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Birth body weight does not always determine subsequent growth performance in grow-finisher pigs

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Introduction

65%

BW variability

Birth BW and Weaning BW

- Factors contributing to slow growth in pigs [2]
- Major part of variability comes from birth and lactation [3]

10-15 % slow growing pigs / batch[1]

Key performance indicators?

- Average Daily Gain (ADG)
- Average Daily Feed Intake (ADFI)
- Feed Conversion Ratio (FCR)
- Days to Target BW (DTBW)

[1] Calderón Díaz J. A, et al. 2017. Porcine Health Management, 3, 1–6.
[2] He Y, et al. 2016. *J.Anim.Sci 94*(5), 2103–2116.
[3] López-Vergé S, et al. 2018. Translational Animal Science, 2(4), 383–395.

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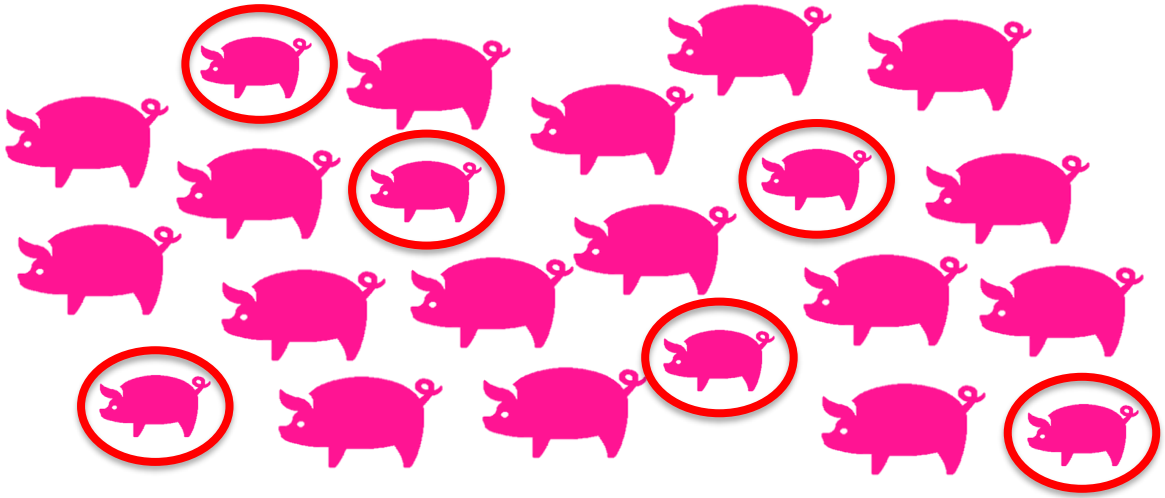
Introduction

Farmers [illegible] piglet if

↓ Birth [illegible] ning BW

Some light birth BW pigs are able to catch up their big counterparts [4]



Is possible to identify the slow growing pigs?

[4] Huting A. M. S, et al. 2018. Porcine Health Management. 4, 1–14.

Objective

To investigate the effect of birth BW and weaning BW on key performance indicators of slow-growing pigs

To identify thresholds for birth BW and weaning BW to recognise slow-growing pigs early in life

