

Dedicated Analytical Solutions

WGN RINGTEST 2015

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March 18th-20th 2015, Milan, Italy



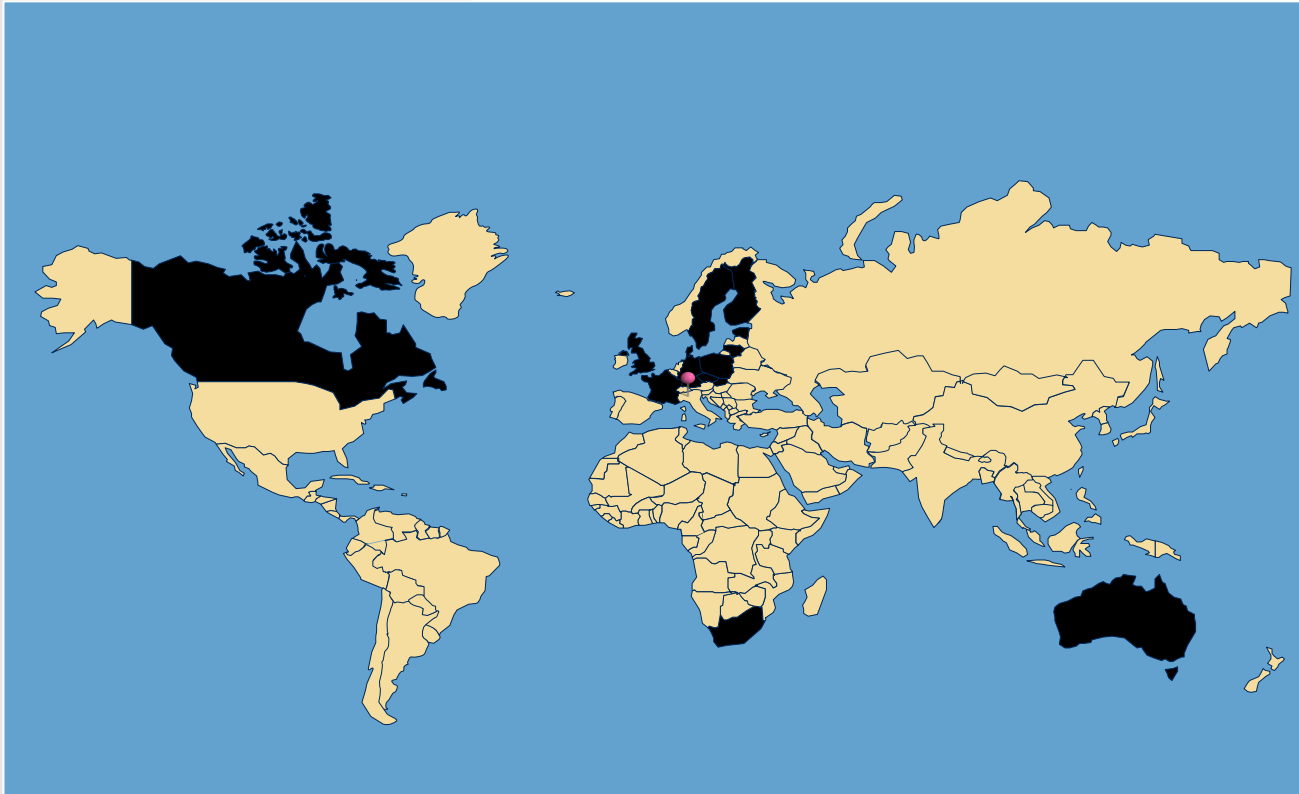
AGENDA

- ▶ Introduction
- ▶ Results for Wheat & Barley
- ▶ Results for Rapeseed
- ▶ Results for Mass per hectolitre by Reference and TWM
- ▶ Conclusions

WORLD GRAIN NETWORK RINGTEST 2015: PURPOSE OF THE STUDY

- ▶ Annual validation of prediction model(s) used in accordance with EN ISO 12099/EN 15948
- ▶ Using samples from the actual harvest in different countries
- ▶ Applying the reference methods valid in the different countries
- ▶ Multi sample, multi parameter and multi lab validation study

PARTICIPATING COUNTRIES

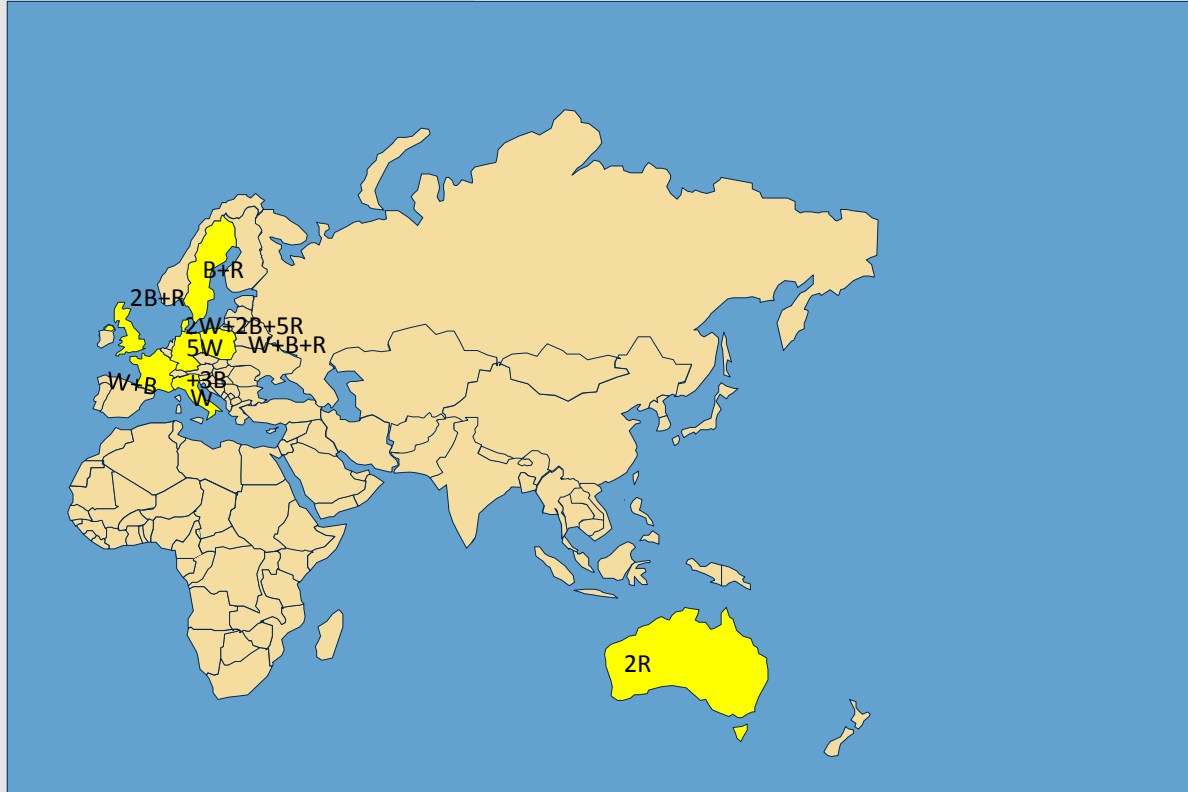


- ▶ Sweden
- ▶ Denmark
- ▶ Finland
- ▶ Estonia
- ▶ Lithuania
- ▶ Poland
- ▶ Germany
- ▶ Czech Republic
- ▶ Slovakia
- ▶ U.K.
- ▶ France
- ▶ Canada
- ▶ South Africa
- ▶ Australia

PARTICIPANTS

Country	Participant	Country	Participant
Australia	CBH, Australian Grain Centre	Poland	Central Lab Agri (CLA), Lublin
Australia	GrainCorp	Poland	Inspectis, Gdansk
Canada	Canadian Grain Commission	Poland	SGS, Gdynia
Czech Republic	Navos	Slovakia	Heineken
Czech Republic	Sladovny Soufflet	South Africa	GWK
Denmark	FOSS Analytical	South Africa	Overberg
Finland	Food Safety Authority (Evira)	South Africa	Rhine Ruhr
France	Agroreso (Arvalis)	South Africa	SAGL
France	InVivo Labs	South Africa	SA Breweries Maltings
Estonia	Agricultural Research Centre Plant Products Quality Testing	South Africa	SENWES
Lithuania	Laboratory	South Africa	SSK
Germany	Max Rubner Institute, Detmold	Sweden	Eurofins
Poland	Cargill	United Kingdom	Sciantec Analytical Services

ORIGIN OF SAMPLES FROM 2014 HARVEST



▶ Total = 30 samples

ORIGIN OF WHEAT SAMPLES FROM 2014 HARVEST

Marking	Specification	Country
W1	Wheat	Italy
W2	“Linus” Wheat	Germany
W3	“Toros” Wheat	Germany
W4	“Palvas” Wheat	Germany
W5	“Matrix” Wheat	Germany
W6	“Arkadia” Winter Wheat	Poland
W7	Wheat	Denmark
W8	“Asano” Wheat	Denmark
W9	“Linus” Wheat	Germany
W10	Durum Wheat	France

ORIGIN OF BARLEY SAMPLES FROM 2014 HARVEST

Marking	Specification	Country
B1	"Marthe" Barley	Denmark
B2	Winter Barley	Germany
B3	"Catamaran" Spring Barley	Germany
B4	"Maris Otter" Barley	UK
B5	"Odyssey" Barley	UK
B6	"Iron" Spring Barley	Poland
B7	"Loreley" Winter Barley	Germany
B8	"Propino" Barley	Denmark
B9	"Sebastian" Barley	France
B10	"Cinnamon" Barley	Sweden

ORIGIN OF RAPESEED SAMPLES FROM 2014 HARVEST

Marking	Specification	Country
R1	Canola	Australia
R2	Canola	Australia
R3	Rapeseed	UK
R4	“Monolith” Winter Rapeseed	Poland
R5	Rapeseed	Denmark
R6	Rapeseed	Denmark
R7	Rapeseed	Denmark
R8	Rapeseed	Denmark
R9	Rapeseed	Denmark
R10	Rapeseed	Sweden

WGN PARAMETERS

Moisture

- Reference methods
- NIRS (local models & ANN)

Crude Protein

- Reference methods
- NIRS (local models & ANN)

Crude Oil

- Reference methods
- NIRS (local models & ANN)

