Progress in Pigs

TOPIGS

Robustness in Pigs

Egbert F. Knol

26-08-2013

Outline

- selection and robustness
- pig farm of the future
- examples
- traits

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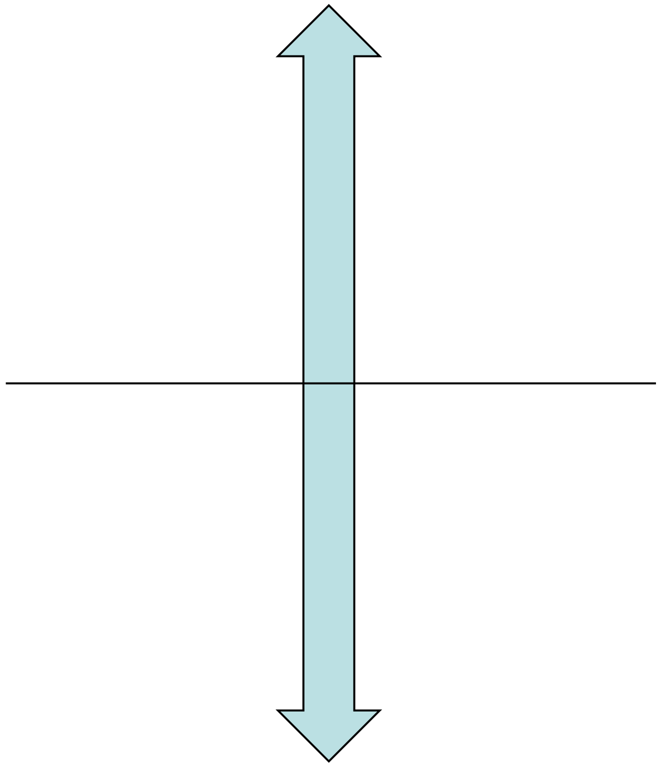
Animal selection



- Breeding values
- Ranking
- BLUP

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starting point for definitions of robustness in other fields, like animal production. Knap (2005) defined robust pigs as 'pigs that combine high production potential with resilience to external stressors, allowing for unproblematic expression of high production potential in a wide variety of environmental conditions'. Whereas Ten Napel *et al.* (2006) defined robustness in a broad sense as

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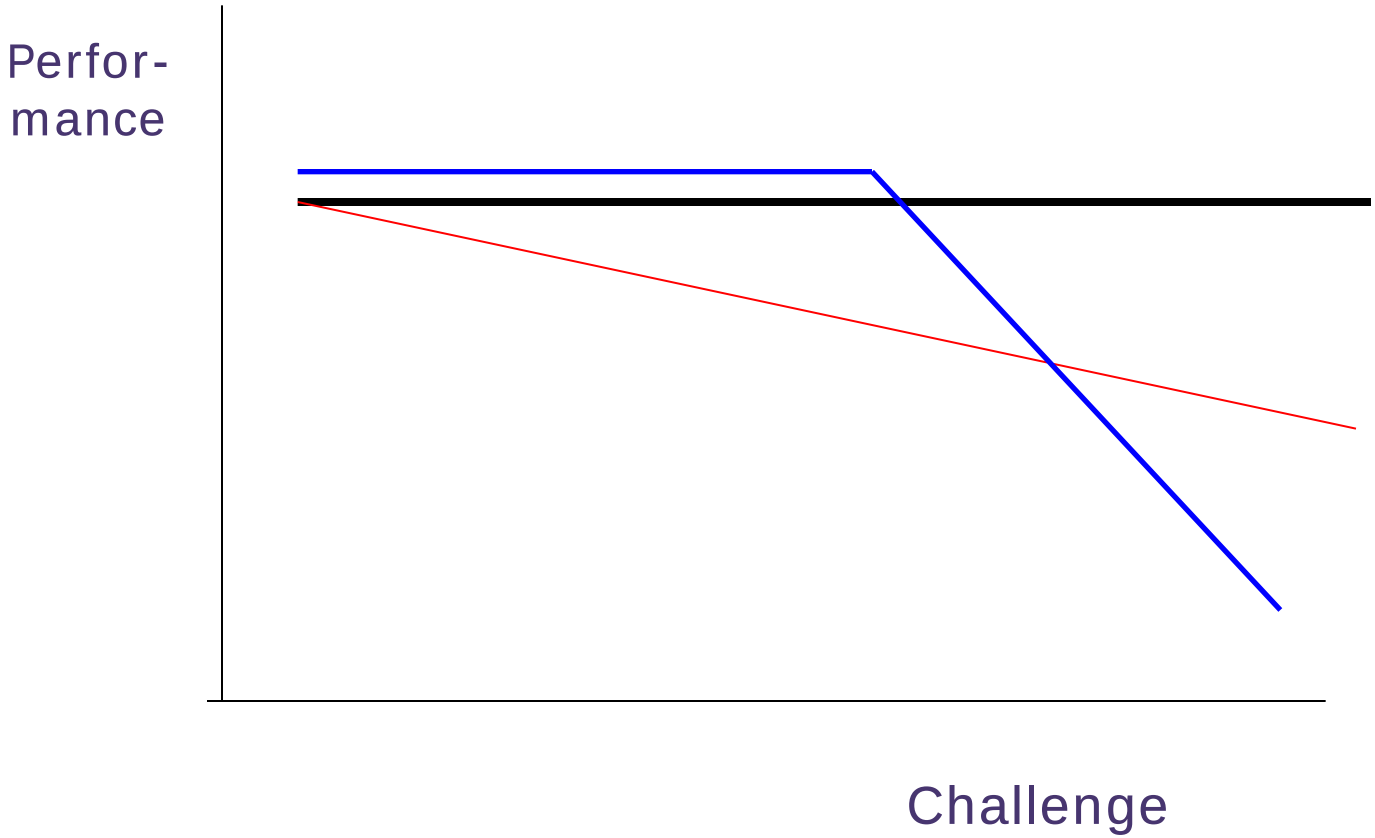
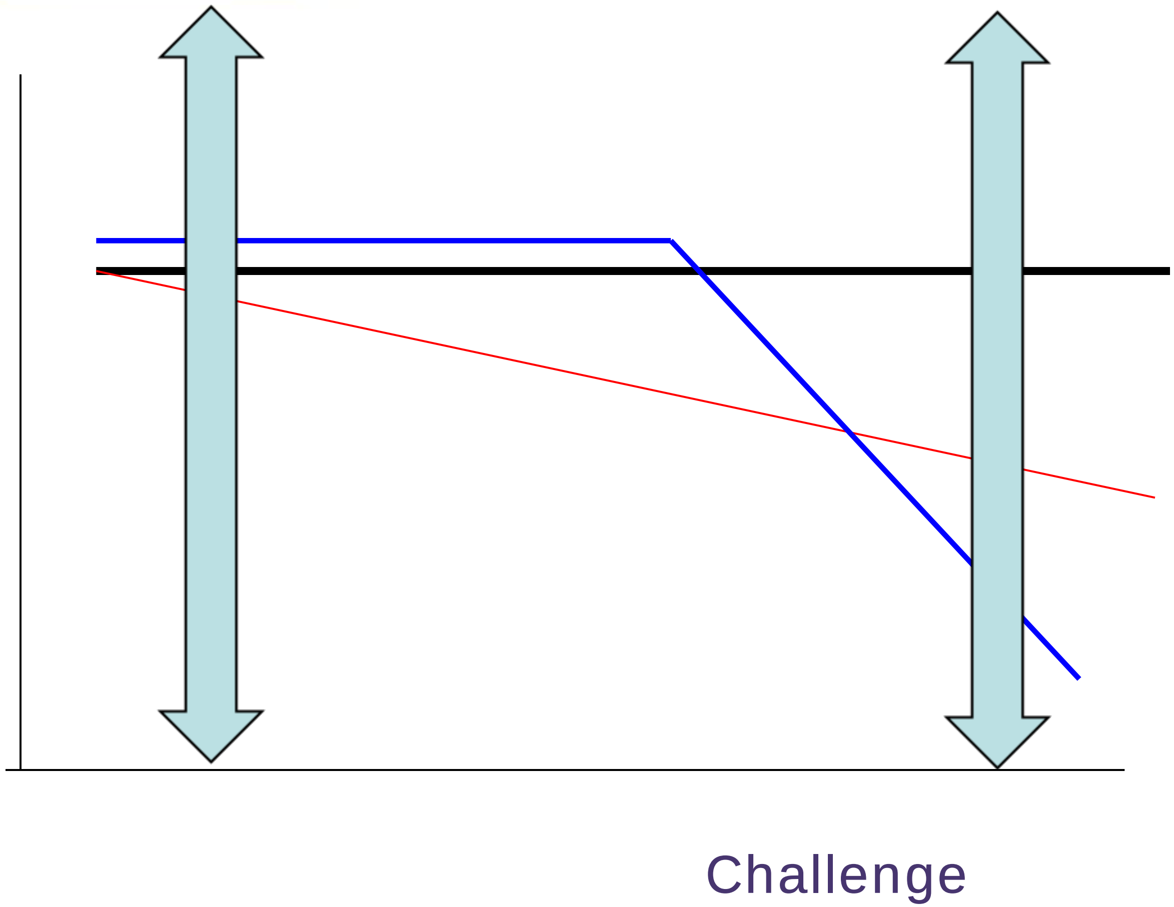
Robustness model



