



SCIENCE AND
EDUCATION **FOR**
SUSTAINABLE
LIFE

Long term effects on production performance of animal welfare improvement related to the social environment for piglets and sows

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Project in Animal Science, A2E

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- Background and aim
- Monitoring and software in pig production in EU
- Material and methods
- Results and discussion
- Reflections / link between monitoring and results





1. Background and aim

- Transition from individual to group housing of sows (*EU Council Directive 2008/102/EU*) → (*EU Commission End the cage age 2021 for 2027*)

Individual housing (*Anil et al. 2005*)

- No relevant space allowance
- No social interaction
- Less aggression



Group housing (*McGlane et al. 2004*)

- More space
- More aggression
- Can socially interact



- Aggression usually occurs during regrouping (*Anil et al. 2005*)
- Form social relationships at 1 week of age (*Petersen et al. 1989*)
- Mix litters prior to weaning -> beneficial for social behaviors (*D'Eath. 2005*)



1. Background and aim

- Transition from Swedish Yorkshire to Dutch Yorkshire (Horback & Parson, 2016)

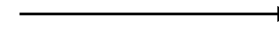
SY

Group housing

(Horback & Parson, 2016)

ZY

Individual housing
More piglets per litter



Different behaviors in different areas

Overall aim



To investigate the **long term effects** of genotypes, early and late social environment on production performance of piglets and sows

2. Monitoring and software in pig production in EU



All around the world
WinPig in Sweden

Input

Output

Impact analysis	Distribution curves	Groups results	Production level	Starting reasons	Age distribution	Dead suckling	Production report	Medicine report	Financial report	Breeding report
Results of different effects	Pregnancy days, growth per day, number of weaned piglets...		Seasonal variations, per months, per quarter	Slaughtered, sold and cause		Three analyses	Inventories, key figures <i>Problems and wrong indicated with colors to correct, production level</i>	Herd drug consumption	Type of costs and incomes, fixed and variable costs	Boar used, pregnancy sows, fertility

Not in pig	Reserviced
Aborted	Removed

Week	Sow	Gilt	Tot	Res																			Exp	NIP	Farrowing						Weaning		Start date	End date
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			No	Pct	Preg pct	Tot	Liv	Dea	Mum	No		
11	48	19	67	18					4											4	55	82.1	18.3	16.8	1.4	0.0	61	12.5	25-10	07-11				
1	42	29	71	10		1		2		5									7	60	84.5	16.5	15.2	1.3	0.0	62	12.1	08-11	21-11					
2	30	20	50	4				1	2	3									6	42	84.0	17.3	15.8	1.5	0.0	29	12.3	22-11	05-12					
3	42	22	64	2				4	4	1									11	50	78.1	17.1	14.9	2.2	0.0	9	8.6	06-12	19-12					
4	35	31	66	1				2	4	1									1	9	52	78.8	2	17.0	15.9	1.2	0.0	5		20-12	02-01			
5	30	24	54	2				1	3	1									24	6	17	31.5	44	19.8	17.6	2.2	0.0			03-01	16-01			
6	35	29	64	3				1	4	2									53	6			83						17-01	30-01				
7	35	30	65	5				2	2	3	3	1	1	1					47	8			72						31-01	13-02				
8	36	31	67	3				2	2	1	2								55	7			82						14-02	27-02				
9	33	31	64	5				1	2	1	4								55	7			86						28-02	13-03				
10	34	32	66	6				1		5	2								57	8			86						14-03	27-03				
11	39	29	68	5					1	1	2								62	3			91						28-03	10-04				
1	48	20	68	6				1											67				99						11-04	24-04				
2	40	9	49	1															49				100						25-04	08-05				

Fertility report

- Born alive per litter
- Weaned per litter
- Farrowing rate
- Weaned per sow per year
- Pre-weaning mortality (%)
- Wasted days per litter
- Litters per sow per year



2. Monitoring and software in pig production in EU



Argentina
Output

Input

Setup your farm	Fast and batch event entry			Multifarm	Report	Performance analysis	Analyse multidimensional data	Report designer
Type Region	Task = management	Inventory	Entry = recorded events	Compare Consolidate	Individuals Groups Feed Financial Import and export Control panel	By time periods By parities By genetics		
	Females due for service, due to pregnancy check, females due to farrow, due for weaning	Animals by status, groups semen, parity, location, total born, live born, still born	Female entry, farrow, deaths weaning, pregnancy, abortion, treatment, heat, removal					

File Type: Females

Identifier: H101 Refresh

Date: 08/22/19

Event Type: Insemination

Semen: 21639

Technician: BARBARA

Dose: 1

Hour:

Group:

Location:

Comment:

Batch Event Entry

Options

Date	Parity	Type	Description
08/22/19	0	Entry to Breeding	

The screenshot displays the main data table of the software, organized by Parity (0-18) and Services (0-18). The table includes columns for various metrics such as Farrow, Farrow Adj, % Dec, Totalborn, Liveborn, Stillborn, and Wean. Below the table, there are several charts: 'Strained (weeks from entry)', 'Lactating (weeks from farrowing)', 'Served (weeks from service)', 'Open (weeks from open)', and a pie chart showing 'Served 1.00%', 'Lactating 0.0%', and 'Entered 0.0%'. A 'Farrowing Date' table is also visible at the bottom right.



