

Effect of genotype, sow rearing system and outdoor access on piglet survival in extensive systems

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Session 26, EAAP 2014, Copenhagen



Background and objectives

Two critical moments in the life of (organic) piglets

- Last days before and during birth + first days of live
- Lactation period: birth - weaning

Objectives

1. Effect of genotype piglet and rearing gilt system on maternal behaviour (litter 1+2) and vitality and health of piglets (0-6 wk)
2. Effect of outdoor environment during lactation on survival and vitality of piglets before and after weaning (1-6 + 6-10wk)

Setup

- 2 x 2 x 3 factorial design:
genotype, rearing system and outdoor run type

Genotype

- Genotype of the fathers of the gilts in this experiment
- Vitality based on breeding index:
 - HPS - High Piglet Survival
 - LPS - Low Piglet Survival

Expected difference in piglet survival 5.2% of total born



Rearing system

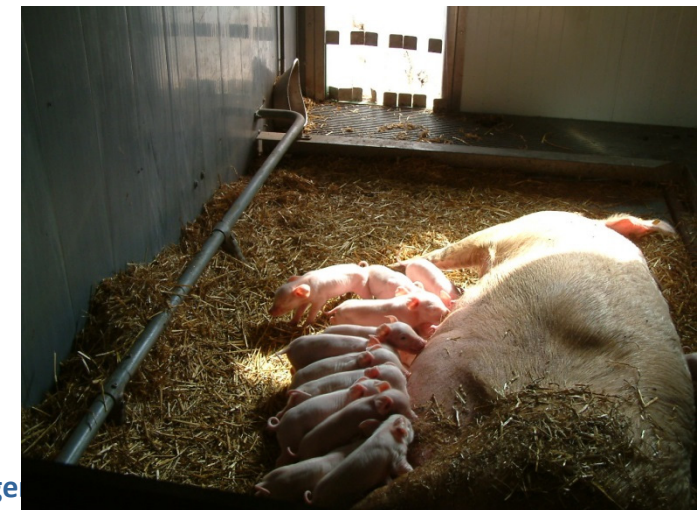


■ CONV - Conventional (“barren”)

- Farrowing pen + crate 2,5 x 1,7m
- Rearing pen, partly slatted, 0,3 - 0,4 m²/piglet (-30kg)
- Rearing until 8 months, p.s., 1.0 m²/gilt – 1.3 m²/gilt

■ ORG - Organic (“enriched”)

- according to EU and Dutch standards

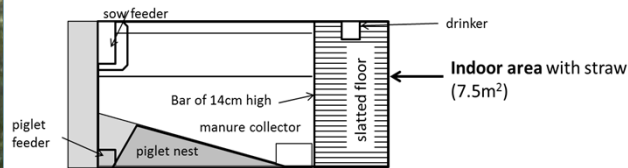


Outdoor run type

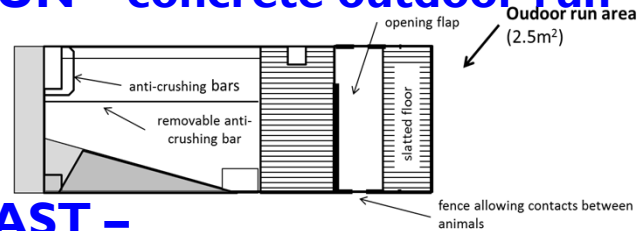
- IN - None, just indoor
- RUN - Concrete outdoor run 2 x 2 m
- PAST - Concrete + additional pasture for the piglets



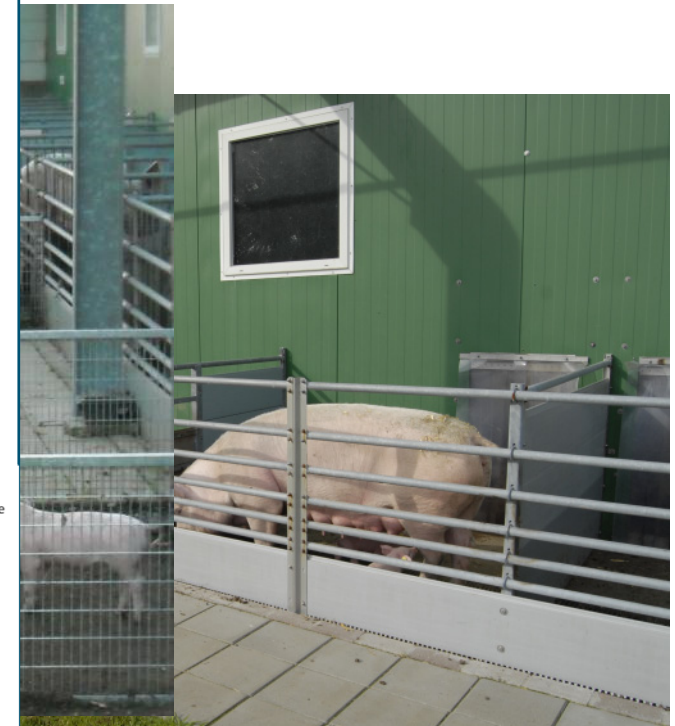
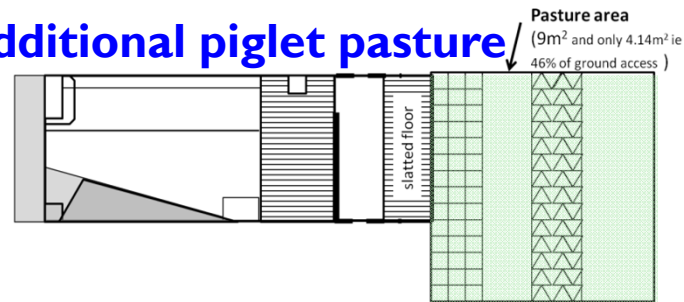
IN – no outdoor area



RUN – concrete outdoor run



PAST – additional piglet pasture



Experimental Setup – Realized number of Litters

		Outdoor run and parity						
		In		Run		Past		total
mothers	Rearing syst	1	2	1	2	1	2	
T20 x HPS	Organic	11	10	13	10	11	9	64
	Conventional	6	5	6	6	7	6	36
T20 x LPS	Organic	11	12	12	12	13	14	74
	Conventional	6	6	5	5	6	7	35
total		34	33	36	33	37	36	209

