Relationship between age and body weight at farrowing over 6 parities in Large White x Landrace sow

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Feed-a-Gene

Adapting the feed, the animal and the feeding techniques to improve the efficiency and sustainability of monogastric livestock production systems

The Feed-a-Gene Project has received funding from the European Union's H2020 Programme under grant agreement no 633531.

Context
precision feeding of gestating sows

Assessment of nutritional requirements over 115 days of gestation

Parity / age

Initial backfat thickness
Initial body weight **(BW)**

Housing conditions

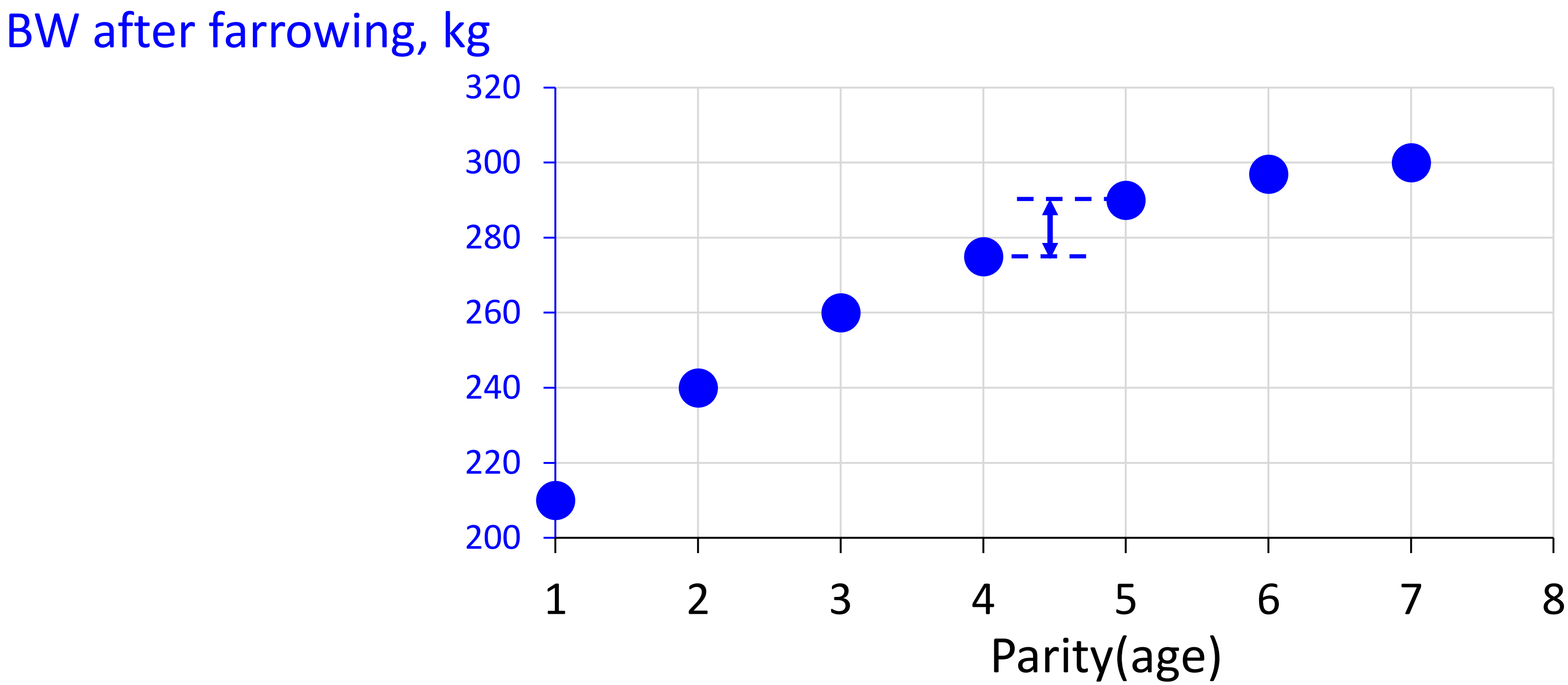
fetal growth
maternal growth
and recovering