2. Monitoring and software in pig production in EU



American software
48 countries all around the world

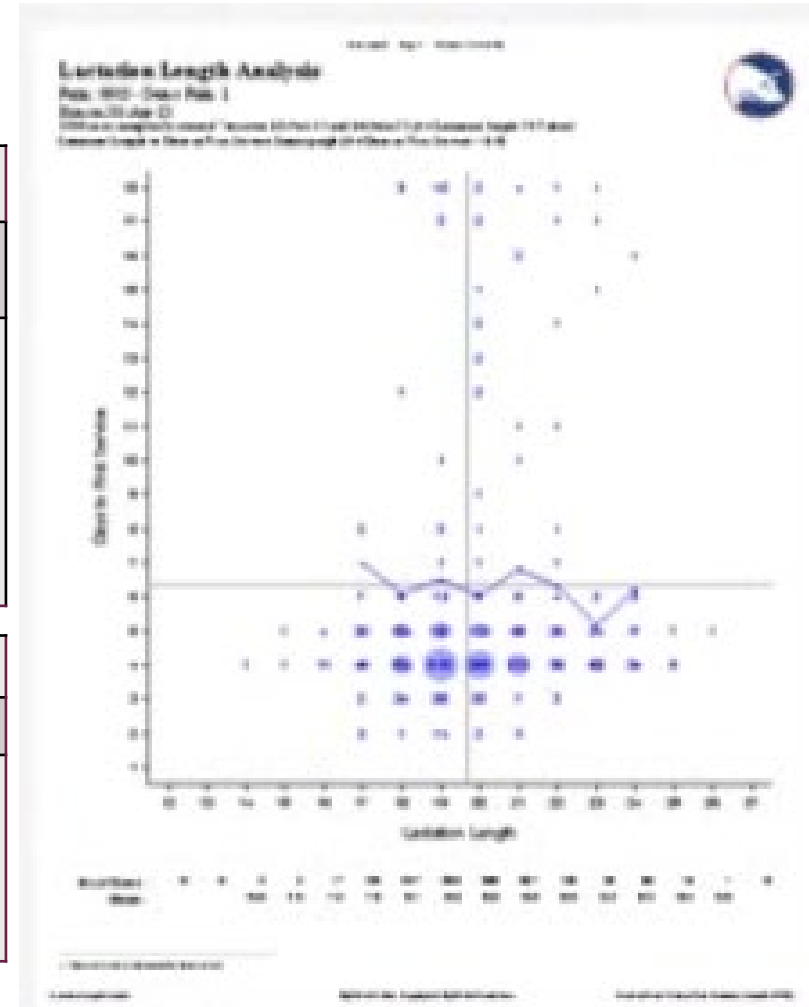
Input 48 individual events

Mating Farrowing Animal movements Batch arrivals Health treatment

Output

40 reports				
Performance report	Production analysis reports	Herd list data reports	Action list reports	Miscellaneous reports
Services Farrowing Piglets losses Weaning	Age/weight at first service analyses the cause and effect relationship between gilts' age or weight at the time of her first service and subsequent performance	Animals by status, groups semen, parity, location, total born, live born, still born	Female entry, farrow, deaths weaning, pregnancy, abortion, treatment, heat, removal	

Individual sow histories	Daily action lists	Benchmarking
	Sows due for attention open sow list sows due to farrow warning lists for sows not weaned or sows not served	Compared to hundreds of thousands of pigs





2. Monitoring and software in pig production in EU



Farm management softwares

American software

German software

7000 licenses worldwide

Input

Output

Farmbrite	Bigfarmnet	Farmbrite	Bigfarmnet
<p>Animal type : pig Sex Breed Identification Birth information and weight Feed information Treatment information</p>	<p>Transfer Output Piglets death Treatment Vaccination Farrowing Weaning Breeding Death Moving Physical conditions : backfat thickness, weight</p>	<p>Average daily gains Break even amount Deaths and losses Due dates Fields being grazed Livestock inventory Reproduction details Reproduction summary Treatments and vaccinations Upcoming treatments Yields details Yields summary</p>	<p>Average and diagram</p>  <p>The screenshot shows a dashboard with three main sections: <ul style="list-style-type: none"> Sow Overview: A donut chart showing 120 Farrowing, 108 Breeding, and a Total of 1038 Sows. Gestation is at 810. Gestation Production Week: A bar chart showing feed consumption over 16 weeks, with a peak at week 6 (60). Worst Performing Sow: A list of four sows with their feed consumption and scores: Sow 00064 (49.8kg, 103), Sow 00039 (36.6kg, 102), Sow 00050 (37.2kg, 101), and Sow 00040 (35.9kg, 100). Sow Feeding Review: A table with columns for Sow No., Parity, State, Days in State, Group, Transponder, Today Received, and -1, -2, -3 Received. </p>



2. Monitoring and software in pig production in EU



American and Chinese
2800 farms

Input

Boar removal

Service

Gilt pool

Sows due for wean

Heat no service

Sow arrival

Sows pre farrow

Sows found not pregnant

Farrow

Sow location

Sows due for service

Not in pig

Sow condition : weight

Sows due for heat check

Piglet

Sow removal

Sows due for preg exam

Pregnancy exam

Treatment

Sows due for farrow

Output

Sow history

Animal list

Dashboard



2. Monitoring and software in pig production in EU

Pros and cons



Inputs very clear and sorted by categories with some possibilities

Input + output



More analysis available + reports designer

Output



Outputs categories : ideas for the farmer

More restrictive : inputs and outputs with categories.

But little information available about precise inputs

Input



Global app but precise for pig production

But little information about outputs and diagrams



Looks like PigVision

But little information available on website



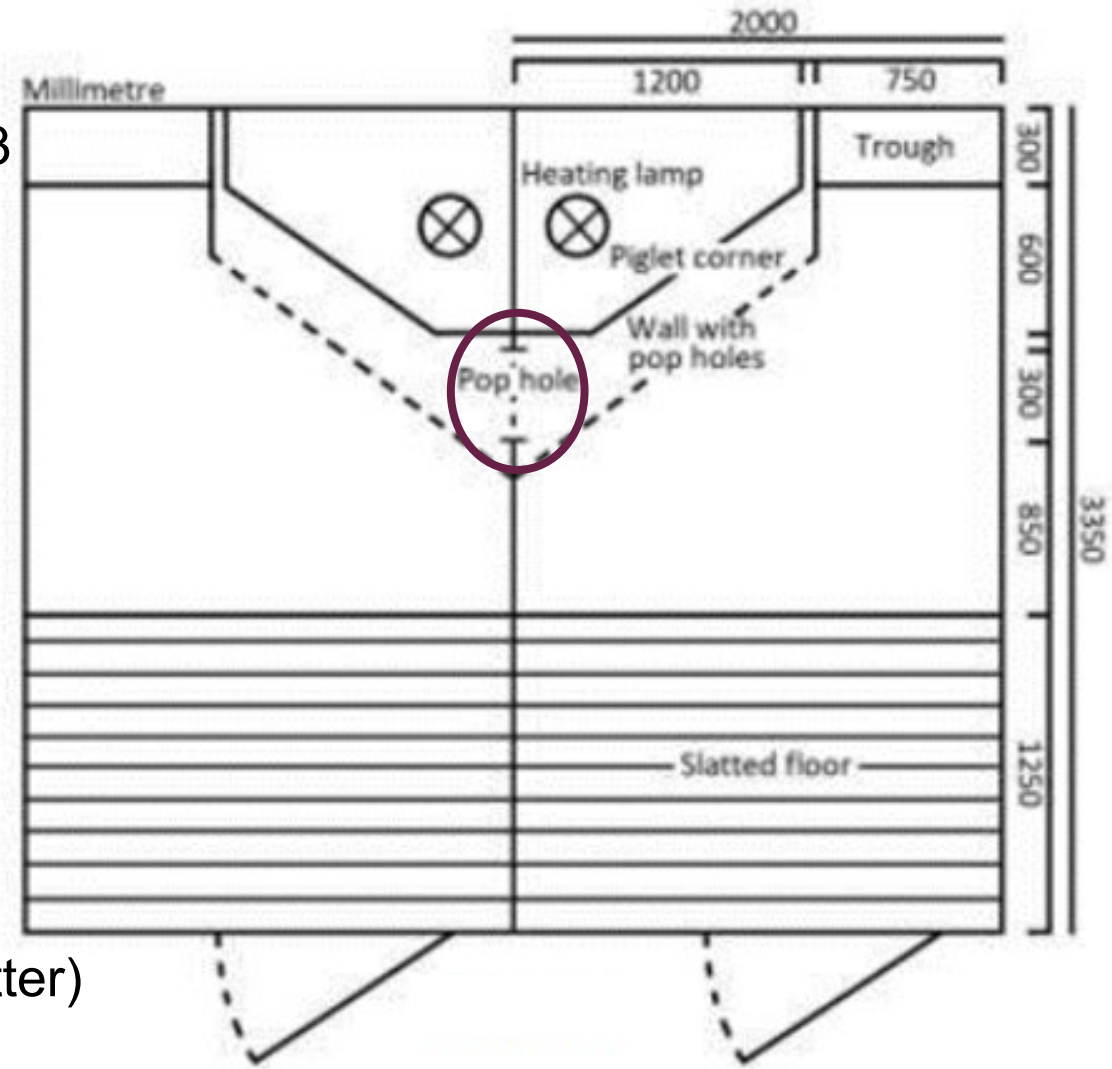
Global app for farming → less focused on pig production → less precise outputs