Observations (2010 - 2014)

- Before weaning (1-6 wk)
 - maternal behaviour
 - piglet behaviour
 - mortality
 - vet. treatments
 - feed intake
 - body weight (3x)

- After weaning (6-10 wk)
 - mortality
 - vet. treatments
 - diarrhoea score
 - body weight (2x)
 - feed intake

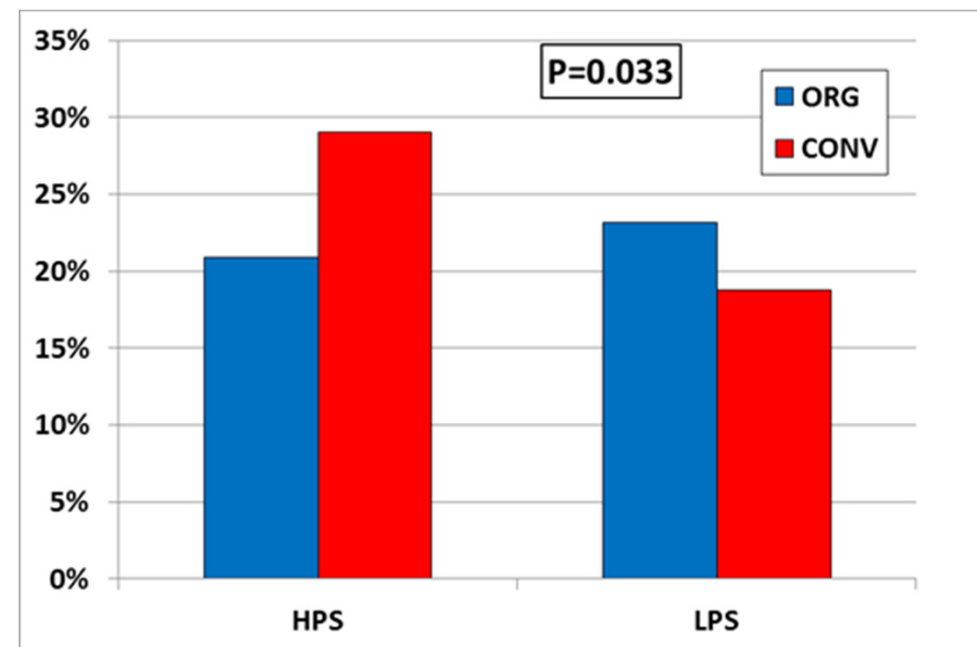
General results

- 209 litters
- 14.88 liveborn piglets
- 1296 g birthweight
- weaning at 42 days
- 11.96 weaned piglets (19.6% mortality)
- weaning weight 11.03 kg
- daily gain 232 g/d

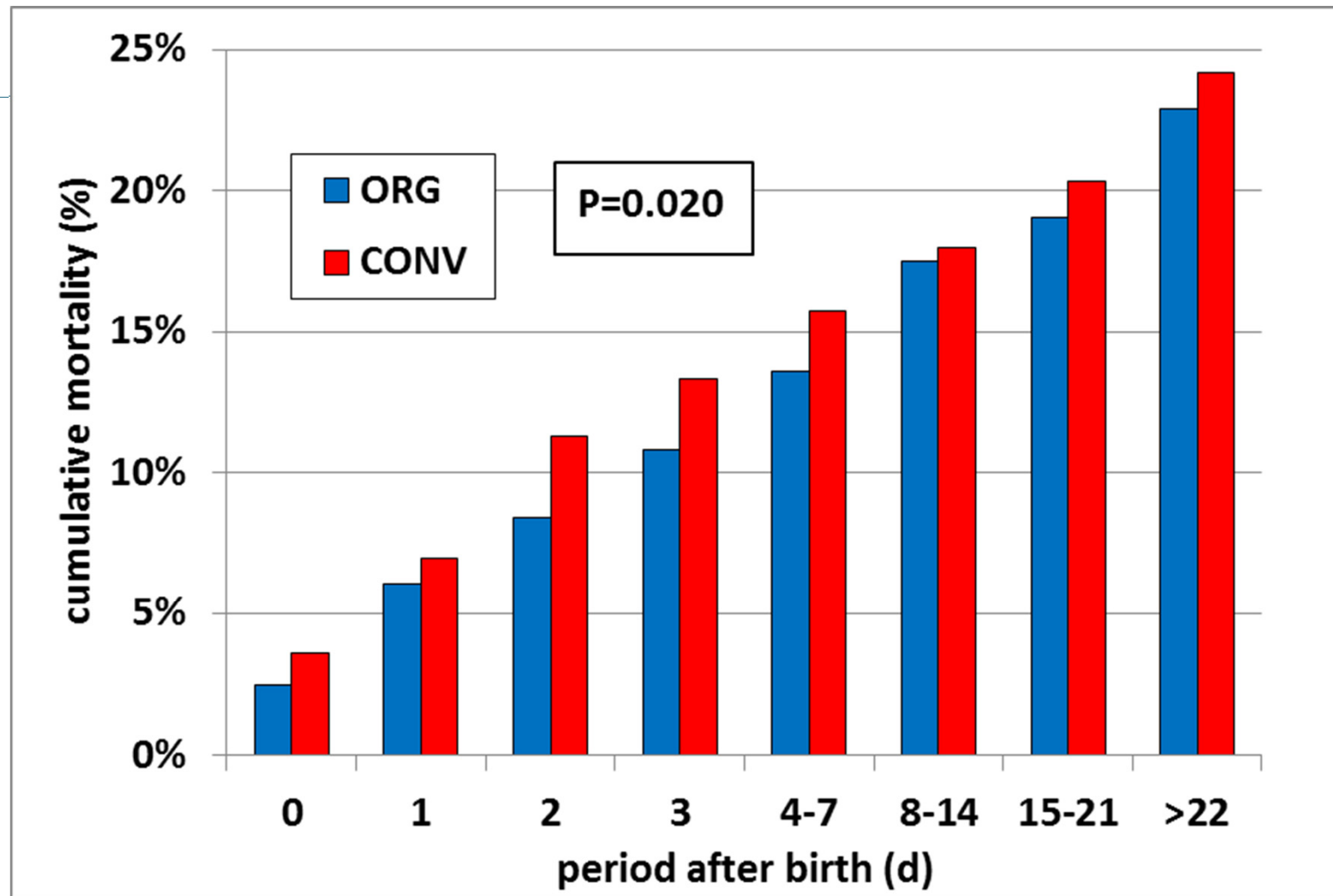


Results Genotype (father of the sow)