Factorial approach / modelling

Target values
at farrowing

Context
precision feeding of gestating sows

1. The reproductive sow still grows during the first parities



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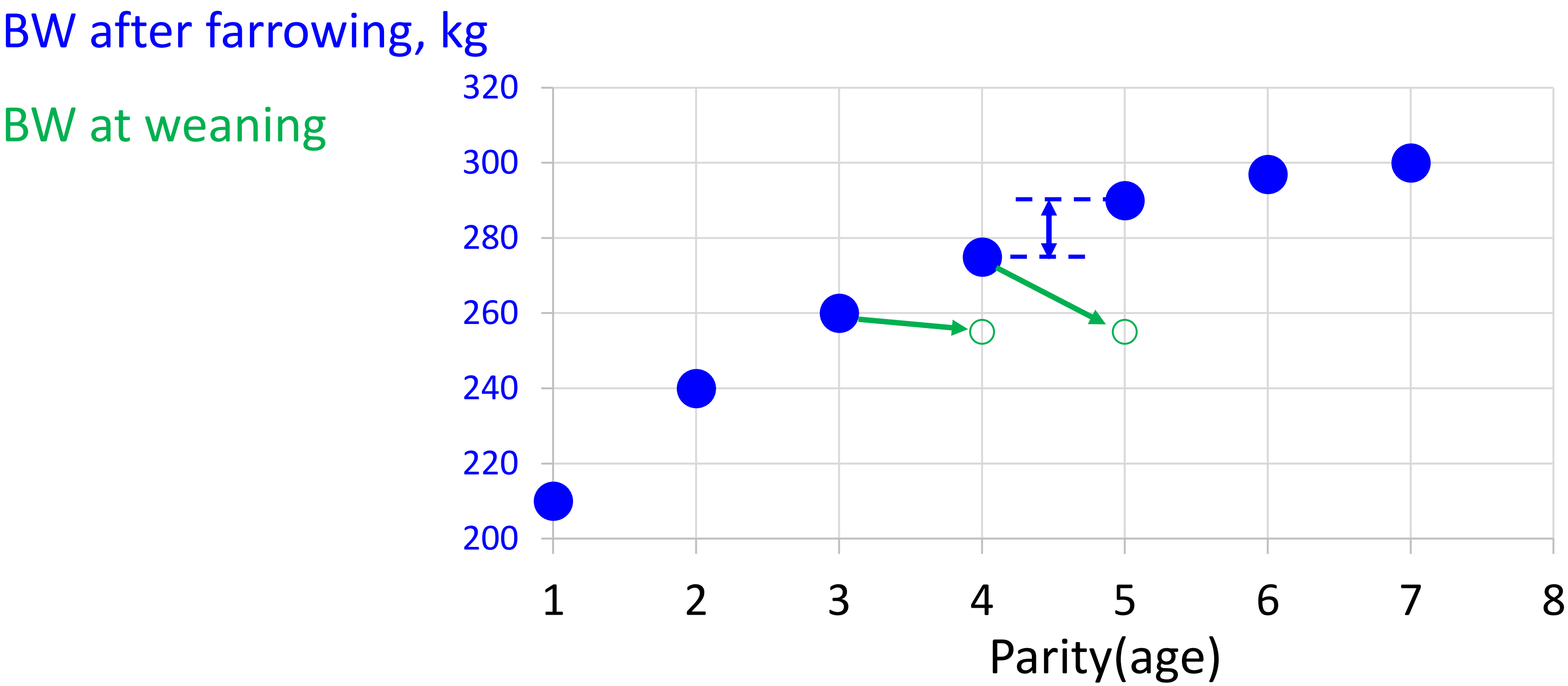
2. Nutritional unbalance induces BW loss during lactation



