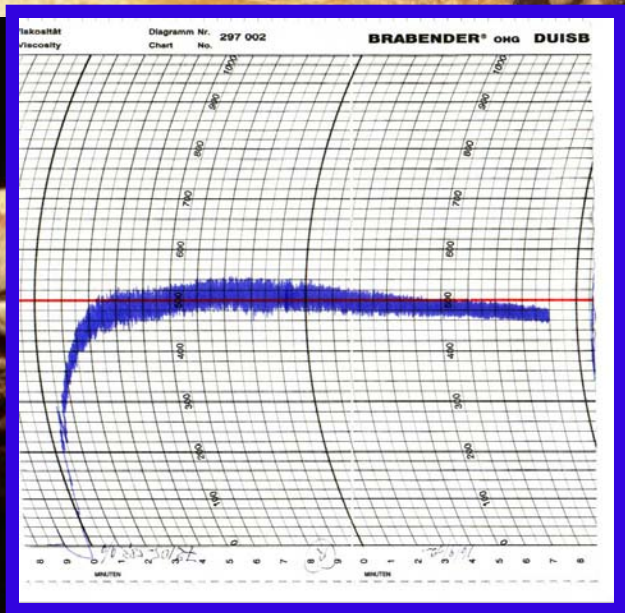
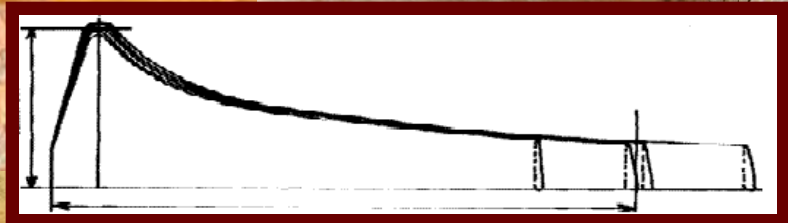
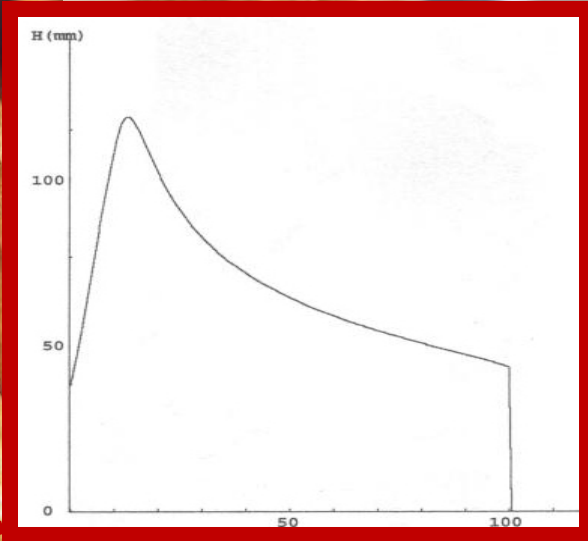




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Consistency



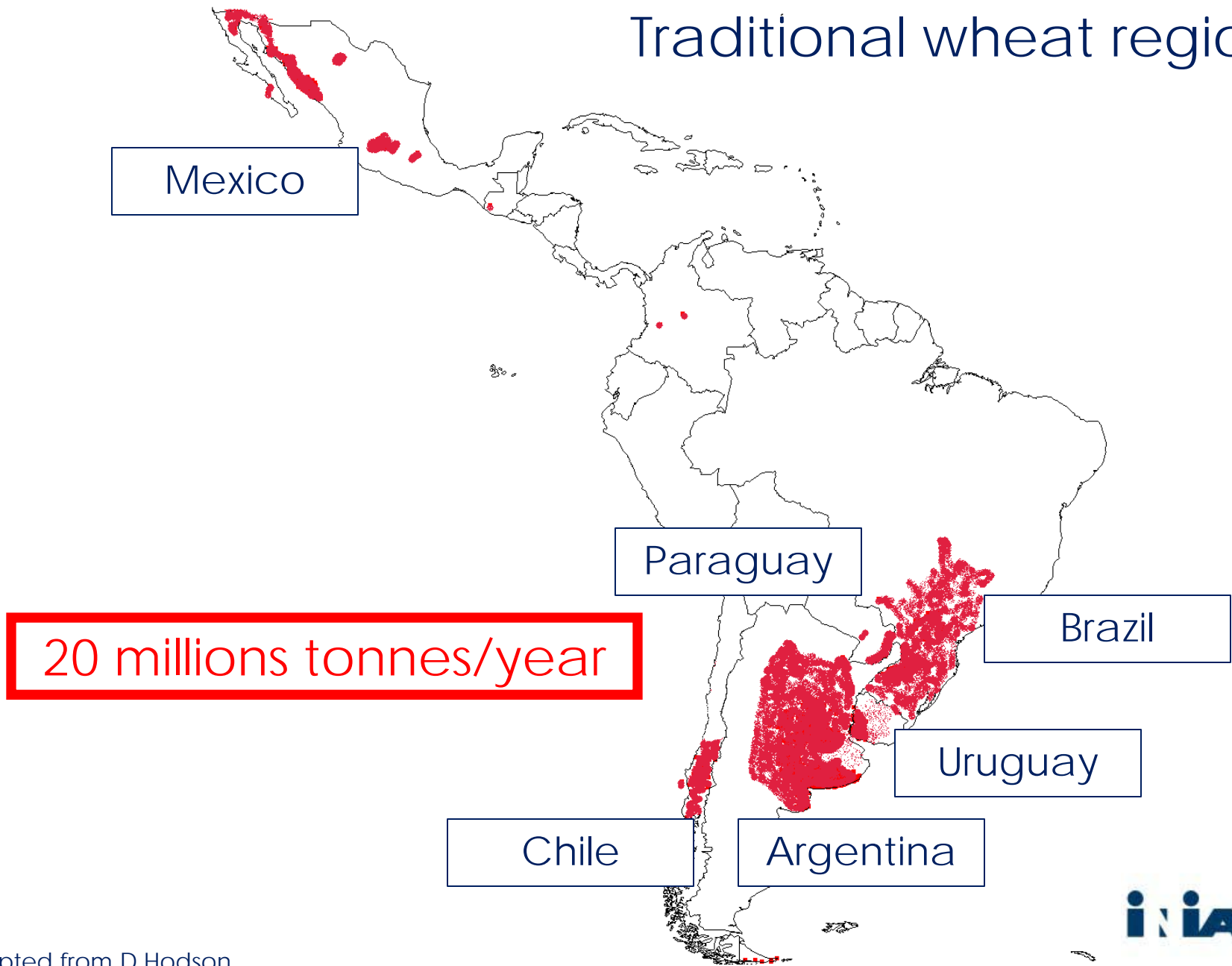


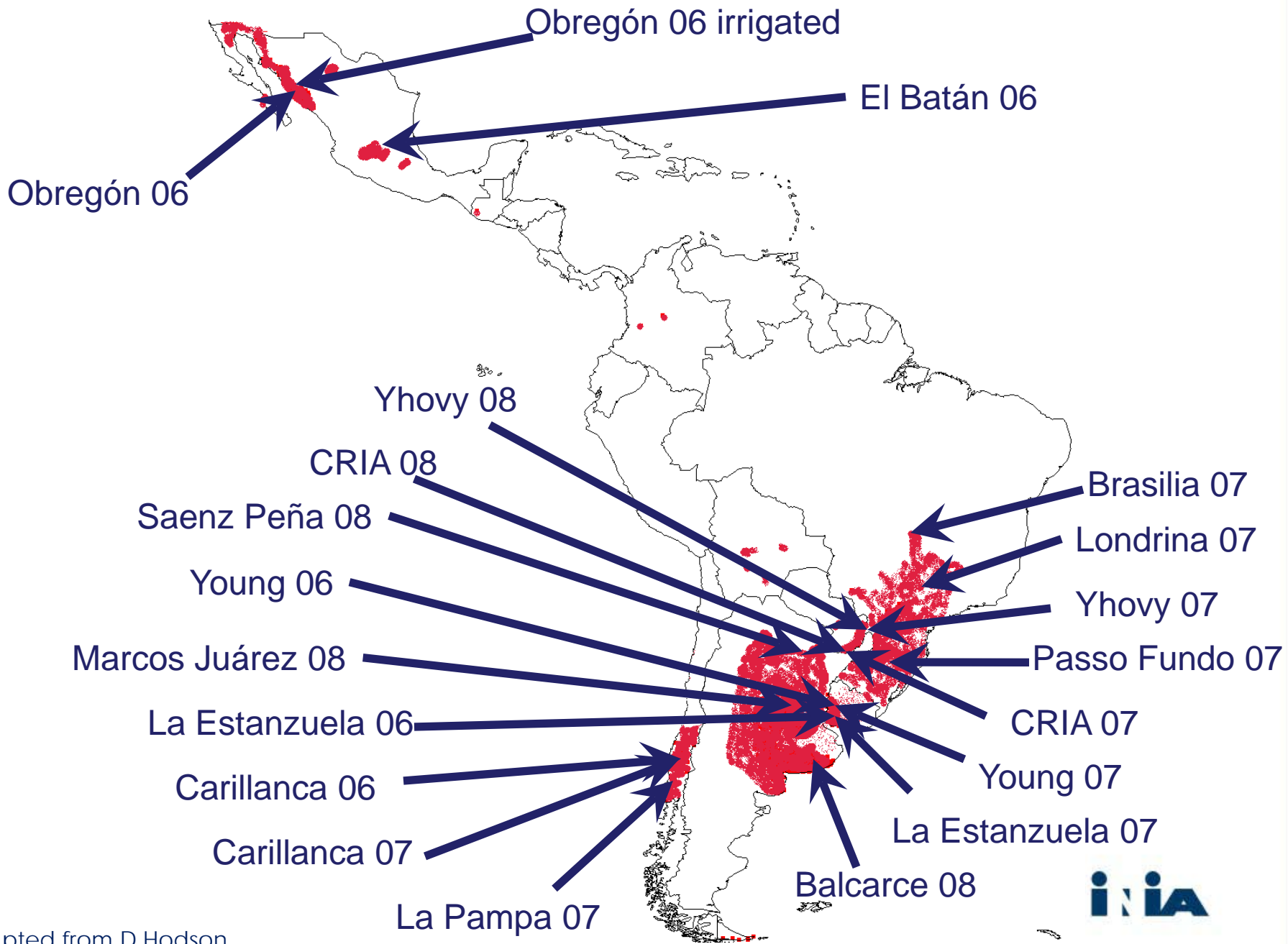
Genotype and environment effects on quality of 23 wheat genotypes cultivated in 20 Latin American environments