Mass/hL

- Reference method(s)
- Test Weight Module

OTHER OPTIONAL PARAMETERS

Falling Number

Wet Gluten

Sedimentation
Index

Starch

Hardness

Erucic Acid

RESULTS FOR WHEAT & BARLEY

- ▶ Protein
- ▶ Moisture

EXAMPLE COMPILATION OF RESULTS: PROTEIN BY REFERENCE METHODS

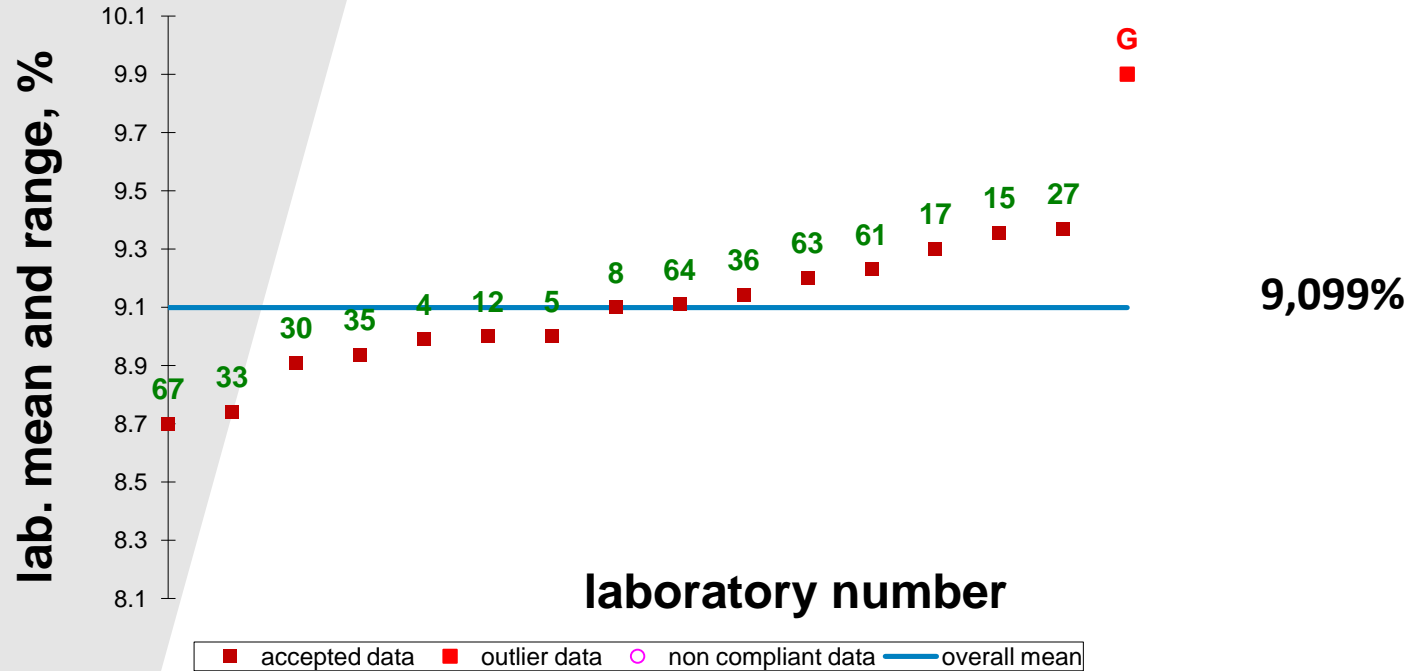
Lab Code	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	Mean	Dev	SDD
4	9.83	9.83	8.99	8.66	10.27	12.39	11.83	9.74	10.70	13.72	10.60	0.01	0.12
5	9.90	10.10	9.00	8.70	10.20	12.20	11.70	9.70	10.60	13.80	10.59	0.00	0.14
8	10.00	10.10	9.10	8.70	10.30	12.40	11.90	9.70	10.70	13.60	10.65	0.06	0.07
12	9.90	9.80	9.00	8.70	10.20	12.40	11.70	9.70	10.40	13.60	10.54	-0.05	0.11
15	9.86	10.04	9.36	8.81	10.08	12.13	11.76	9.93	10.76	13.47	10.62	0.03	0.14
17	9.80	10.00	9.30	8.60	10.10	12.00	12.00	9.70	10.40	13.60	10.55	-0.04	0.18
27	9.99	10.06	9.37	8.83	10.51	12.35	11.85	10.05	10.80	14.09	10.79	0.20	0.18
30	10.07	10.02	8.91	8.71	10.27	12.45	11.85	9.89	10.66	13.81	10.66	0.08	0.14
33	9.81	9.93	8.74	8.51	10.33	12.28	11.85	9.73	10.43	13.44	10.51	-0.08	0.15
35	9.70	9.73	8.94	8.49	9.97	12.25	11.77	9.55	10.48	13.68	10.45	-0.13	0.15
36	9.94	10.05	9.14	8.86	10.61	12.44	11.57	9.90	10.91	N/A	10.38	-0.21	0.18
61	9.91	9.90	9.23	8.76	10.33	12.54	11.92	10.51	10.56	13.95	10.76	0.17	0.26
62	10.30	10.40	9.90	8.90	10.20	12.80	11.90	9.40	10.70	10.50	10.50	-0.09	1.06
63	10.40	9.80	9.20	8.90	10.10	12.40	11.60	9.90	10.60	13.70	10.66	0.07	0.20
64	10.27	10.13	9.11	9.06	10.13	12.16	12.09	9.64	11.10	13.82	10.75	0.16	0.23
67	9.91	9.78	8.70	8.55	9.81	11.94	11.74	9.70	10.51	13.41	10.41	-0.18	0.15
Average	10.0	10.0	9.1	8.7	10.2	12.3	11.8	9.8	10.6	13.5	10.6	0.0	0.2
Std	0.20	0.17	0.29	0.16	0.19	0.21	0.14	0.25	0.19	0.84	0.12	0.12	0.23
Min	9.7	9.7	8.7	8.5	9.8	11.9	11.6	9.4	10.4	10.5	10.4	-0.2	0.1
Max	10.4	10.4	9.9	9.1	10.6	12.8	12.1	10.5	11.1	14.1	10.8	0.2	1.1

Deviation = Mean Value - Average Value

SDD=Standard Deviation of Differences (after adjustment for deviation)