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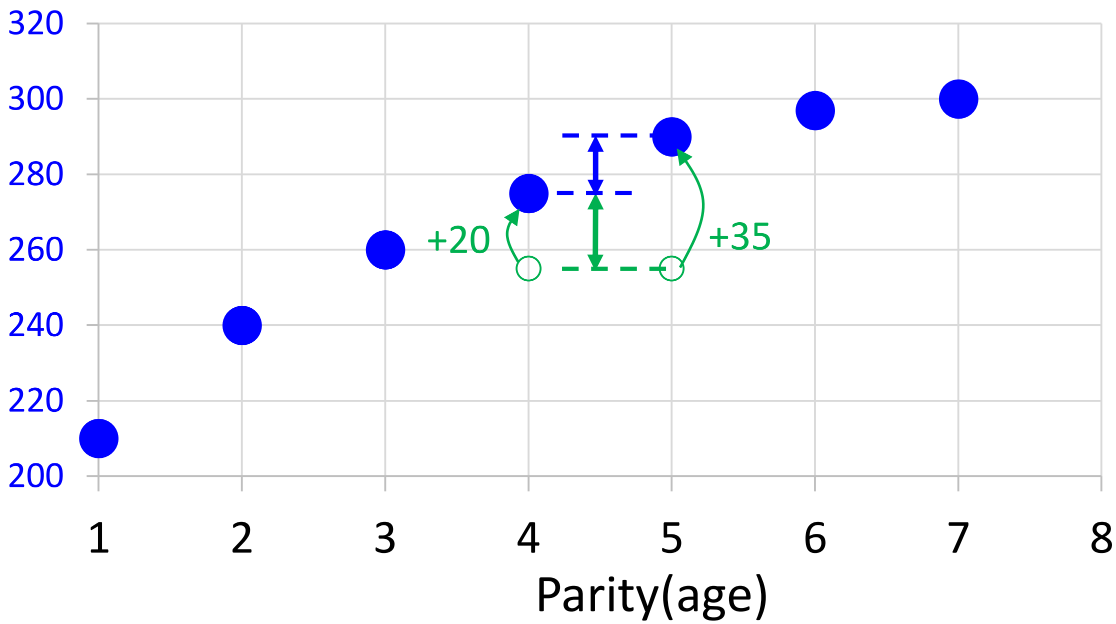
2. Nutritional unbalance induces BW loss during lactation
3. BW loss during lactation has to be recovered