3. Materials and methods

- 140 litters (83 parity 1, 43 parity 2, 14 parity 3) -> 1 and 2-3
- Analysing of production performance on sows and piglets
- Genotypes
 - Swedish Yorkshire (SY)
 - Dutch Yorkshire (ZY)
- Early social environment (2-5 weeks of age)
 - Access Pen (AP) : birth sow + litter mates + sow and piglets in neighbouring pen
 - Control Pen (CP) : birth sow + litter mates
- Late social environment (10 weeks until farrowing of first litter)
 - Mixed Group (MG) : mixed with another birth litters gilts
 - Intact Group (IG) : stays in the same gilt group



3. Materials and methods

• Model

$$y = \text{parity} + \text{breed} + \text{early social environment} + \text{late social environment} + e$$

pvalue < 0,1

Litter size	Mortality	Mortality (percent)	Weight and growth	Sow	Sow weight change	Sow backfat thickness change
Number of piglets born in the litter	Number of piglets alive at 5 weeks	Percent of stillborn piglets	Growth between birth and weaning	Mother weight at weaning	Sow weight change between birth and weaning	Sow backfat thickness change between birth and weaning
	Number of piglets alive at 9 weeks	Number of dead of the liveborn at 5 weeks	Growth between weaning and 9 weeks	Mother backfat thickness at weaning		
	Number of stillborn piglets					
	Number of liveborn piglets					

Stepwise backward

Factors	tv05	tv59
kulnr1	0,2786 not signi	0,6252 not signi
breed	0,0056 signi	0,2971 not signi
treat1	0,4169 not signi	0,8409 not signi
treat2	0,4278 not signi	0,1748 not signi
breed*treat2	0,0952 signi	0,9611 not signi
treat1*treat2	0,4079 not signi	0,2111 not signi
kulnr1*breed*treat1	0,8826 not signi	0,9441 not signi
kulnr1*breed*treat2	0,6113 not signi	0,7135 not signi
breed*treat1*treat2	0,1143 not signi	0,0964 signi
mfodd	0,0023 signi	0,1866 not signi
Mfivkt	0,2068 not signi	x
mvikt5	x	<0,0001 signi

Least Squares Means for effect breed*treat1*treat2

Pr > |t| for H0: LSMean(i)-LSMean(j) pvalue < 0,05

Dependent Variable: tv59

ij	1	2	3	4	5	6	7	8
1		0,441	0,5535	0,904	0,9013	0,4117	0,5712	0,3487
2	0,441		0,088	0,3268	0,4207	0,0552	0,0877	0,7706
3	0,5535	0,088		0,6305	0,3681	0,7584	0,9537	0,0737
4	0,904	0,3268	0,6305		0,7843	0,4729	0,6568	0,2699
5	0,9013	0,4207	0,3681	0,7843		0,2402	0,3771	0,3252
6	0,4117	0,0552	0,7584	0,4729	0,2402		0,7082	0,0455
7	0,5712	0,0877	0,9537	0,6568	0,3771	0,7082		0,0737
8	0,3487	0,7706	0,0737	0,2699	0,3252	0,0455	0,0737	