D. Vázquez; A.G. Berger; M. Cuniberti; C. Bainotti; P. L. Scheeren; M. Zavariz de Miranda; C. Jobet; R. J. Peña, G. Cabrera; R. Verges



Traditional wheat regions





Genotypes

BIOINTA 1000

BIOINTA 1001

BIOINTA 1002

BIOINTA 1004

Embrapa 42

CD 104

IPR 85

Ônix

BRS 208

BRS Guabiju

BRS Guamirim

PANDORA - INIA

QP3065-01

Kronstad F04

Tollocan F05

KABY//2*ALUBUC/BAYA

ALTAR 84/AE. SQUARROSA (TAUS)//OCI ...

Itapua 40 - Obligado

Itapua 50 - Amistad

Itapua 65 - Don Valerio

IAN 10 - Don Arte

INIA Churrinche

INIA Tero

Argentina

Brazil

Chile

México

Paraguay

Uruguay



Design

- Alpha lattice, 3 reps
- Seeding conditions according to regional uses
(density, tillage, etc.)
- Nitrogen fertilization: to avoid N limitation
- Disease protection

Only few reps were analysed

Analysis

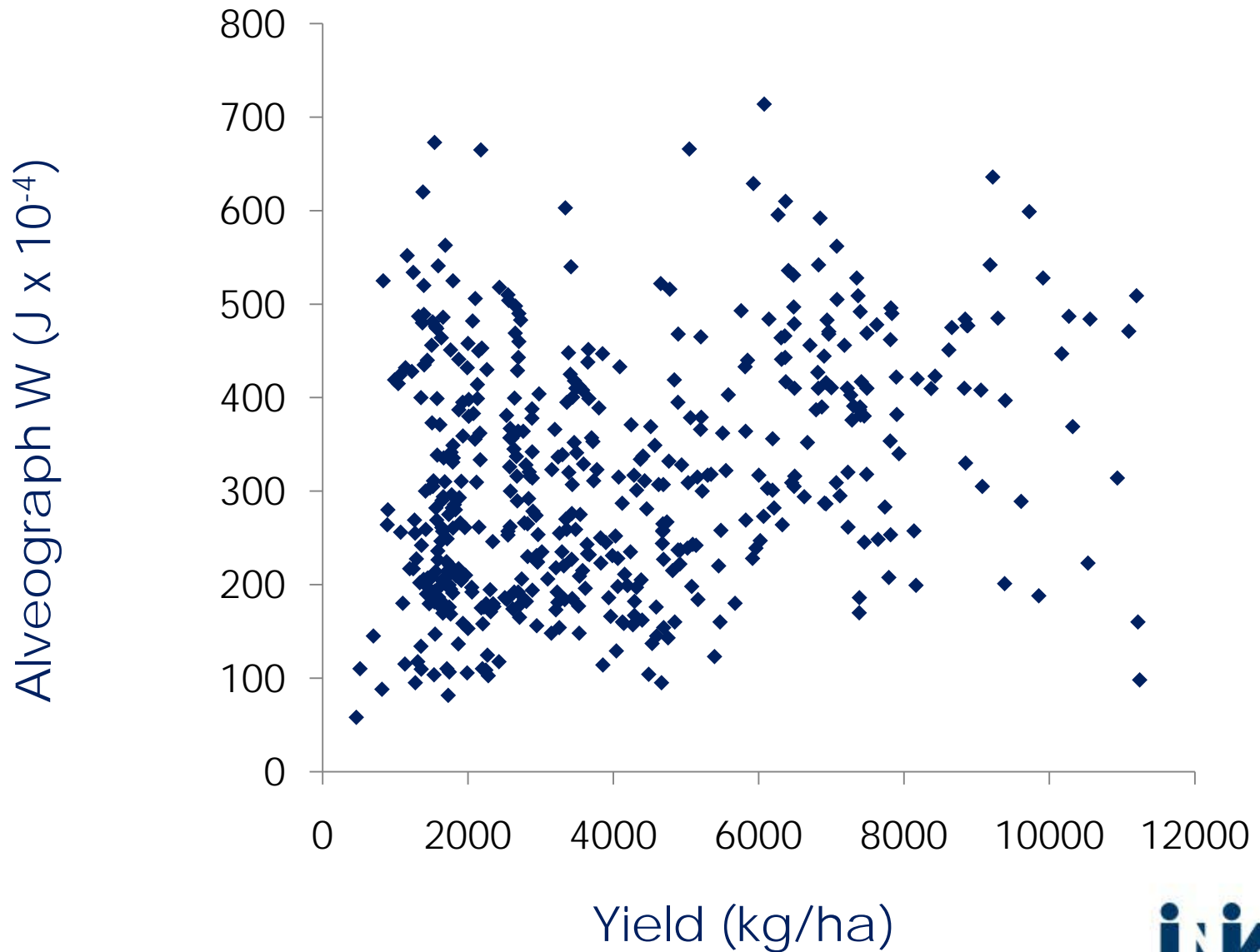
- Grain
 - Test weight
 - Grain protein content
 - Grain ash content
- Flour
 - Wet gluten
 - Alveograph (W, P, L, P/L)
 - Farinograph (absorption, stability)
 - Flour color: Minolta (L^* , a^* , b^*)
 - Falling Number
 - Sedimentation volume Peña et al 1990

Statistical analysis

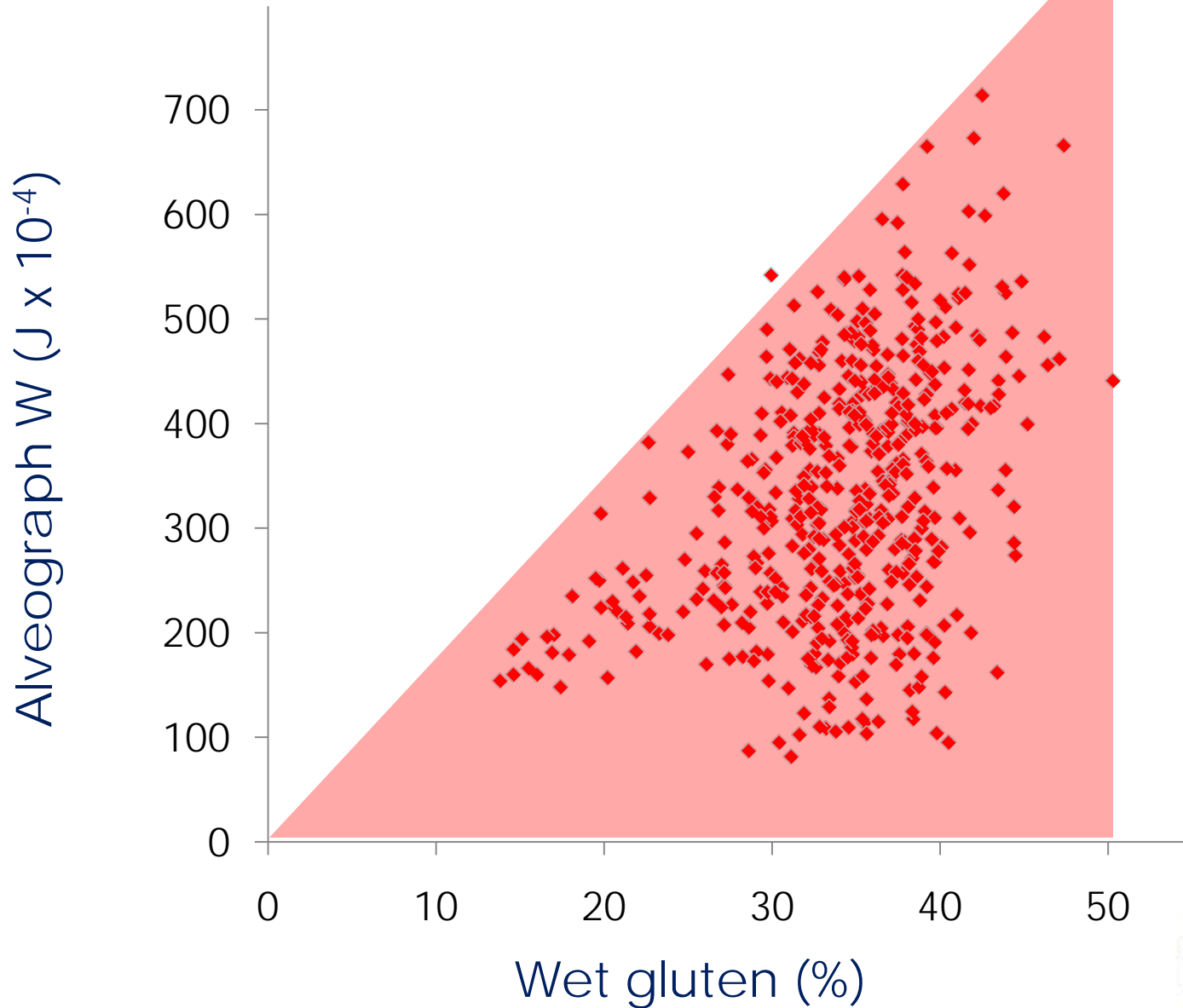
- R stats package
- Principal Component Analysis: Bayesian PCA
(pcaMethods)

RESULTS

Quality or yield?



