoots and roots (mean of 40 plants/plot) Jan '08



8th April



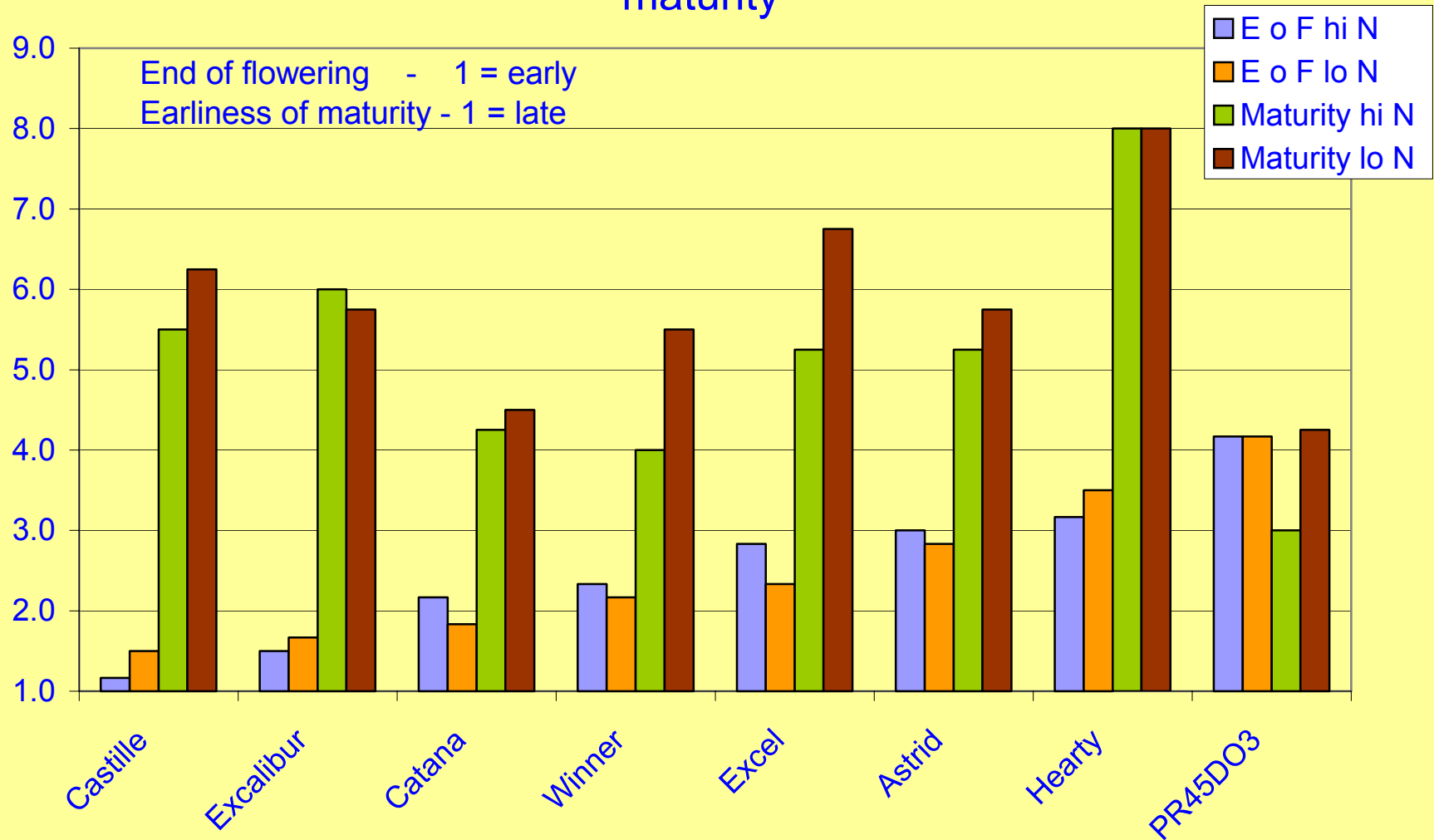