BW after farrowing, kg

BW at weaning
=initial BW
at the next parity

Expected BW gain



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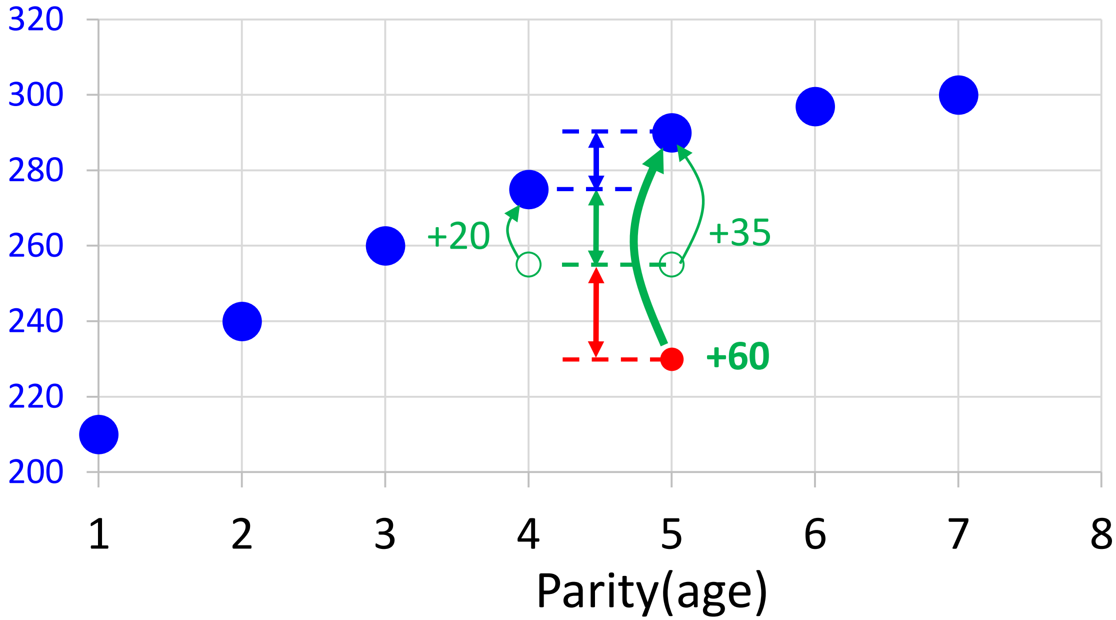
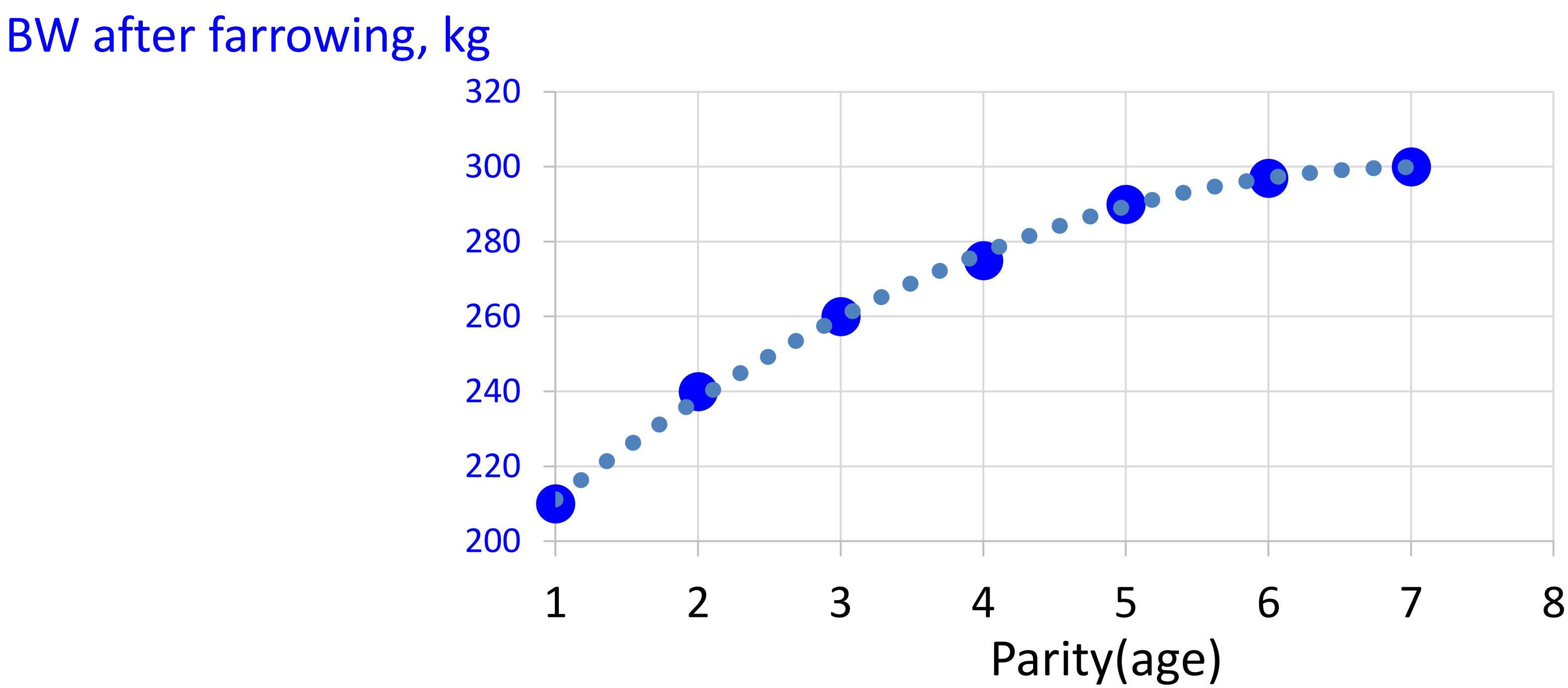


Context
precision feeding of gestating sows

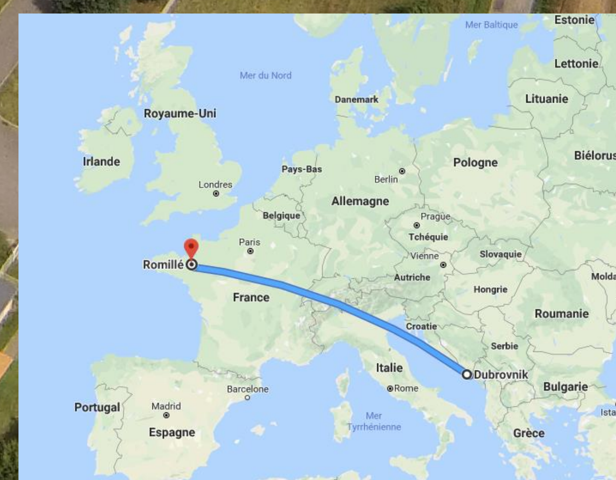
1. The reproductive sow still grows during the first parities