Robustness model



Possible approaches

1. Challenge in specific forms
   a) Climate
   b) Disease
   c) Feed
   d) Labor

2. Challenge in general terms: reaction norms

3. Predictable, ‘residual low’ animals

4. Choice of appropriate traits

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Fits nicely

1 Specific

2 Reaction Norms

3 Residual Low

4 Traits

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FARM of the future

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	2012	2022
# sows	1200	2400
# labour	4	5
Weaned/s/y	30	34

Per worker: 9,000 ➔ 16,320 piglets weaned

Words that come to mind

- Low in labor
- Easy to manage
- Uniform
- Problem free
- Challenge proof
- Society acceptable

Cheap

Cheap

Cheap

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Laatste 20 cycli					Werpen						Spenen			Cyclus		
Cyc	Int	Dekdatum	Beer	2e Beer	Datum	Drg	Lg	Dg	Mm	Uitv	Datum	+/-	Opg	Duur	Index	Gesp/j
2	6	2/1/2005	28V66	29V06	5/27	115	16	1		1	6/22	-4	11	147	2.48	27.3
3	6	6/28/2005	28V85	64	10/21	115	14				11/23	8	22	154	2.37	52.1
4	6	11/29/2005	29V91	29V20	3/22	113	20				4/19	-8	12	147	2.48	29.8
5	5	4/24/2006	28V94	28V15	8/16	114	15	3			9/13	-4	11	147	2.48	27.3
6	5	9/18/2006	C0003	C0034	1/10	114	15	3	1		2/7	-3	12	147	2.48	29.8
7	5	2/12/2007	E0155	E0473	6/5	113	15	2		1	7/6	-3	11	149	2.45	26.9
8	4	7/10/2007	E0842	E0578	11/2	115	15	1			11/28	-4	11	145	2.52	27.7
9	5	12/3/2007	E1045	E0346	3/26	114	17	1		1	4/23	-5	11	147	2.48	27.3
10	5	4/28/2008	C0076	C0077	8/20	114	15	2	2	1	9/17	-3	11	147	2.48	27.3
11	5	9/22/2008	S1920	S1920	1/14	114	13				2/11	-1	12	147	2.48	29.8
12	5	2/16/2009	D-LIJN	D-LIJN	6/11	115	15	3			7/8	-3	12	147	2.48	29.8
13	5	7/13/2009	D-LIJN	D-LIJN	11/4	114	14	2			12/1	-2	12	146	2.50	30.0
14	5	12/6/2009	D-LIJN	D-LIJN	3/31	115	13	2		1	4/29	-1	11	149	2.45	26.9
15	4	5/3/2010	TEMPO	TEMPO	8/25	114	14	2			9/23	-2	12	147	2.48	29.8
16	5	9/28/2010	TEMPO	TEMPO	1/21	115	15	4			2/17	-3	12	147	2.48	29.8
17	5	2/22/2011	TEMPO	TEMPO	6/16	114	12	3			7/14	.0	12	147	2.48	29.8
18	5	7/19/2011	TEMPO	TEMPO	11/10	114	16	2			12/8	-3	13	147	2.48	32.3
19	5	12/13/2011	TEMPO	TEMPO	4/5	114	14	4			5/3	-2	12	147	2.48	29.8
20	4	5/7/2012	TEMPO	TEMPO	8/30	115	12	4			9/27	0	12	147	2.48	29.8
21	5	10/2/2012	TEMPO	TEMPO												

Some examples

Possible approaches

1. Challenge in specific forms
   a) Climate
   b) Disease
   c) Feed
   d) Labor

2. Challenge in general terms: reaction norms

3. Predictable, ‘residual free’ animals

4. Choose appropriate traits

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1a Climate is next

Heat tolerance and farrowing rate in two sow lines

Summary of a PhD project

Saskia Bloemhof, Egbert Knol, Ignacy Misztal, Liesbeth van der Waaij

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1a Poster on ‘priming’