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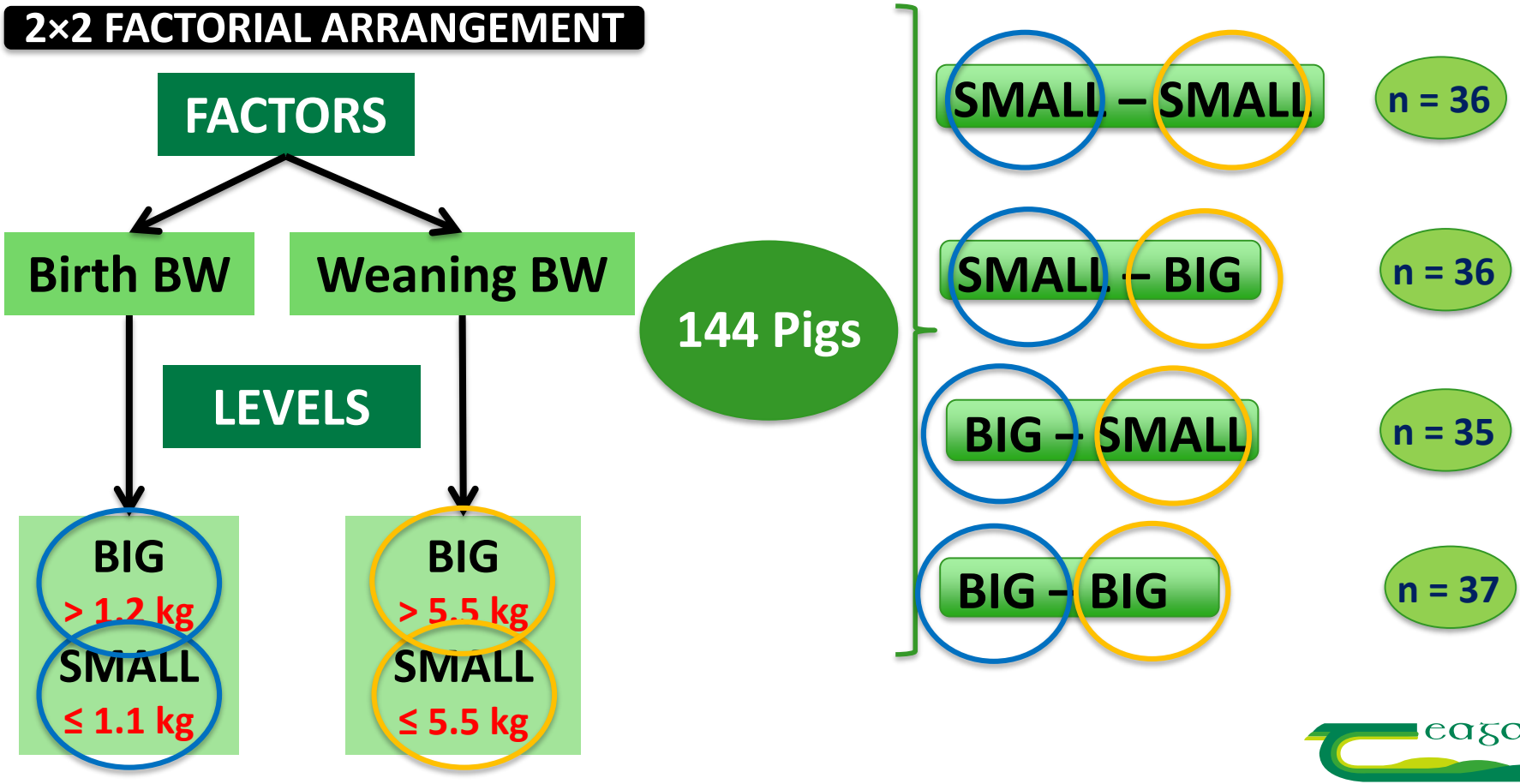
Materials & Methods

2×2 FACTORIAL ARRANGEMENT



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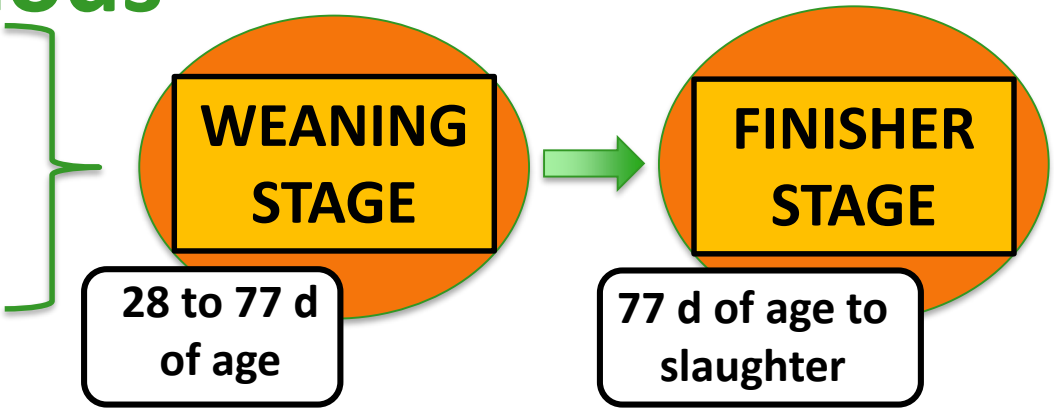
Materials & Methods

- Pig fitted with a Transponder
- Mixed Sex pens
- **Electronic Feeding System**



MEASUREMENTS

Body Weight (BW)

- Every 2 weeks individually

Feed Intake (FI)

- Daily and individually

CALCULATED

Key Performance Indicators

- Average Daily Gain (ADG)
- Average Daily Feed Intake (ADFI)
- Feed Conversion Ratio (FCR)
- Days to Target BW (DTBW)