➡ **Relationship between age and post-farrowing BW?**



Material and methods

- IFIP experimental station
- 7 batches x 24 Large White x Landrace sows
- Database of BW
  ➔ measured routinely after farrowing



Datasets and statistics

- Data removed from the database
  - early culled sows, i.e. longevity < 6th litter
  - special events (illness, appetite, upgrading buildings…)
  - number of available data < 6

- Dataset 1 ➔ **modelling BW = f(Age)**

- Datasets 2 to 4 ➔ **evaluation**

- Stat. with SAS (v9.4): proc corr, reg, nlin

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- Dataset 1 ➔ **modelling BW = f(Age)**
  - 90 sows born between 2012 and 2015

- Datasets 2 to 4 ➔ **evaluation**
  - Sows born in 2000/03, 2004/07, 2008/11
    n = 116   n = 109   n = 112

- Stat. with SAS (v9.4): proc corr, reg, nlin

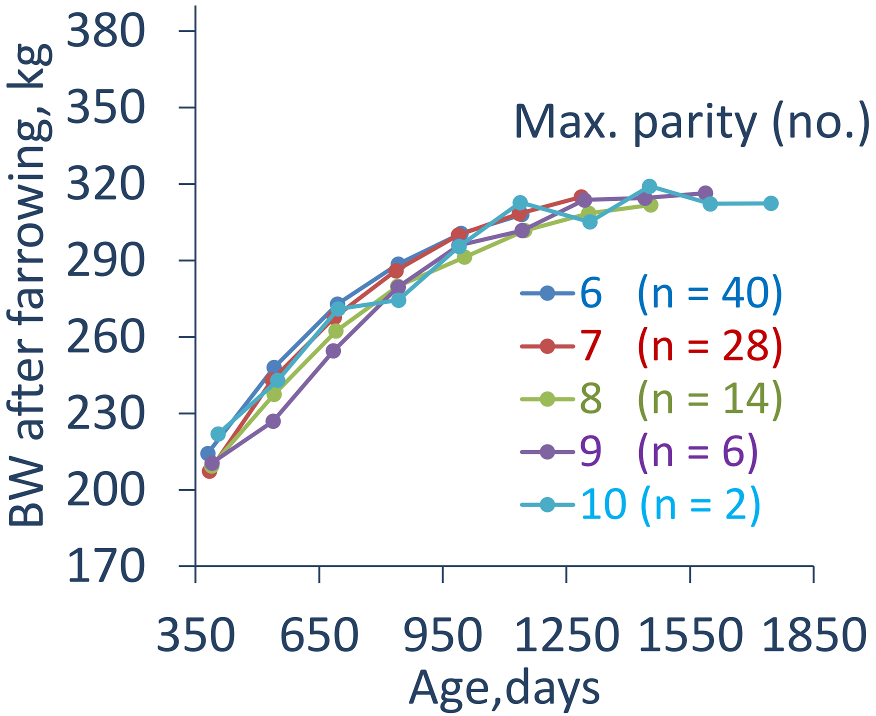
Models and inputs

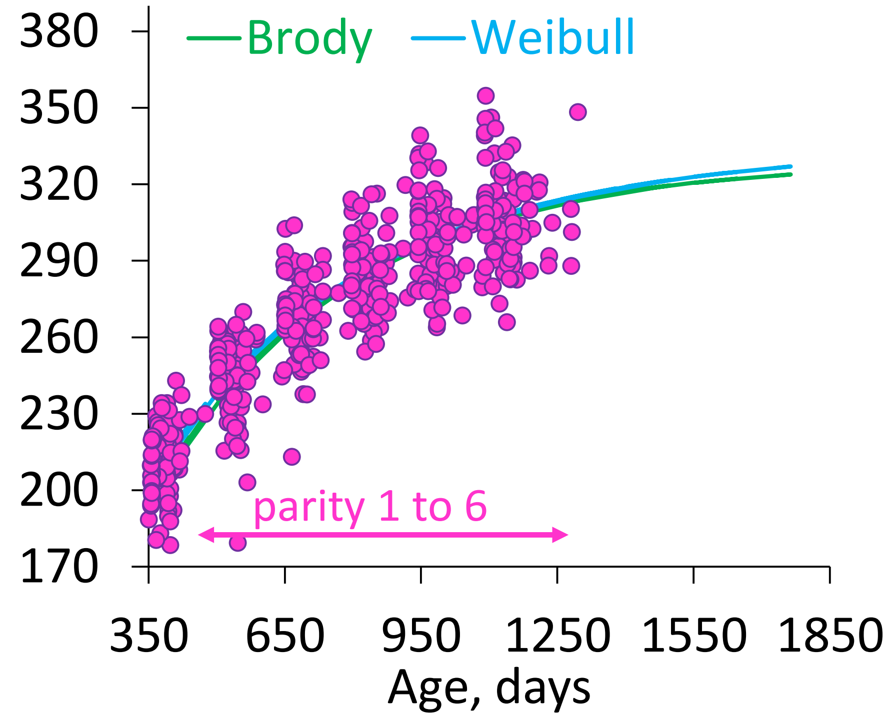
- Modeling individuel BW with age (t)
  - Brody } based on average mature BW
  - Weibull
  - Logistic } based on BW at first parity and BW gain to reach average mature BW
  - Weibull'

- Inputs characterised at the 1st parity
  - Age at 1st farrowing = t1i
  - BW at 1st farrowing = BW1i

