GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN

# Assessing climatic effects on the reproductive performance of sows in a temperate climate

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64th EAAP – Nantes – 27.08.2013

# Negative effects of high temperatures on sows

| | |
|---|---|
| Weaning-to-service interval | Almond & Bilkei, 2005<br>Prunier et al., 1997 |
| Conception rate | Almond & Bilkei, 2005<br>Suriyasomboon et al., 2006 |
| Litter size | Almond & Bilkei, 2005<br>Edwards et al., 1968 |
| Live born piglets | Omtvedt et al., 1971 |
| Stillborn piglets | Omtvedt et al., 1971 |

# Heat stress effects during gestation

| Day of gestation | Effect |
|---|---|
| 8. – 16. | Disordered implantation of embryos,<br>Reduced conception rates,<br>Reduced no. of vital embryos |
| 53. – 61. | No effects of heat stress |
| 102. – 110. | Less live born, more stillborn piglets |

Omtvedt et al. (1971)

# When does heat stress begin ?

- Above 22 °C (Black et al., 1993)
- But: temperature explains climatic effects insufficiently
  - → Development of temperature-humidity index (THI) as heat stress indicator
  - → No exact thresholds for sows described

# Objectives

What effects does the THI have on the reproductive performance in sows ?

# Materials and Methods

- 6 indoor sow farms in Northern Germany
- Juli 2011 – August 2012

# Measurements



- Temperature and relative humidity recorded
- 2 data loggers
  - Farrowing,
  - Waiting,
  - Servicing compartment

# Temperature-humidity index

NWSCR (1976):

$$THI = [(1.8\ T\ ) + 32] – [0.55\ (RH/100] * [((1.8\ T) + 32) – 58]$$

where T is the temperature (°C) and RH the relative humidity (%)

# Reproductive performance

- 8 274 litters
- Herd monitoring program db-Planer (BHZP, Ellringen)
  - Mating date and no.
  - Parity no.
  - Farrowing and weaning date
  - No. of live born and stillborn piglets
  - No. of weaned piglets
  - Preweaning mortality
  - Weaning-to-service interval

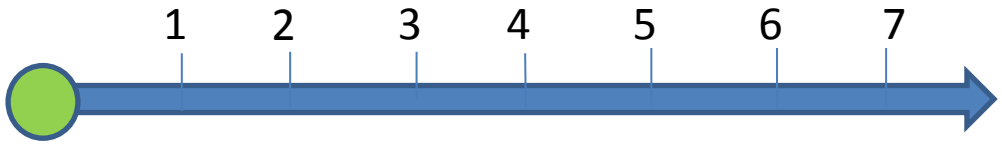
# Statistics

$$Y_{ijklm} = \mu + P_i + S_j + PS_k + F_l + THI + e_{ijklm}$$

| | | |
|---|---|---|
| $Y_{ijklm}$ | = | reproductive parameter |
| $\mu$ | = | overall mean |
| $P_i$ | = | fixed effect of parity i (5 classes) |
| $S_j$ | = | fixed effect of season j (4 classes) |
| $PS_k$ | = | fixed effect of the interaction between parity and season |
| $F_l$ | = | fixed effect of the farm (1 to 6) |
| THI | = | covariate |
| $e_{ijklm}$ | = | random residual term |

# THI effects

– After AI



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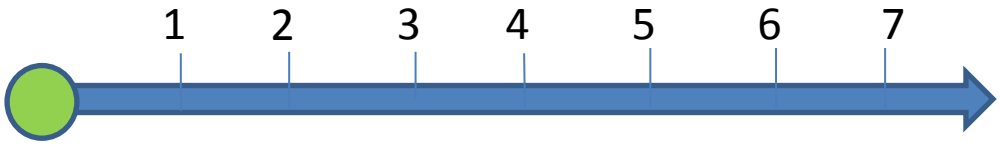
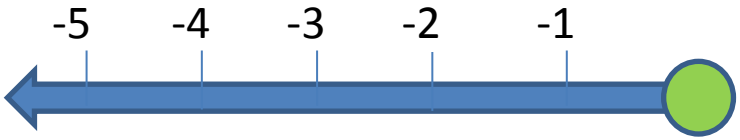