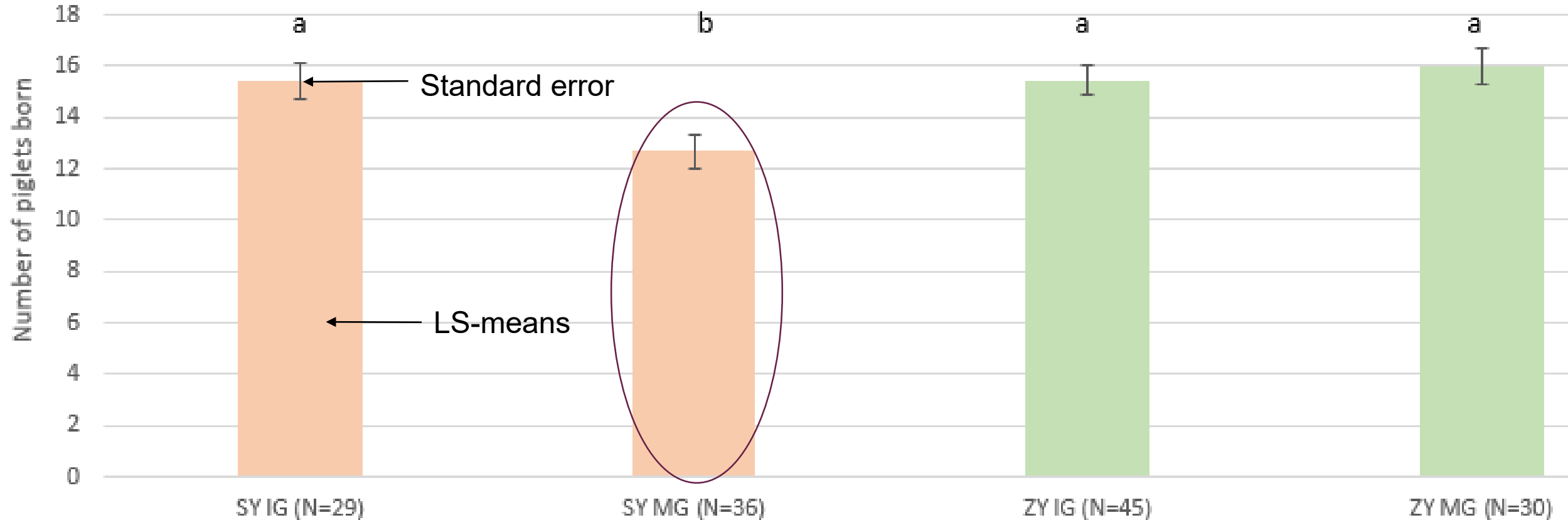


4. Results and discussion – Litter size model

Genotypes * late social environment. N=140
Different letters (a,b) = pairwise differences at p<0,05.

- Genotypes
 - Swedish Yorkshire (SY)
 - Dutch Yorkshire (ZY)

- Late social environment
 - Mixed Group (MG)
 - Intact Group (IG)



Conclusions

SY IG has a bigger litter size than ZY -> Coincidence



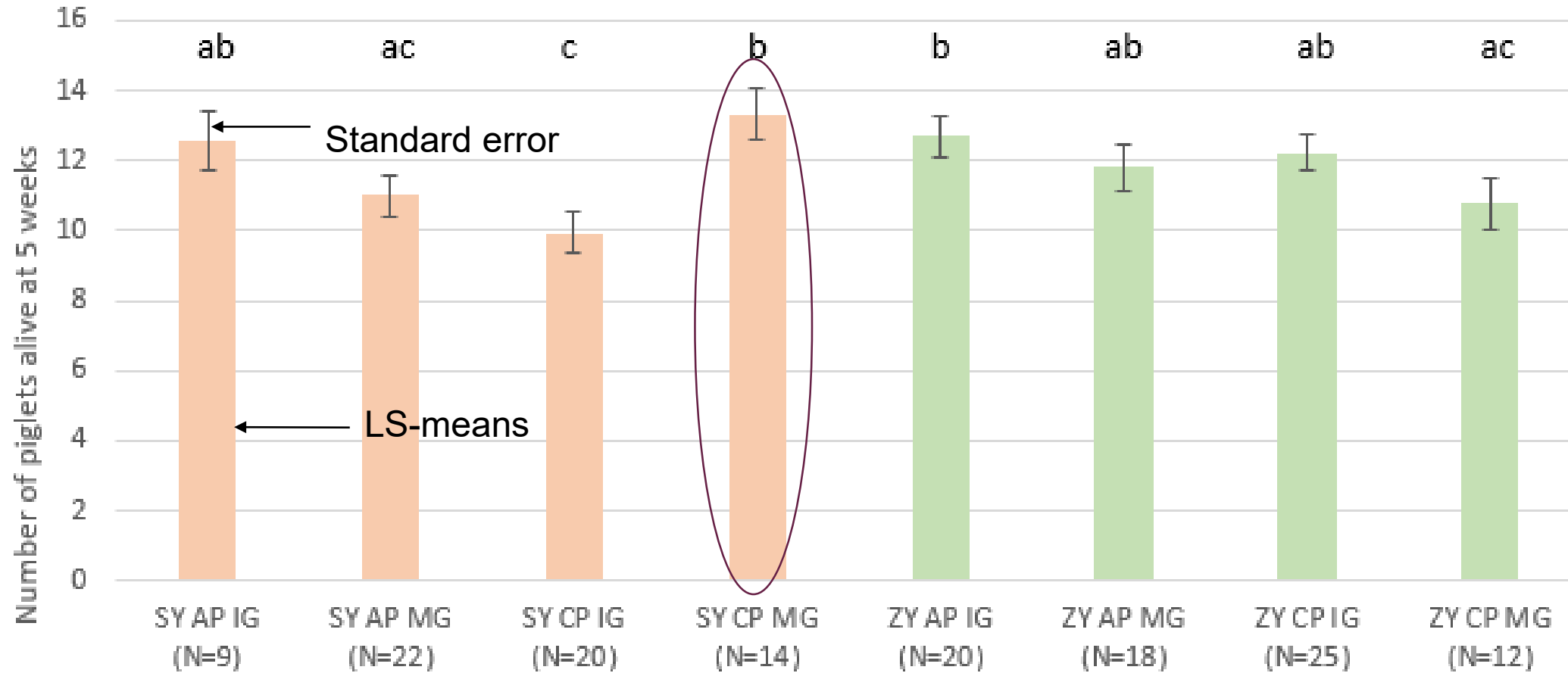
4. Results and discussion – Mortality model

Genotypes * early * late social environment. N=140
Different letters (a,b,c) = pairwise differences at p<0,05.

- Genotypes
 - Swedish Yorkshire (SY)
 - Dutch Yorkshire (ZY)

- Early social environment
 - Access Pen (AP)
 - Closed Pen (CP)

- Late social environment
 - Mixed Group (MG)
 - Intact Group (IG)