STATISTICAL EVALUATION OF PROTEIN IN BARLEY BY REFERENCE ANALYSIS

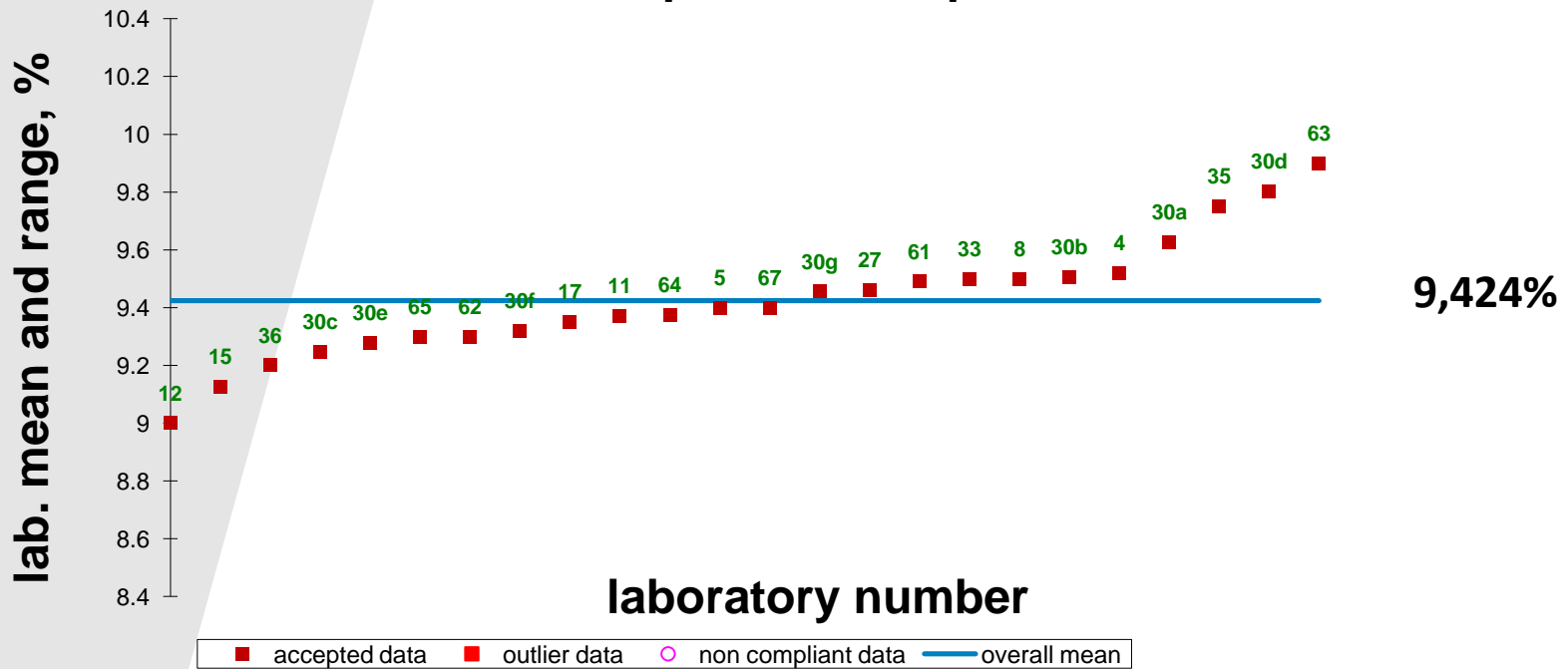
WGN 2015, protein, sample B3, reference



Lab 62 excluded as outlier

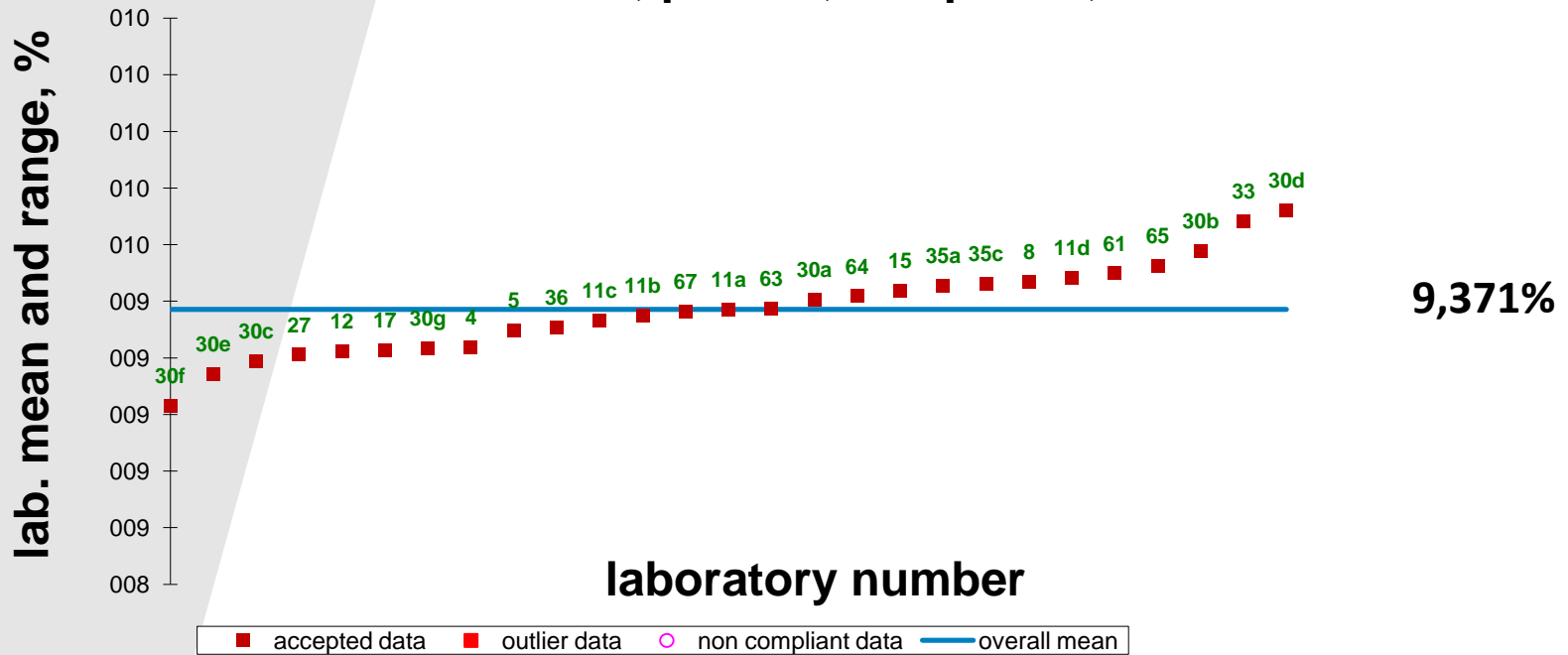
STATISTICAL EVALUATION OF PROTEIN IN BARLEY BY LOCAL ANN MODELS

WGN 2015, protein, sample B3, local



STATISTICAL EVALUATION OF PROTEIN IN BARLEY BY GLOBAL ANN MODEL

WGN 2015, protein, sample B3, ANN

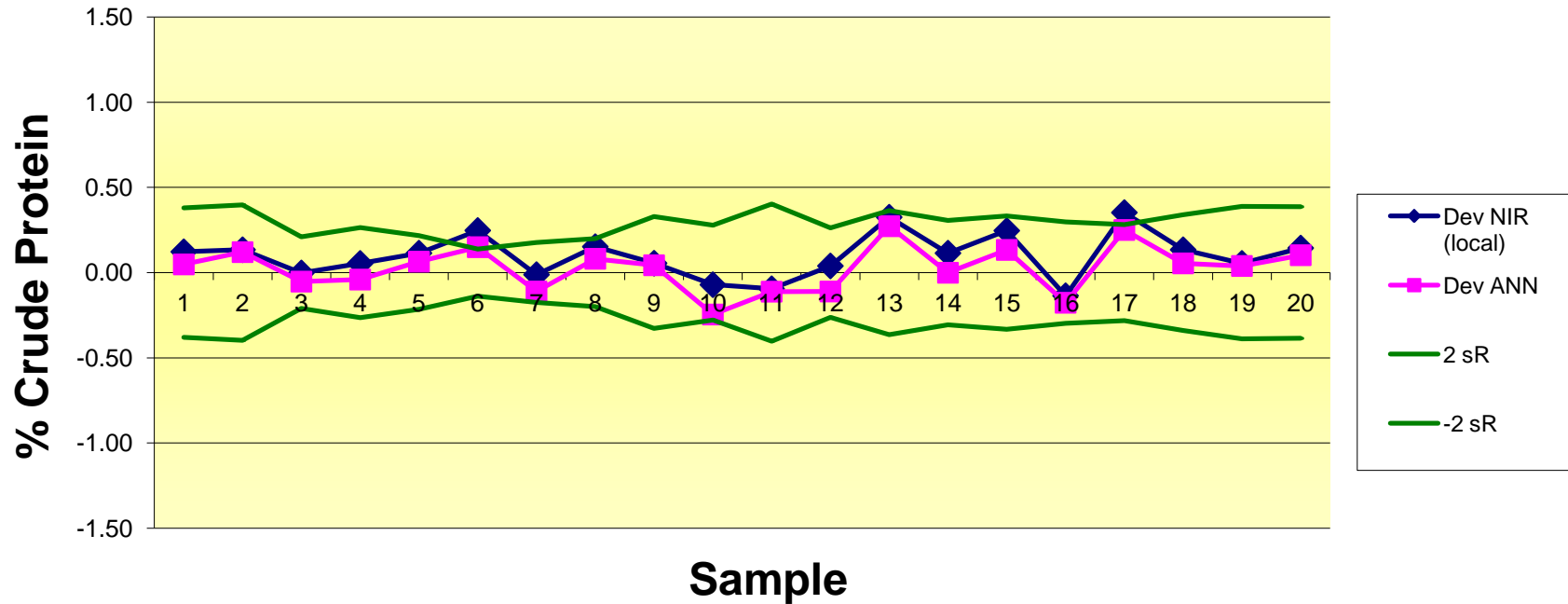


PROTEIN BY REFERENCE METHOD: Z-VALUES FOR BARLEY

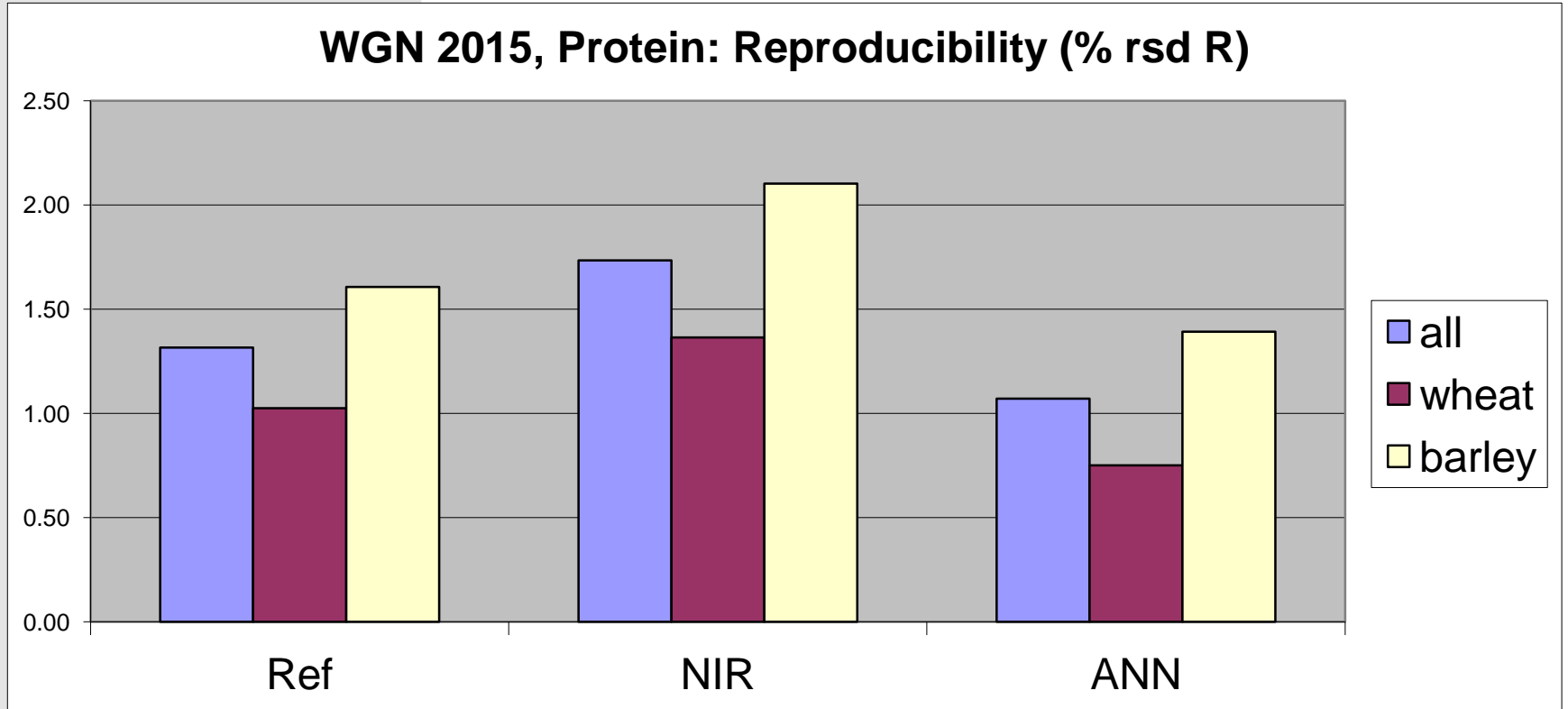
Lab Code	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
4	-0.7	-0.7	-0.5	-0.4	0.1	0.4	0.1	-0.1	0.2	0.1
5	-0.4	0.7	-0.5	-0.2	-0.2	-0.6	-0.6	-0.3	-0.3	0.5
8	0.1	0.7	0.0	-0.2	0.3	0.4	0.4	-0.3	0.2	-0.5
12	-0.4	-0.8	-0.5	-0.2	-0.2	0.4	-0.6	-0.3	-1.3	-0.5
15	-0.6	0.4	1.3	0.3	-0.8	-0.9	-0.3	0.9	0.5	-1.1
17	-0.9	0.2	1.0	-0.7	-0.7	-1.6	0.9	-0.3	-1.3	-0.5
27	0.1	0.5	1.4	0.4	1.4	0.2	0.2	1.5	0.7	2.0
30	0.5	0.3	-0.9	-0.2	0.1	0.7	0.2	0.7	0.0	0.6
33	-0.8	-0.2	-1.8	-1.2	0.4	-0.2	0.2	-0.1	-1.1	-1.3
35	-1.4	-1.2	-0.8	-1.3	-1.4	-0.3	-0.3	-1.0	-0.9	-0.1
36	-0.2	0.4	0.2	0.6	1.8	0.6	-1.3	0.8	1.3	N/A
61	-0.3	-0.3	0.7	0.1	0.4	1.1	0.5	3.8	-0.5	1.3
62	1.6	2.2	4.0	0.8	-0.2	2.4	0.4	-1.8	0.2	-16.0
63	2.1	-0.8	0.5	0.8	-0.7	0.4	-1.1	0.7	-0.3	0.0
64	1.5	0.8	0.1	1.6	-0.5	-0.8	1.4	-0.6	2.2	0.6
67	-0.3	-0.9	-2.0	-1.0	-2.2	-1.9	-0.4	-0.3	-0.7	-1.4