Materials & Methods

Key Performance Indicators

- At 20 weeks of age
- At Target BW, 110 kg

Threshold for birth BW and weaning BW

Statistical Analysis

- Pig as experimental unit
- Mixed Models

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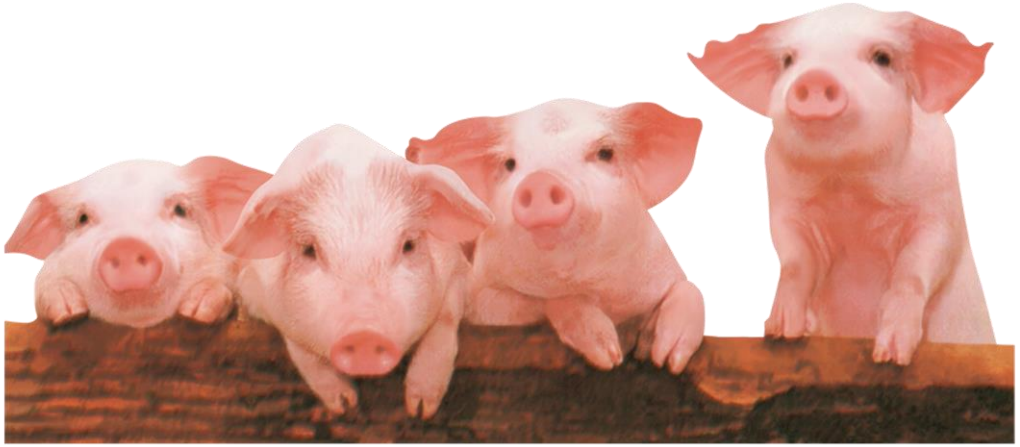
Results

Key performance indicators of slow-growing pigs



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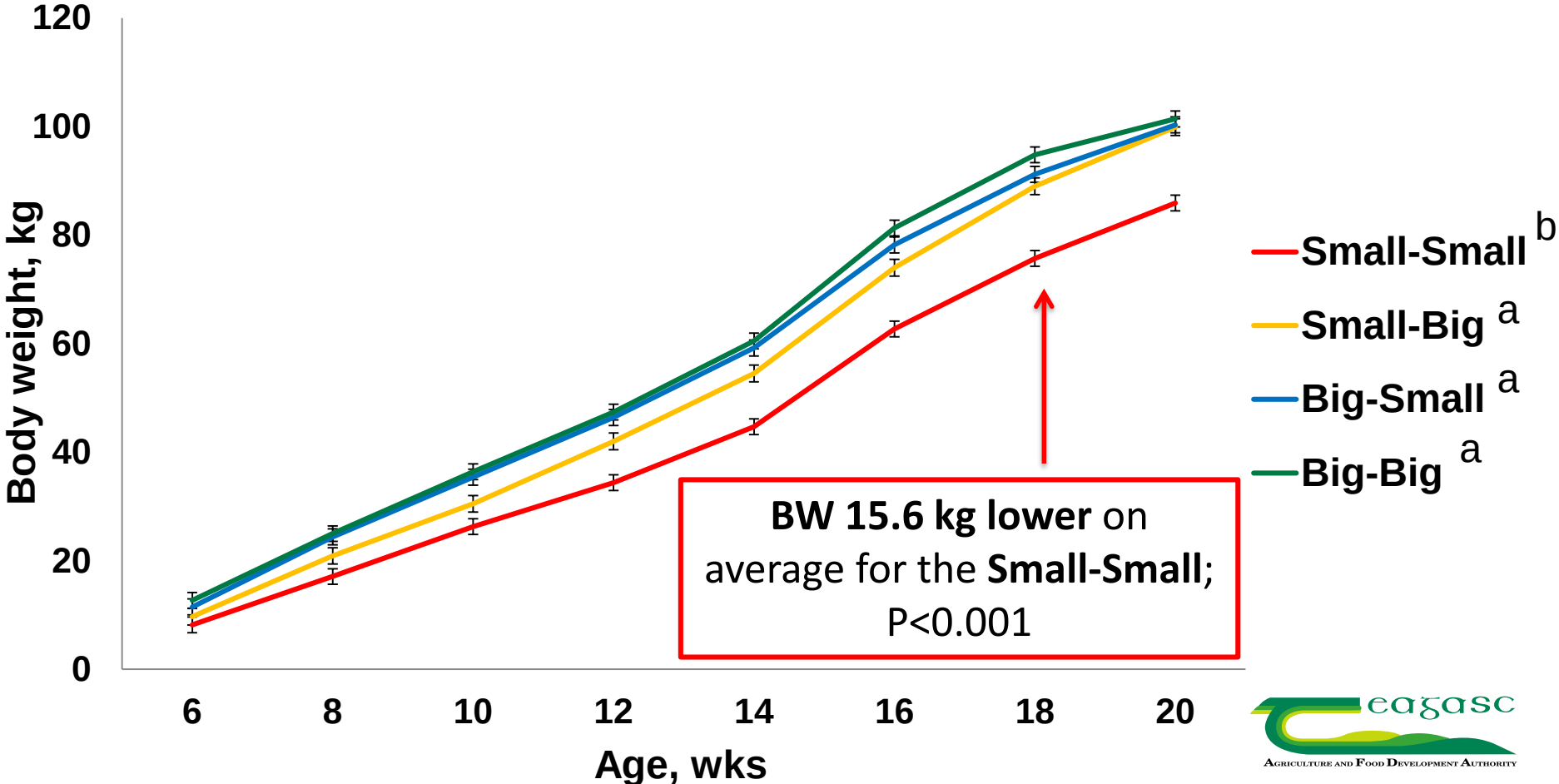
BW performance until 20 wks of age