Conclusions

No clearly pattern



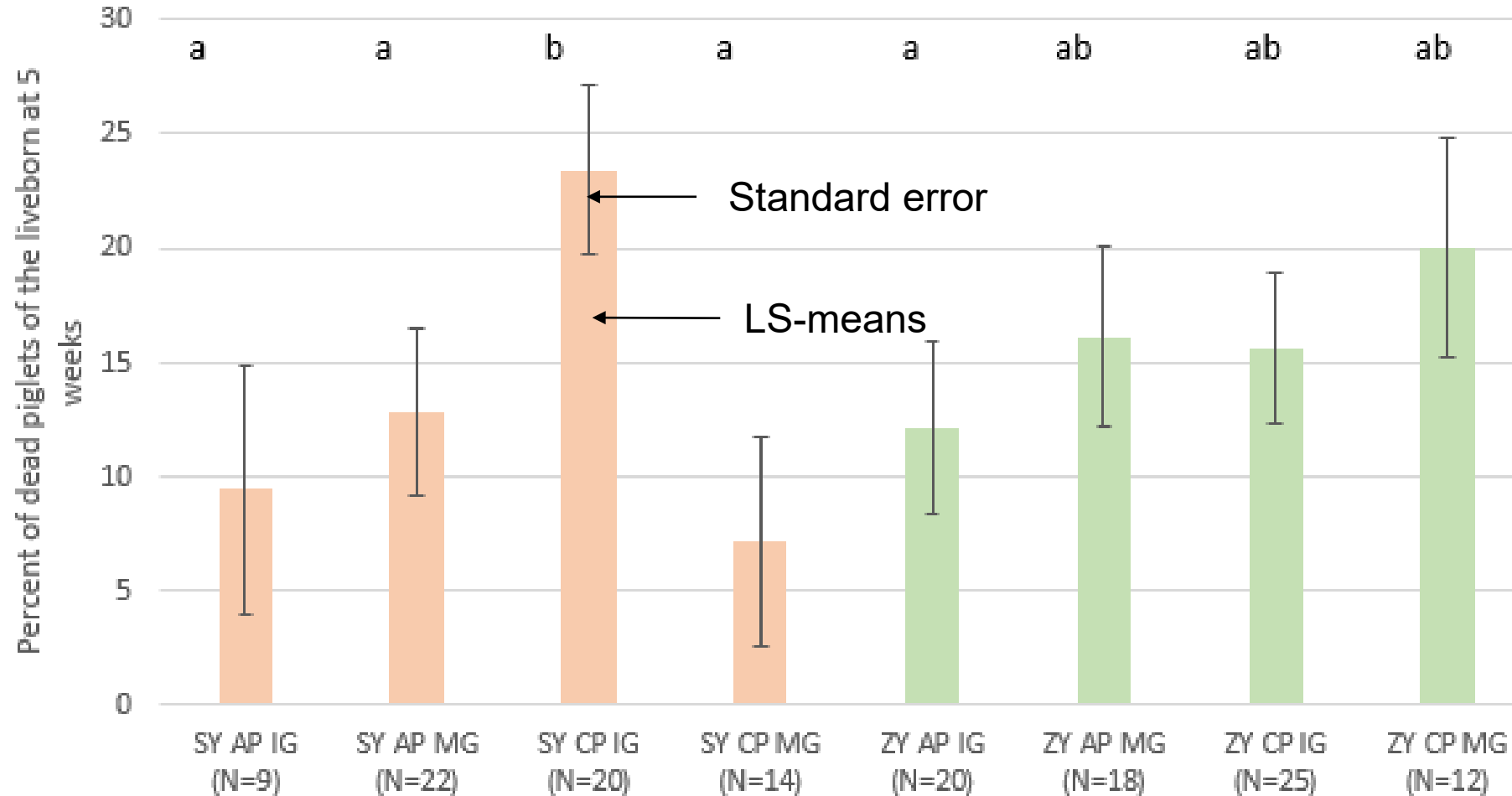
4. Results and discussion – Mortality (percent) model

Genotypes * early * late social environment. N=140
Different letters (a,b,c) = pairwise differences at p<0,05.

- Genotypes
 - Swedish Yorkshire (SY)
 - Dutch Yorkshire (ZY)

- Early social environment
 - Access Pen (AP)
 - Closed Pen (CP)

- Late social environment
 - Mixed Group (MG)
 - Intact Group (IG)

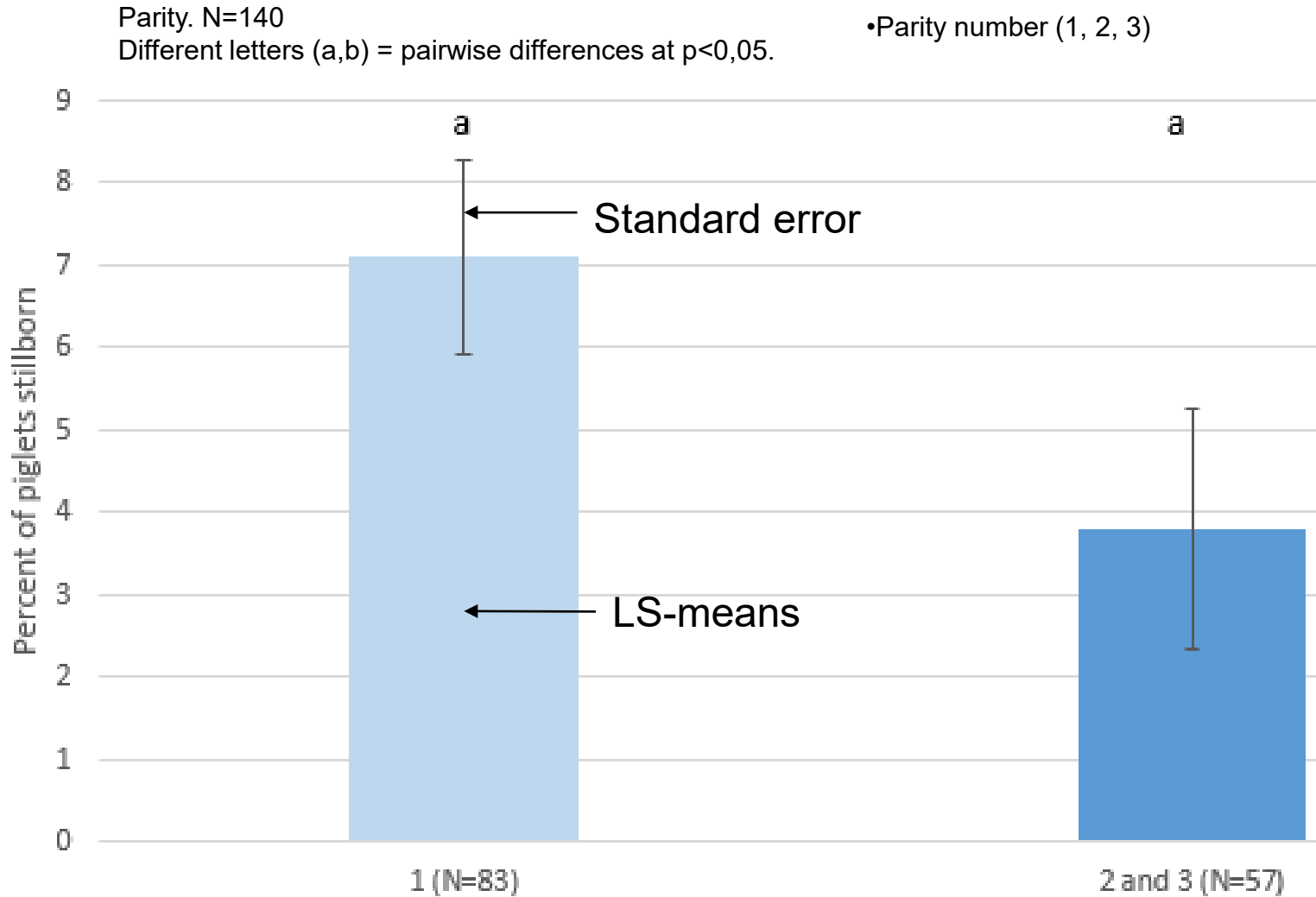


Conclusions

No clearly pattern



4. Results and discussion – Mortality model percent



Conclusions

No significant difference -> why are there more piglets per litter in the 2 and 3 parity ?