PERFORMANCE OF PROTEIN PREDICTION MODELS

WGN 2015, Protein: Deviation from BETV

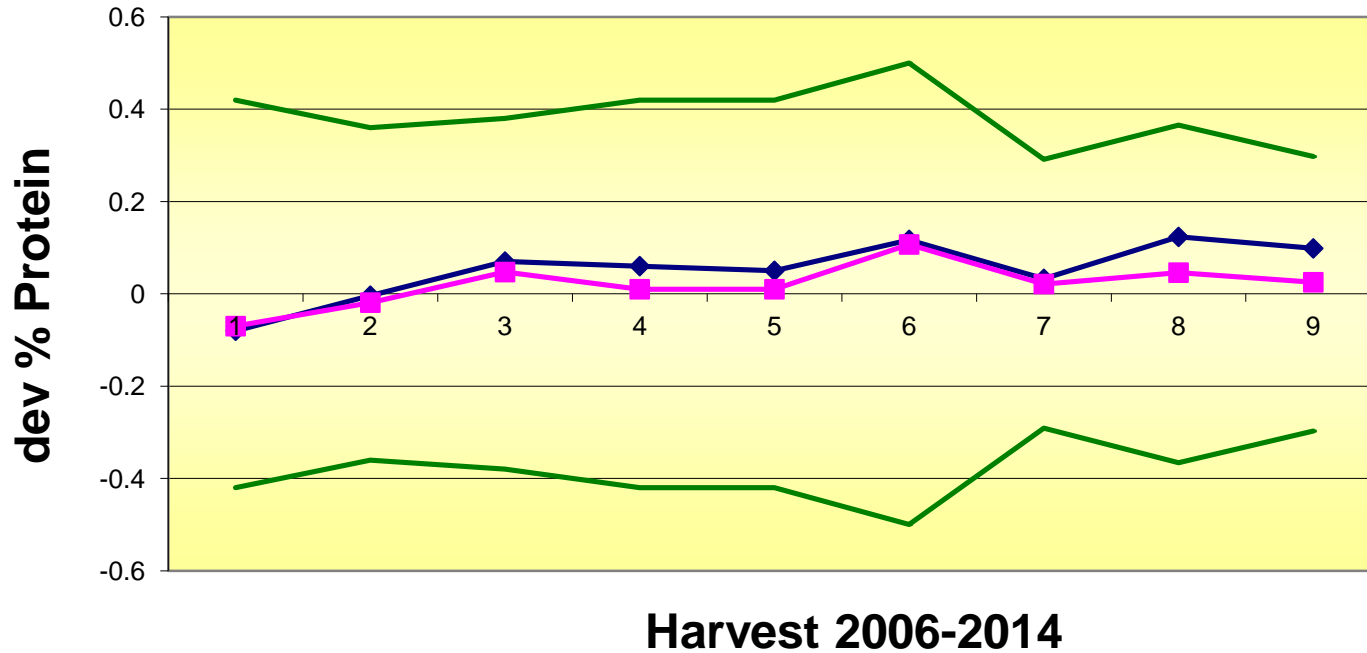


PROTEIN IN WHEAT & BARLEY: AVERAGE RSD R



HISTORICAL PERFORMANCE OF PROTEIN PREDICTION MODELS

Stability Protein



Z-VALUES FOR MOISTURE IN WHEAT

Reference methods

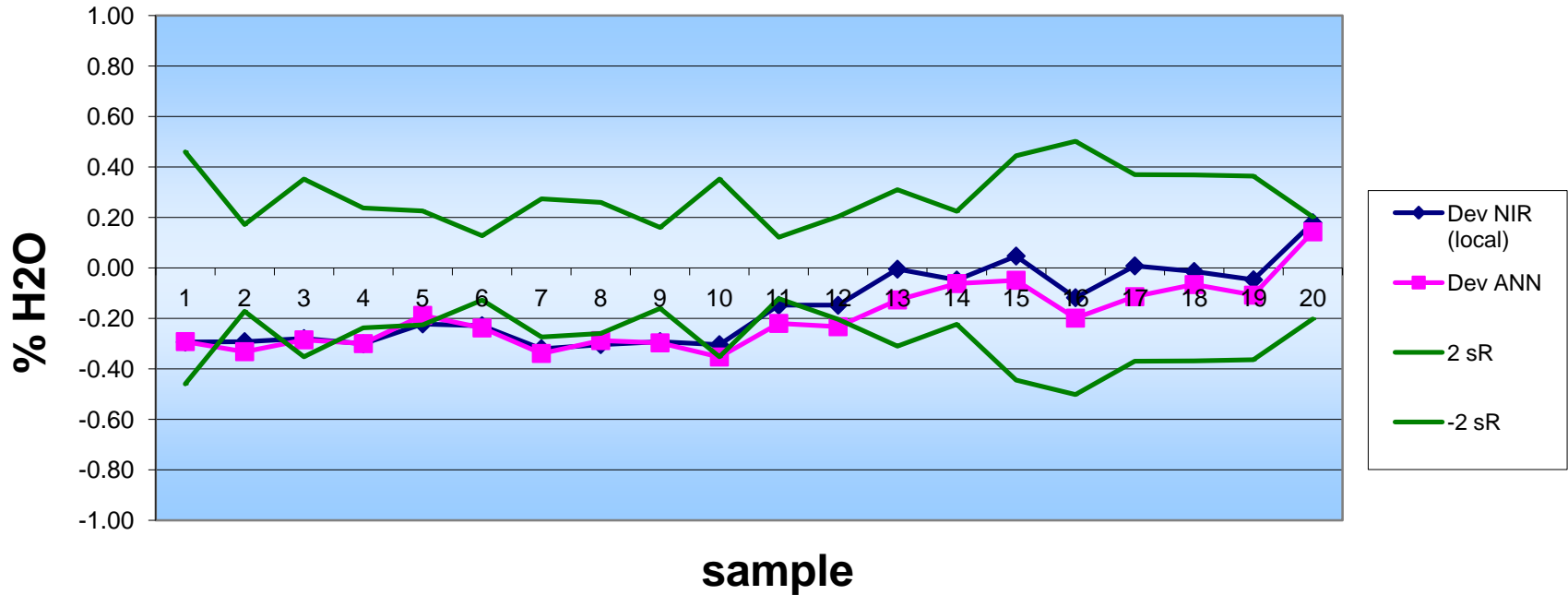
Lab	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
4	-3.0	0.6	0.6	1.2	0.5	0.8	0.6	0.6	0.7	0.6
5	0.5	0.5	0.9	-0.3	1.1	-0.3	0.7	0.4	0.5	2.5
8	1.2	0.5	0.2	0.5	1.1	-0.3	0.7	0.4	-0.2	0.3
12	-0.9	-0.9	-1.2	-0.3	-1.1	-0.3	-0.7	-0.3	-0.2	0.3
15	0.3	-0.3	-0.9	0.1	-0.7	-0.6	-0.1	-0.4	-0.8	-0.8
17	0.9	0.0	-0.2	0.2	0.4	0.7	0.7	0.6	0.8	1.5
27	-0.5	-1.1	-1.3	-1.5	-1.0	-2.1	-0.3	-1.4	-1.2	-1.0
30	-2.4	-11.6	-14.8	-8.1	-11.1	-11.8	-9.3	-11.7	-9.5	-11.8
33	4.0	4.2	3.1	0.4	0.3	-0.2	1.4	1.9	3.0	7.3
35	-0.4	-0.1	-0.2	0.3	-0.2	0.0	-0.9	0.3	-0.1	-1.1
36	0.5	-0.2	-1.2	-1.0	-0.3	-0.3	-2.1	-1.7	-0.2	-1.8
61	0.0	0.7	0.3	0.8	0.4	0.6	-1.1	-0.7	0.0	-1.1
64	0.3	0.7	1.0	0.8	0.8	0.2	0.8	0.4	0.3	1.0
67	-0.4	-0.5	-1.3	-1.3	-1.2	-0.2	0.2	-0.2	0.2	-0.4