18th April



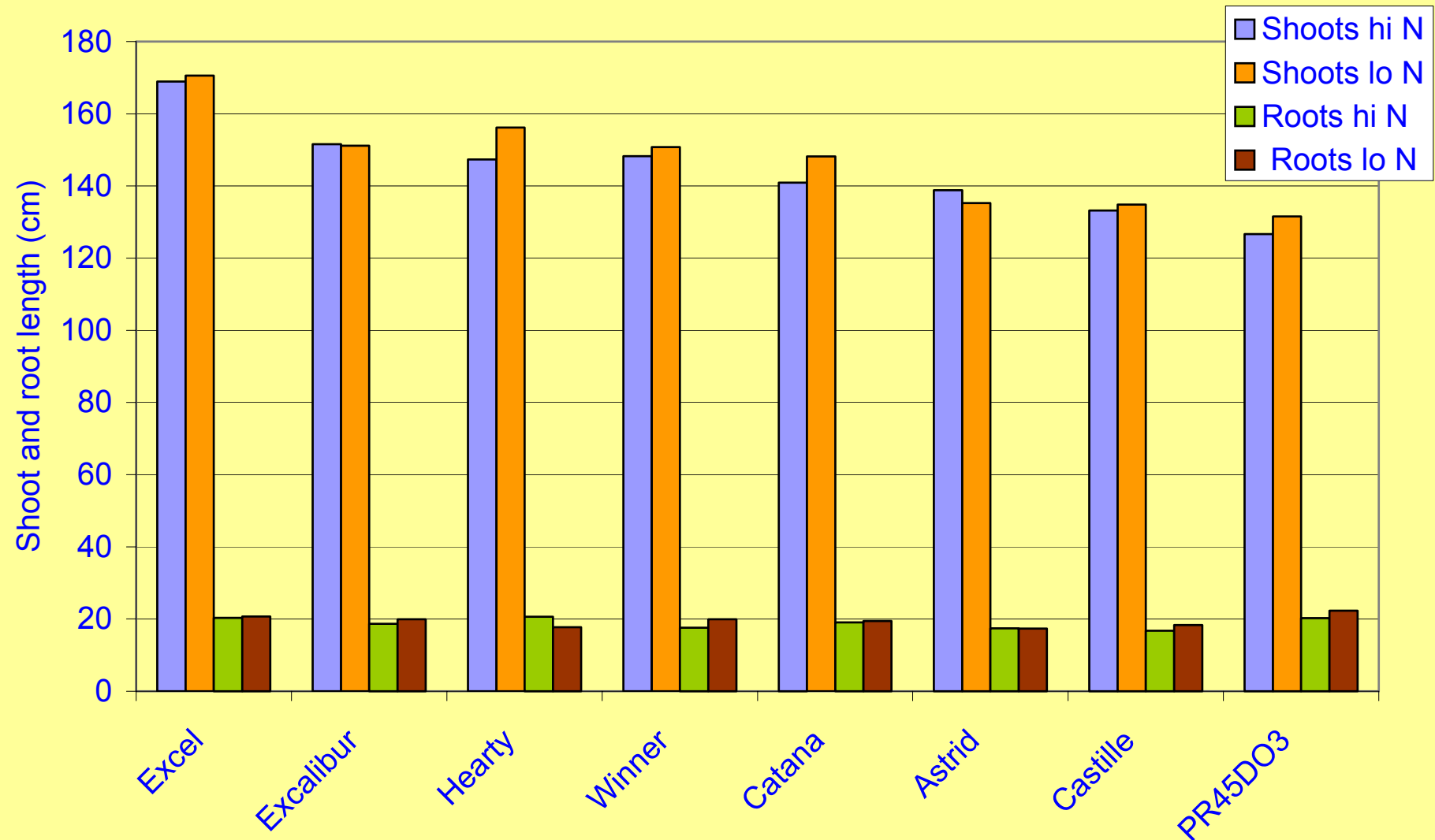
12th May

On-set of flowering in
hybrid semi dwarf –
PR45DO3