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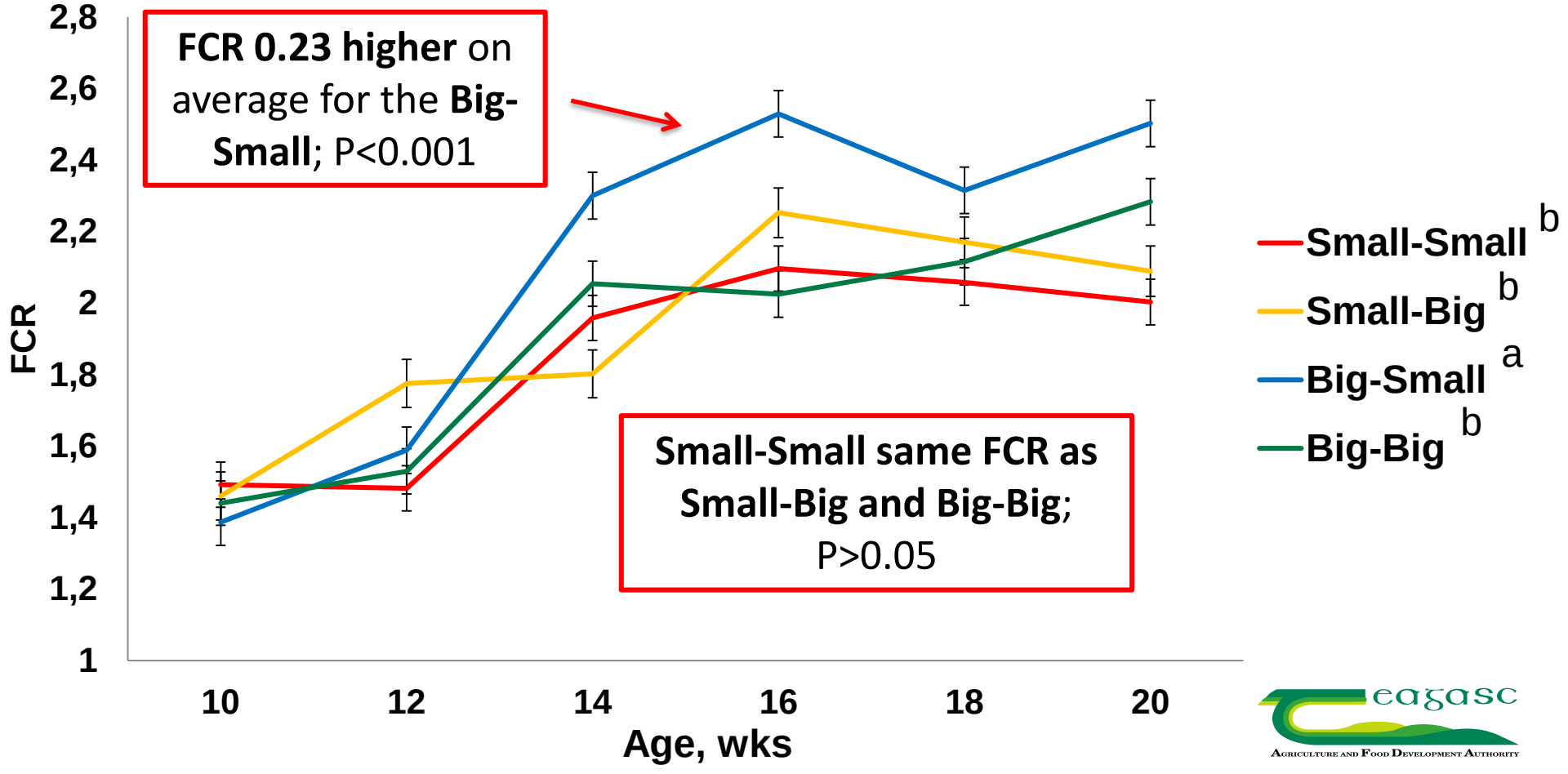
FCR performance until 20 wks of age