- Precision:
  - RMSEP

Model based on mature BW

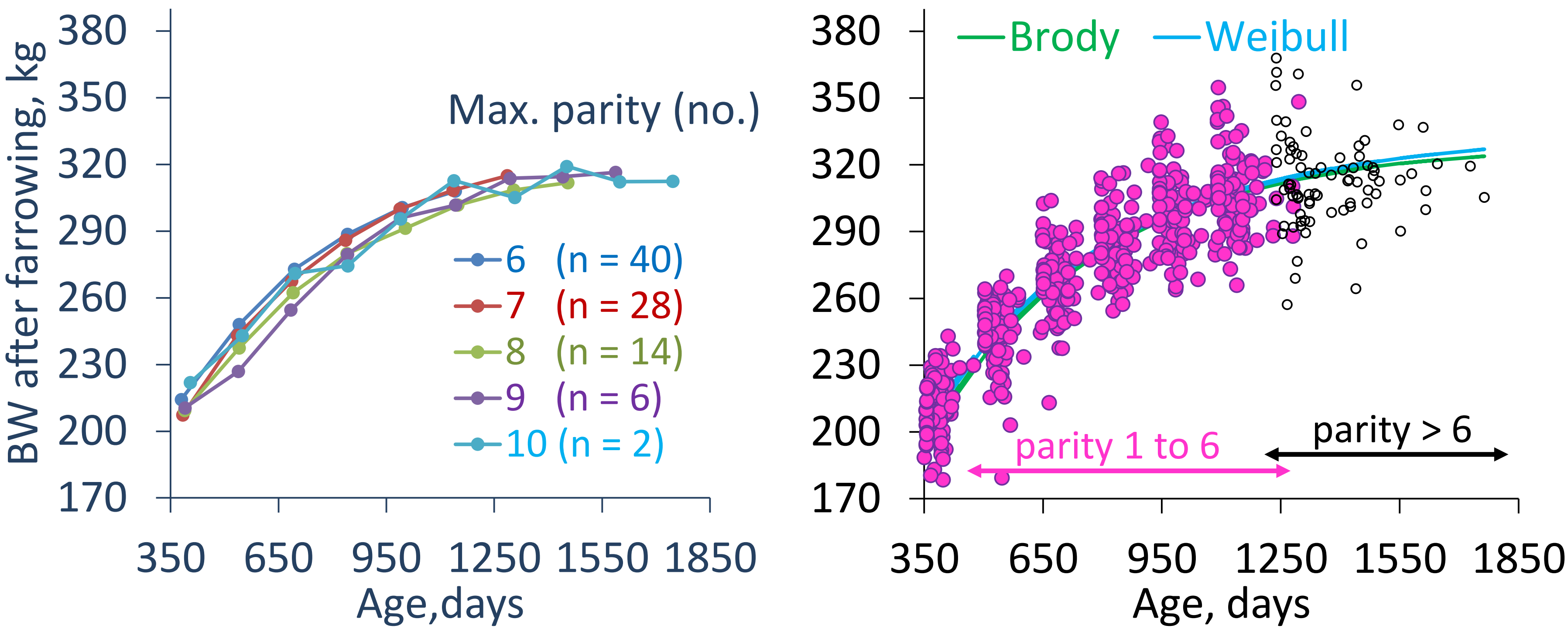




[1] Brody ➔ $BW_1 = 328.9 \times (1 - 0.907 \exp(-2.310 . 10^{-3} \times t_i))$

[2] Weibull ➔ $BW_2 = 335.5 \times (1 - \exp(-2.592 . 10^{-3} \times t_i)^{0.855})$