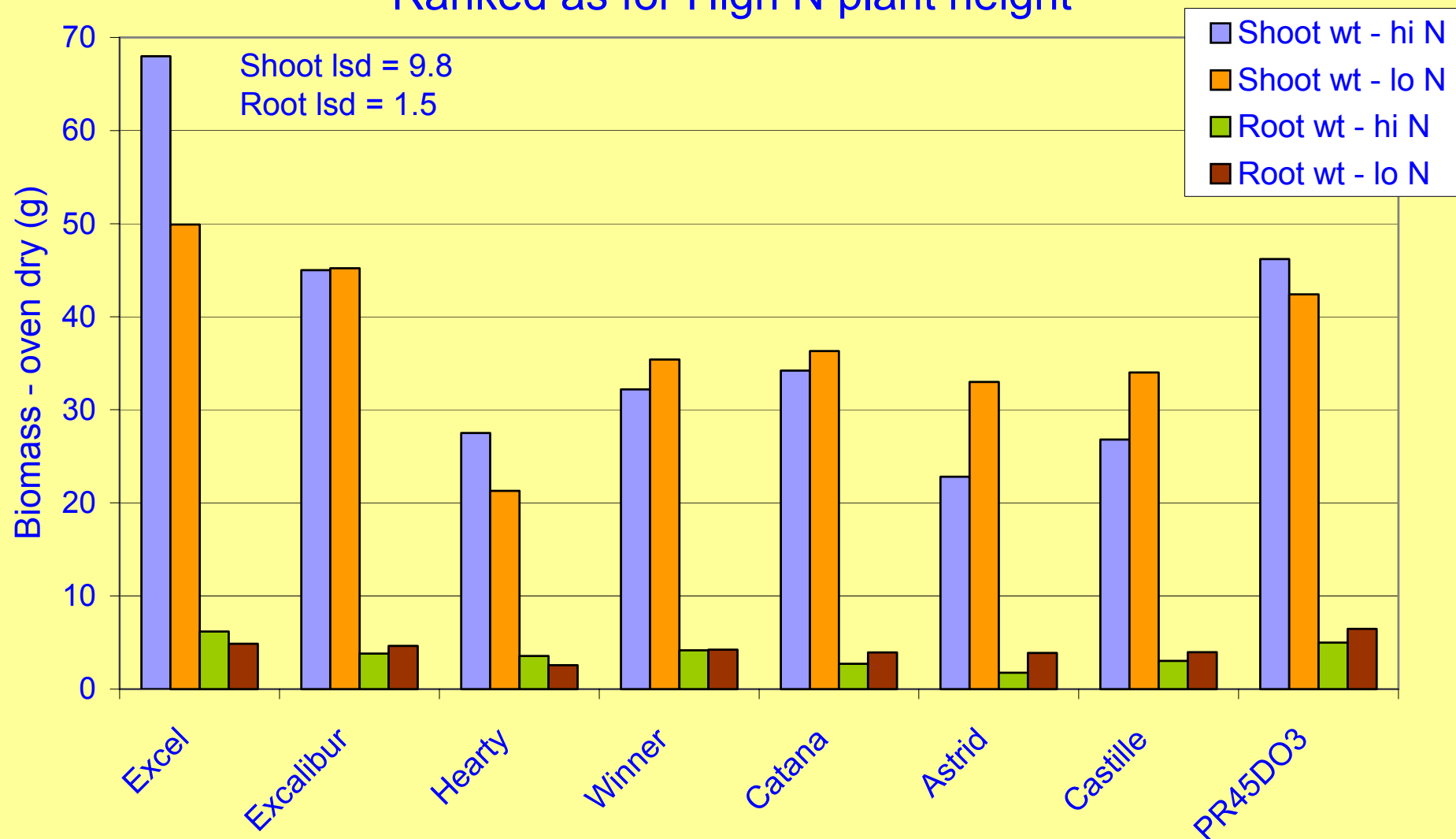
Low input trial 2007/08: End of flowering and earliness of maturity