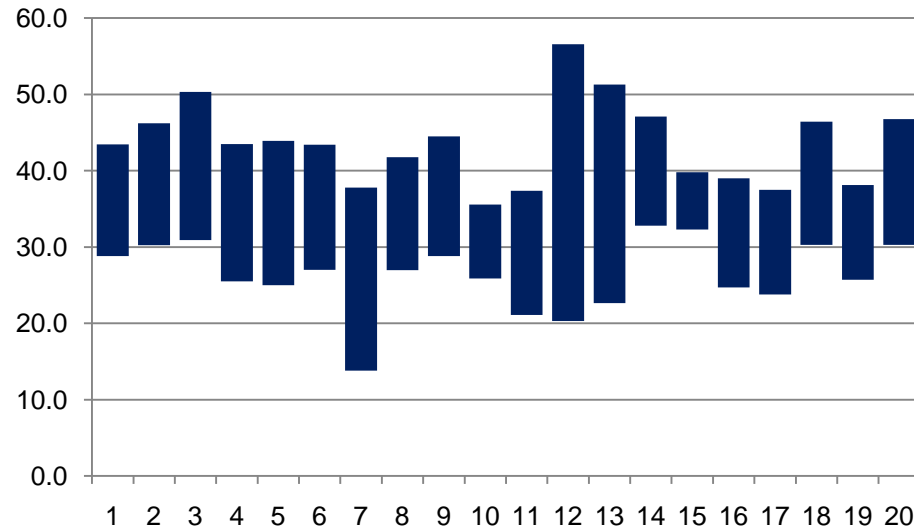
Protein: quality vs quantity



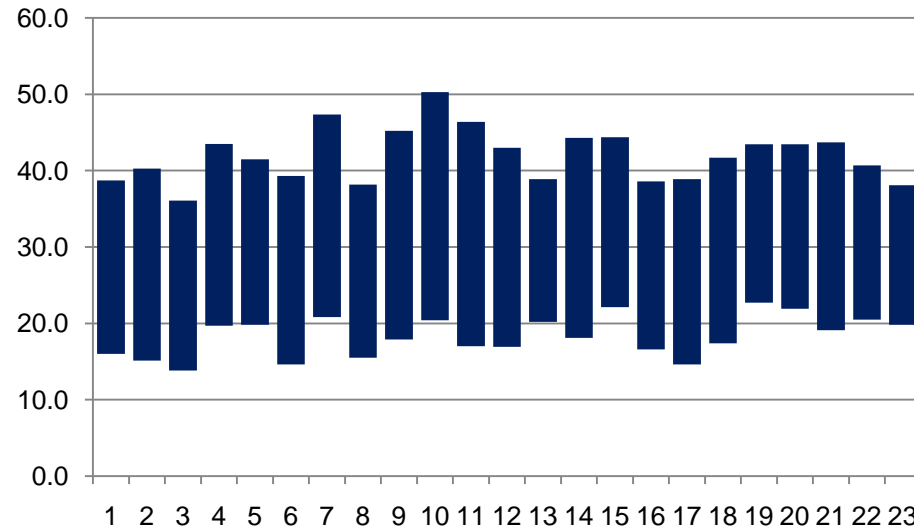
Maximum and minimum of averages

	Environments	Genotypes
Yield (kg/ha)	1498 - 9049	3217 - 4614
Protein content (%)	9.8 - 15.5	12.4 - 14.5
Test weight (kg/hl)	70.7 - 84.4	74.8 - 80.7
Wet gluten (%)	20.6 - 38.9	27.3 - 39
Alveograph W ($j \times 10^{-4}$)	198 - 465	221 - 453
Alveograph P (mm)	61 - 152	68 - 128
Alveograph L (mm)	57 - 141	60 - 140
Alveograph P/L	0.6 - 2.7	0.7 - 2.8
Farinograph absorption (%)	30 - 67	57 - 65
Farinograph stability (min)	6 - 41	10 - 34
Flour color: Minolta L*	87.9 - 93.8	90.6 - 92.1
Flour color: Minolta a*	-0.8 - 0.1	-1.3 - 0.1
Flour color: Minolta b*	7 - 12	8 - 11
Falling Number (seg)	288 - 455	337 - 428
Sedimentation volume (ml)	11.0 - 22.0	12.0 - 19.0
Grain ash content (%)	1.3 - 2.01	1.55 - 1.83