Model based on mature BW



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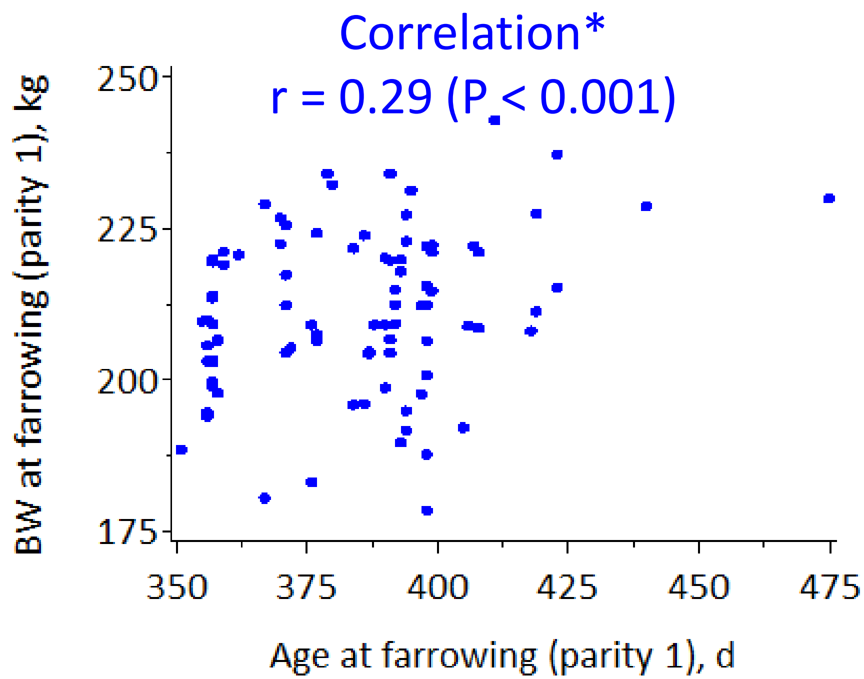
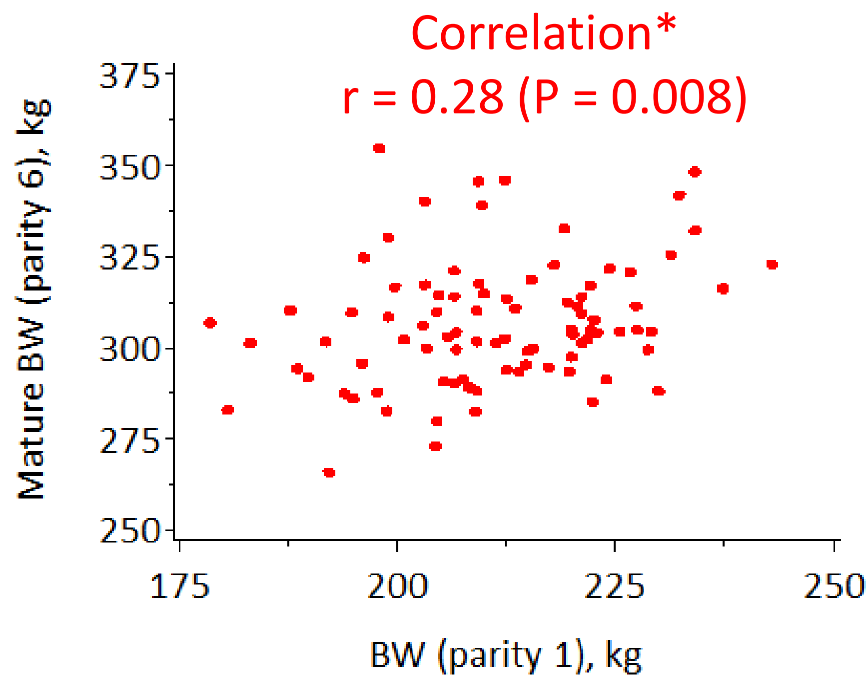
Including body weight at 1st farrowing (BW1i)