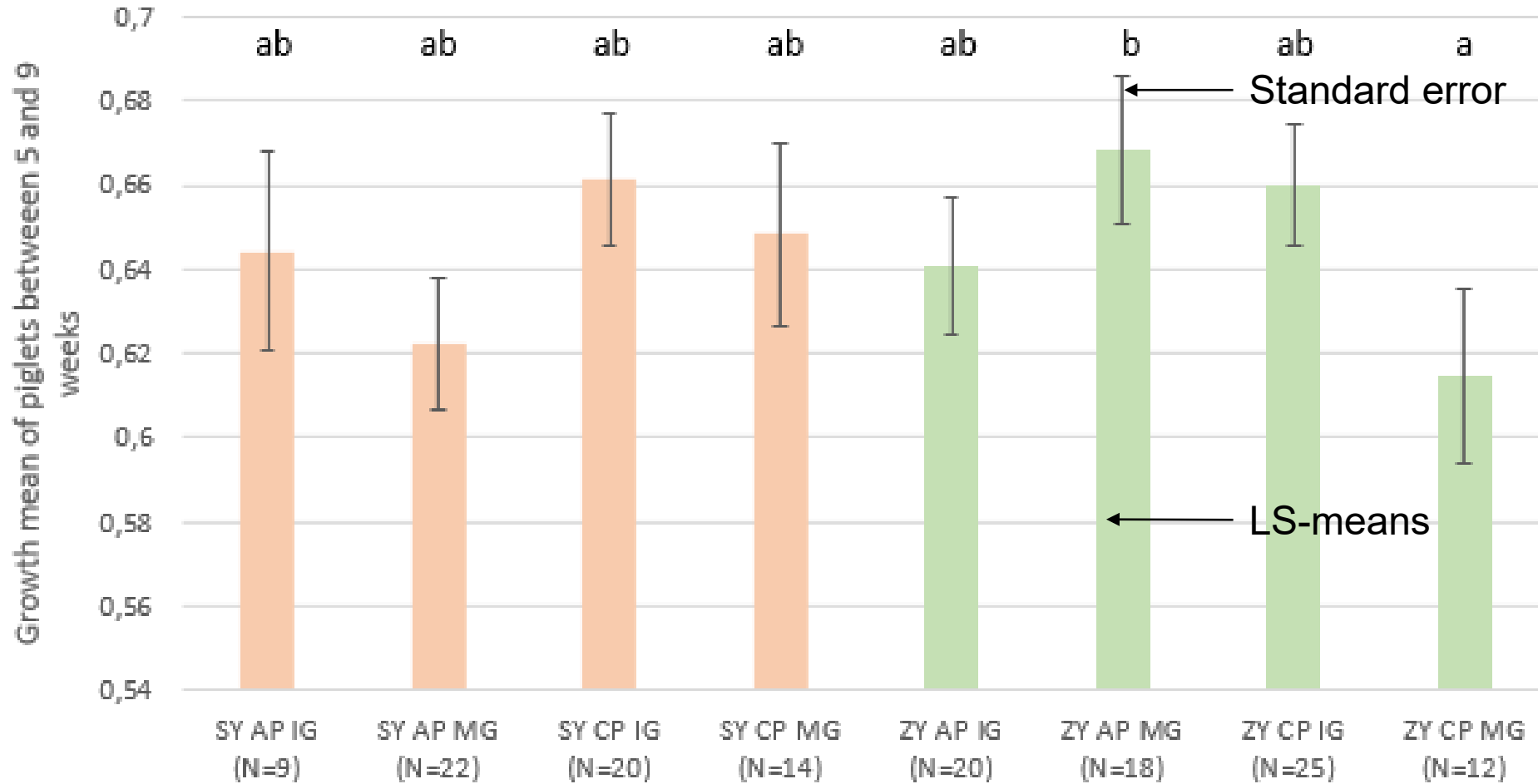
4. Results and discussion – Weight and growth model

Genotypes * early * late social environment. N=140
Different letters (a,b,c) = pairwise differences at p<0,05.

- Genotypes
 - Swedish Yorkshire (SY)
 - Dutch Yorkshire (ZY)

- Early social environment
 - Access Pen (AP)
 - Closed Pen (CP)

- Late social environment
 - Mixed Group (MG)
 - Intact Group (IG)