Local prediction models

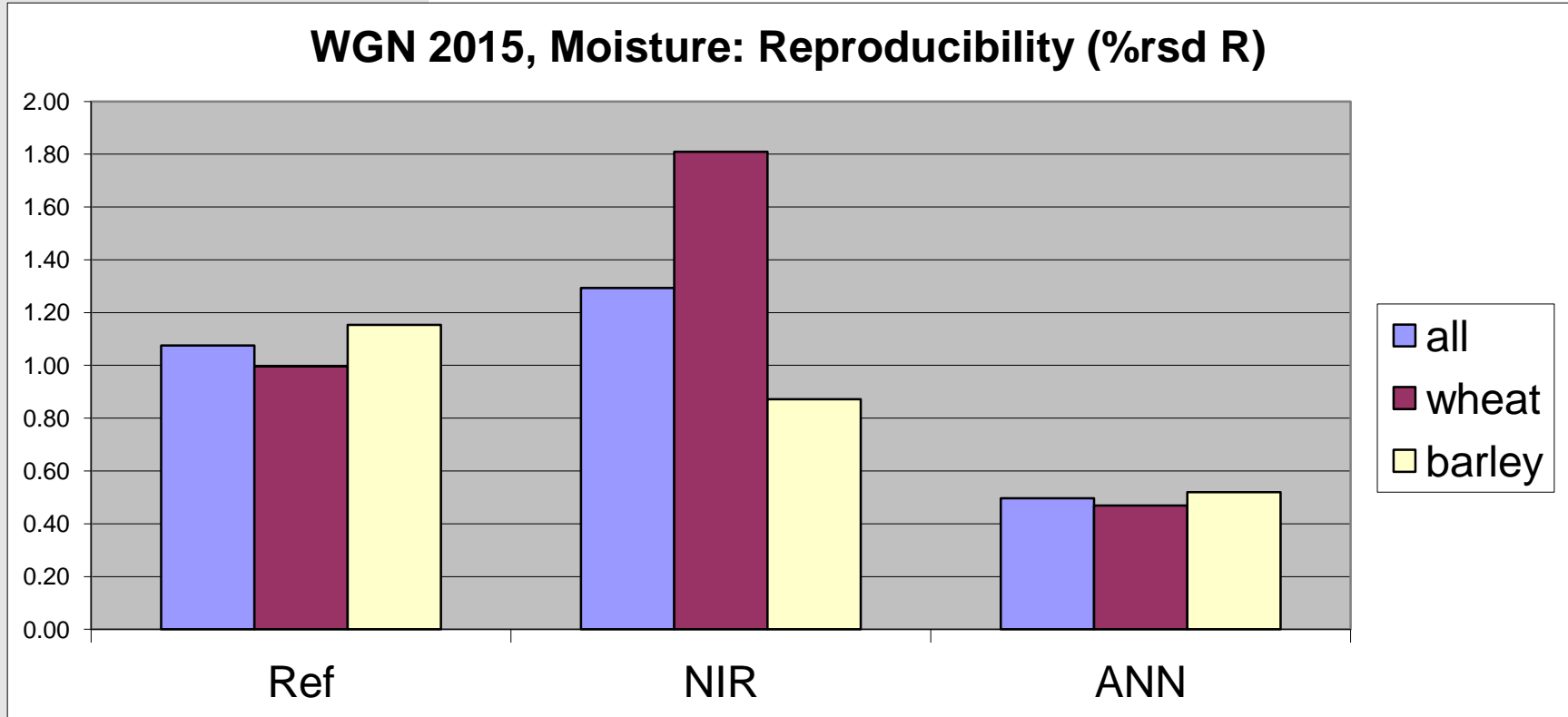
Lab	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
4	0.4	0.1	0.3	0.0	0.4	0.6	0.9	0.7	0.4	0.4
5	2.6	1.9	2.2	2.6	2.7	2.0	1.6	2.6	1.9	1.8
8	2.6	2.6	3.0	2.6	2.7	2.7	2.3	2.6	2.6	2.5
11	-0.1	-0.5	0.2	-0.1	0.1	0.0	-0.4	0.0	-0.4	-0.6
12	0.4	1.2	1.5	1.2	1.2	0.6	0.2	1.2	0.5	0.4
15	1.7	1.1	1.5	1.6	1.8	1.2	1.2	1.8	1.5	1.6
17	0.4	0.1	0.1	0.1	-0.2	-0.1	0.9	0.5	0.5	0.7
27	-0.1	-1.2	-0.7	0.4	-0.7	-1.0	-0.4	-1.1	0.3	-0.9
30a	-1.8	-2.1	-2.2	-2.0	-1.7	-2.0	-1.5	-1.4	-1.7	-1.6
30b	-2.5	-2.3	-2.3	-2.5	-2.2	-2.7	-2.3	-2.4	-2.4	-3.1
30c	-2.0	-1.6	-1.5	-1.6	-1.7	-2.1	-1.7	-1.6	-1.5	-2.3
30d	-1.7	-0.5	0.1	-0.4	-0.5	-0.8	-1.2	-0.9	-1.4	-1.9
30e	-2.3	-2.3	-2.2	-2.1	-2.0	-2.3	-2.0	-2.3	-2.4	-2.7
30f	-2.4	-2.3	-2.2	-2.2	-2.0	-2.2	-1.9	-1.9	-2.4	-2.7
33	2.6	1.9	3.0	2.6	2.7	2.0	2.3	2.6	2.6	1.8
35	1.2	0.2	-0.4	0.3	0.5	0.1	1.7	0.8	0.8	0.8
36	0.8	-1.4	-1.8	-1.4	-2.0	-2.2	0.6	-1.4	0.2	0.7
61	0.2	0.2	0.5	0.0	0.0	0.0	-0.3	0.1	0.3	-0.1
62	6.2	5.5	6.5	6.2	5.5	5.6	5.9	5.5	6.2	5.4
64	-0.1	-0.1	0.4	0.4	0.1	-0.5	-0.4	-0.3	0.2	-0.2
66	-0.3	-1.0	-0.6	-0.3	-0.2	0.6	0.2	-0.3	-0.2	-0.3
67	0.4	0.5	1.0	0.7	1.0	0.4	0.4	0.8	0.4	0.2

PERFORMANCE OF MOISTURE PREDICTION MODELS

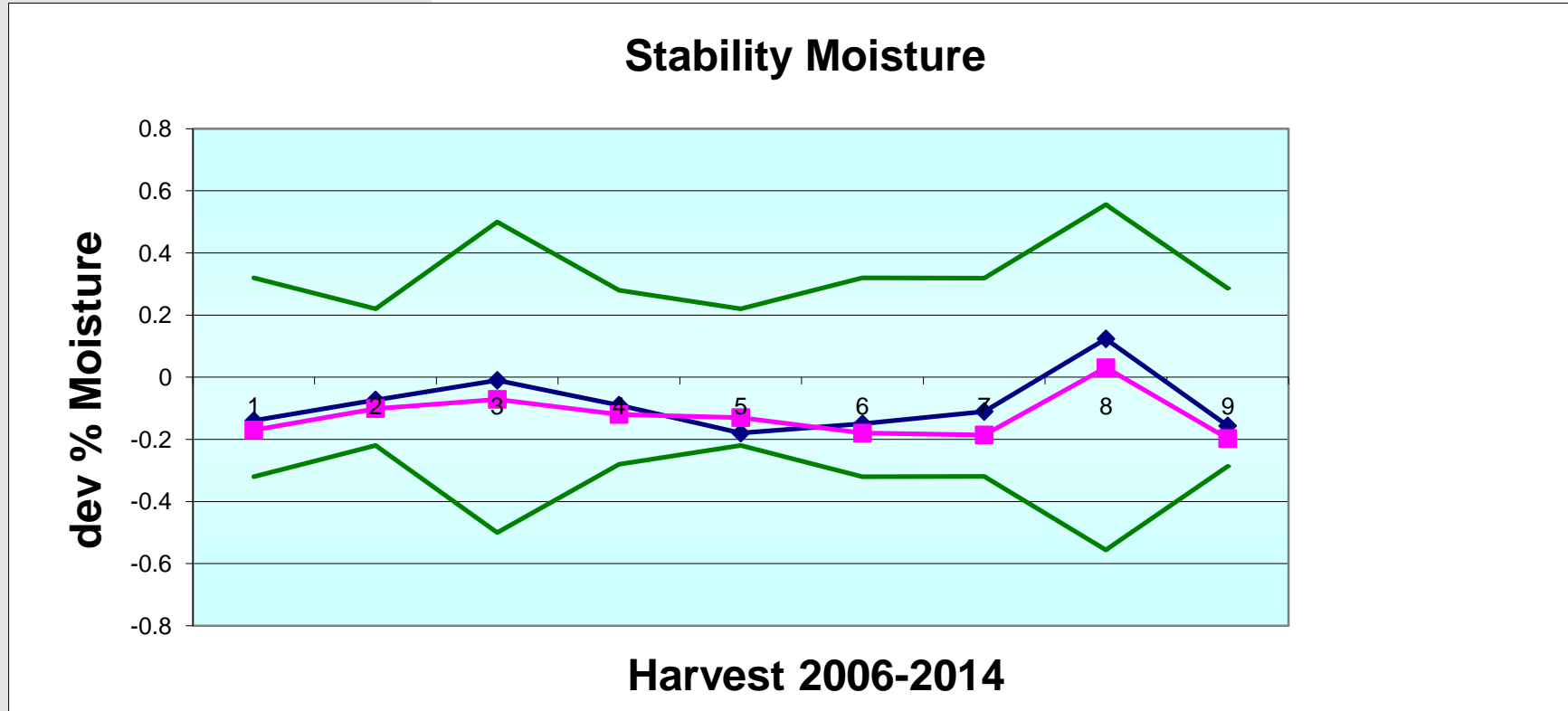
WGN 2015, Moisture: Deviation from BETV



MOISTURE IN WHEAT & BARLEY: AVERAGE RSD R



HISTORICAL PERFORMANCE OF MOISTURE PREDICTION MODELS



WGN SUMMARY 2015

PROTEIN/MOISTURE IN WHEAT/BARLEY

WGN 2015 all samples (2014 harvest)	Ref. methods	local models	FOSS ANN
Protein, range	8.7 % - 14.3 %		
Mean (%)	11.58	11.67	11.60
deviation from mean		0.10	0.03
SD reproducibility	0.15	0.20	0.12
RSD reproducibility	1.3	1.7	1.1
Moisture, range	11.8 % - 15.0 %		
Mean (%)	13.34	13.18	13.14
deviation from mean		-0.16	-0.20
SD reproducibility	0.14	0.17	0.07
RSD reproducibility	1.1	1.3	0.5