- No effect of genotype on piglet survival
- Death causes not different
- Daily gain (0-3d) higher for first litters HPS and ORG, not for second litters
- Low number of health problems and not analysed
- Interaction with rearing:



Results - cumulative mortality in lactation per rearing system



Behaviour

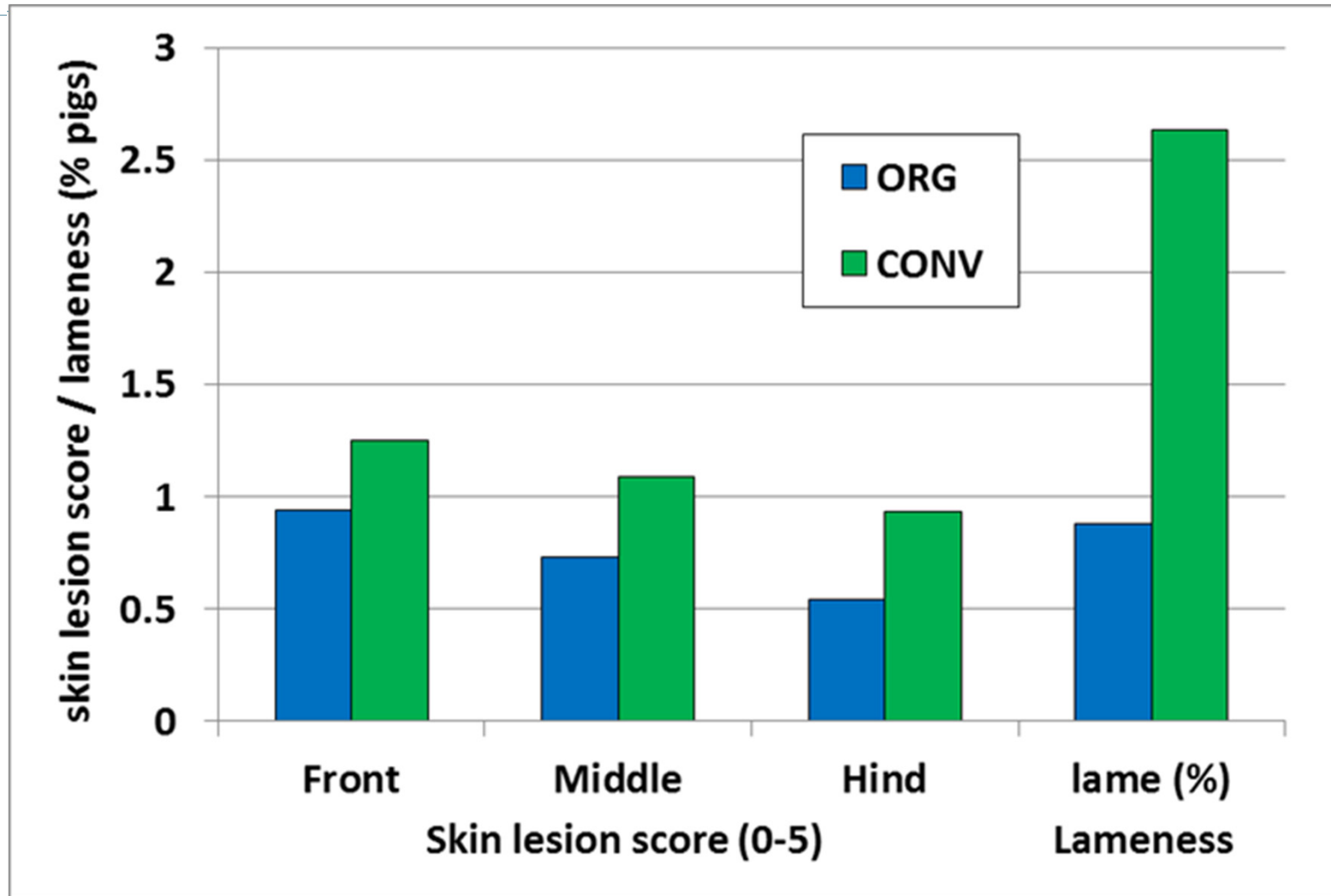


- HPS more eating/drinking pre farrowing (P=0.017)
- HPS more outdoors pre farrowing (P=0.063)
- LPS more exploring pre farrowing (P=0.061)
- ORG more on slatted floor pre farrowing (P=0.090)

- No behavioural differences during farrowing

- HPS head more to outdoor post farrowing (P=0.096)
- CONV more sitting post farrowing (P=0.030)