[3] Logistic

→ $BW_3 = \mathbf{BW1i} + (328.9 - \mathbf{BW1i})(1 - 2.550 \exp(-2.310.10^{-3} \times (t - \mathbf{t1i}))$

[4] Weibull'

→ $BW_4 = \mathbf{BW1i} + (335.5 - \mathbf{BW1i})(1 - \exp(-(2.037.10^{-3} \times (t - \mathbf{t1i}))^{1.059}))$

**Pearson coefficient*

Evaluation based on other datasets
(collected within the same herd)

	modeling	evaluation		
Dataset	**1**	**2**	**3**	**4**
Age1	381 ± 23	381 ± 13	375 ± 13	379 ± 15
BW1	211 ± 13	210 ± 11	213 ± 9	218 ± 10
BW6	308 ± 17	303 ± 15	296 ± 13	301 ± 14

datasets 2 to 4 =
more homogeneous sows at 1st farrowing

Precision of prediction / RMSEP*

Dataset		1	2	3	4
[1]	Brody	16.2	14.7	14.0	14.4
[2]	Weibull	16.3	15.0	14.4	14.7
[3]	Log.	16.4	13.3	13.0	12.9
[4]	Weibull‘	14.9	13.2	13.5	13.1

more homogeneous sows → lower RMSEP

similar average characteristics
→ no ↗ RMSEP

Compared to dataset 1

(*without parity 1)

Conclusion

- Choice of the equation
  - When BW1i and Age1i are known ➔ Weibull'
  - When BW1i and Age1i are **un**known ➔ Brody

- Evaluation from other data from the same herd
  - Precision remains rather stable over 15 years with stable average characterics
  - Improved precision due to lower variability of sows' characteristics

- Equations are adapted to a LWxLD population in a herd

➔ a calibration is required for other breeds in other herds

➔ in commercial farm = delevopment of sensors/tools (precision farming) for automatic measurement of BW ➔ the future input for precision feeding

Thank you for your attention

YouTube

Updated abstract

EAAP Annual Meeting 2018, Dubrovnik, Croatia

Abstract title: Relationship between age and body weight at farrowing over 6 parities in Large White x Landrace sow
Author: Quiniou, N.
Presentation: Theatre
Session 32: Precision Livestock Farming (PLF) in nutrition, genetics, and in physiology

Abstract text:

Parity and back fat thickness are frequently used by farmers to gather sows in groups and thereafter to choose a feeding plan at the pen- or individual-scale. At a given parity, ignoring differences in body weight with age contributes to the variability of body reserves at farrowing. Therefore, improvement of the adequacy in feed allowance relies on a better knowledge of the dynamic change of body weight over the productive lifetime. Data collected routinely in an experimental station on 90 crossbred Large White x Landrace sows were used to characterise the relationship between individual age (t) and body weight after farrowing (BW). Sows were born between 2012 and 2015, group-housed from the 25th to the 108th day of gestation, and studied over six parties at least. Among tested models, the Brody (BW = 328.9 x (1 – 0.907 exp(-2.310/1000 t)) and the Weibull (BW = BW1i + (335,5 – BW1i)(1 - exp(-(2.037/1000 x (t – t1i))$^{1.059}$)) were the most precise models (RMSEP = 16.2 and 14.9 kg, respectively on average between parity 2 and 6). Models were evaluated using other datasets obtained within the same herd from sows born over a period of 12 years whose BW characteristics remained rather comparable to one of dataset 1. The more homogeneous the herd was, the more precise was the prediction. Calibration of such models in commercial herd will be possible in a close future from automatic BW measured, using tools developed in context of precision farming. This study is part of the Feed-a-Gene project and received funding from the European Union’s H2020 program under grant agreement no. 633531.