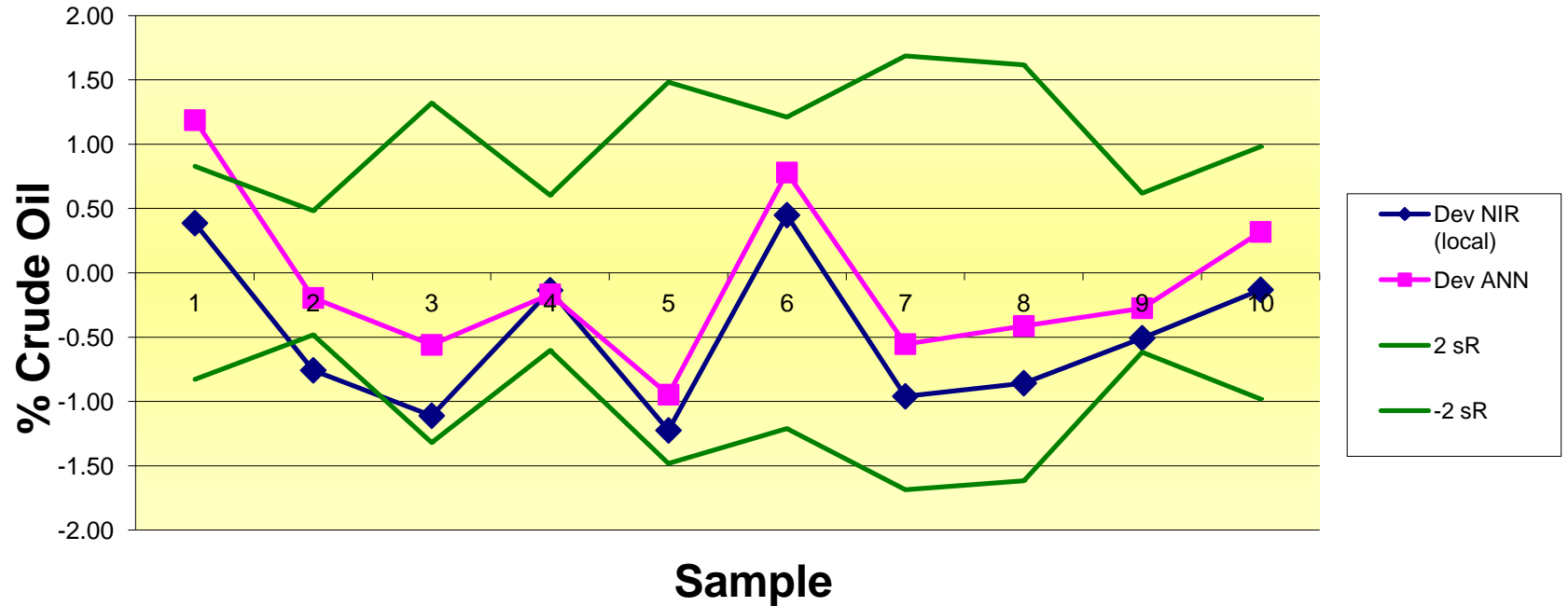
RESULTS FOR RAPESEED

- ▶ Oil
- ▶ Moisture

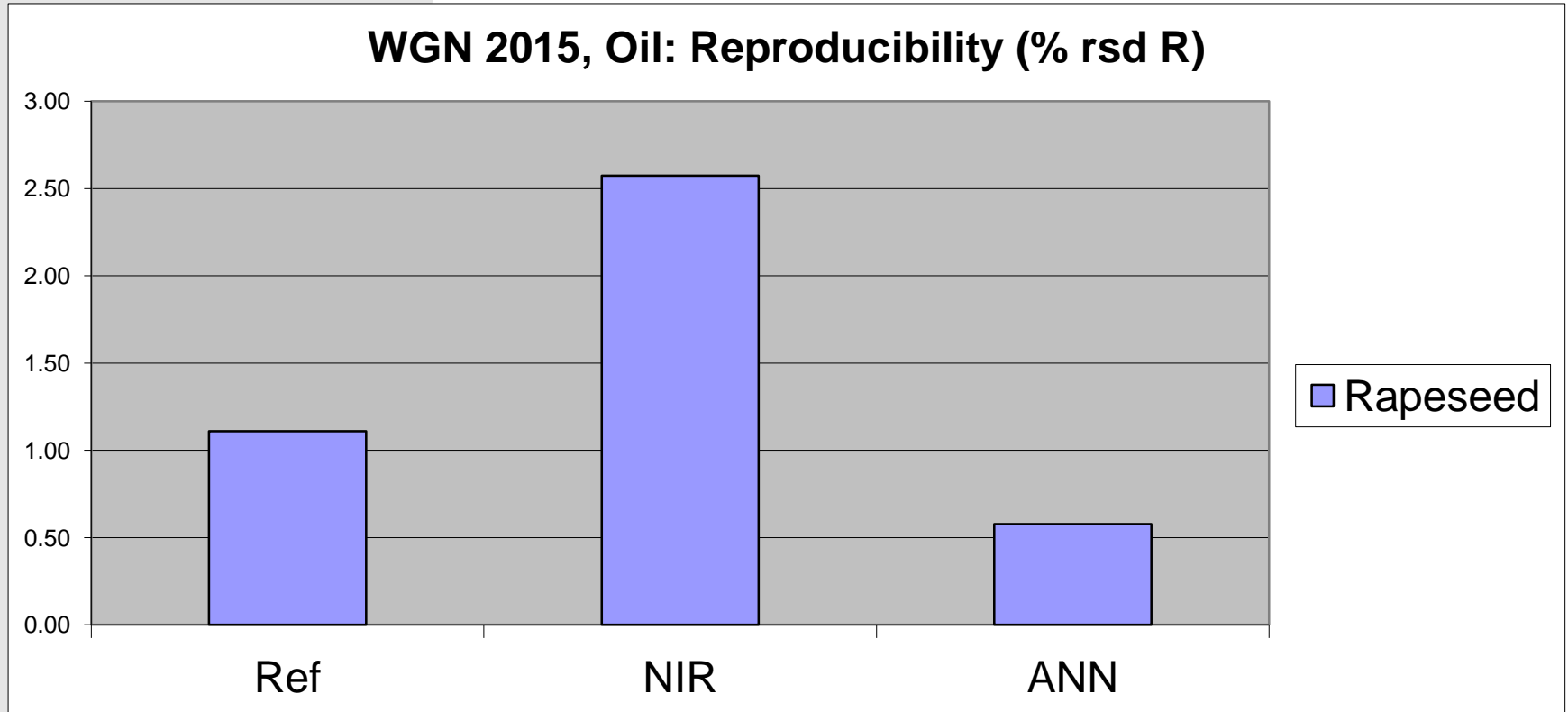


PERFORMANCE OF OIL PREDICTION MODELS

WGN 2015, Oil: Deviation from BETV

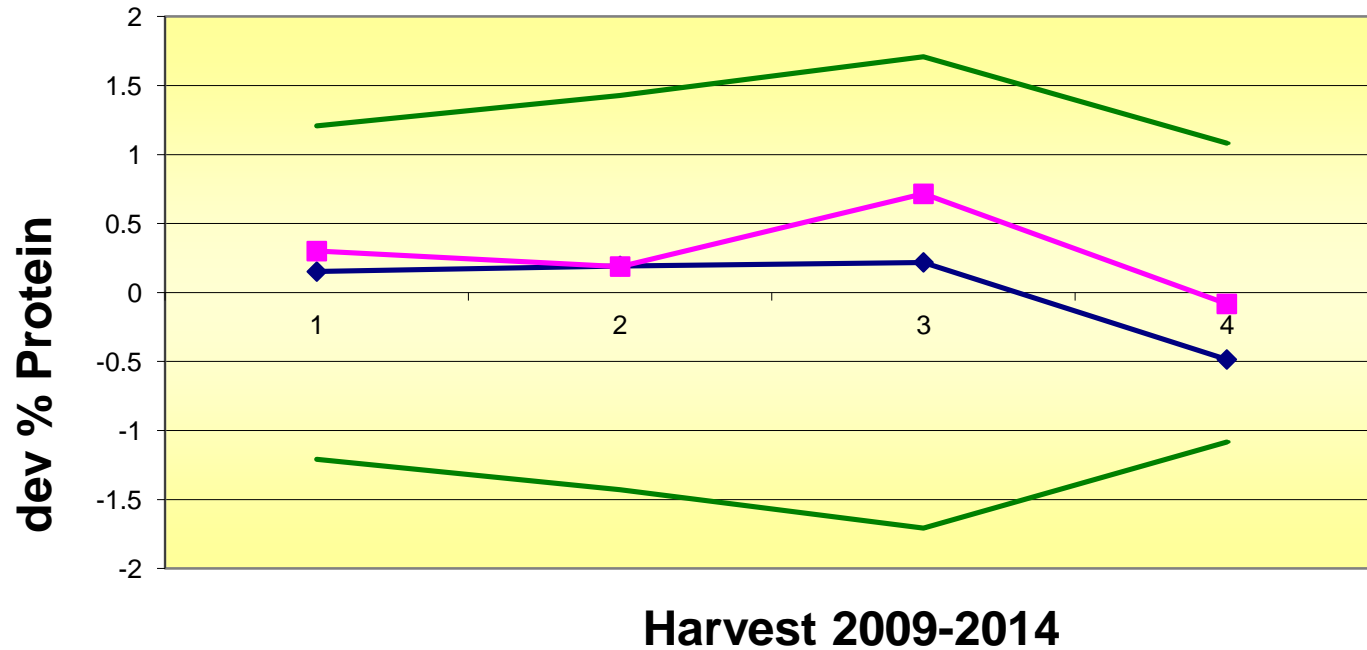


OIL IN RAPESEED: AVERAGE RSD R



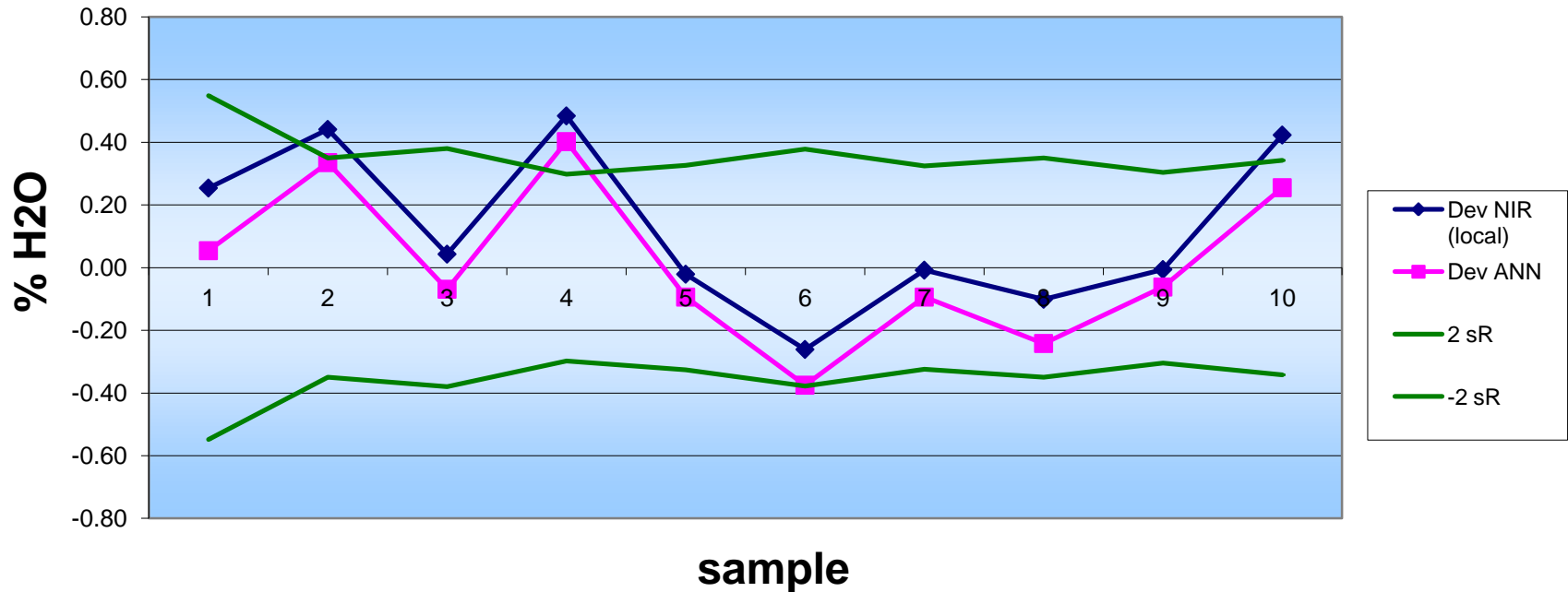
HISTORICAL PERFORMANCE OF OIL PREDICTION MODELS