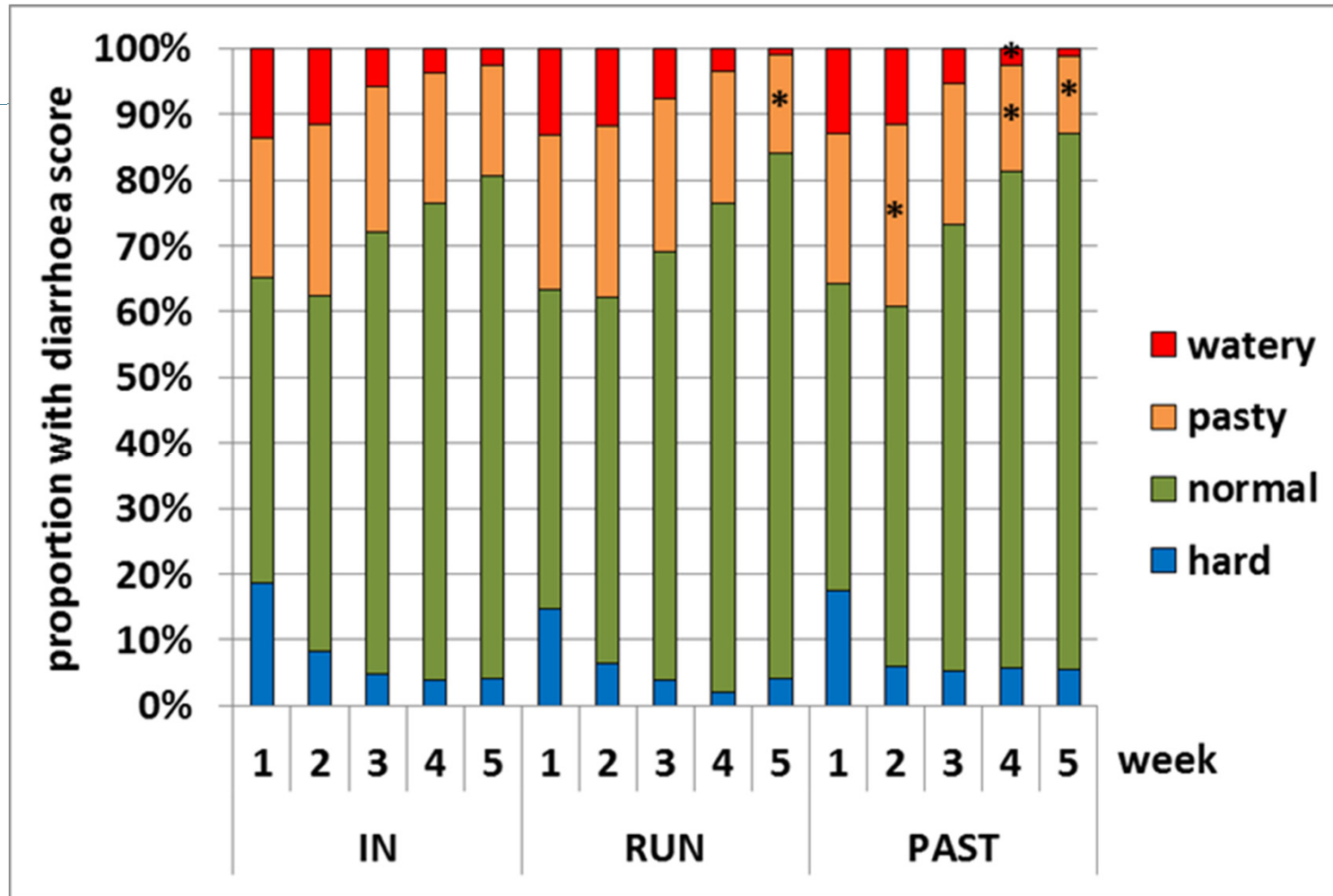
Mean skin lesion scores and % lame gilts at start and end of 1st pregnancy



Performance during rearing phase (6-10 wk)

	IN	RUN	PAST	P
Starting age (d)	44.6	45.8	44.7	0.269
Starting weight (kg)	10.76	11.06	10.66	0.517
Daily gain (kg/d)	0.370	0.378	0.386	0.359
Veterinary treatments (%)	1.2	0.3	1.9	-

Back transformed proportions of diarrhoea scores during 5 weeks



Conclusions

- Fathers selected on piglet survival in conventional systems did not improve maternal behaviour of daughters and consequent piglet survival;
- Rearing gilts from birth to first insemination under organic conditions compared to conventional conditions did not improve maternal behaviour and consequent piglet survival;
- Rearing conditions did effect social behaviour during 1st pregnancy: less skin lesions and fewer lameness in organically reared gilts;
- As well for first litters from gilts with high piglet survival fathers and also from organic rearing the daily gain of the piglets during lactation is higher;
- Providing piglets during lactation some pasture resulted in more diarrhoea in week 2 after weaning, but less diarrhoea in week 4 and 5 after weaning compared to indoor and concrete outdoor run piglets



Thanks for your attention!

ACKNOWLEDGEMENT

The authors gratefully acknowledge funding from the European Community financial participation under the Seventh Framework Programme for Research, Technological Development and Demonstration Activities, for the Integrated Project LOWINPUTBREEDS FP7-CP-IP 222623.