Wet gluten



Environments

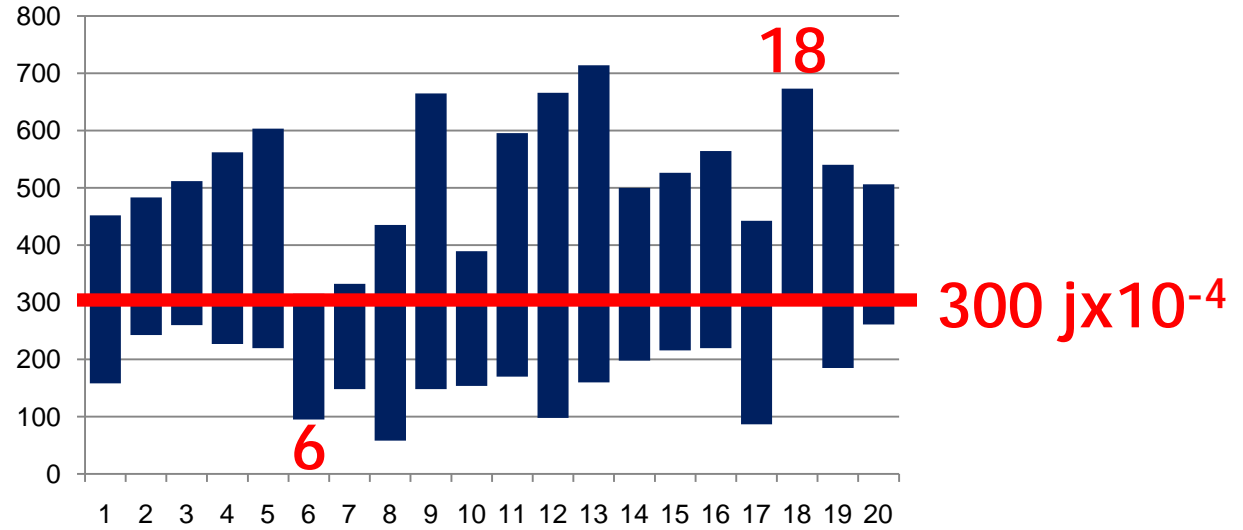


Genotypes

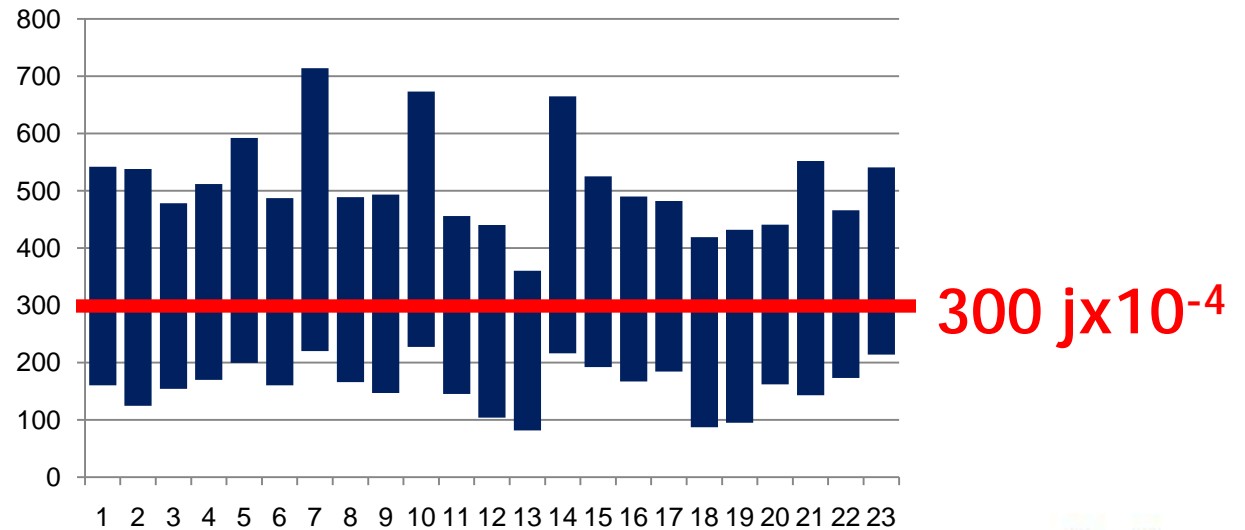
Alveograph

W

Environments

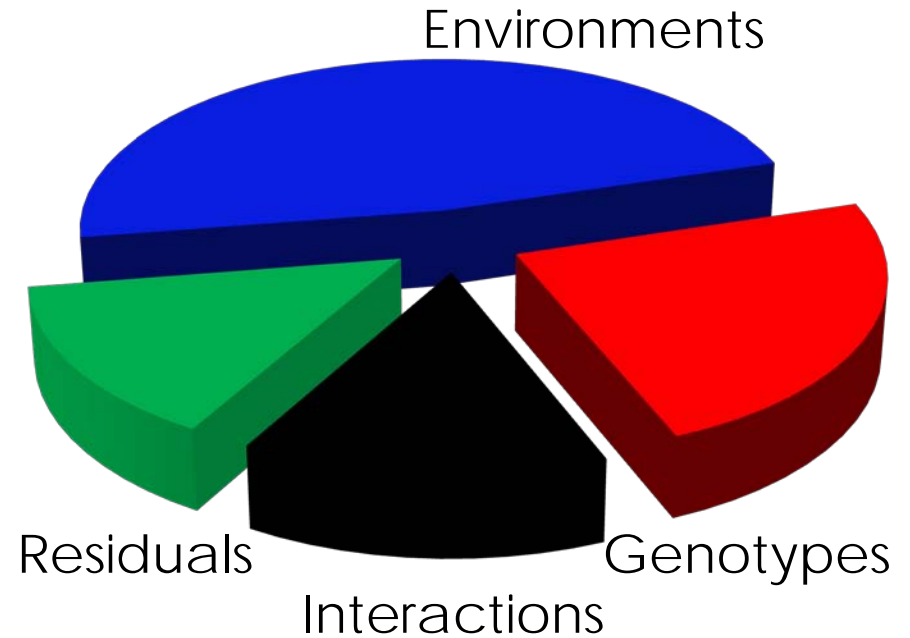
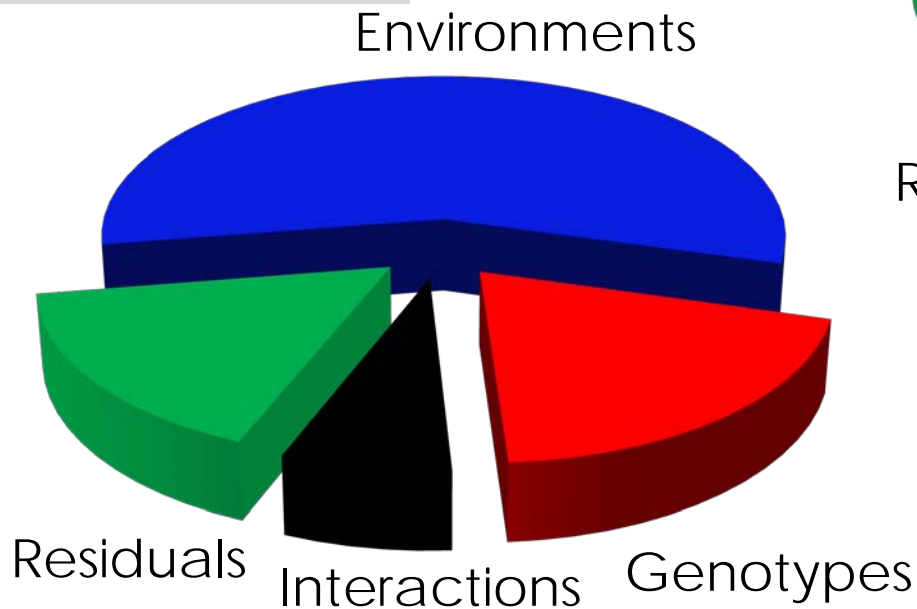


Genotypes



Variance Components

Wet gluten



Alveograph W

Principal Components Analysis (PCA)

PCA loadings

	PC1	PC2	PC3
Yield	-0.19	0.50	-0.52
Protein content	0.63	0.07	0.37
Test weight	0.00	0.40	-0.69
Wet gluten	0.77	0.19	0.17
Alveograph W	0.33	0.74	-0.01
Alveograph P	-0.40	0.73	0.35
Alveograph L	0.79	-0.04	-0.39
Alveograph P/L	-0.69	0.36	0.39
Farinograph absorption	0.46	0.52	0.26
Farinograph stability	-0.48	0.44	0.03
Flour color: Minolta L*	0.02	-0.11	-0.26
Flour color: Minolta a*	0.44	-0.04	0.49
Flour color: Minolta b*	-0.53	-0.44	-0.26
Falling Number	-0.19	0.55	-0.45
Sedimentation volume	0.54	0.55	-0.03
Grain ash content (%)	-0.06	-0.60	0.25
Individual R square	0.277	0.245	0.143
Accumulative R square	0.277	0.522	0.664

PCA loadings

PC1:
Protein
content

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PCA loadings

PC1:
Protein
content

PC2:
Dough
strength

	PC1	PC2	PC3
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PCA loadings

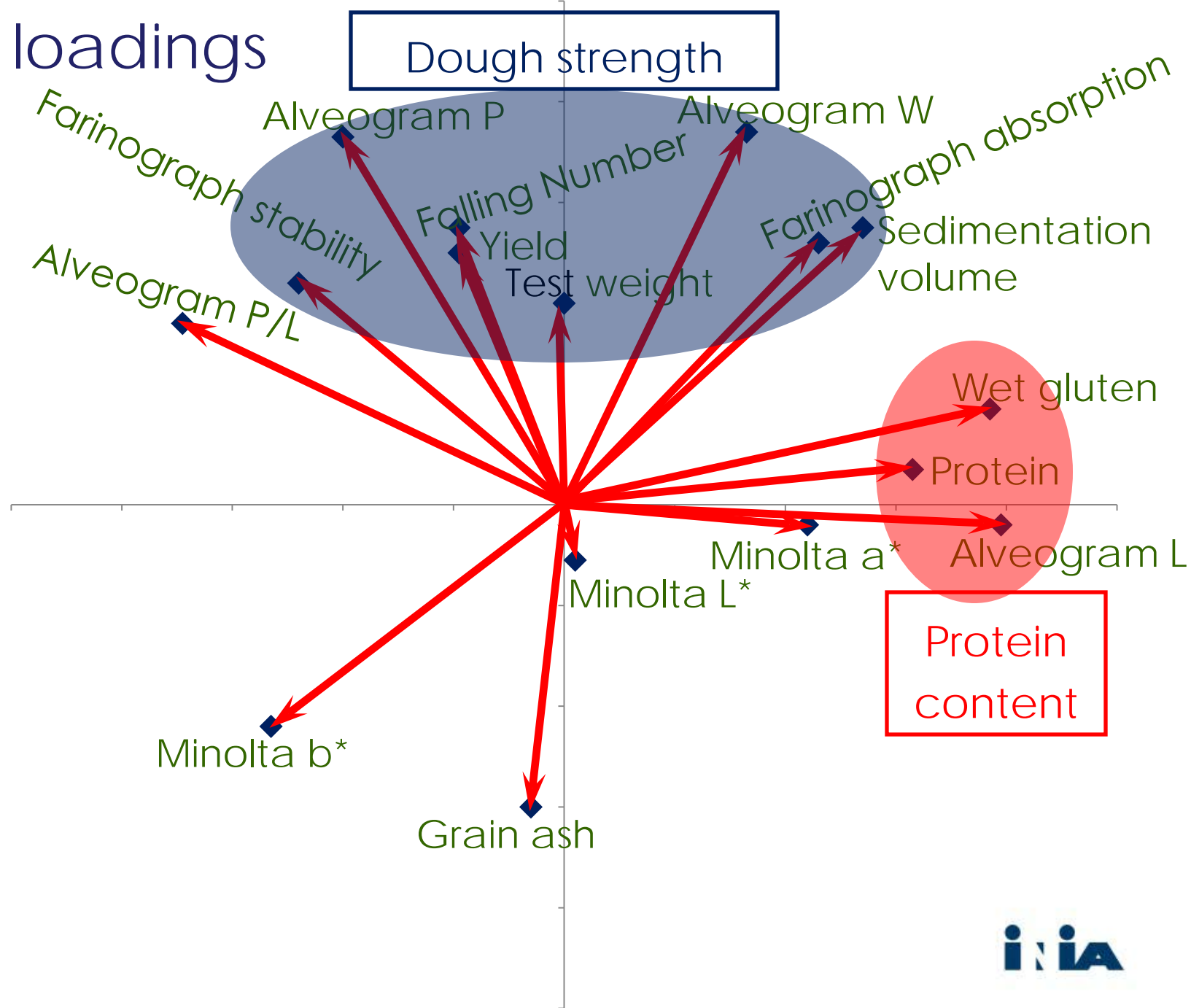
PC1:
Protein content

PC2:
Dough strength

PC3:
Physical quality

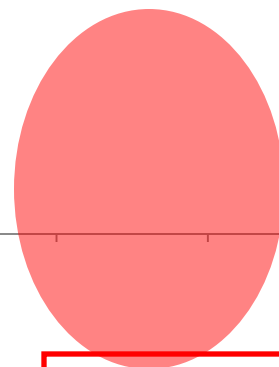
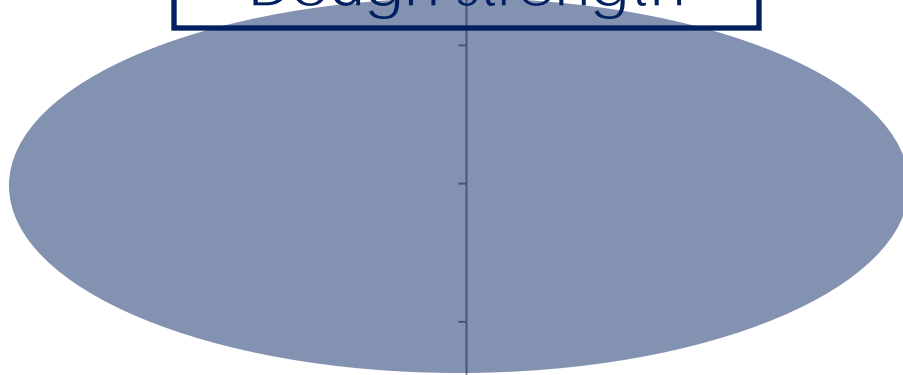
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PCA loadings