– Before farrowing



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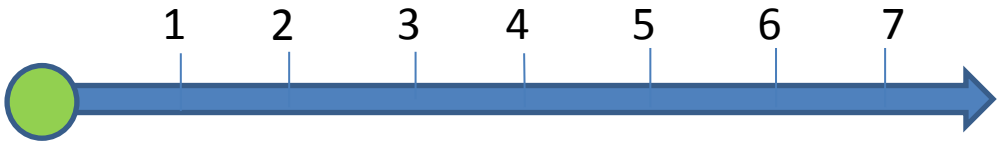


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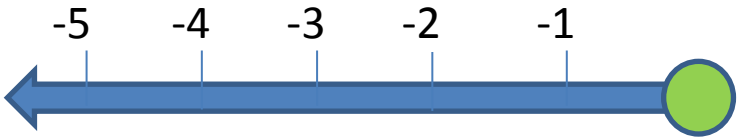


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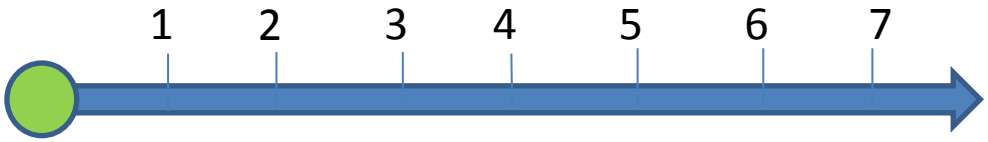
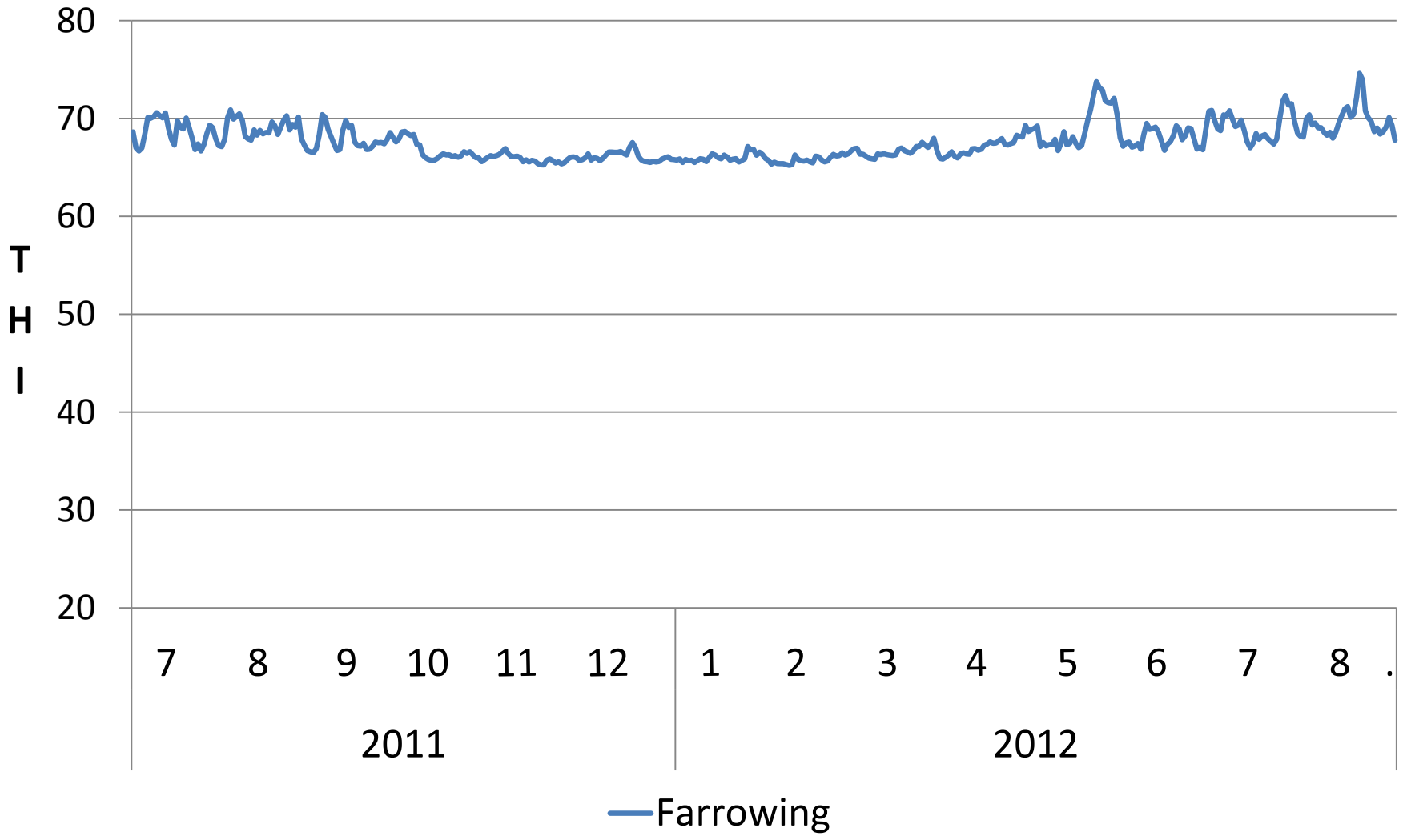