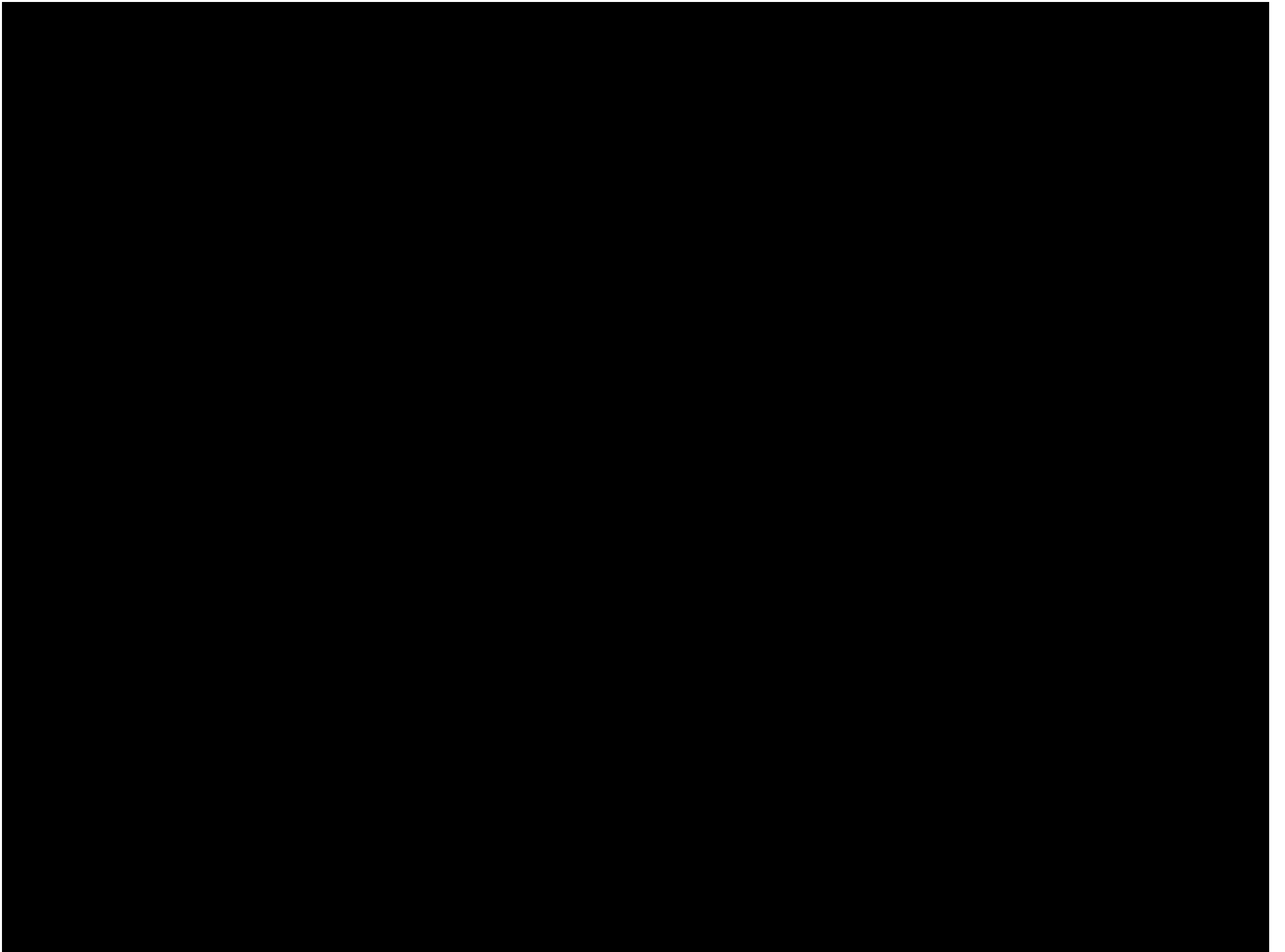


Table 5. Back transformed mean percentages pre farrowing behaviour for the categories Activity, Position, Posture and Head direction with P-value per treatment and P-value for the Genotype*Rearing system interaction.

	Genotype			Rearing system			P-int.
	HPS	LPS	P-value	ORG	CONV	P-value	
ACTIVITY							
Passive	59.11	61.89	0.432	58.61	62.38	0.224	0.150
Explore floor	14.41	13.44	0.880	14.23	13.61	0.488	0.041
Other activity	8.12	9.79	0.207	9.63	8.25	0.779	0.758
Outside	7.81	4.93	0.063	6.26	6.17	0.251	0.397
Eat/drink	4.53	2.52	0.017	3.76	3.04	0.132	0.404
Explore not straw/floor	2.61	3.03	0.420	3.20	2.48	0.284	0.668
Explore straw	0.15	0.50	0.061	0.41	0.18	0.793	0.511
POSITION							
Solid floor	87.08	87.37	0.216	85.19	89.02	0.118	0.403
Outside	7.81	4.93	0.063	6.26	6.17	0.251	0.397
Slatted floor	4.52	6.57	0.531	6.97	4.26	0.090	0.823
POSTURE							
Ly lateral	45.37	46.43	0.647	44.61	47.20	0.376	0.335
Ly ventral	13.18	14.54	0.332	13.33	14.38	0.536	0.327
Outside	7.81	4.93	0.063	6.26	6.17	0.251	0.397
Walk	0.42	0.23	0.291	0.33	0.30	0.833	0.711
Kneel/ ly-down	0.00	0.01	0.182	0.01	0.00	0.600	-
Feed/drink	0	0	-	0	0	-	-
HEAD DIRECTION towards							
Slatted floor	67.45	63.81	0.686	63.10	68.12	0.631	0.785
Trough	13.08	16.34	0.183	16.68	12.81	0.976	0.753
Outside	7.81	4.93	0.063	6.26	6.17	0.251	0.297
From slatted floor to diff. direction	3.36	4.47	0.863	5.42	2.76	0.041	0.630
Piglet nest	3.21	3.40	0.566	2.96	3.68	0.942	0.796
From slatted floor to solid floor	0.92	1.26	0.516	1.02	1.15	0.805	0.952



Table 6. Back transformed mean percentages behaviour during farrowing for the categories Posture, Head direction and Piglet location with P-value per treatment and P-value for the Genotype*Rearing system interaction.