Conclusions

No clearly pattern



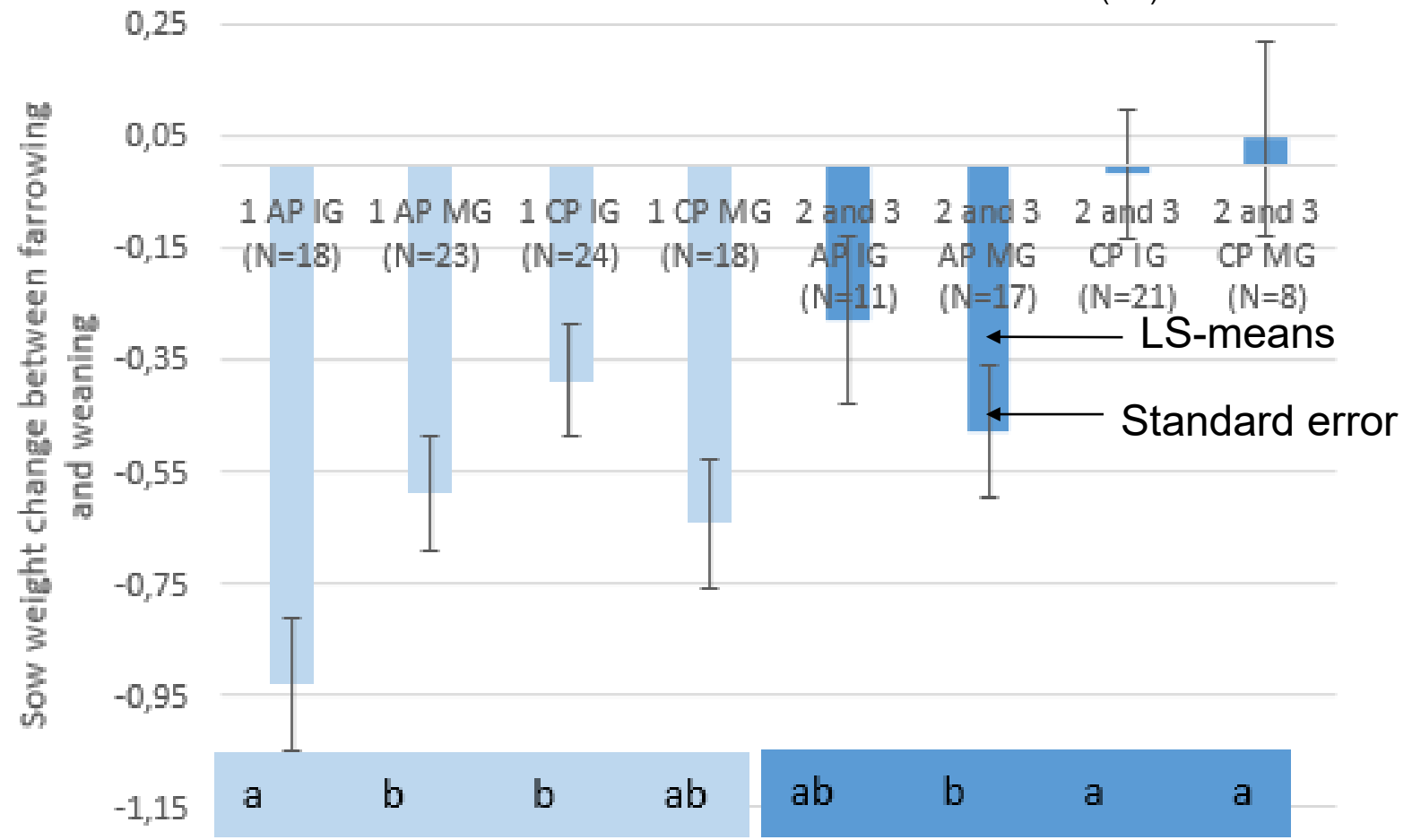
4. Results and discussion – Sow weight change model

Parity * early * late social environment. N=140
Different letters (a,b,c) = pairwise differences at p<0,05.

•Parity number (1, 2, 3)

•Early social environment
- Access Pen (AP)
- Closed Pen (CP)

•Late social environment
- Mixed Group (MG)
- Intact Group (IG)



Conclusions

Parity 1 : sows lose more weight -> growth is not yet completely finished ?

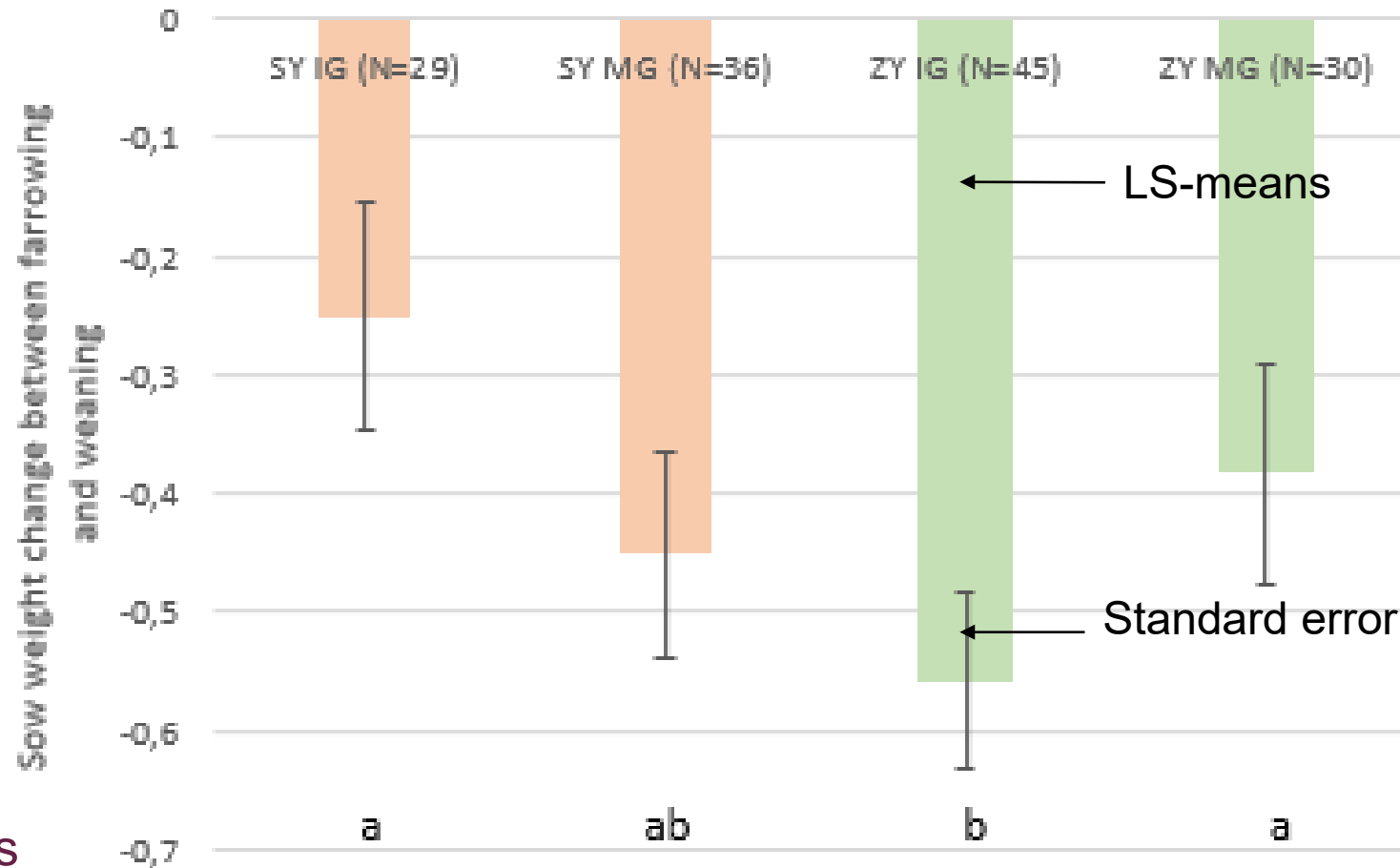


4. Results and discussion – Sow weight change model

Genotype * late social environment. N=140
Different letters (a,b) = pairwise differences at $p < 0,05$.