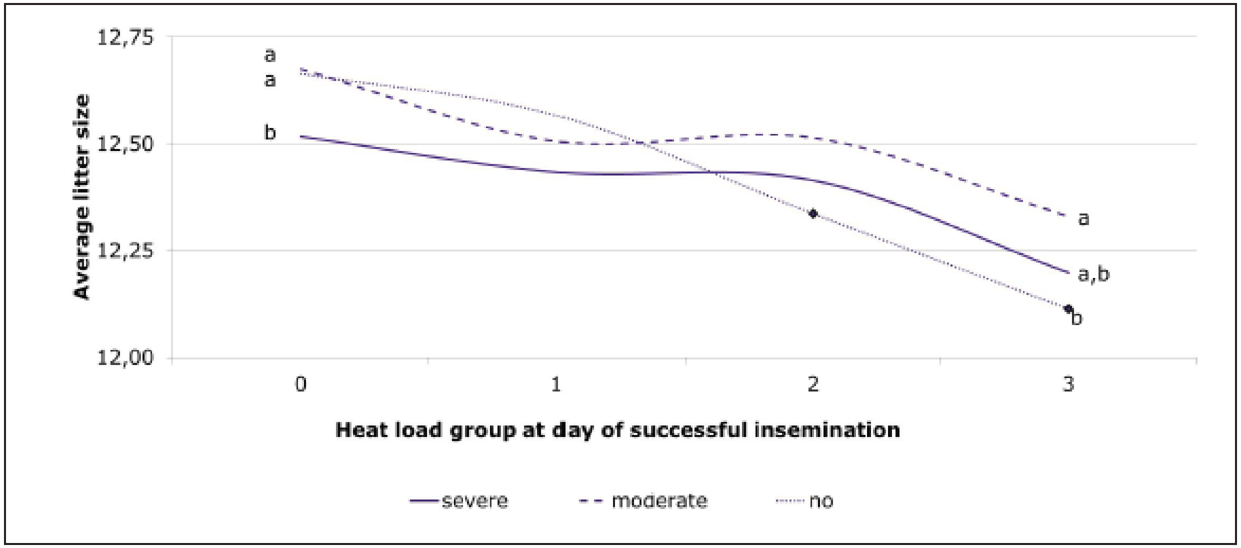
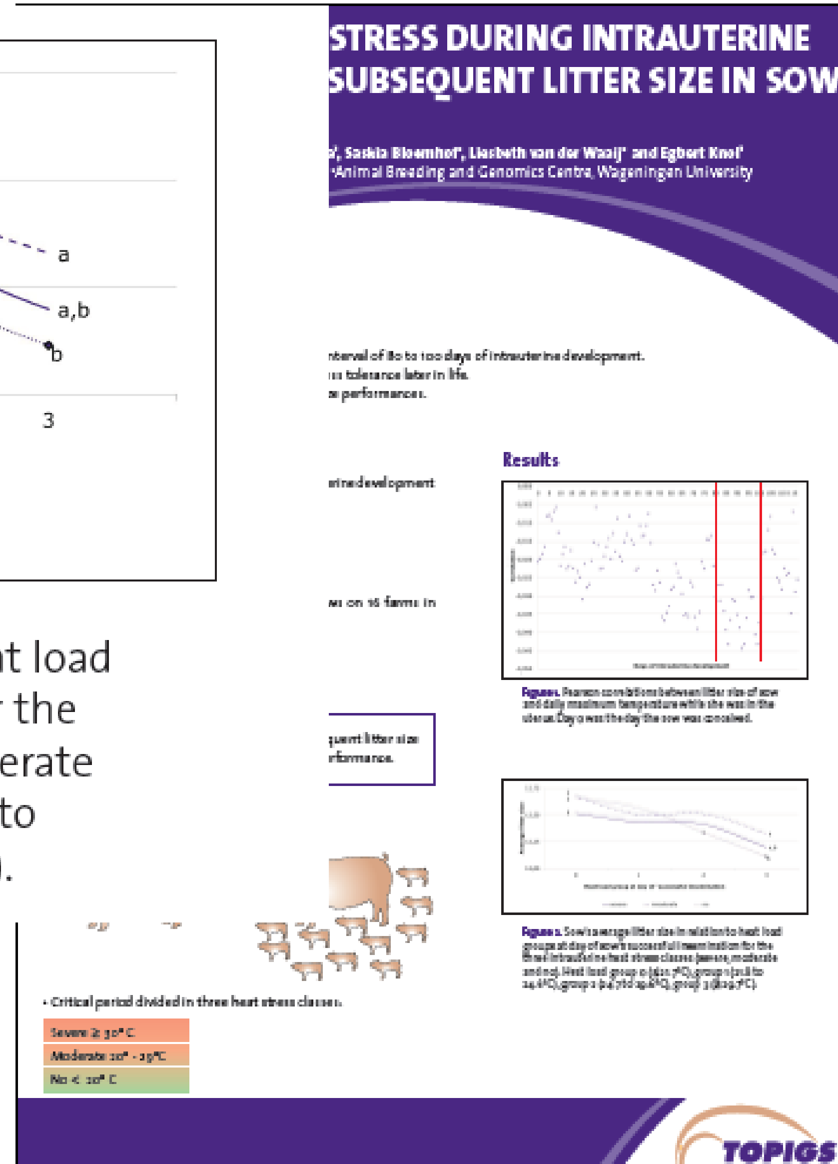
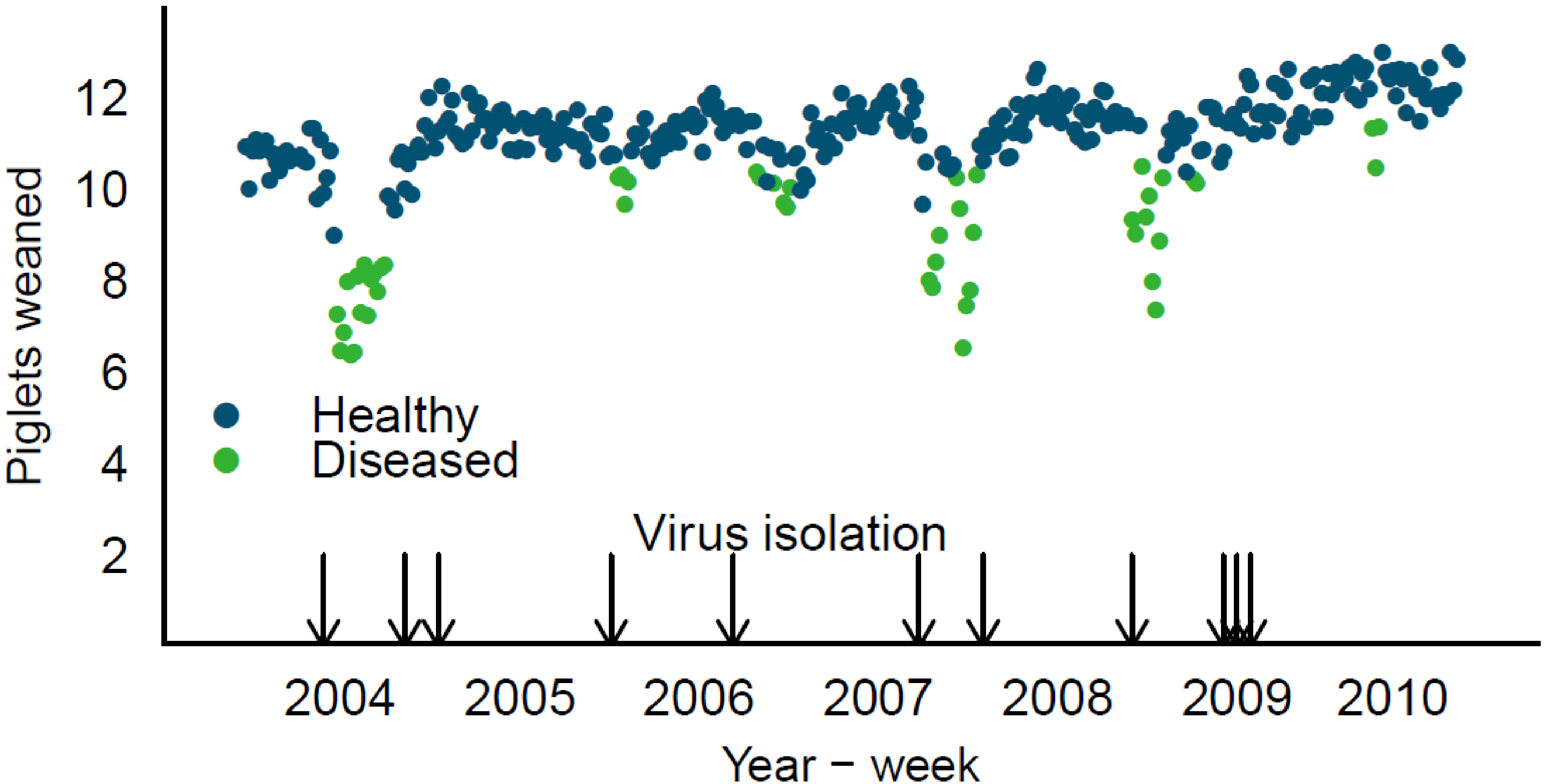


Figure 2. Sow’s average litter size in relation to heat load groups at day of sow’s successful insemination for the three intrauterine heat stress classes (severe, moderate and no). Heat load group 0 (≤21.7°C), group 1 (21.8 to 24.6°C), group 2 (24.7 to 29.6°C), group 3 (≥29.7°C).