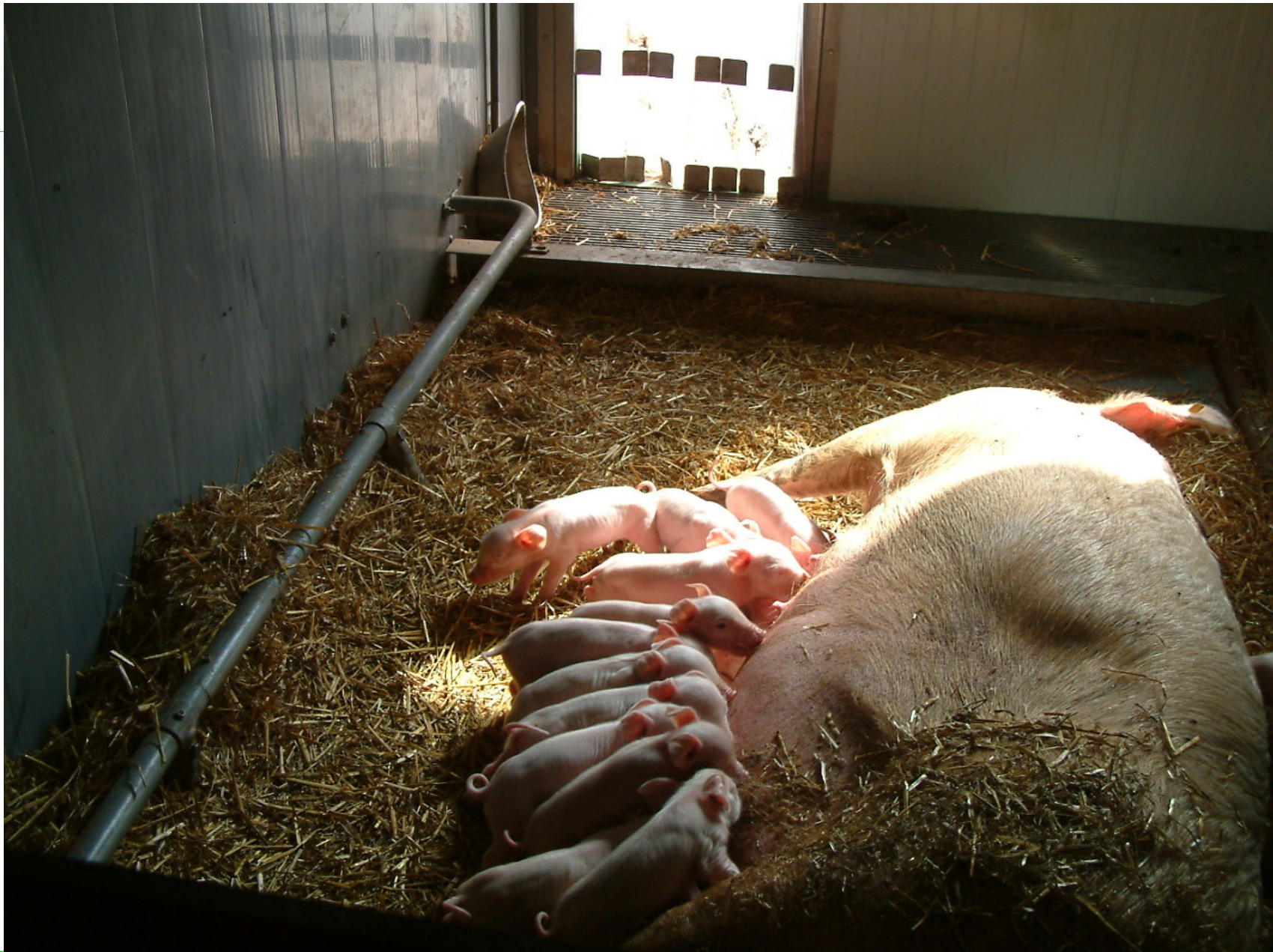
	Genotype			Rearing system			P-int.
	HPS	LPS	P-value	ORG	CONV	P-value	
POSTURE							
Ly lateral	84.20	82.98	0.907	82.22	84.89	0.835	0.315
Stand	8.23	6.18	0.469	8.64	5.87	0.863	0.629
Ly ventral	1.87	3.15	0.291	2.80	2.11	0.687	0.852
Sitting	1.85	2.96	0.196	2.34	2.33	0.858	0.647
Feed/drink	0.04	0.01	0.853	0.00	0.06	0.323	0.710
HEAD DIRECTION towards							
Slatted floor	58.08	65.67	0.587	68.15	55.33	0.582	0.285
Trough	26.67	16.12	0.444	19.70	22.18	0.798	0.973
PIGLET LOCATION							
Udder	67.33	63.91	0.374	67.10	64.15	0.705	0.317
Near sow, not udder	22.64	26.00	0.350	21.99	26.73	0.305	0.182
Solid floor	4.57	4.34	0.897	3.88	5.11	0.851	0.517

Table 7. Back transformed mean percentages post farrowing behaviour for the categories Posture, Head direction and Piglet location with P-value per treatment and P-value for the Genotype*Rearing system interaction.

	Genotype			Rearing system			P-int.
	HPS	LPS	P-value	ORG	CONV	P-value	
POSTURE							
Ly lateral	77.12	77.92	0.682	77.67	77.38	0.897	0.540
Ly ventral	8.63	9.97	0.477	10.57	8.13	0.233	0.807
Feed/drink	8.59	8.07	0.576	6.68	10.33	0.105	0.701
Sitting	1.40	1.27	0.612	1.08	1.65	0.030	0.958
Outside	0.37	0.00	0.557	0.01	0.05	0.375	0.104
HEAD DIRECTION towards							
Slatted floor	69.31	54.16	0.096	59.17	64.80	0.830	0.193
Trough	19.05	32.96	0.109	30.59	20.79	0.969	0.190
Piglet nest	2.85	2.24	0.385	2.63	2.43	0.833	0.569
From slatted floor to diff. direction	1.40	1.56	0.555	1.35	1.62	0.498	0.125
From slatted floor to solid floor	0.13	0.46	0.173	0.22	0.28	0.987	0.713
Outside	0.37	0.00	0.556	0.01	0.05	0.375	0.104
PIGLET LOCATION							
Udder	80.84	81.28	0.947	81.53	80.58	0.861	0.396
Near sow, not udder	11.47	9.15	0.855	10.16	10.34	0.542	0.813
Solid floor	5.96	7.66	0.937	6.30	7.25	0.215	0.209

Average production on research farm

	2010	2011	2012	2013
n litters	204	203	197	196
n live born	15.9	15.8	16.0	14.7
n weaned	12.0	11.9	11.5	10.7
mortality (%)	24.1	24.8	27.4	29.5
farrowing rate (%)	89.5	89.8	86.8	75.5
n weaned/sow/year	26.5	25.5	25.3	22.6



Conventional farrowing and rearing







of
d
n



Performance until October 2013

	First litter (91)	Second litter (85)
Total born	14.5	15.5
Live born	13.8	14.9
Birth weight	1.28	1.35
Weight Gain d 1-3 (g/d)	136	125
Weaned	12.0	11.3
Weaning weight	10.5	11.5