# Results and discussion

# Course of the THI



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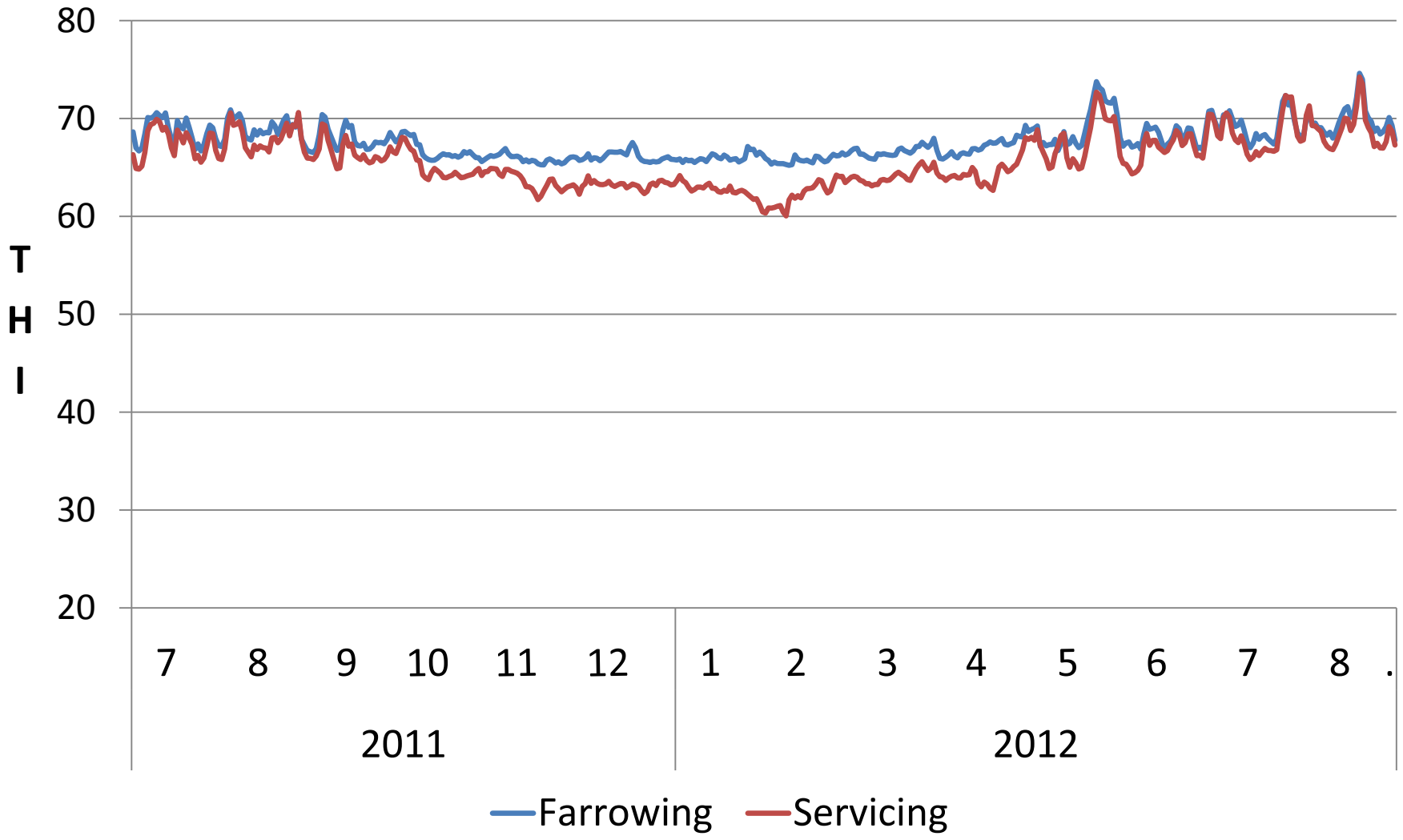