1b PRRS challenge



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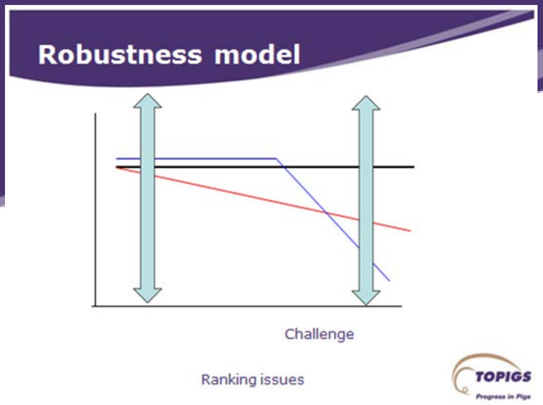
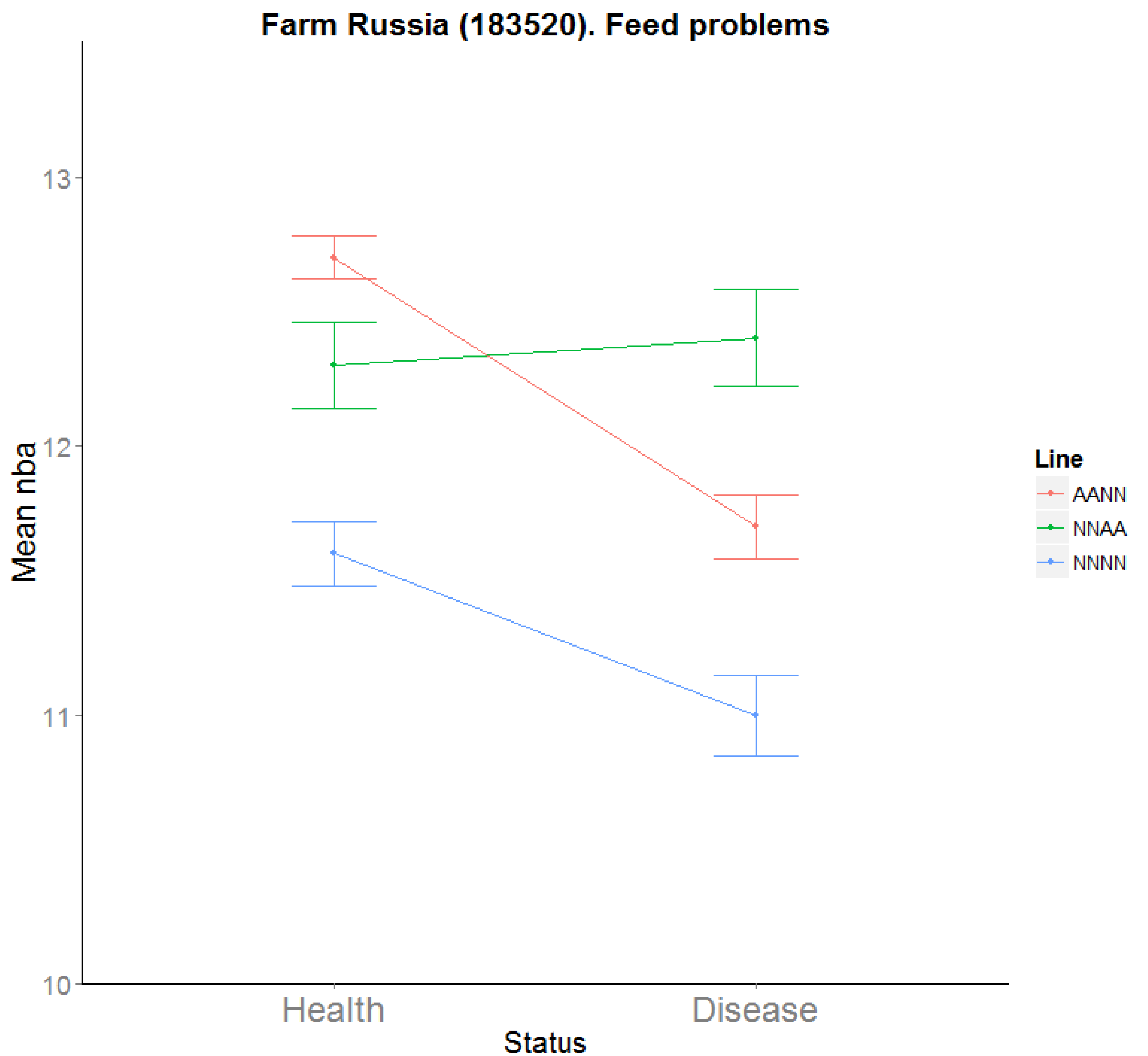
PRRS Piglet losses



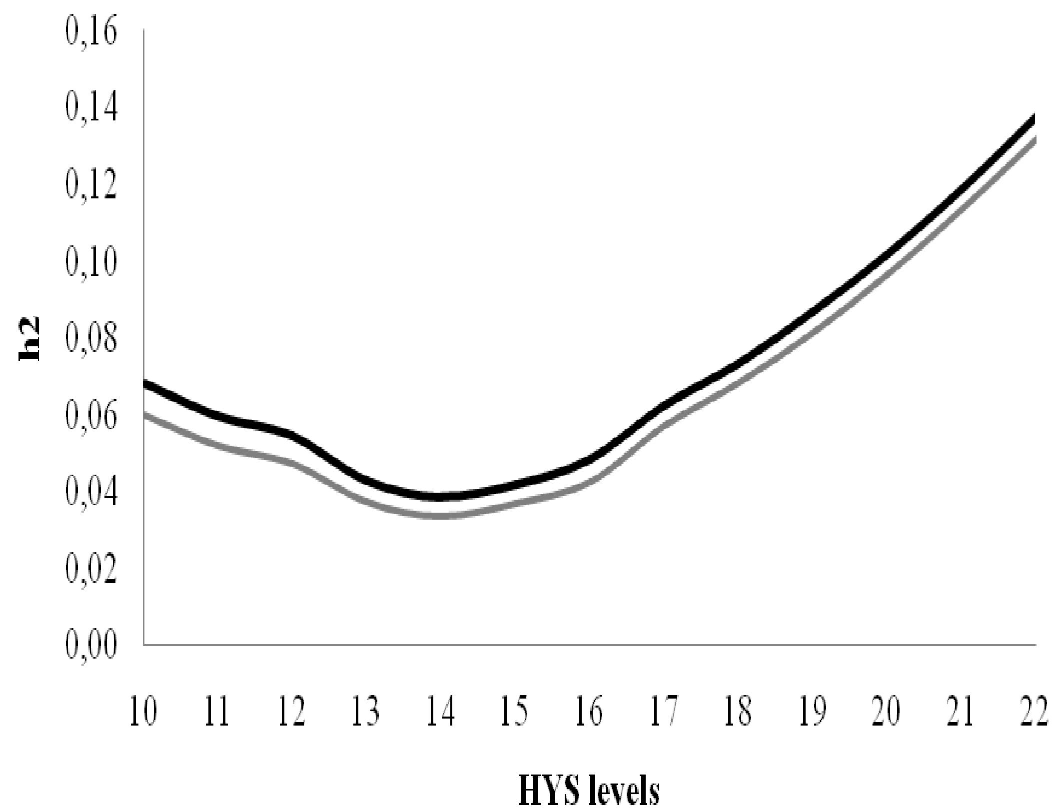
Stillborn and mummified

Variance components	Healthy	Disease
#Litters	17430	948
Animal	0.15	1.08
Permanent environment	0.20	
Herd-year-month	0.01	2.63
Service sire	0.01	0.08
Residual	2.40	11.97
Total	2.77	15.76
Heritability	**0.05**	**0.07**

1c Feeding issues



2 Reaction norms: Litter size



Sire evaluation for total number born in pigs using genomic reaction norms approach[1]

F.F. Silva [*,2], H. Mulder [§],E.F. Knol[†], M.S. Lopes [†], S.E.F. Guimarães[‡], P.S. Lopes[‡],

J.W.M. Bastiaansen [§]