Performance until October 2013

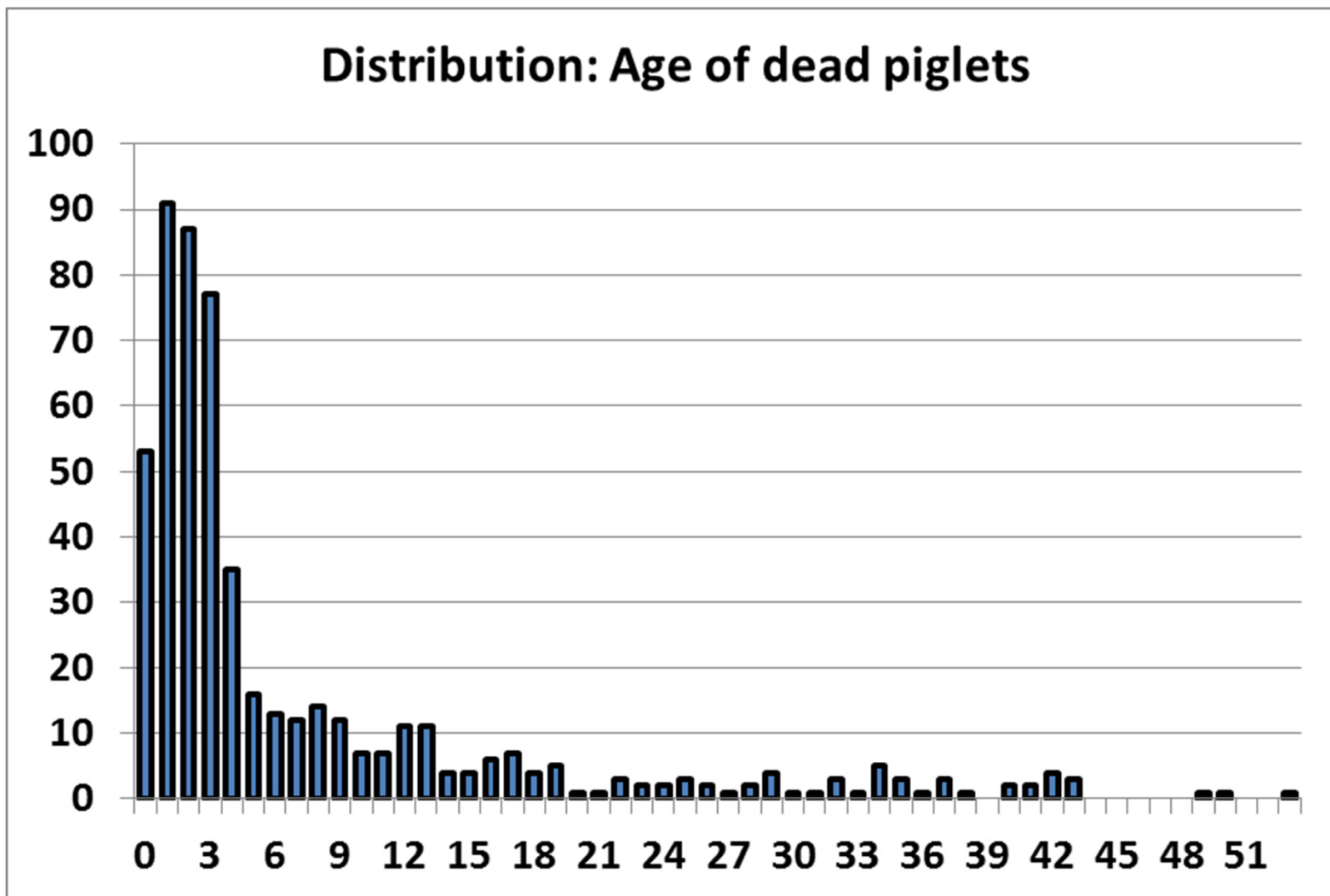
	Indoor	Concrete	Concrete+pasture
Total born	14.8	15.4	15.0
Live born	14.2	14.5	14.5
Birth weight	1.37	1.32	1.35
Weight Gain d 1-3 (g/d)	142	123	126
Weaned	12.1	11.5	11.8
Weaning weight	10.9	11.2	11.0

Performance until October 2013

	Avg survival boar	High survival boar
Total born (n)	14.7	15.4
Live born (n)	14.2	14.5
Birth weight (kg)	1.30	1.33
Weight Gain d 1-3 (g/d)	129	132
Weaned (n)	11.9	11.4
Weaning weight (kg)	11.1	10.9

Performance until October 2013

	Conventional rearing	Organic rearing
Total born (n)	14.6	15.1
Live born (n)	14.2	14.4
Birth weight (kg)	1.37	1.30
Weight Gain d 1-3 (g/d)	141	127
Weaned (n)	11.8	11.6
Weaning weight (kg)	10.8	11.0



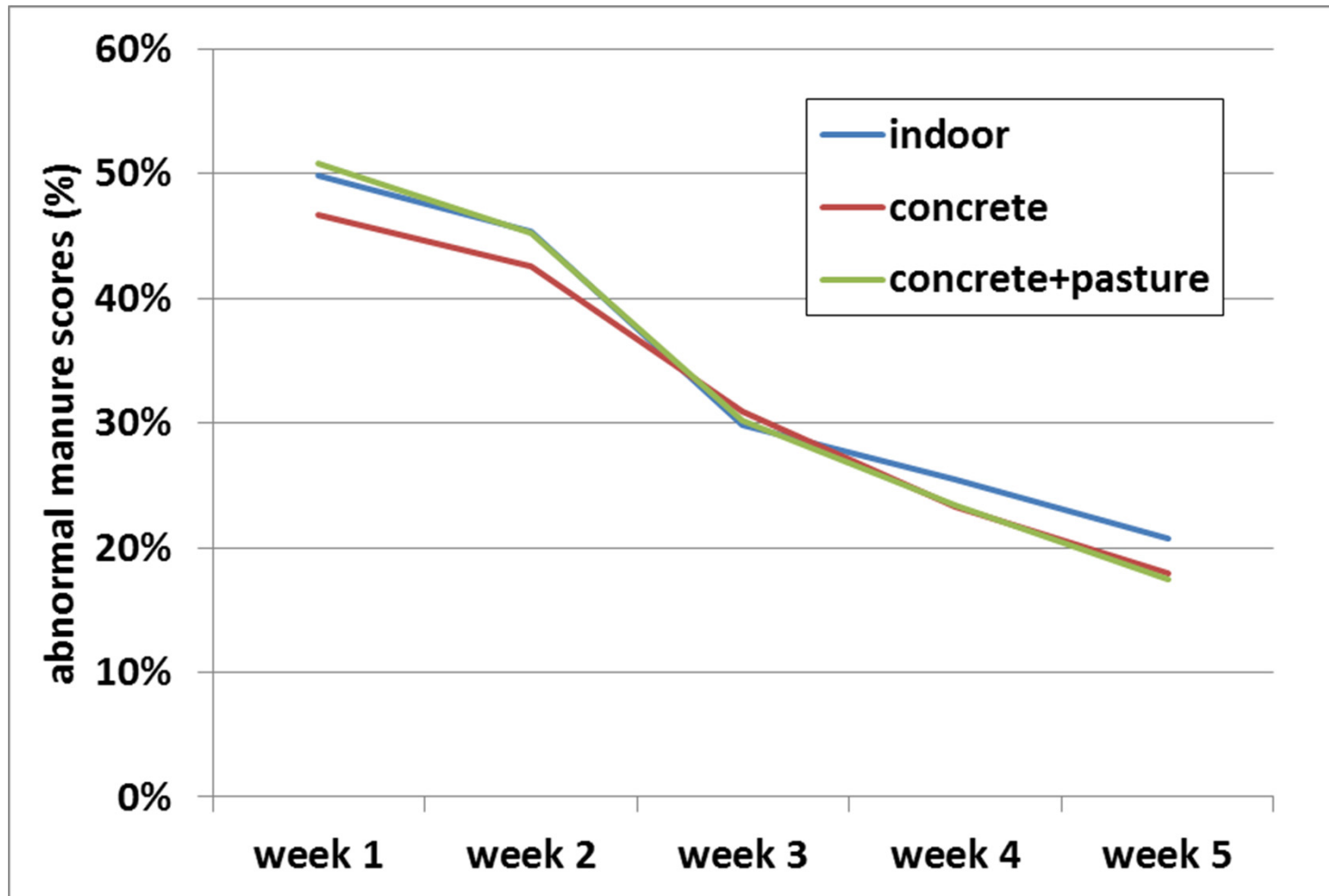
Piglet mortality: mainly on the **first 3 days** of live