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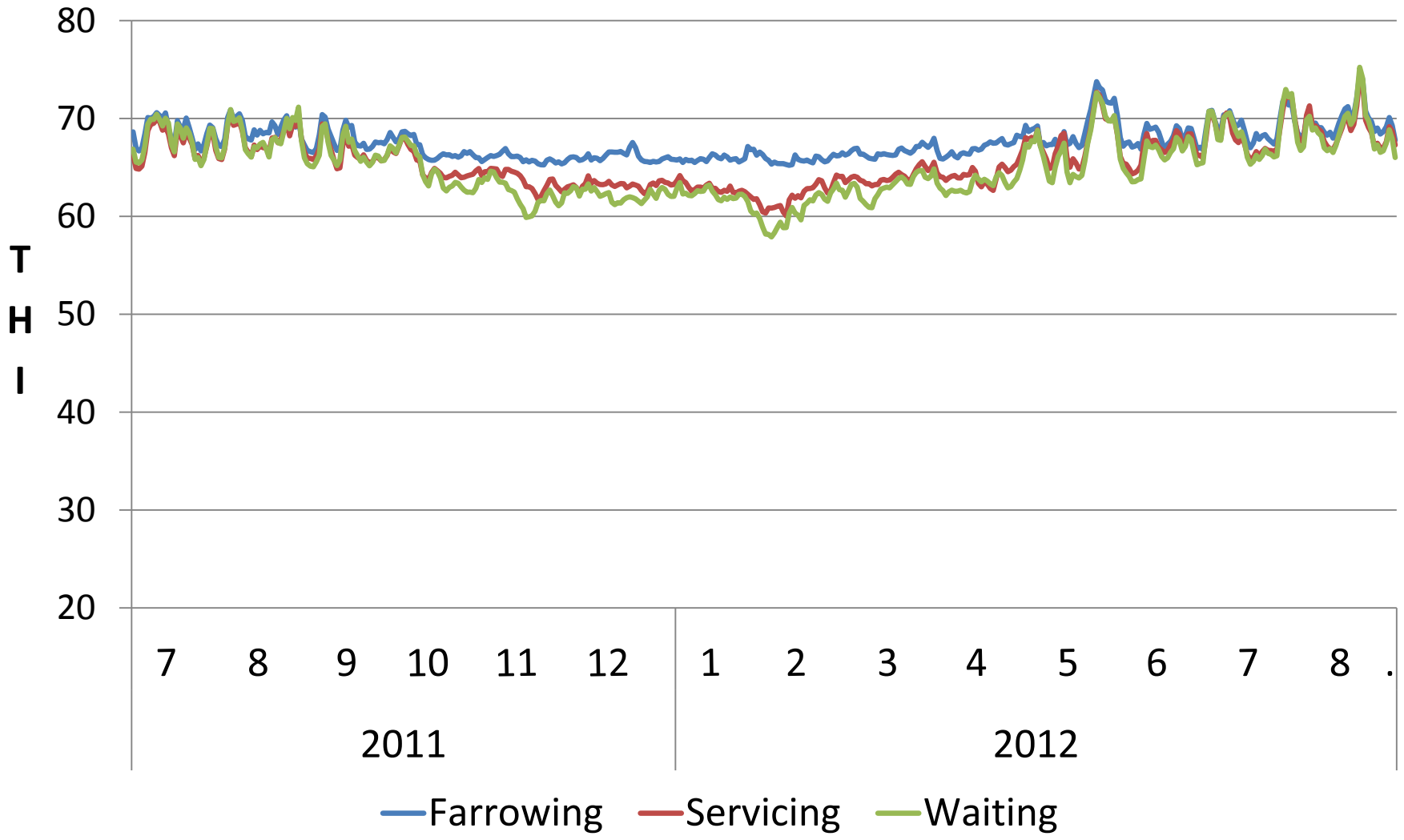