Low input trial 2007/08: Adult plant heights and root lengths



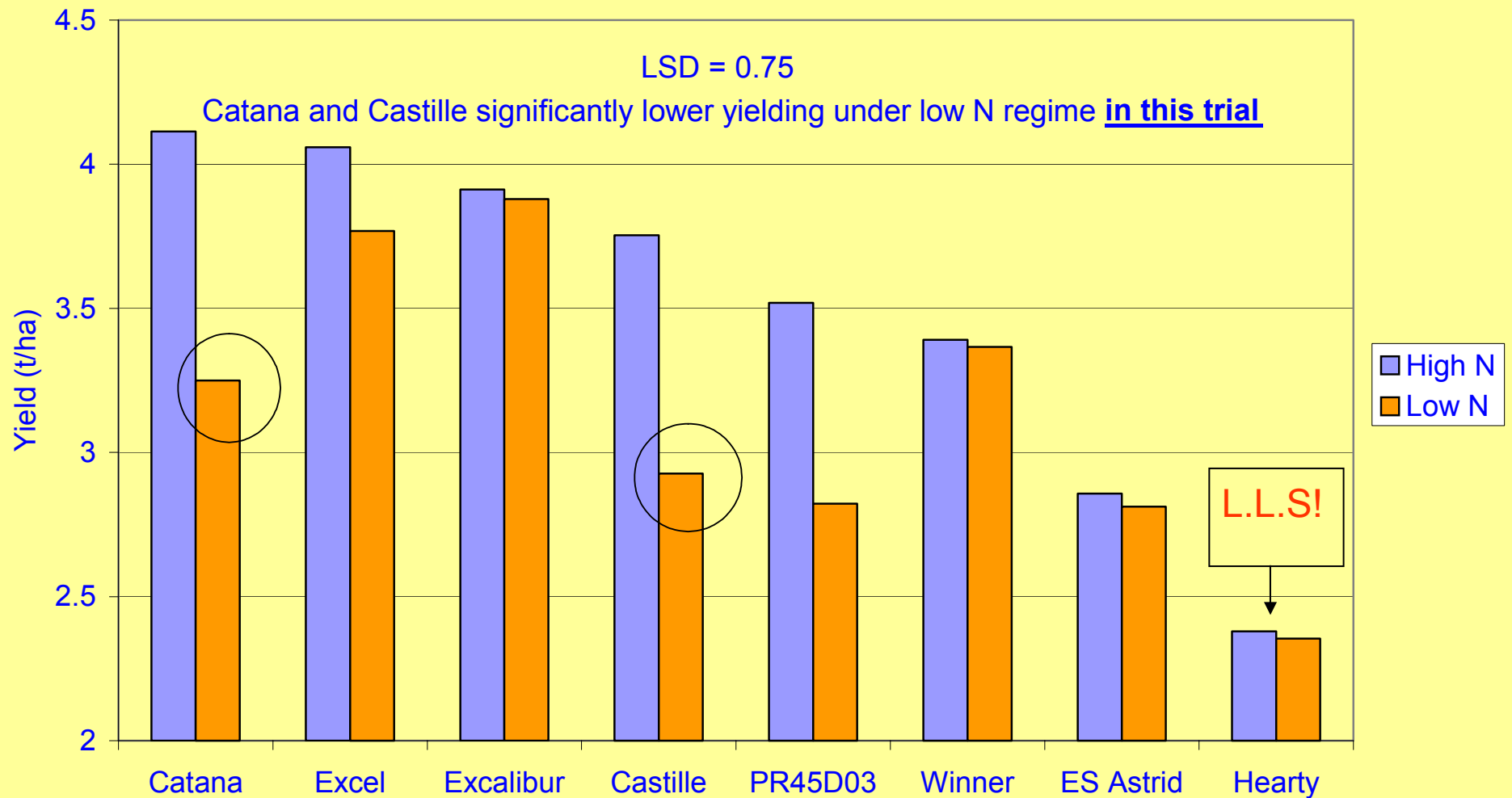
Low input trials 2007/08: Adult plant shoot and root biomass Ranked as for High N plant height



And so to harvest.....



Low input trial 2007/08: Seed yield (t/ha) High N vs low N



And something for the pathologists:

	MEAN LLS%		
	High N	Low N	Overall
Hearty	42.46	31.96	37.21
Castille	1.33	0.71	1.02
Es Astrid	1.13	0.17	0.65
Winner	1.04	0.5	0.77
Excalibur	0.92	0.88	0.9
Excel	0.25	0.79	0.52
PR45DO3	0.25	0.38	0.31
Catana	0.08	0.08	0.08
Grand Mean	5.9	4.4	5.18
l.s.d.	6.0	6.0	4.3
C.V%	-	-	54.6

LLS = light leaf spot = *Pyrenopeziza brassicae*

Low input trial 2008/09

- Same 8 varieties
- 3-rep yield trial
- Good, uniform establishment
- 3 N rates: 0 / 100 / 200kg/ha
- Fungicides to be applied

- Progress so far:

Plots sown 11.09.08 with border row drill



Variety data 2008-2009

- The following data set for young plant development is based on a mean of 9 plots per variety as, at this stage, no fertiliser treatments have been applied.
- Subsequent data will be based on 3 plots per variety for each of 3 N regimes.