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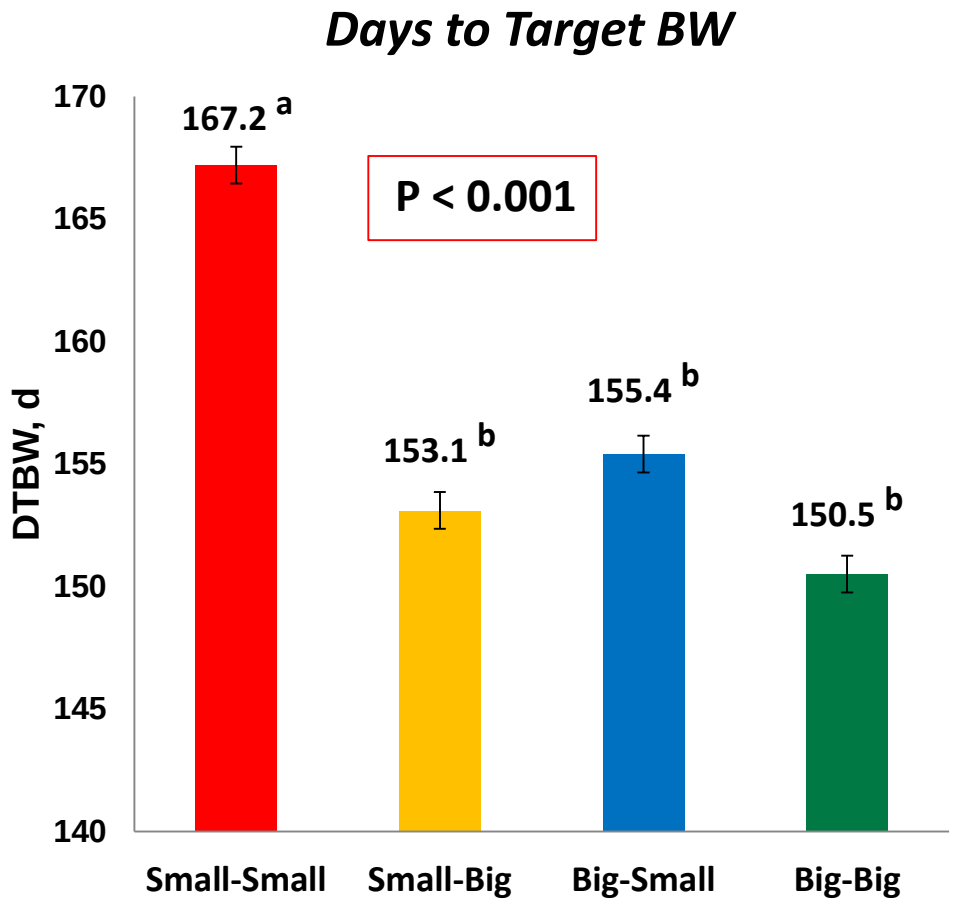
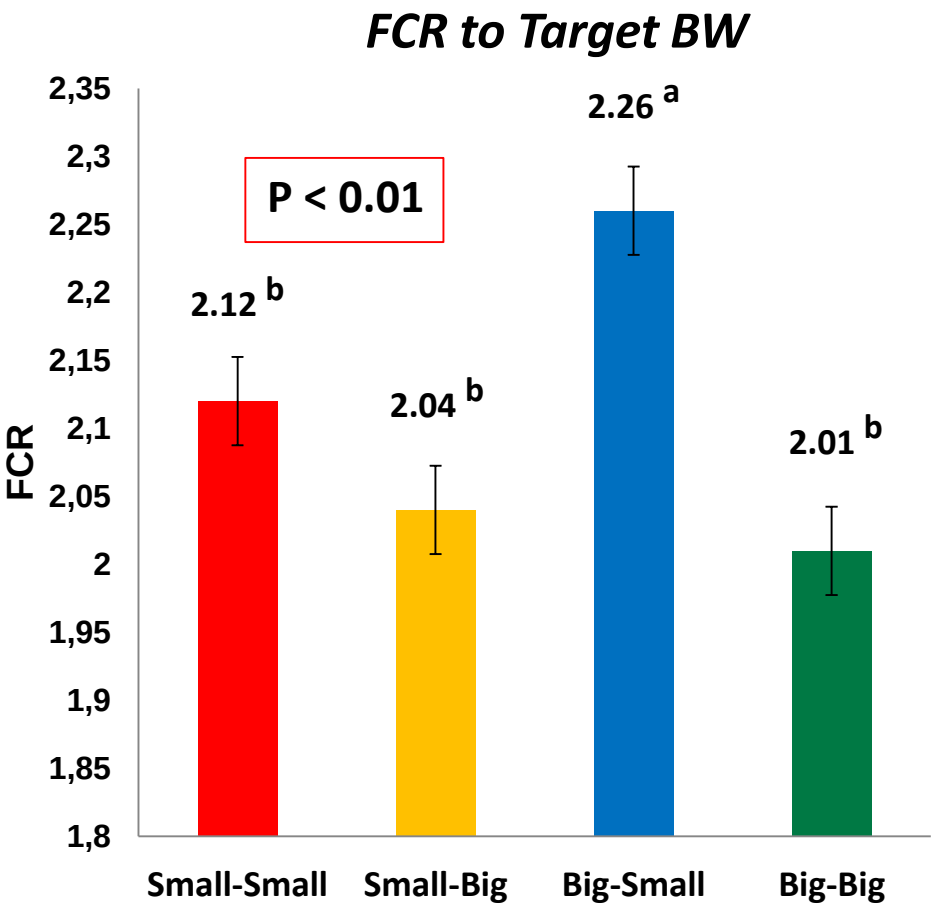
Performance to Target BW, 110kg