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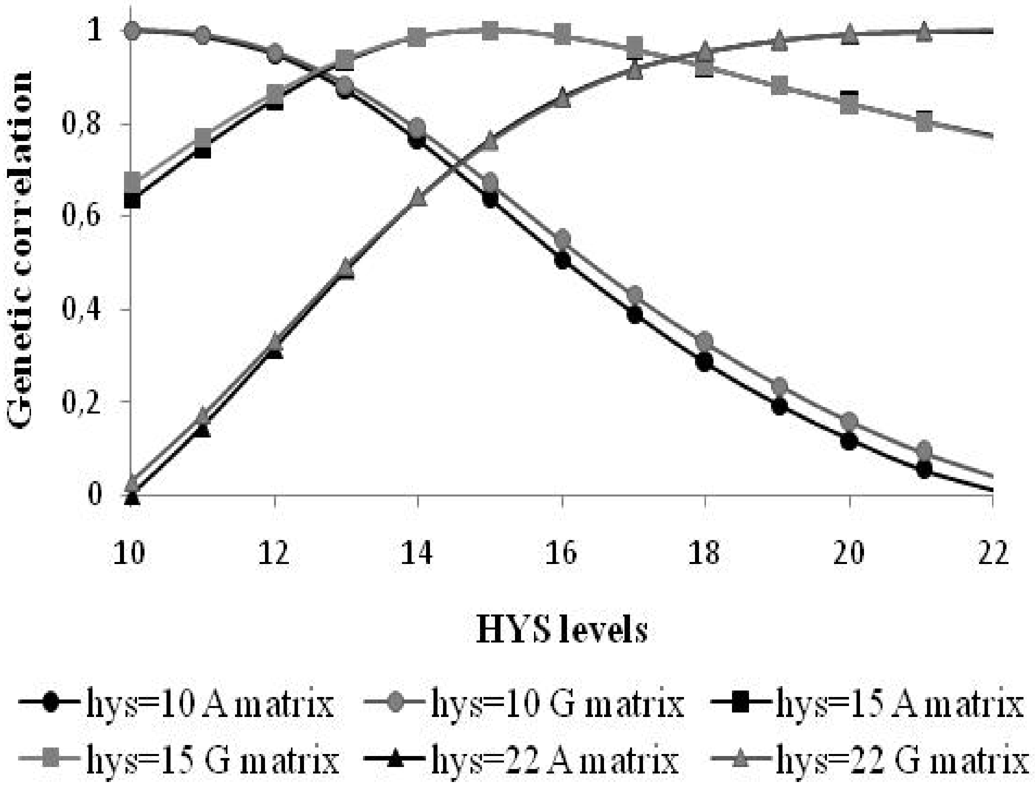
Correlations unfavourable



Conclusion: single line for all markets is suboptimal (?)

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3 Predictable animals

$$Y = HYS + animal + residual$$

- Residual is partly heritable
- Selection can increase predictability

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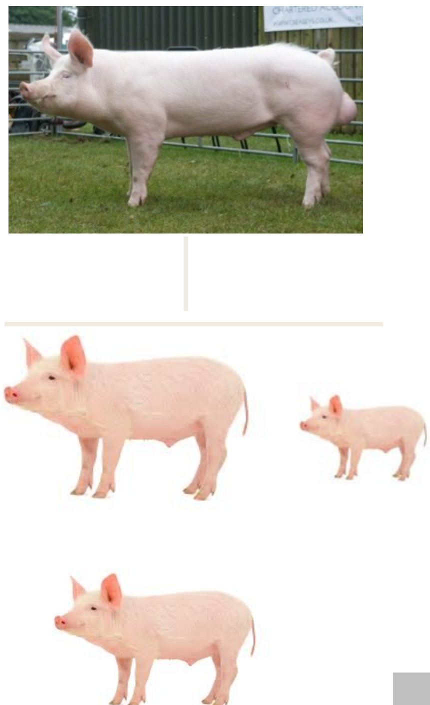
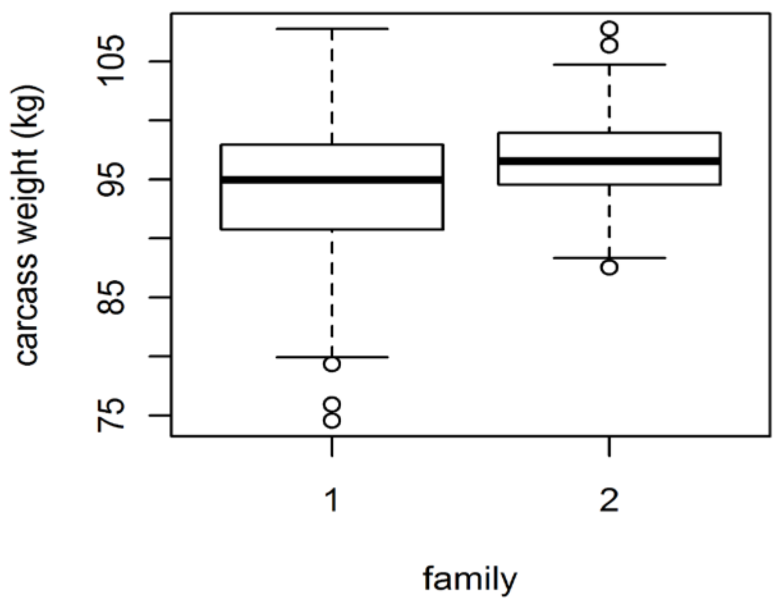
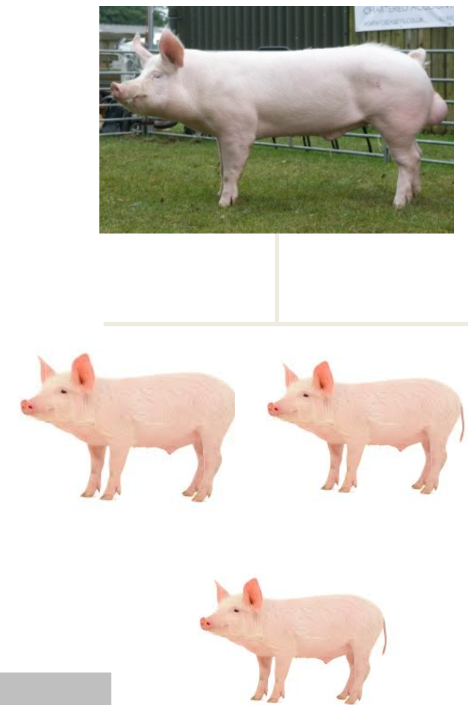
Two extreme EBV sires

Family 1

Family 2







Difference in within-family variance

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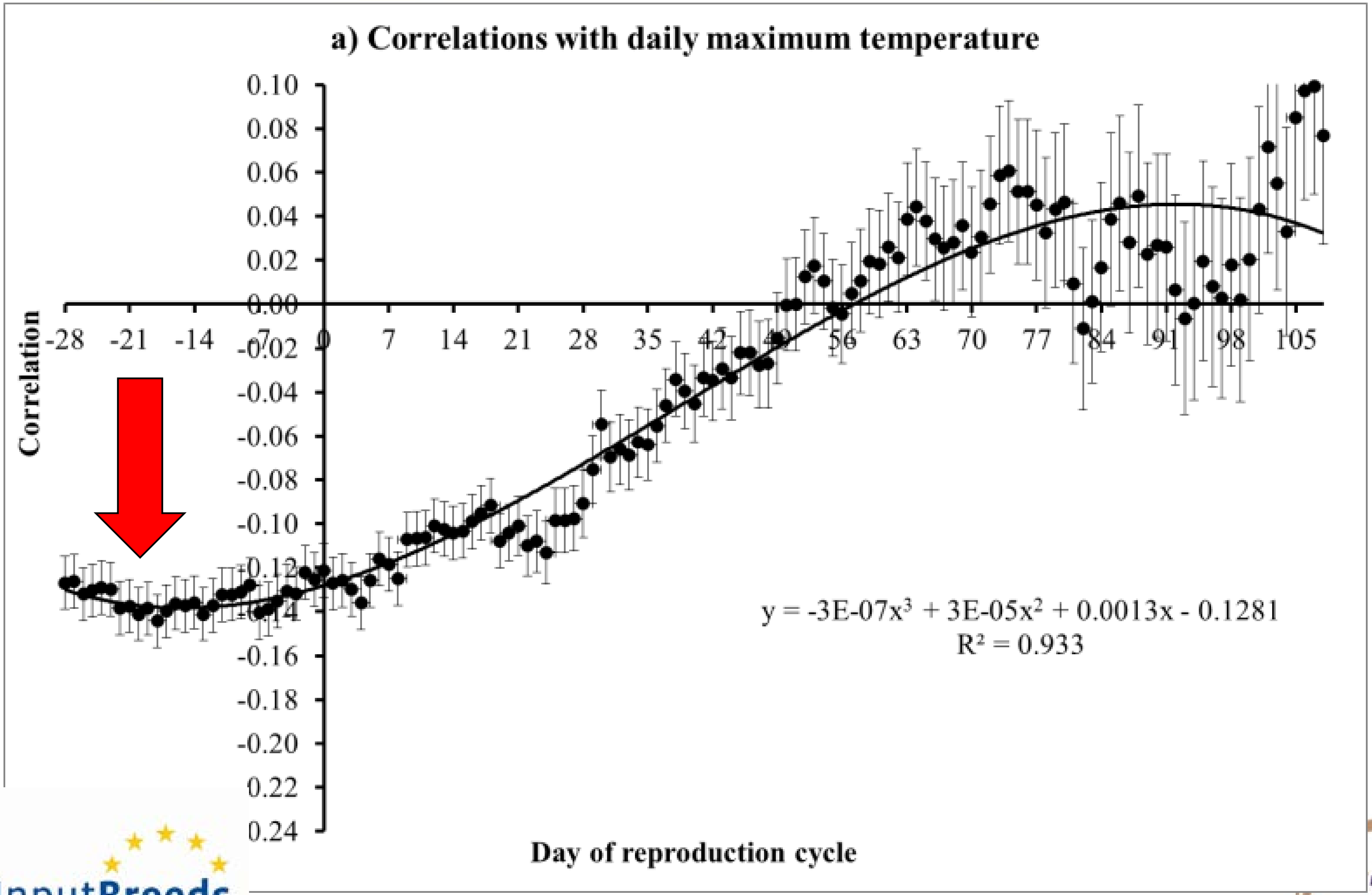
4 Traits combinations