Young plant assessments - Nov '08

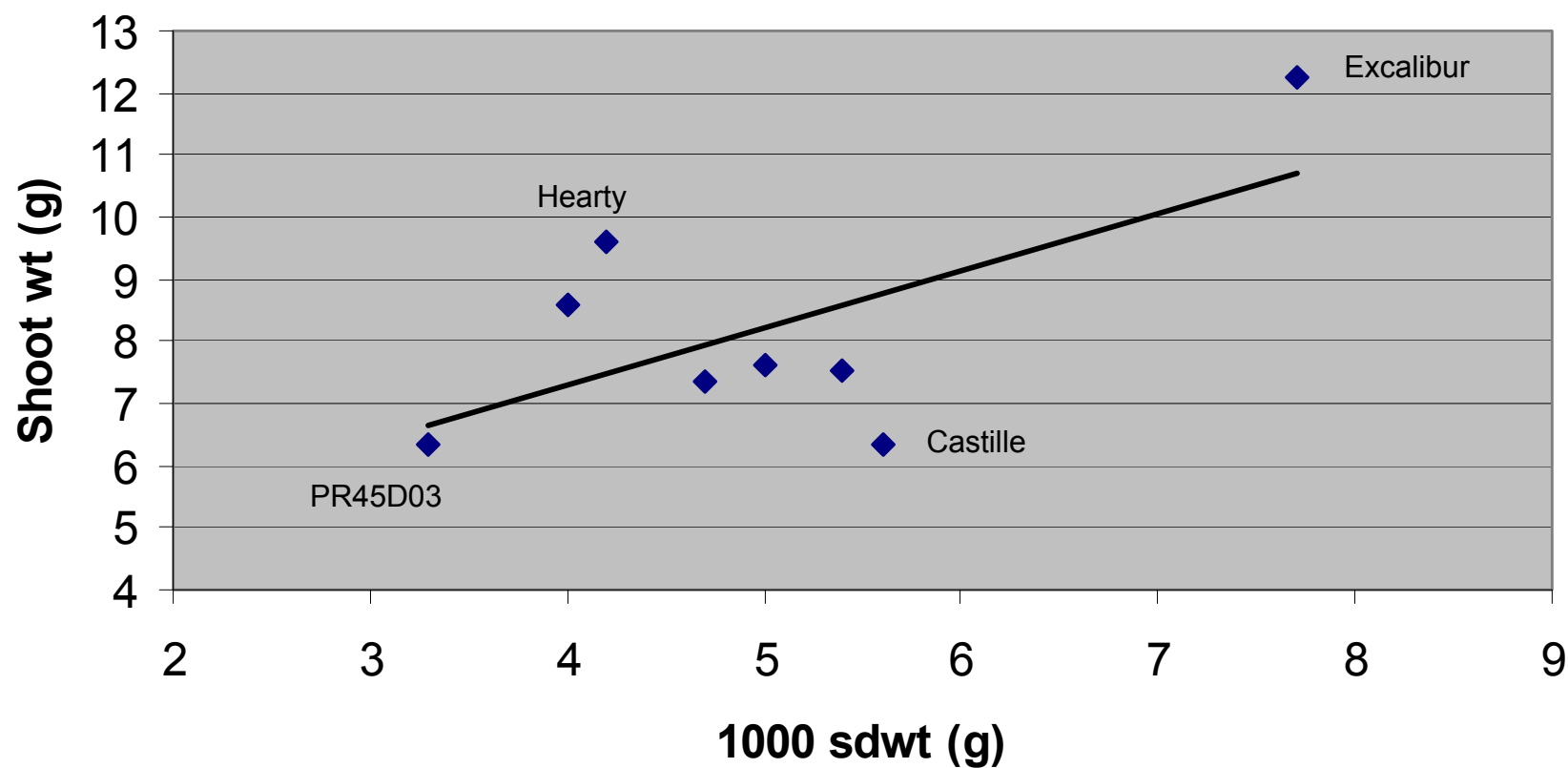
Variety	1000 sd wt (g)	GAI	Biomass (g/10 plants)		Shoot/ root ratio	E. Vig. (9=good)	Leaf nos.
			Shoots	Roots			
Excalibur	7.70	0.74	12.24	1.37	8.9	8.2	6.14
Hearty	4.20	0.82	9.60	1.41	6.8	7.2	5.70
Astrid	4.00	0.62	8.58	0.85	10.2	6.2	5.76
Excel	5.00	0.49	7.62	0.74	10.4	5.3	5.63
Winner	5.40	0.59	7.54	0.99	7.8	5.3	5.43
Catana	4.70	0.50	7.35	0.71	10.4	4.6	5.62
PR45DO3	3.30	0.36	6.34	0.75	8.5	1.4	5.76
Castille	5.60	0.42	6.32	0.68	9.3	3.8	5.77
Mean		0.57	8.20	0.94	9.02	5.26	5.73
LSD		0.12	1.56	0.17	0.74	1.02	0.27
CV%		23.2	20.2	19.1	8.7	20.6	5.0