- Genotypes
 - Swedish Yorkshire (SY)
 - Dutch Yorkshire (ZY)

- Late social environment
 - Mixed Group (MG)
 - Intact Group (IG)



Mean weight at 9 weeks

SY 1	ZY 1
29,00	30,32
SY 2-3	ZY 2-3
30,86	30,61

Conclusions

No differences for SY / More loss for ZY IG -> negative effect of IG ?
Impact of piglets growth, genetic potential ?



4. Results and discussion – Sow backfat thickness change model

Early * late social environment. N=140

Different letters (a,b) = pairwise differences at $p < 0,05$.

•Early social environment

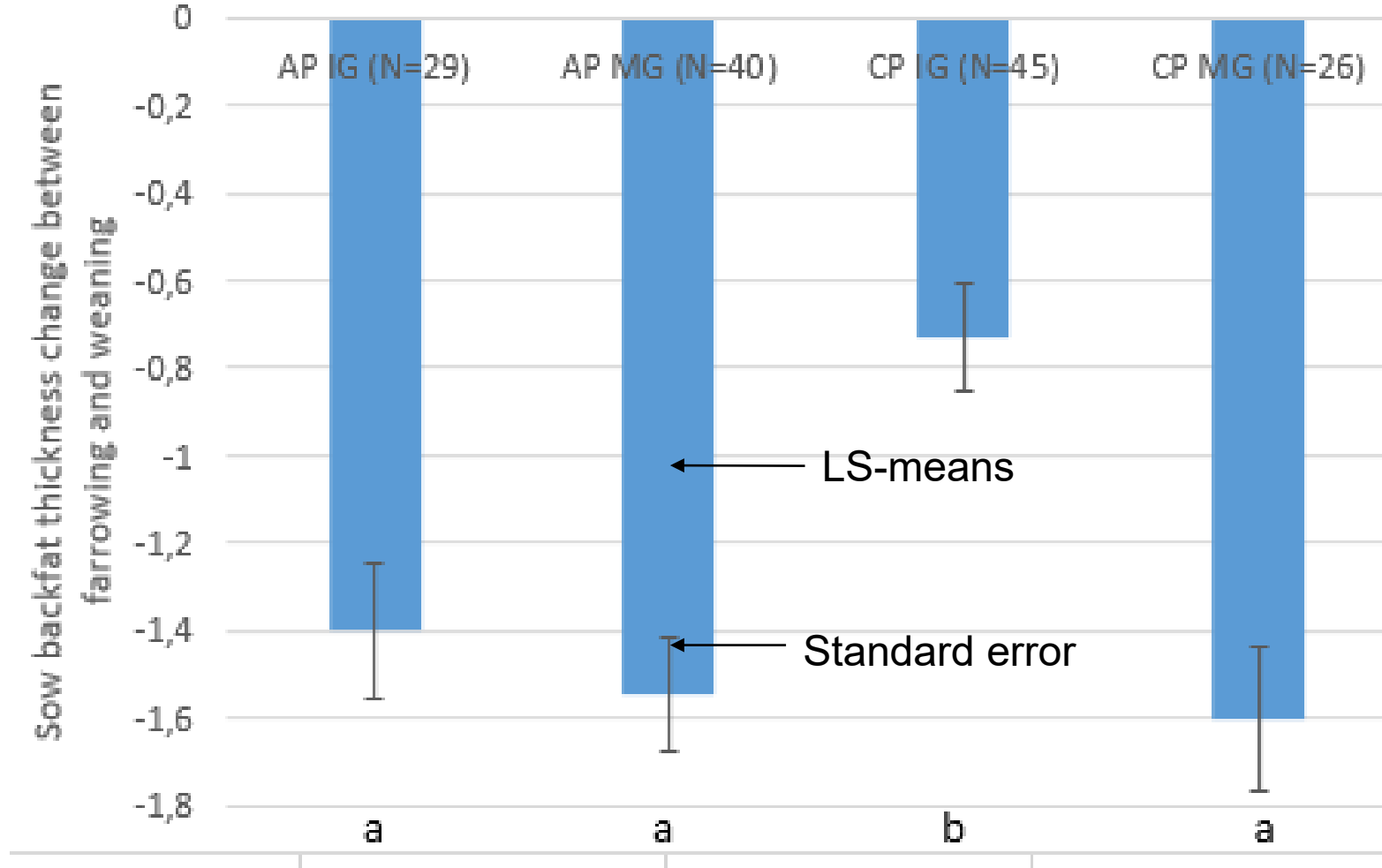
- Access Pen (AP)

- Closed Pen (CP)

•Late social environment

- Mixed Group (MG)

- Intact Group (IG)



Conclusions

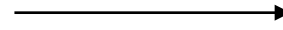
Less loss for CP IG -> positive impact of no social interaction ? Less movements so less loss ?



5. Reflections on production aspect and monitoring

Level

- More information at the individual level



- Results grouped by race. Ex : effectiveness of weight gain between the two breeds ?

Date

- Production information at precise date (critical periods) -> weight loss, milk production, piglets mortality

Environment

- Water and feed consumption. Ex on piglets : early feed consumption and growth later on
- Climate data. Ex : temperatures, ventilation
- Disruption. Ex : change of location, of feed, microclimate, noise...

Thank you for your attention

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2. Monitoring and software in pig production in EU

Apparent pros

	PigVision	Porcitech	PigChamp	Farmbrite	BigFarmNet	PigKnows
Real-time data	X	X	X	X	X	X
No paper	X	X	X	X	X	X
Secured	X	X	X	X	X	X
Quick and simple	X	X	X	X	X	X
Online and offline	X	X	X	X	X	X
Less mistakes	X	X	X	X	X	X
More time	X	X	X 15-30 % time -> 1.45\$/sow/year	X	X	X
Writing, barcode	X	X	X		X	
QR code	X	X				



2. Monitoring and software in pig production in EU

Apparent pros

	PigVision	Porcitec	PigChamp	Farmbrite	BigFarmNet	PigKnows
Interfaces with genetics and feed companies			X	X	X	
To compare with other farms (benchmarking)		X	X Magazine			
Sorted in precise categories	X		X			
Fast and batch event entry		X				
Analyse multidimensional data		X				
Built-in data validation			X			