Dough strength

Good quality

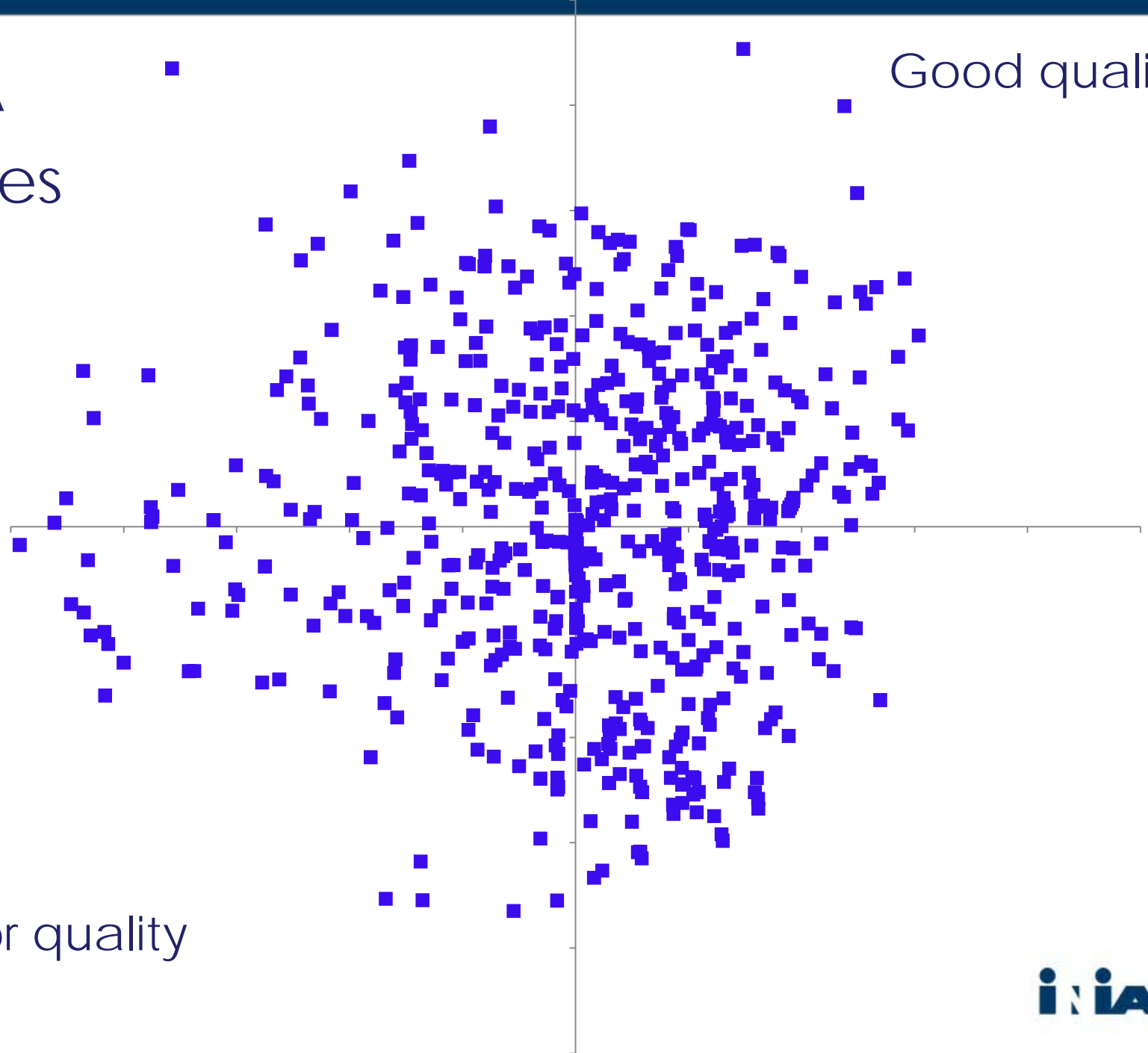


Protein content

Poor quality

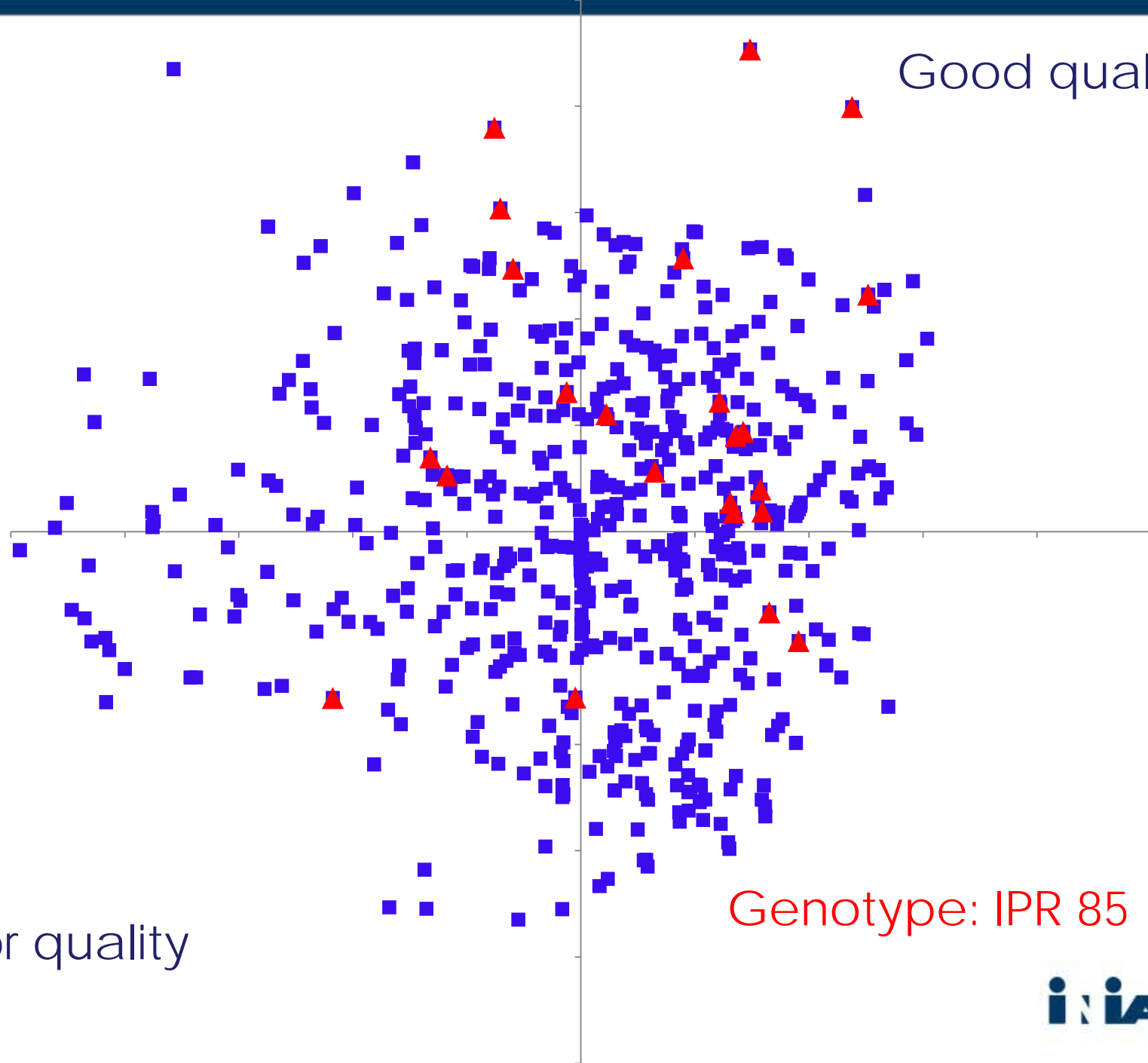
PCA
scores

Good quality



Poor quality

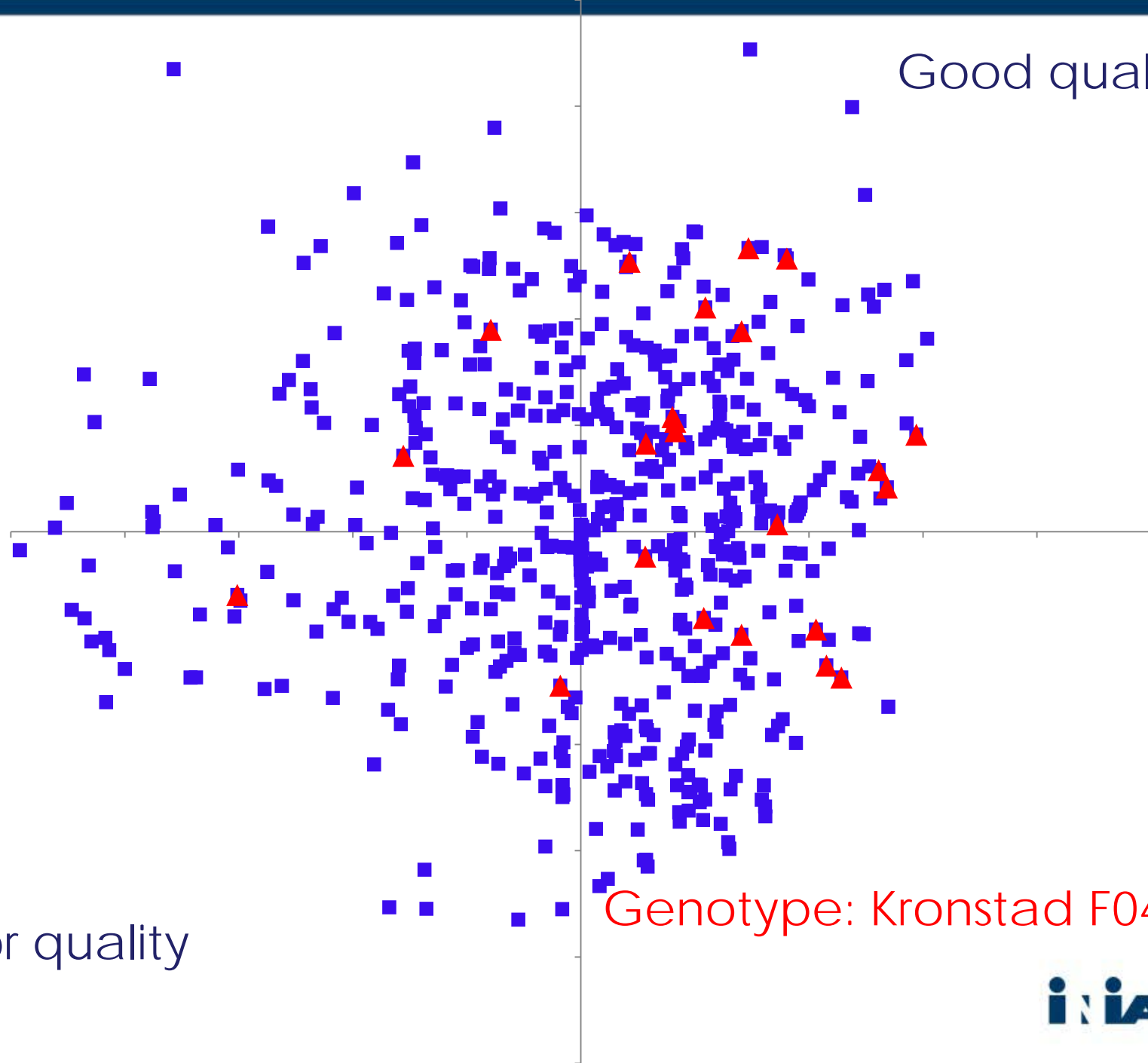
Poor quality



Good quality

Genotype: IPR 85

Good quality

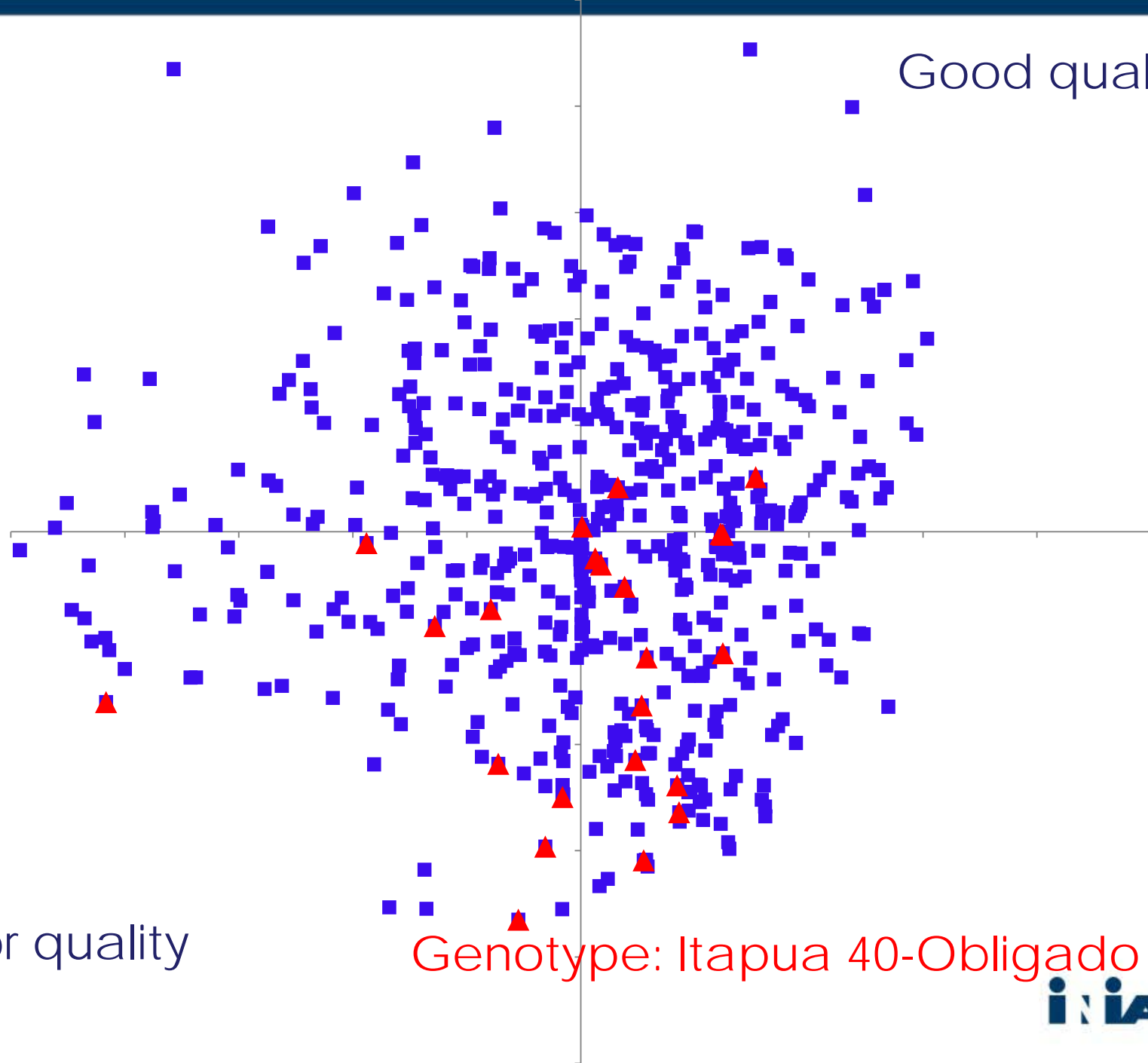


Poor quality

Genotype: Kronstad F04



Good quality

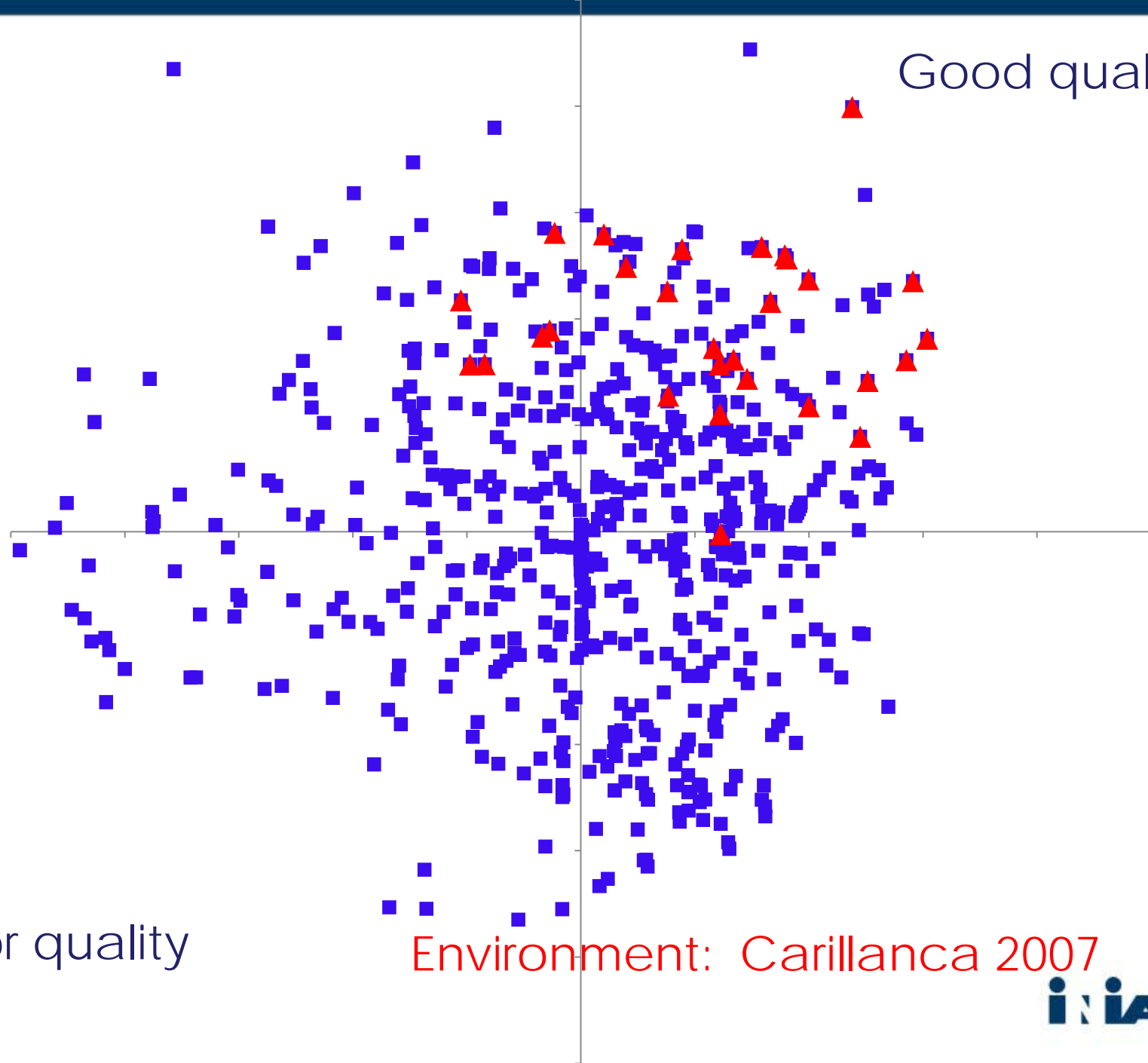


Poor quality

Genotype: Itapua 40-Obligado



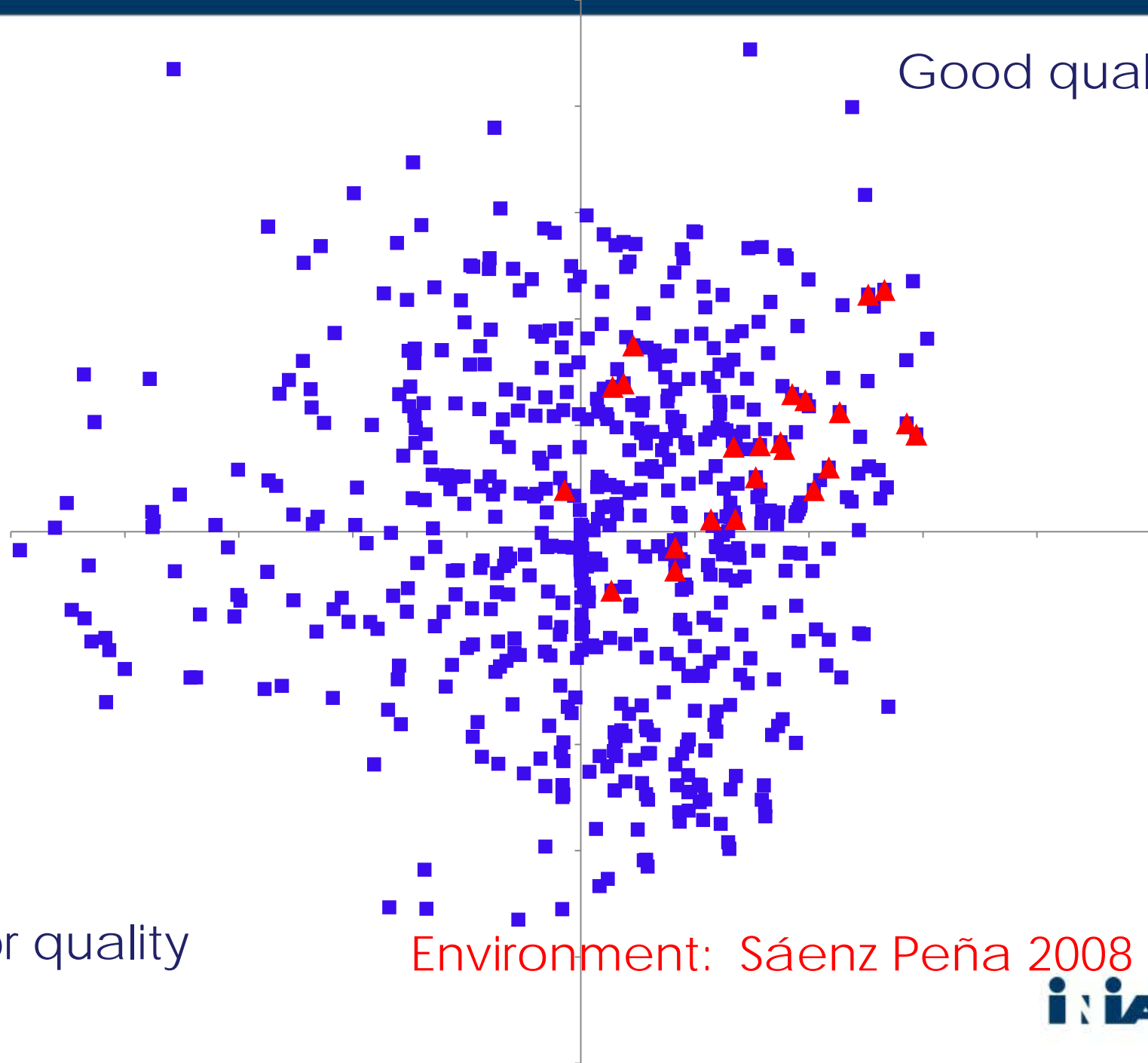
Good quality



Poor quality

Environment: Carillanca 2007