I Farrowing rate

Get ‘in pig’ or skip 3 weeks

- Ideal adaptation mechanism

I Farrowing rate: *Sows parity 2-7*



LowInputBreeds

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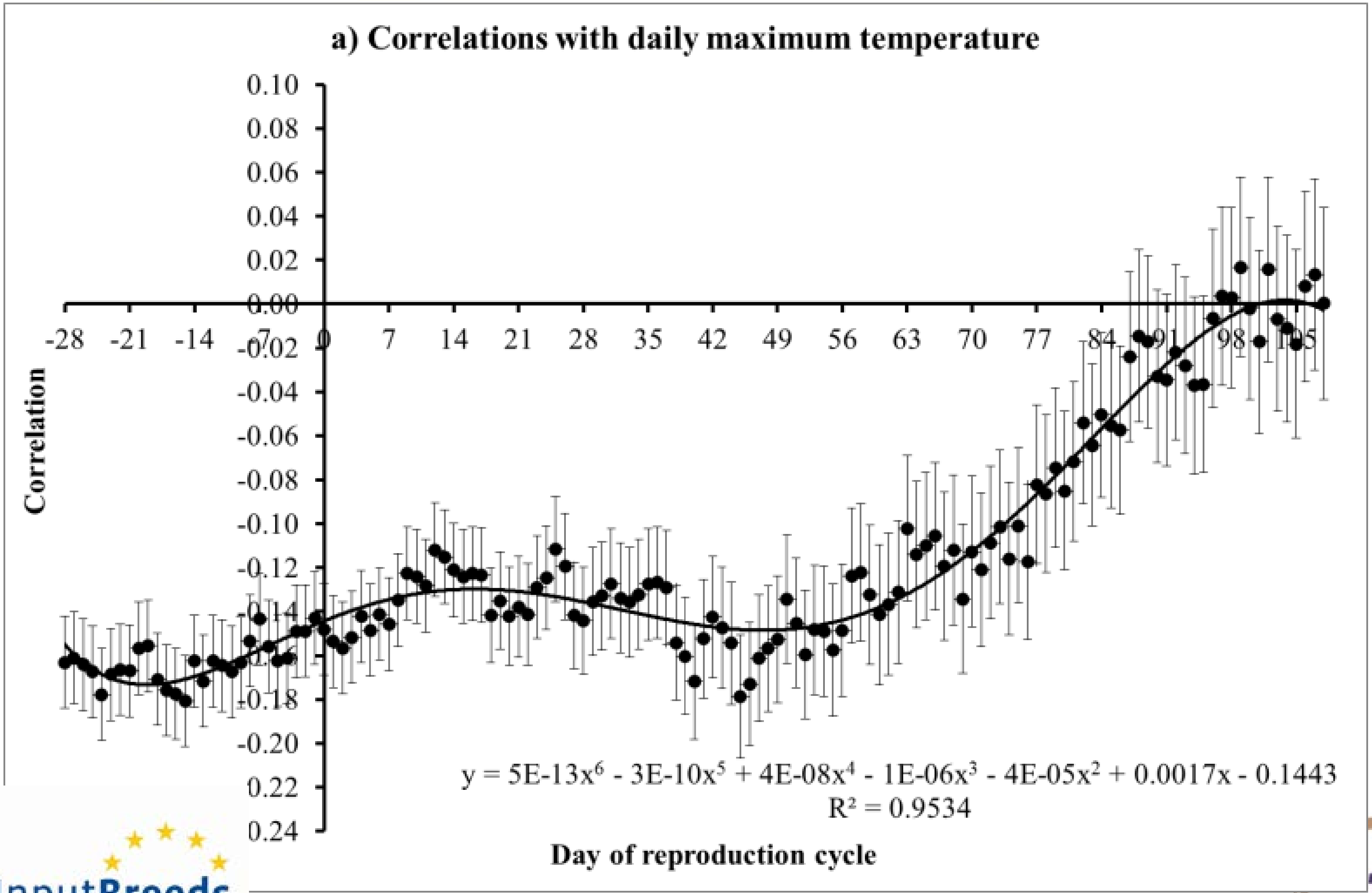
I Farrowing rate: *Gilts*



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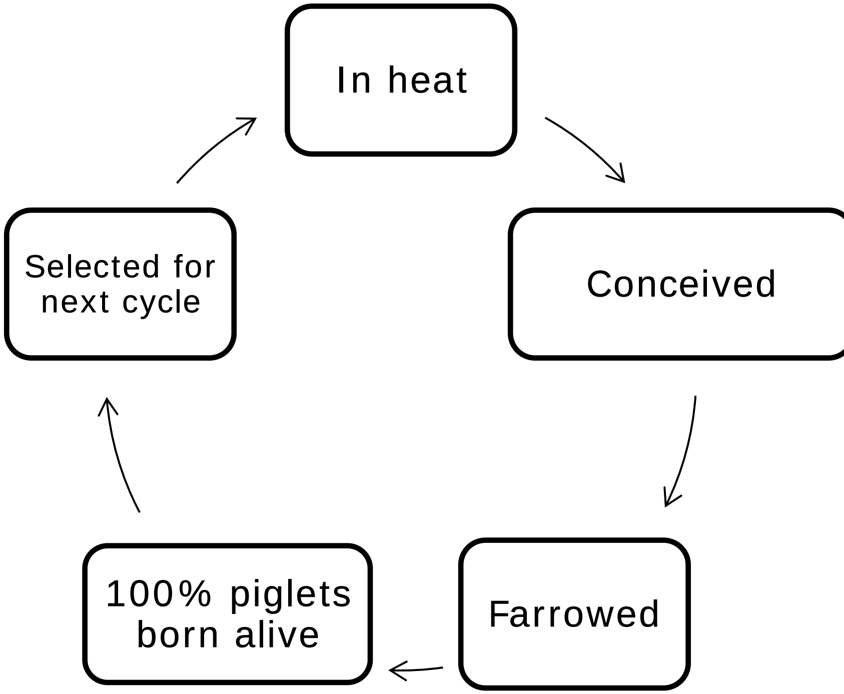
II Merry go round

More standardized pig production ➔ farmers want less problems so that they can plan better