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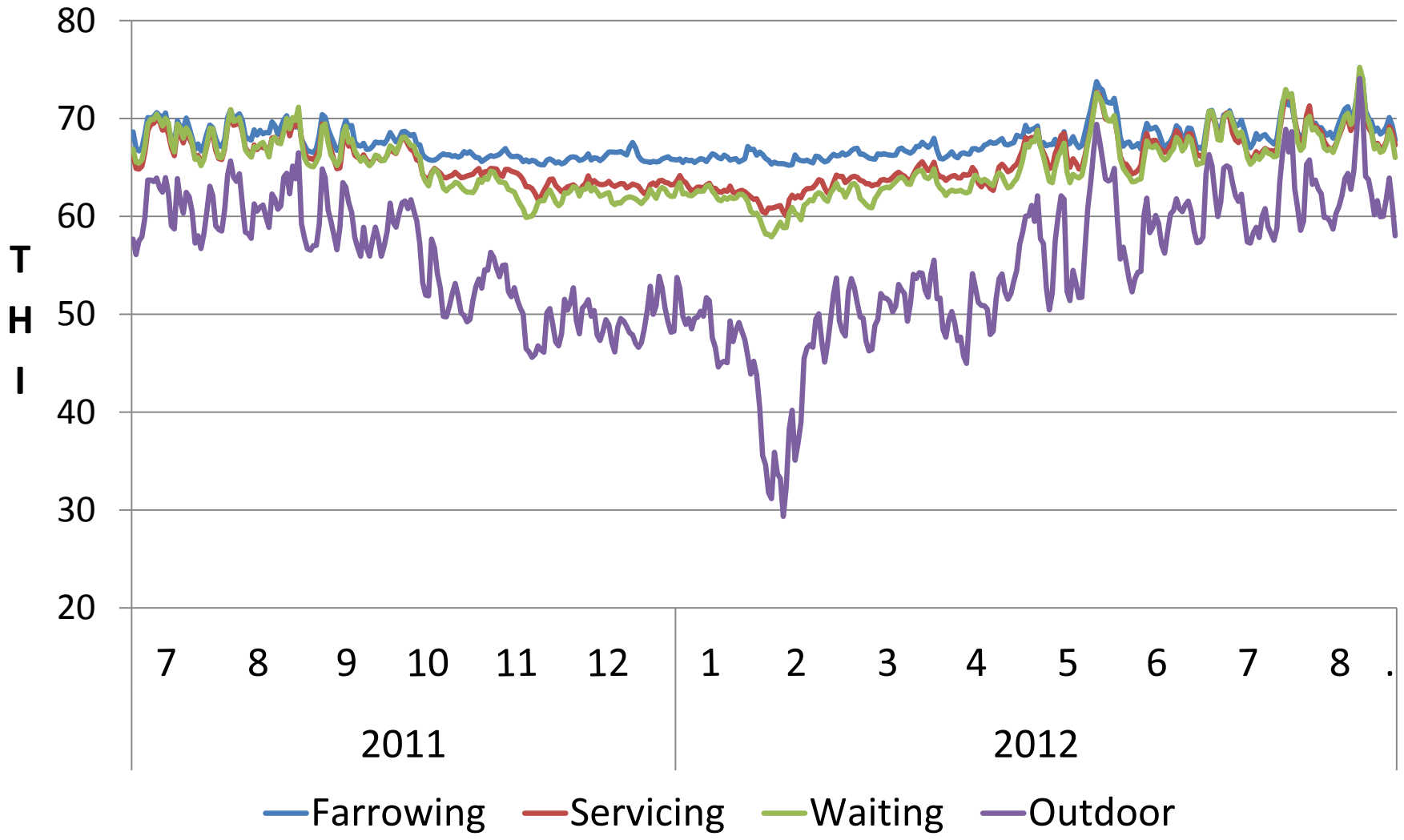
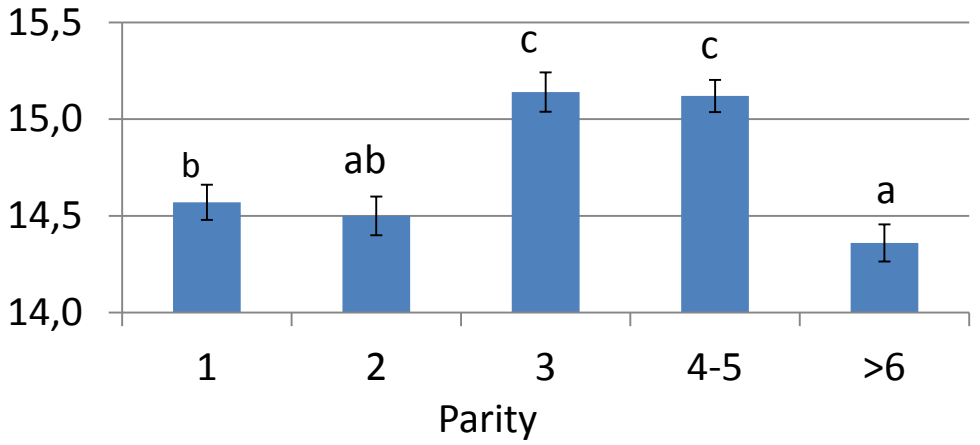