Stability Oil

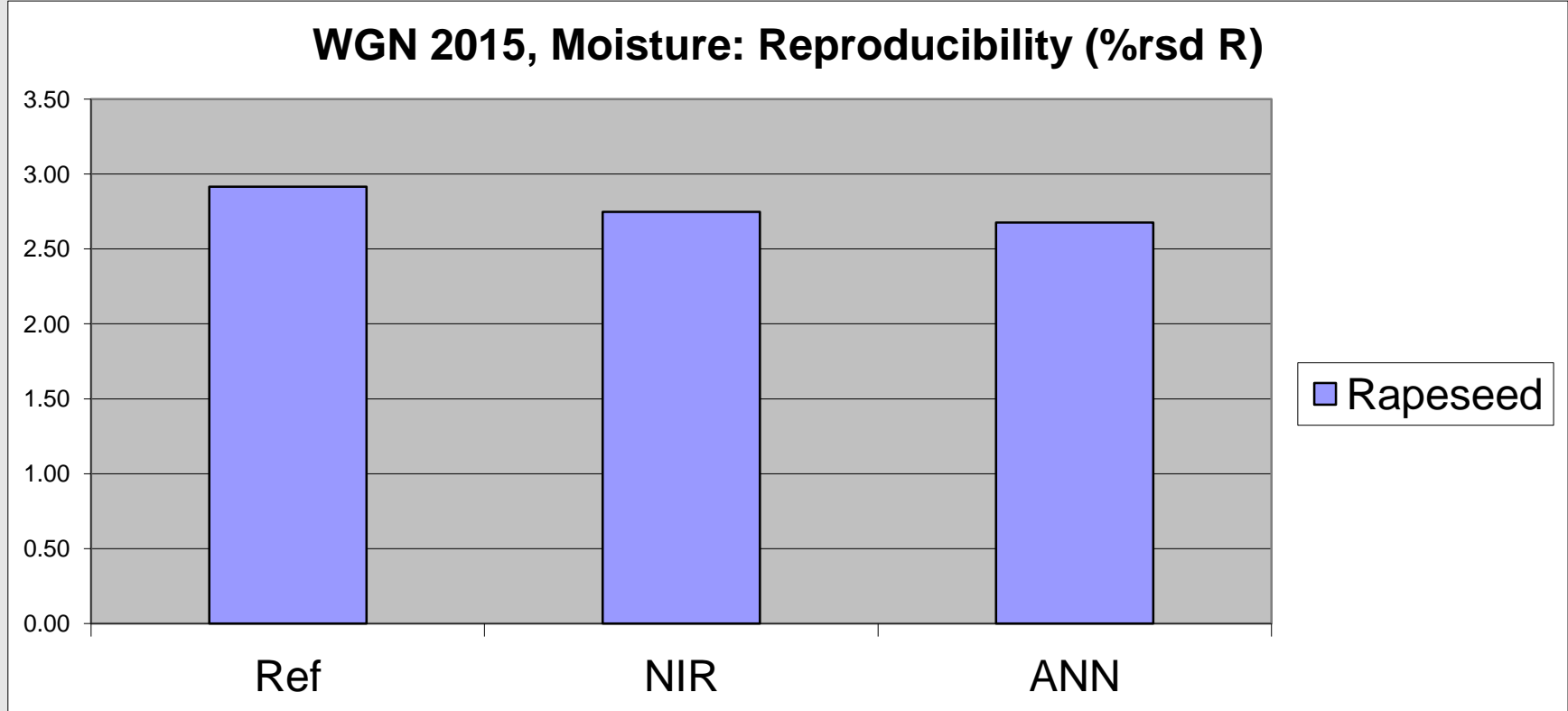


PERFORMANCE OF MOISTURE PREDICTION MODELS

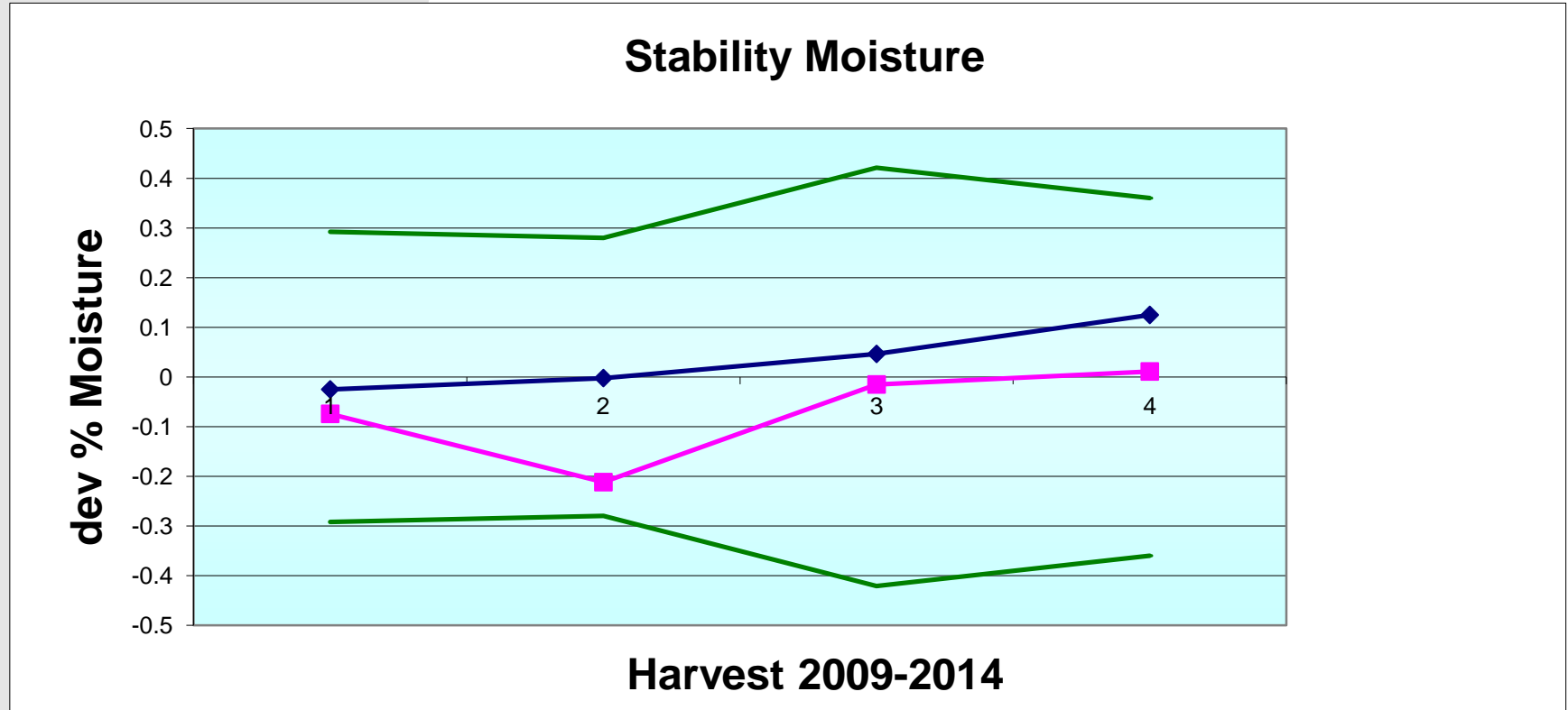
WGN 2015, Moisture: Deviation from BETV



MOISTURE IN RAPESEED: AVERAGE RSD R



HISTORICAL PERFORMANCE OF MOISTURE PREDICTION MODELS



HISTORICAL PERFORMANCE OF MOISTURE PREDICTION MODELS

WGN 2015 all samples (2014 harvest)	Ref. methods	local models	FOSS ANN
Oil, range	41.0 % - 51.6 %		
Mean (%)	48.95	48.47	48.87
deviation from mean		-0.49	-0.08
SD reproducibility	0.54	1.25	0.28
RSD reproducibility %	1.1	2.6	0.6
Moisture, range	5.4 % - 7.3 %		
Mean (%)	6.20	6.33	6.22
deviation from mean		0.1	0.01
SD reproducibility	0.18	0.17	0.16
RSD reproducibility	2.9	2.7	2.7

RESULTS OF MASS/HL BY

- ▶ Reference method
 - ▶ 1 litre
 - ▶ 500 ml
 - ▶ 571.6 ml
 - ▶ 250 ml
- ▶ Infratec TWM