36% of sows is easy

Trait:	Mean
Inheat-survival	87.23
NR-survival	80.59
FR-survival	68.43
BA-survival	39.78
Selection-survival	36.04

27,781 observations



In heat <7 days, no return into heat, no abortion, no stillborn, not culled

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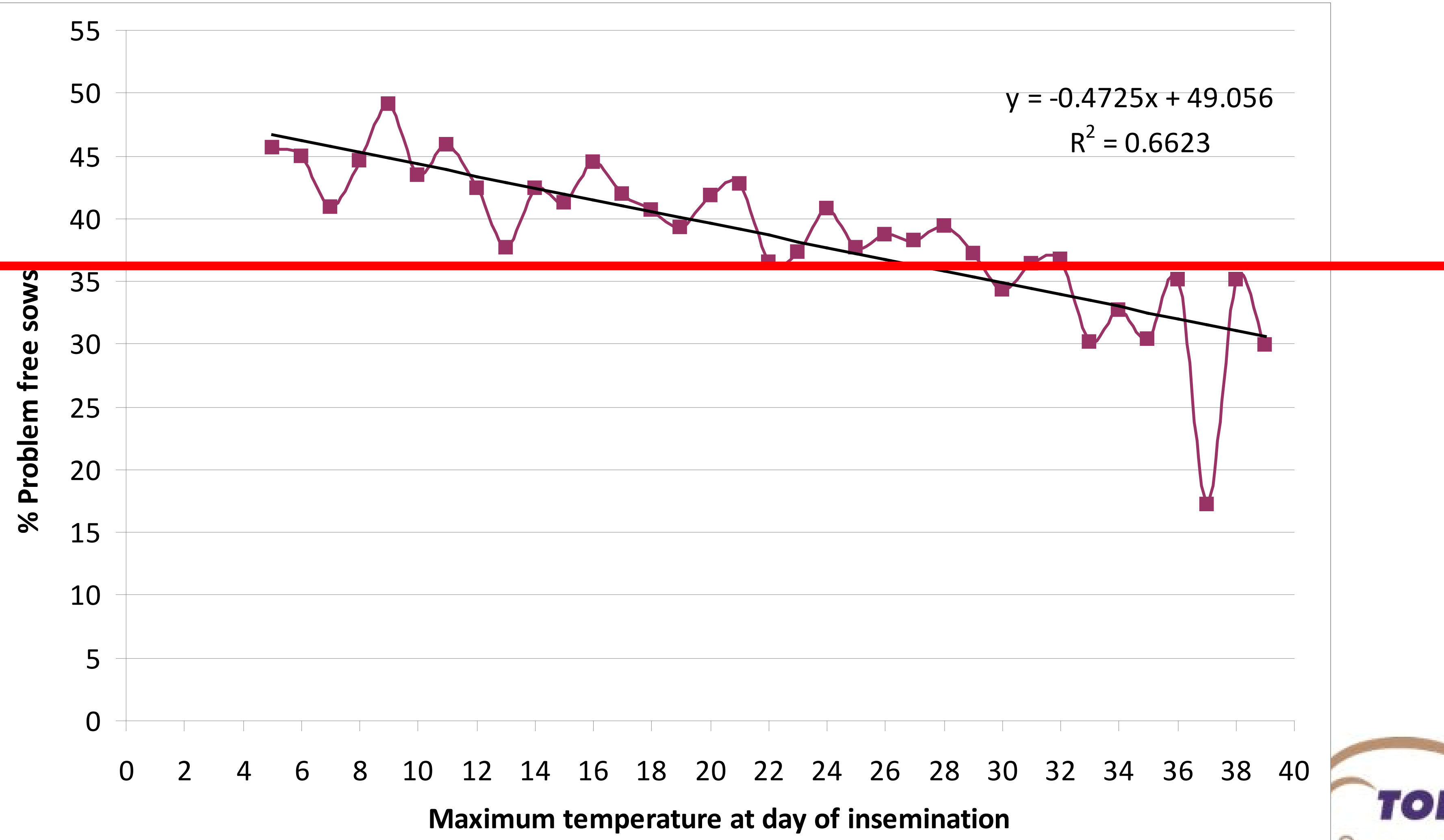
Slippery when wet



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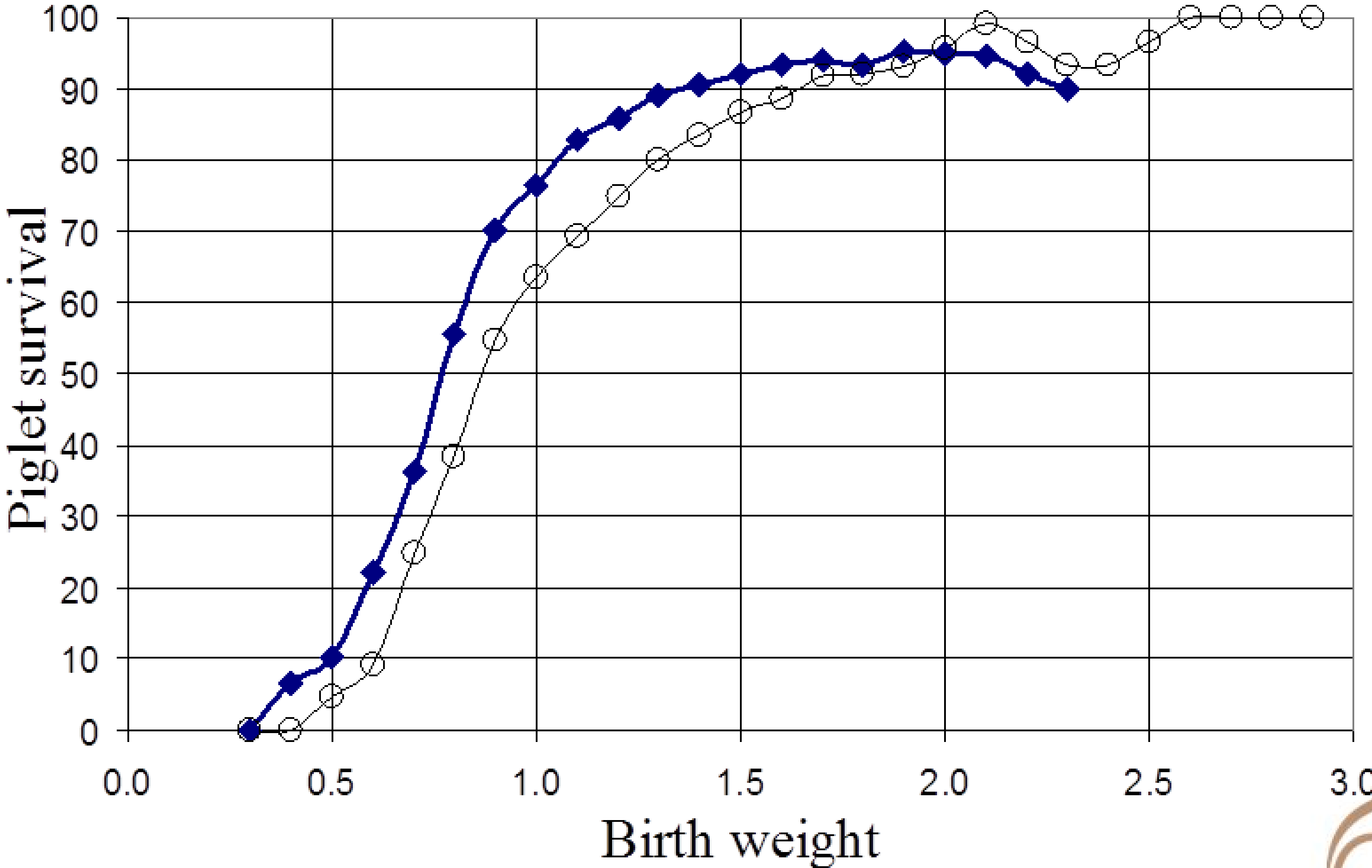
III Piglet survival peri partum