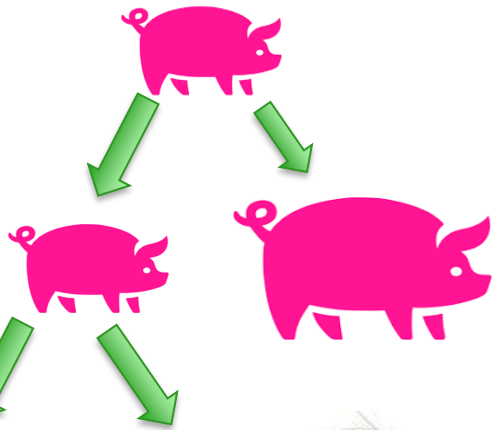




Birth BW

Subsequent performance

Birth BW



FCR

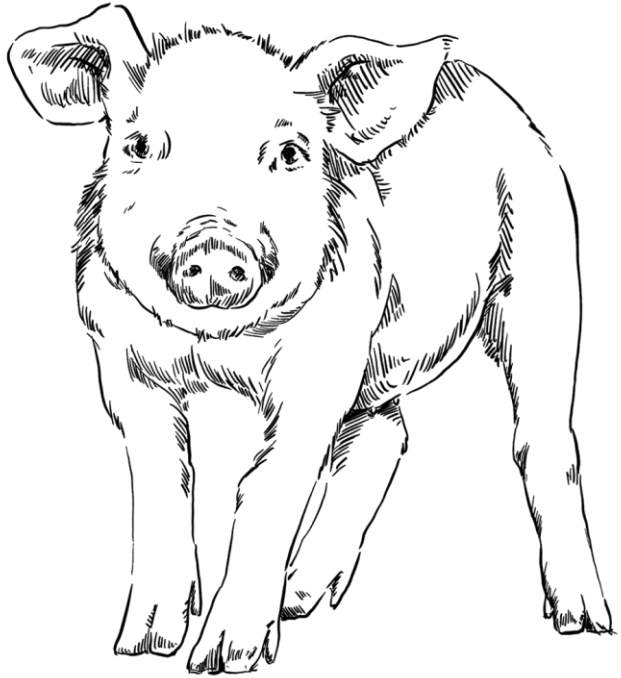
Time to slaughter

?

Can we identify slow-growing pigs early in life based on their birth and/or weaning weight?

Results

Thresholds for birth and weaning weight to recognise slow-growing pigs early in life