Z-VALUES FOR MASS/HL OF WHEAT

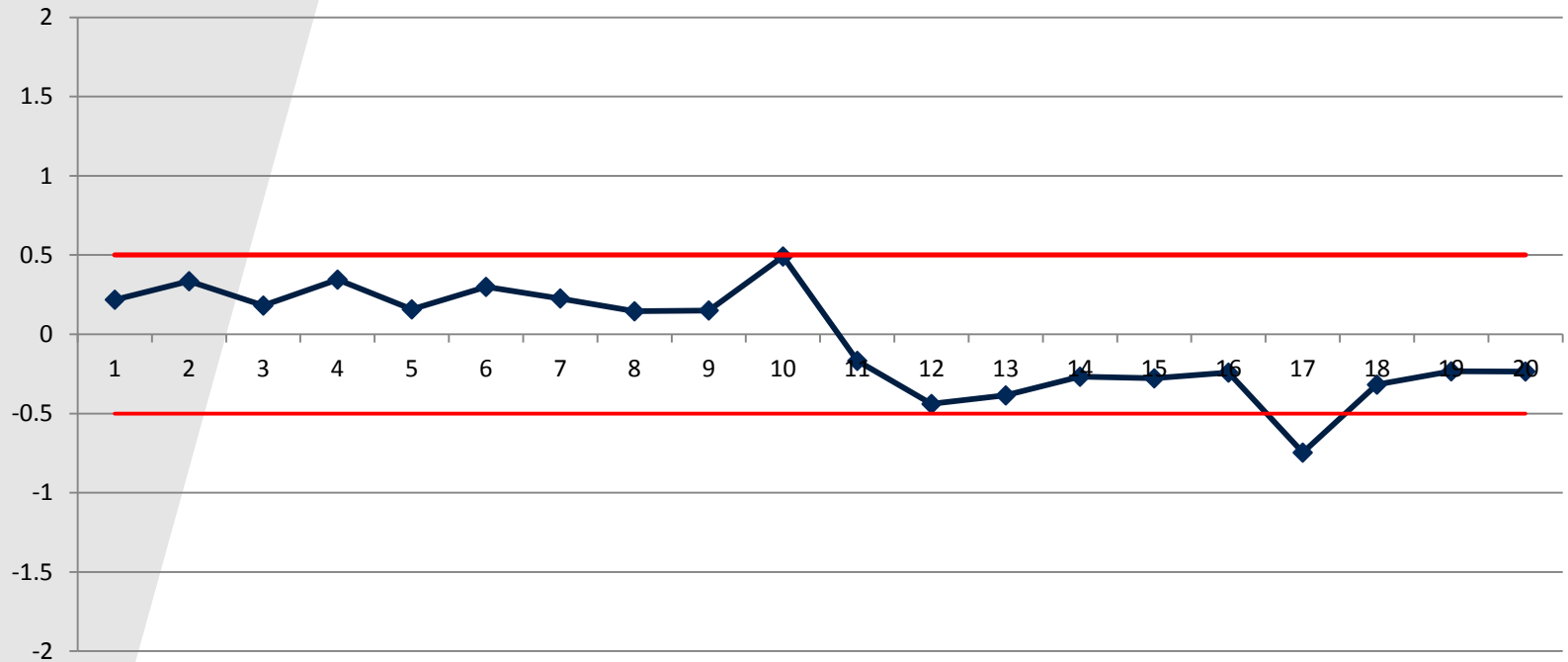
Lab	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
4	0.3	0.7	0.5	1.1	0.5	0.3	0.3	0.4	0.8	0.3
5	0.1	-0.1	0.3	0.3	-0.3	-0.7	-0.1	-0.6	-0.6	0.3
8	0.5	0.5	0.3	0.7	-0.1	-0.3	0.3	0.0	0.0	-0.3
12	0.5	1.7	1.9	2.1	0.9	0.9	0.3	-0.6	0.6	0.3
17	N/A	N/A	N/A	N/A	N/A	0.5	N/A	0.8	N/A	N/A
27	-2.4	-3.4	-4.3	-4.0	-3.5	-3.9	-2.7	-3.7	-3.1	-3.6
33	-12.1	-7.1	-4.3	-2.1	-9.1	-7.3	-3.1	-2.0	-0.6	0.1
35	-0.1	0.5	0.7	1.5	0.3	0.7	-0.1	-0.2	-0.2	0.9
36	-4.3	-2.8	-2.4	-3.0	-3.5	-3.5	-4.2	-3.4	-2.1	-3.0
61	-0.7	0.5	-0.1	0.5	-0.1	-0.1	0.3	0.6	0.6	-0.1
64	-0.7	-0.8	-0.9	-1.0	-1.2	-1.5	-0.8	-0.2	-0.8	-1.1

Z-VALUES FOR MASS/HL OF BARLEY

Lab	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
4	0.7	0.0	0.2	0.3	0.1	-0.1	0.1	0.5	0.2	0.3
5	-0.2	-0.2	-0.4	-0.3	0.1	-0.1	0.1	0.5	0.0	0.3
8	0.3	-0.4	0.3	0.7	0.3	0.9	0.9	0.3	0.4	0.7
12	0.7	-0.2	0.3	0.5	0.1	-0.1	0.3	0.1	0.2	0.1
17	N/A	N/A	N/A	N/A	N/A	0.5	2.1	N/A	N/A	N/A
27	-1.9	-2.3	-2.4	-2.1	-1.7	-3.9	-2.4	-2.5	-1.3	-1.8
33	1.0	0.8	2.0	1.1	0.9	0.7	0.1	0.9	1.4	0.3
35	1.3	0.6	1.3	1.1	1.9	1.5	-0.3	1.9	1.8	1.3
36	-1.9	-2.4	-1.3	-2.1	-1.4	-2.7	-1.6	-1.9	-1.9	-1.5
61	0.5	-0.4	0.0	0.9	0.0	0.3	0.8	0.4	0.2	0.5
64	-0.5	-0.3	0.2	-0.3	-0.3	-0.7	0.3	-0.3	-0.7	-0.2

PERFORMANCE TWM FOR WHEAT & BARLEY

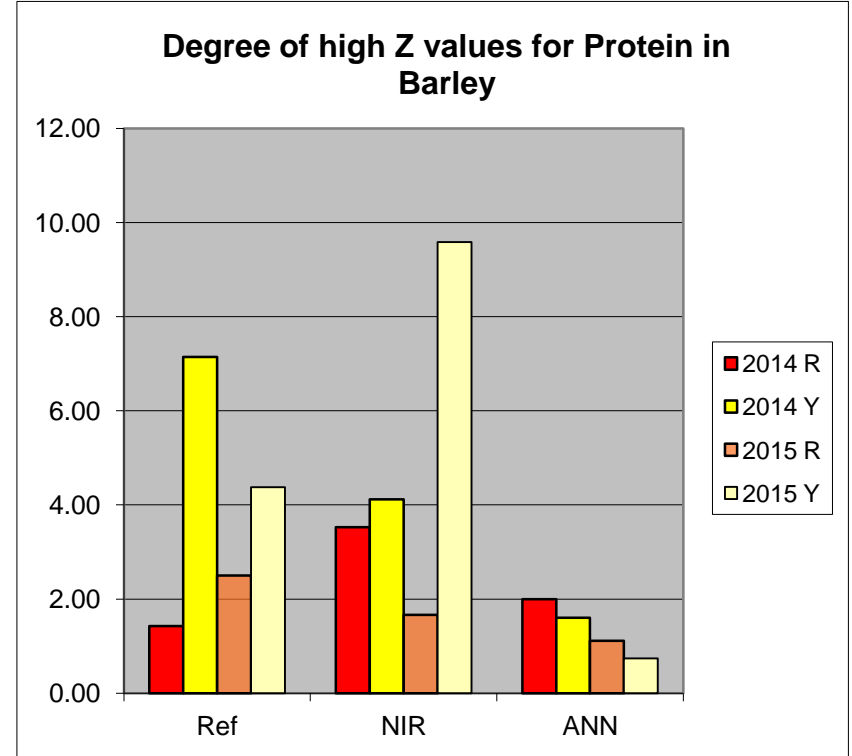
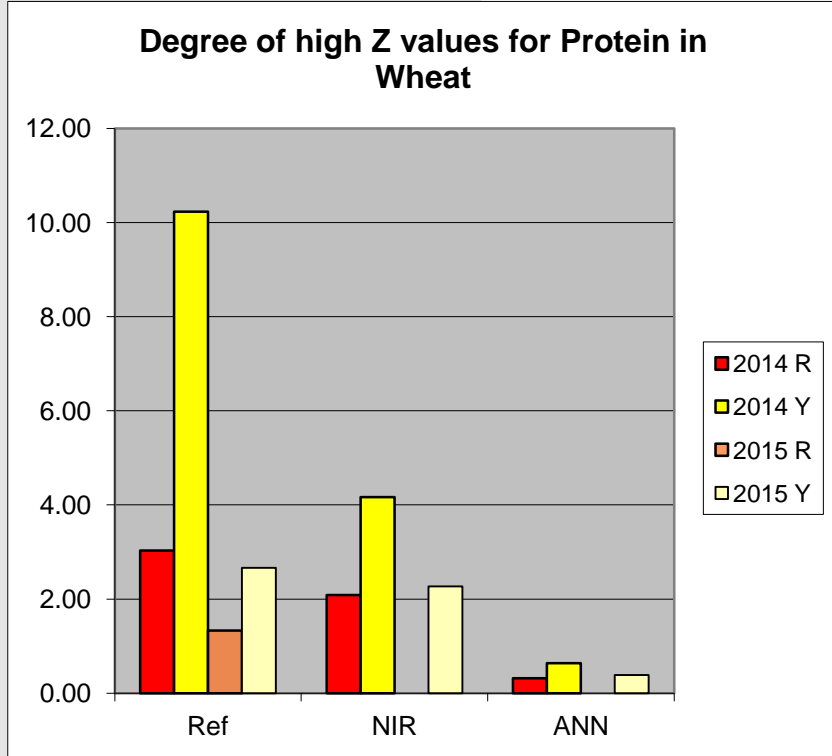
Difference to Mass/hl Normal



WGN RINGTEST 2015: SUMMARY & CONCLUSIONS

- ▶ Excellent performance and stability of Wheat & Barley prediction models
- ▶ Very good performance and stability of Rapeseed prediction models
- ▶ Reduced number of outliers (ref, local, ANN) this year.
- ▶ International ringtests like the WGN scheme are essential
 - ▶ For validations according to EN ISO 12099/EN 15948
 - ▶ To avoid models drifting apart
 - ▶ For surveillance of reference methods, instruments and prediction models

COMPARISON WITH LAST YEAR: AMOUNT OF HIGH Z-VALUES FOR PROTEIN IN WHEAT & BARLEY



COMPARISON WITH LAST YEAR: AMOUNT OF HIGH Z-VALUES FOR MOISTURE IN WHEAT & BARLEY