Good quality

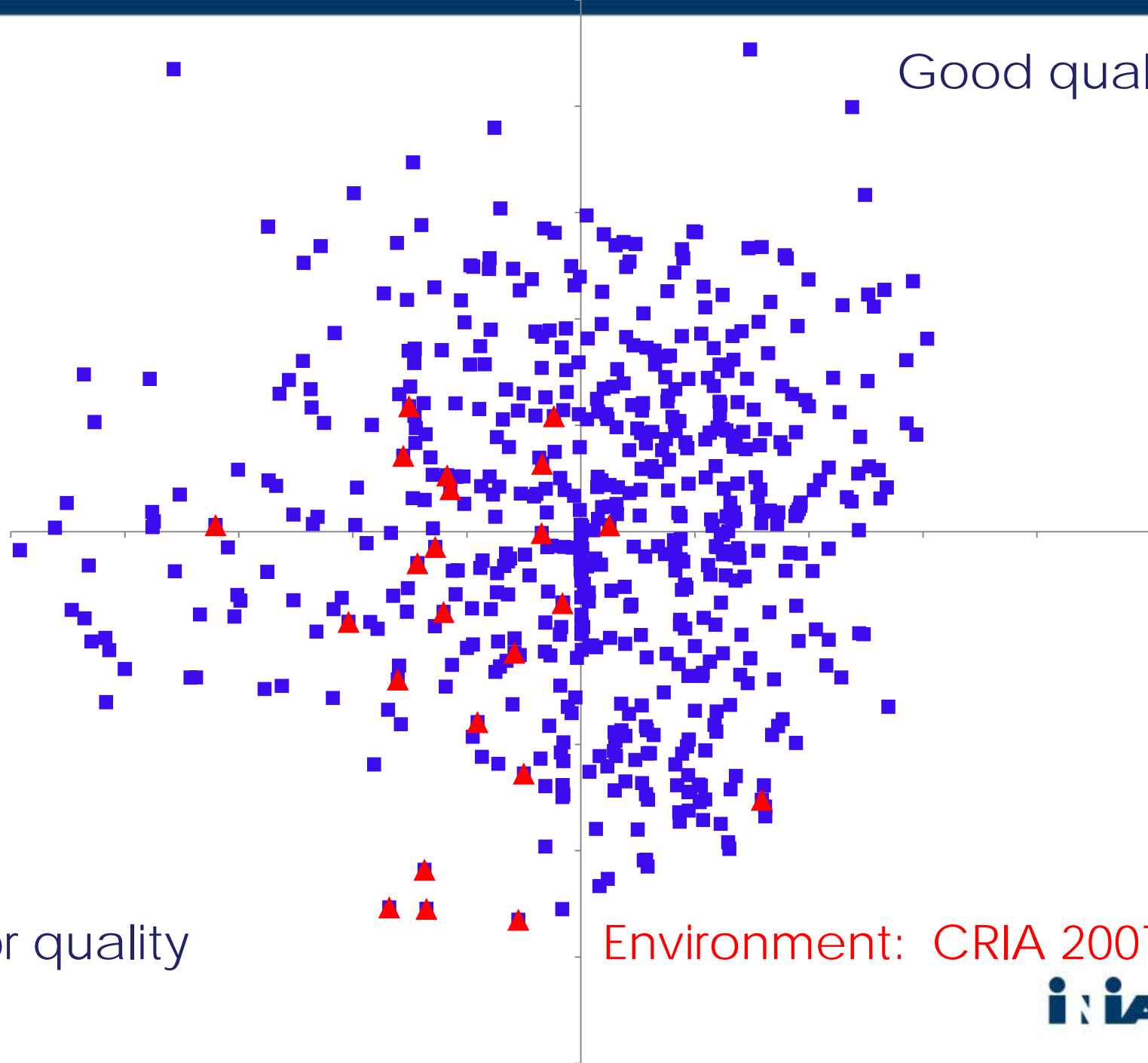


Poor quality

Environment: Sáenz Peña 2008



Good quality

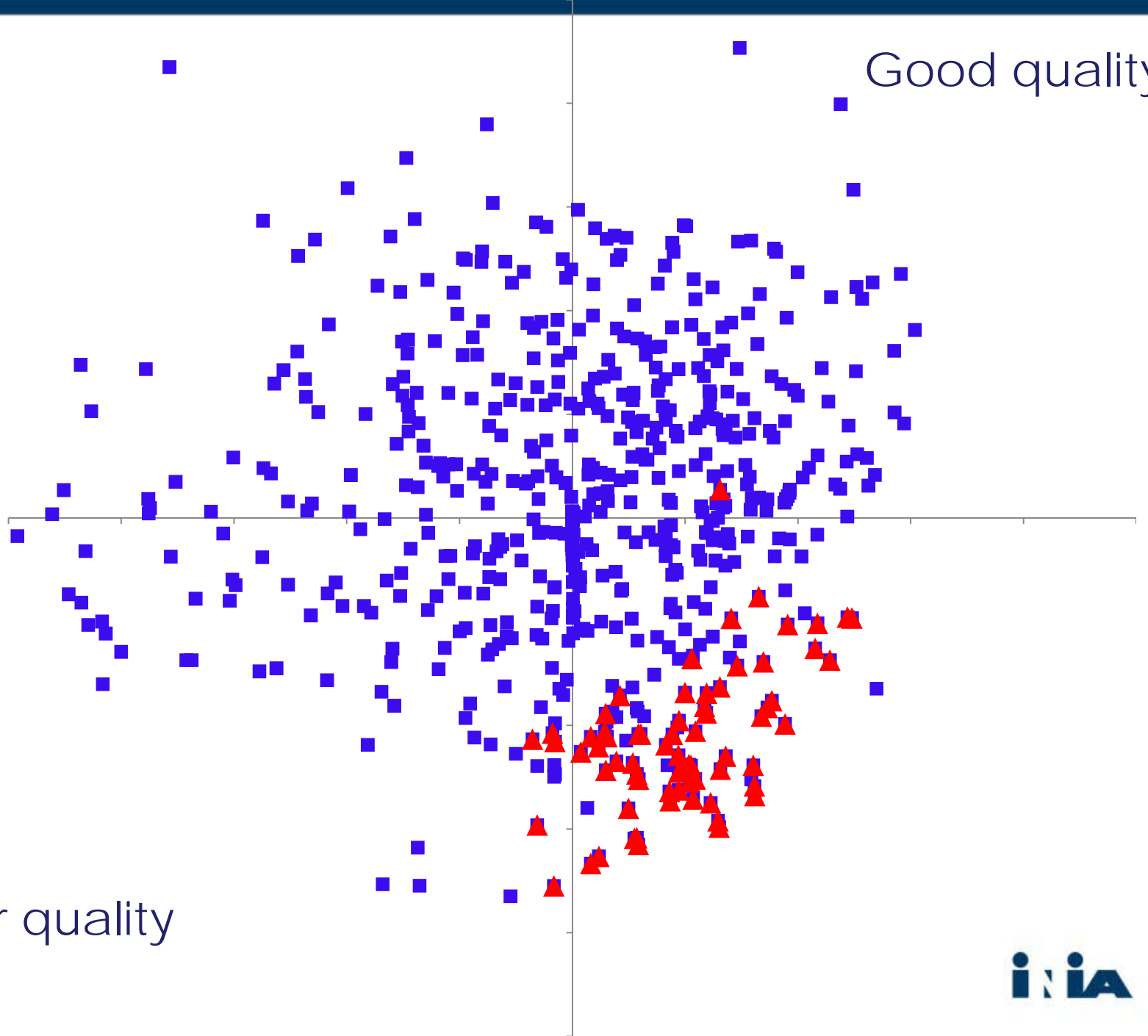


Poor quality

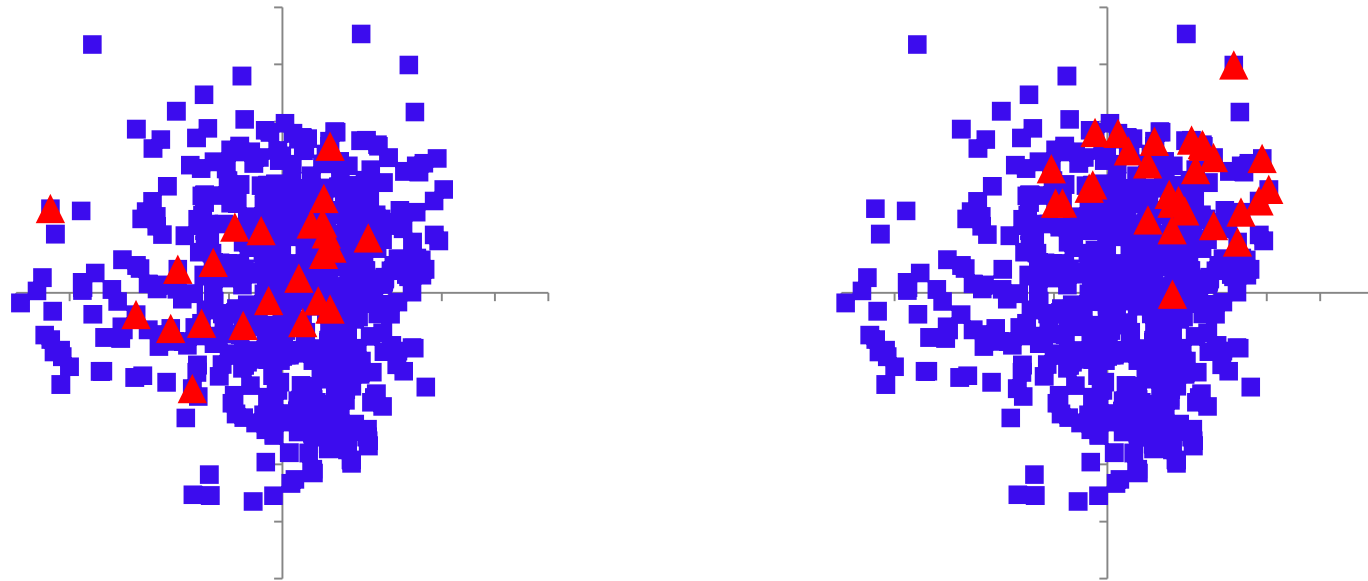
Environment: CRIA 2007



Good quality

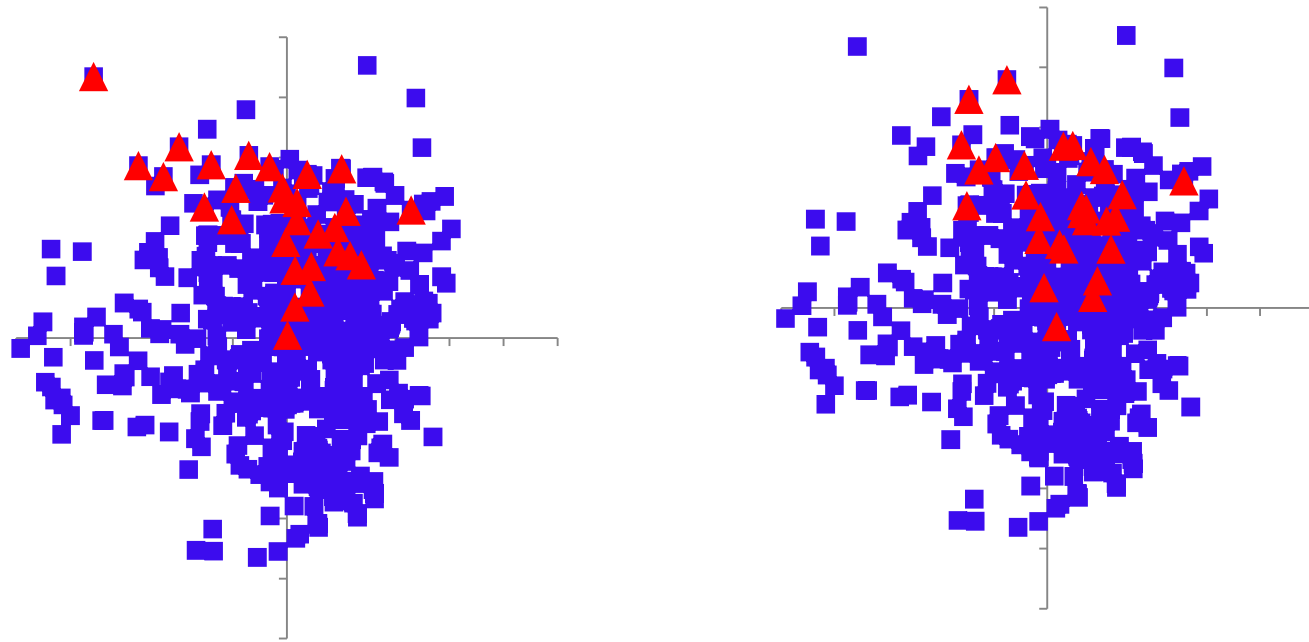


Poor quality



Same location, different year

Therefore, location is not the key factor



Same location, same year, different irrigation

Therefore, irrigation is not the key factor

“Good quality” environments:

- Associated with

Low crop yields

or