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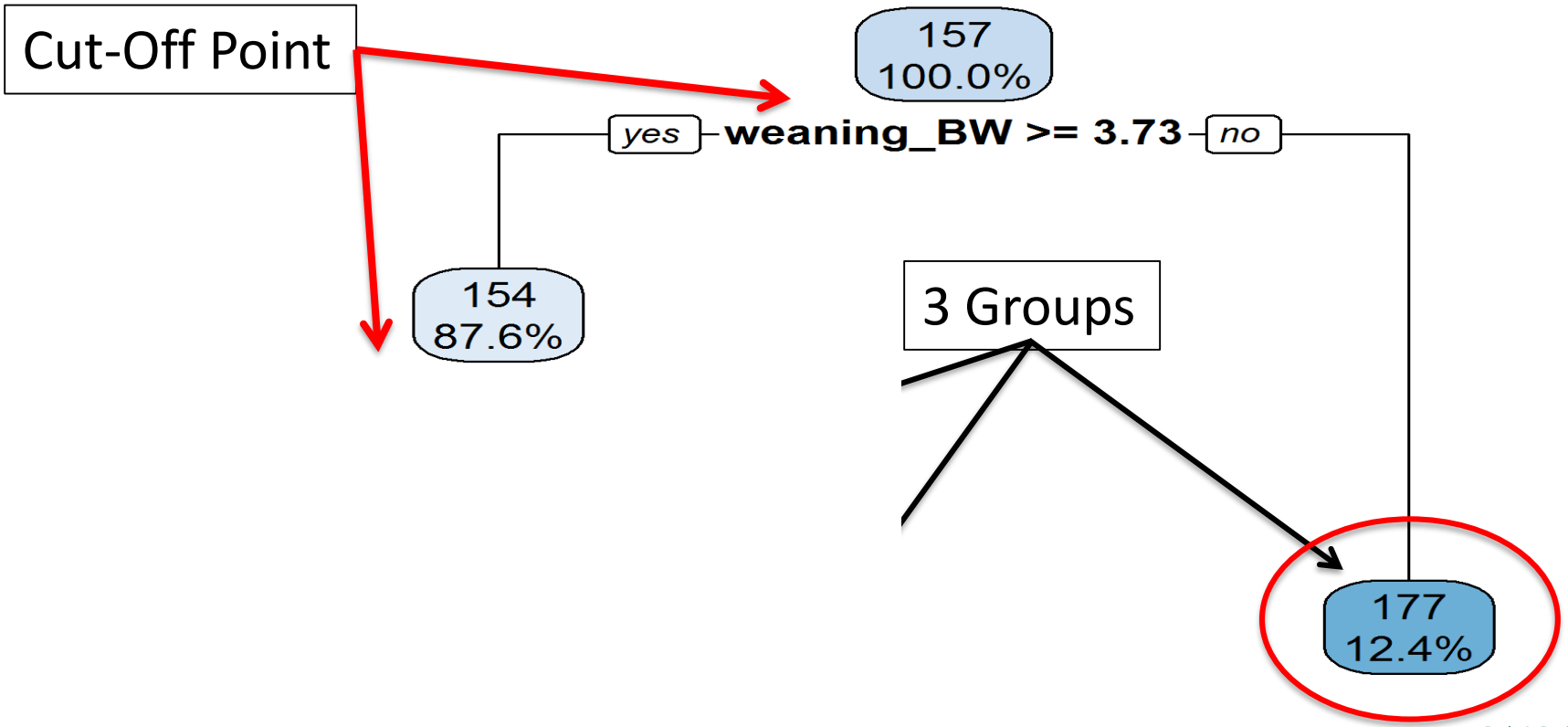
Regression Tree Analysis to Days to Target BW



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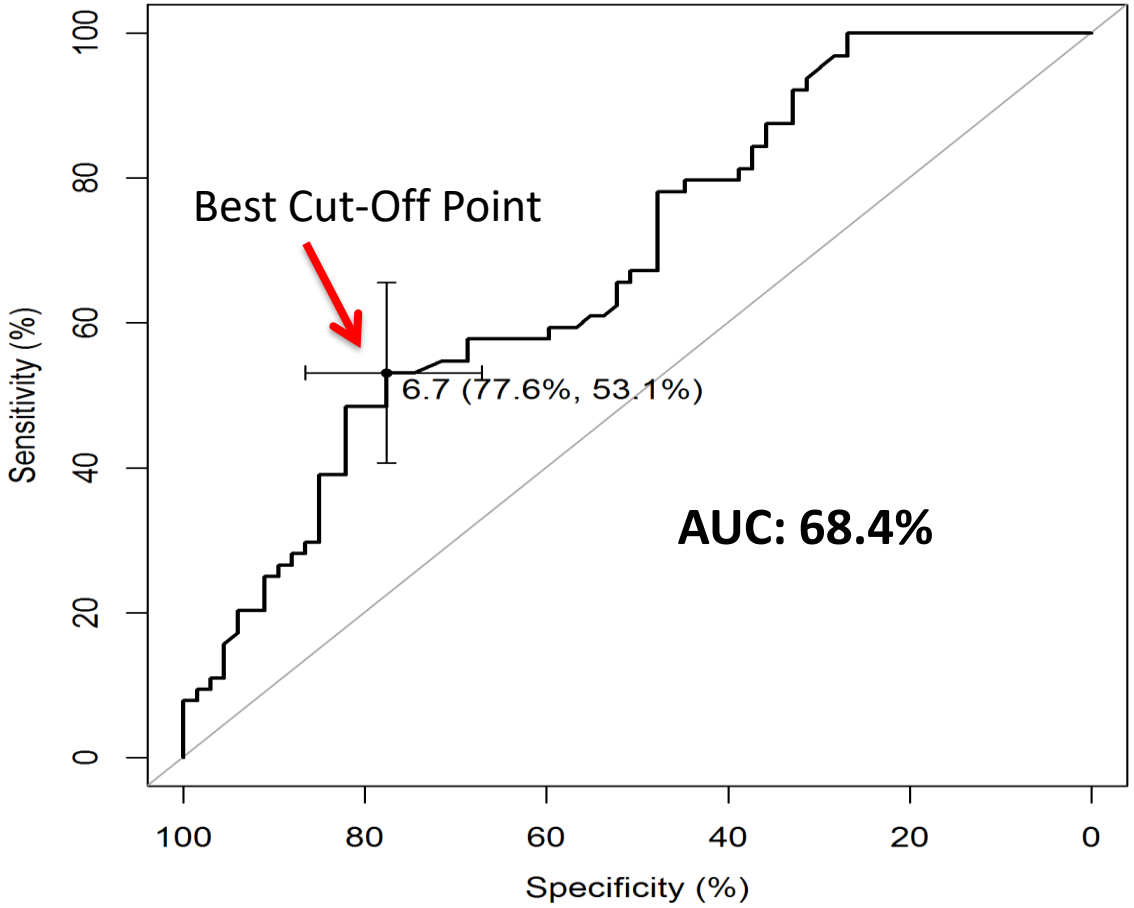
ROC Curve Analysis