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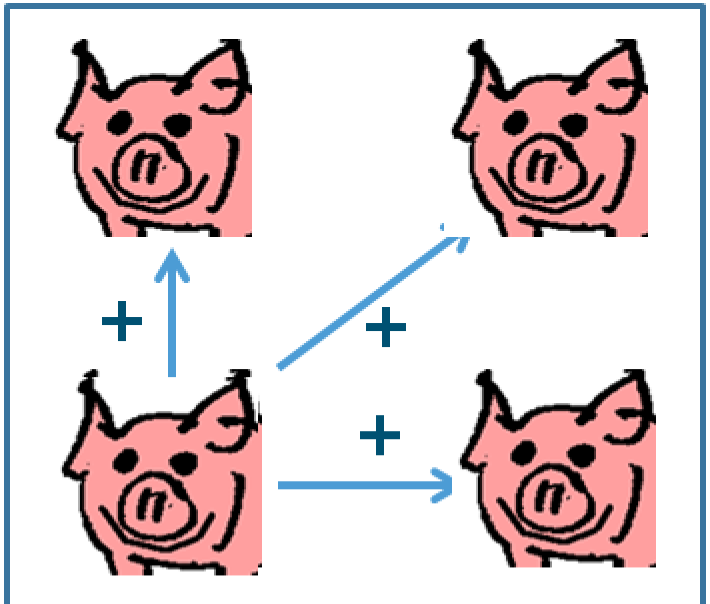
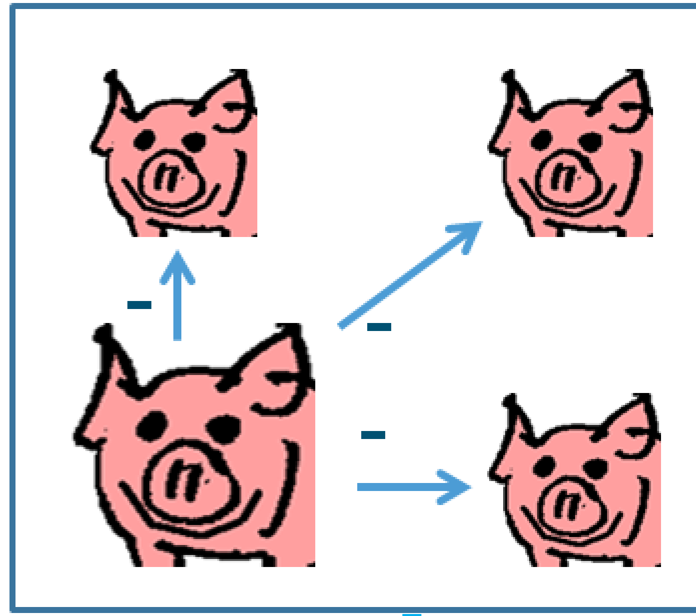
IV Social effects
Daily gain



Positive effect on growth of pen mates

High social breeding values (for growth)



Negative effect on growth of pen mates

Low social breeding values (for growth)

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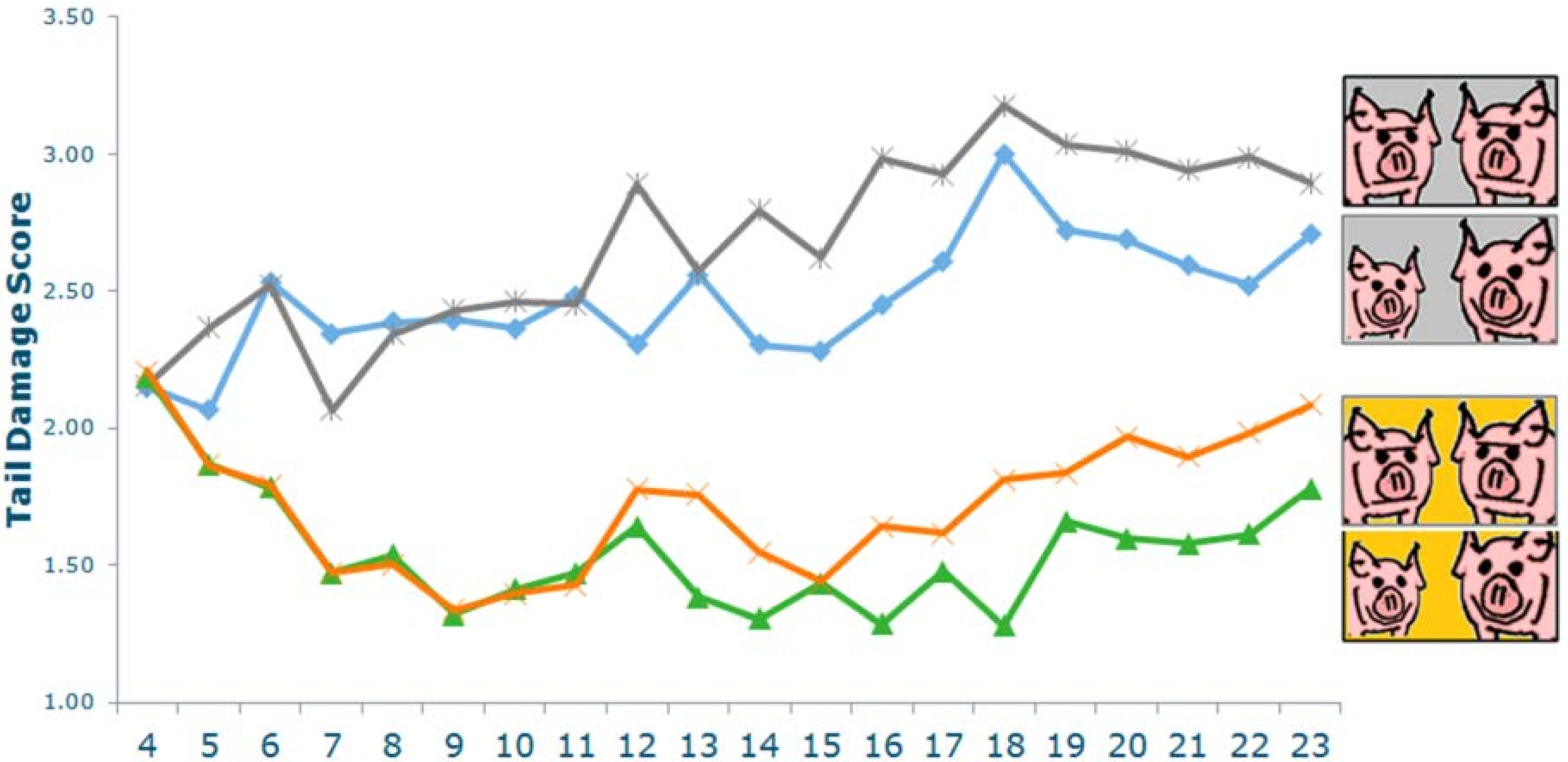
Tailbiting consequences



Approaches and traits

	Reaction norm	Residual Selection	Challenge trials	…..
Survival				
Performance	X			
Farrowing rate				
Immune Response			X	
Uniformity		X		
….				

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Thanks to

Low input Breeds

- Saskia Bloemhof
- Claudia Sevillano
- Fabyano Silva

ITN Nematode SystemHealth

- Hamed Rashidi
- Pramod Mathur
- Juan Herrero Medrano
- Panoraia Alexandri

Breed4Food (WUR)

- Han Mulder
- John Bastiaansen
- Liesbeth van der Waaij

Universidade Federal de Viçosa

- Simone Guimaraes

University of Georgia

- Ignacy Misztal

LowInputBreeds

UNIVERSITY OF GEORGIA

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Summary

Future needs

- Low in labour
- Easy to manage
- Uniform
- Problem free
- Challenge proof
- Society acceptable

Robustness

- Proper trait selection
- Statistical tools
  - Predictable pigs
  - Social pigs
- Uniformity
- Challenge reactions
- Maintain genetic variation

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Thank you for your attention!

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