High yields under temperate climates

- Highest yield environment had good quality

Conclusions

- High yield/good quality is possible
- Some environments have poor quality inherently
(although genotypes are differentiated)
- Important findings to help
to define breeding programs objectives

Fiódor Dostoyevski:



G&E effect on quality

~~Man~~ is a mystery:
if you spend your entire life
trying to puzzle it out,
then do not say that
you have wasted your time"

(Personal correspondence, 1839)

"If we understand too quickly,
we may not understand well"

(The idiot, 1868)

Acknowledgments



MYT

PROCISUR



Participated:

CHILE



J. Zúñiga
L. Vera
G. Marin

URUGUAY



A. García
M. Castro
S. Ceretta
J. Hernández
D. Ramallo
M. E. García
P. González

MEXICO



Y. Mannes
H. Gonzalez
F. Cervantez
R. Trethowan

PARAGUAY



E. Morel
A. Rodriguez
J. Szostak
V. Valdez
E. Altamirano
O. Arce
E. Zayas

BRAZIL



M. C. Bassoi
J. C. Albrecht

ARGENTINA



L. Mir
S. Macagno
O. Berra
G. Mansilla
M. Pronotti
H. J. Bariffi
I. Cettour
G. Kraan
J. Salines
J. Frascina

Thanks

Gracias

Спасибо



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