⇒ importance of **maternal behaviour**

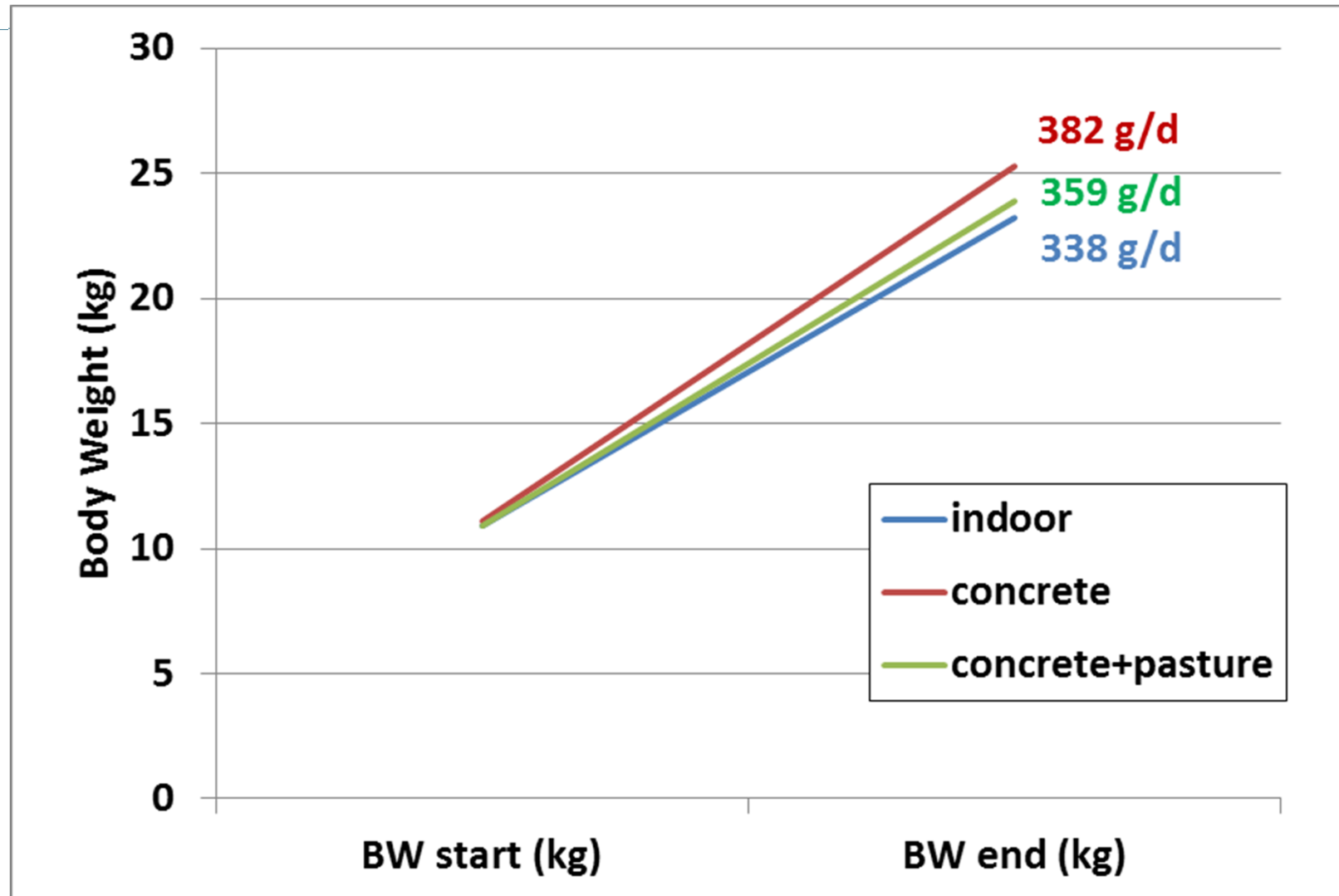
Piglet mortality (% from starting number)

grandfathers	Rearing syst	Outdoor run			avg
		indoor	concr	concr+past	
Low vitality	Organic	19.8	22.5	19.4	20.5
	Conventional	12.9	23.1	19.7	18.6
High vitality	Organic	21.8	26.8	22.2	23.6
	Conventional	15.0	16.9	12.3	14.7
Average		17.4	22.3	18.4	19.3

Abnormal dunging scores on pen level



Daily Gain during 5 weeks post weaning (10-25 kg)



Research Farm Raalte



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Experimental setup