Significantly **above** / **below** the mean

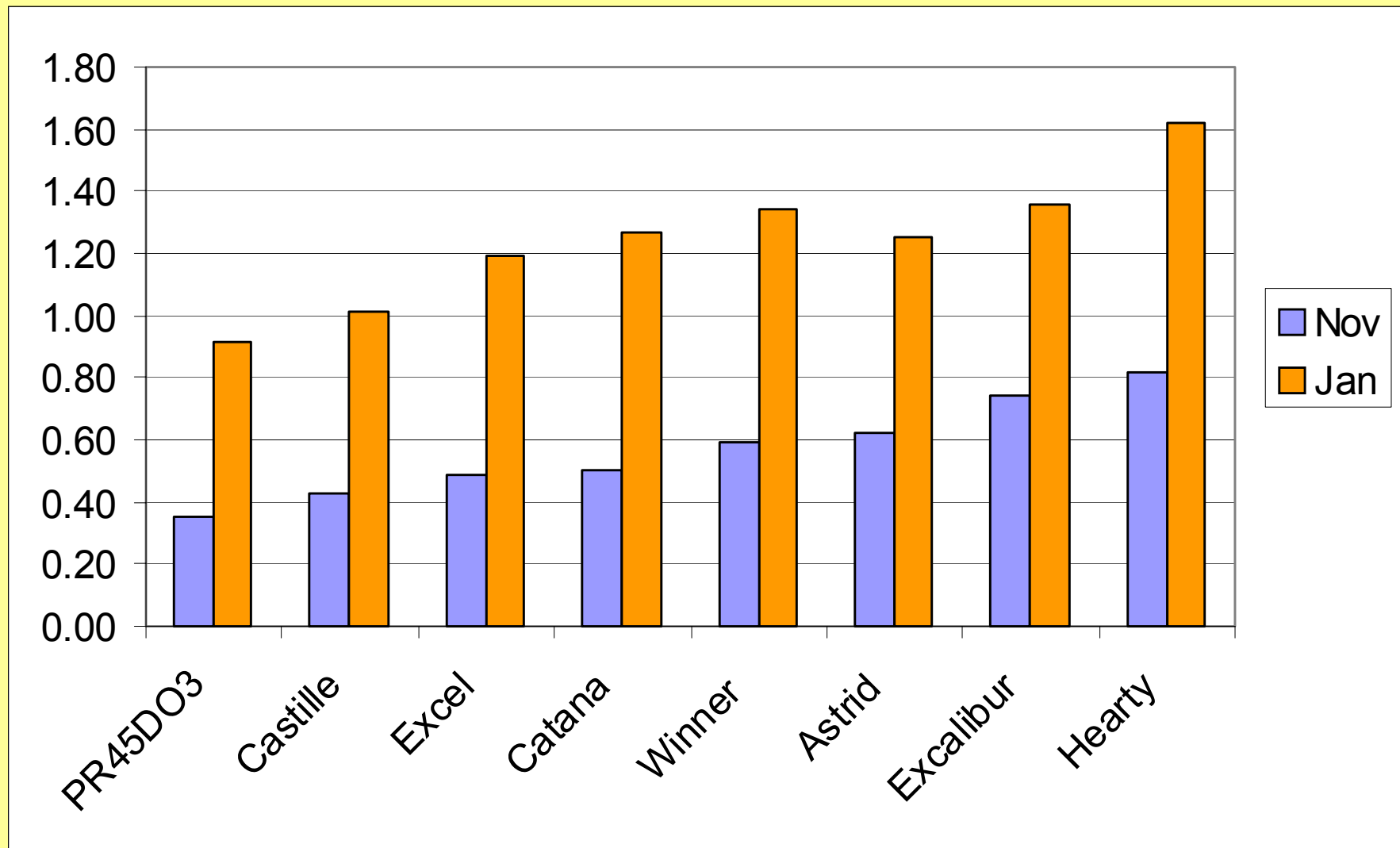
GAI = green area index; E.Vig = early vigour

Low input trial 2008/09

1000 sdwt vs. shoot weight



Green Area Index continuing to develop in early winter



Thank you!

For a full explanation of this presentation and further data from this project
please contact simon.kightley@niab.com