What is the threshold for identify the pigs that would go to slaughter at 22 weeks of age?

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Conclusions

- Small-Small pigs have the same feed efficiency as their counterparts that were big at weaning

- Big-Small pigs have a worse feed efficiency

- Regression trees and ROC curves could aid farmers in identifying slow growing pigs at weaning

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What's next?

Identify the slow growing pigs and design different management and nutritional strategies such as:

- Diets with high amino acids requirements for light BW pigs at nursery and growing-finisher period.

- Phase feeding strategies

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Results - Descriptive Statistics Groups

Table 1. Descriptive analysis for birth and weaning BW, ADG in lactation, weaning age, parity and litter size by group.

	BW birth, kg	BW weaning, kg	ADG Lactation, g	Weaning age, d	Parity	Litter size
Groups	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Small - Small	0.9 ± 0.13	4.0 ± 0.95	121 ± 39.0	25.7 ± 1.09	3.7 ± 2.01	16.9 ± 2.55
Small - Big	1.0 ± 0.13	6.8 ± 0.99	228 ± 33.4	25.5 ± 1.17	3.0 ± 2.17	16.9 ± 2.67
Big - Small	1.4 ± 0.22	4.6 ± 0.74	129 ± 29.4	25.3 ± 0.96	4.0 ± 2.04	16.7 ± 2.81
Big - Big	1.4 ± 0.19	8.0 ± 0.83	257 ± 31.2	25.7 ± 1.01	3.9 ± 2.09	17.5 ± 2.43

Big - Small group has a **similar ADG** in lactation to **Small - Small** group.
Small - Big group has an **ADG above the average** of the herd.

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Results - Lineal Regression Model

BWb = Birth BW
BWw = Weaning BW

Days to Target Body Weight (DTBW):

$$DTBW = BWb + Sex \; ; \; \mathbf{R^2_{adj} = 0.11} \; P < 0.001$$

$$DTBW = BWw + Sex; \; \mathbf{R^2_{adj} = 0.28} \; P < 0.001$$

$$DTBW = BWb + BWw + BWb \times BWw + Sex; \; \mathbf{R^2_{adj} = 0.39} \; p < 0.001$$

WEANING BW EXPLAIN TWICE AS MUCH AS BIRTH BW

Results - ROC Curve - Commercial criteria

	AUC	CI	Sensitivity	Specificity
Birth BW	72.7%	64.0-81.5	71.6%	70.3%
Weaning BW	68.4%	59.4-77.5	77.6%	53.1%
Birth + Weaning BW	76.3%	67.8-84.8	82.8%	69.2%

	P - Value
Birth BW – Weaning BW	0.424
Birth BW – Birth BW + Weaning BW	0.201
Weaning BW – Birth BW + Weaning BW	0.015

Economic Analysis

	BIG-SMALL	BIG-BIG	SMALL-SMALL	SMALL-BIG
Price kg meat sold (€)	1.60	1.60	1.60	1.60
Total income / pig (€)	139.4	138.9	139.0	139.9
Total Cost / pig (€)	121.54	114.12	122.27	122.72
Profit / pig (€)	17.89	24.83	16.72	17.18
Difference profit groups (€)	- 6.94	-	- 8.11	- 7.65
Feed cost	86.66	79.90	84.21	87.31
Other variable cost	9.11	9.11	9.11	9.11
Fixed cost	25.78	25.11	28.96	26.31

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