# Fixed effect of parity

- Litter size

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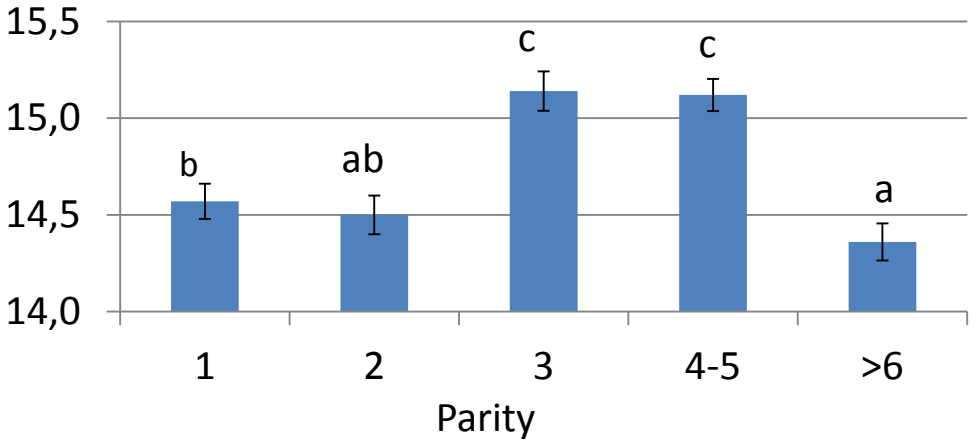


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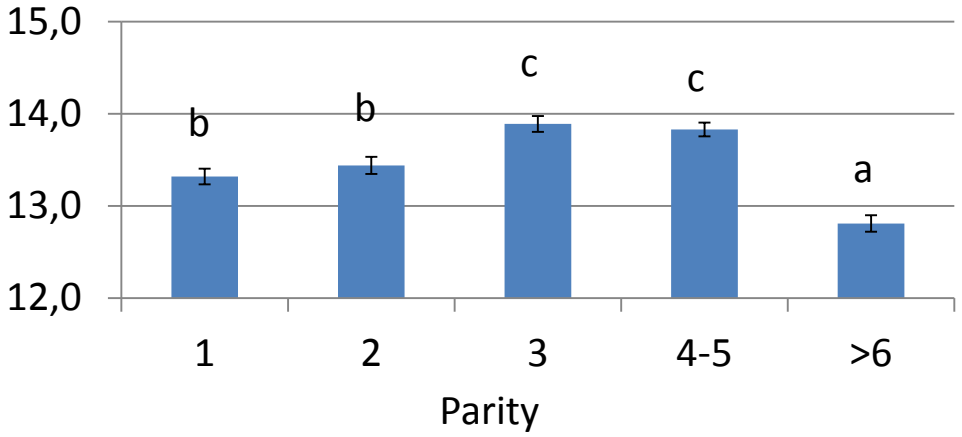
- Live born piglets

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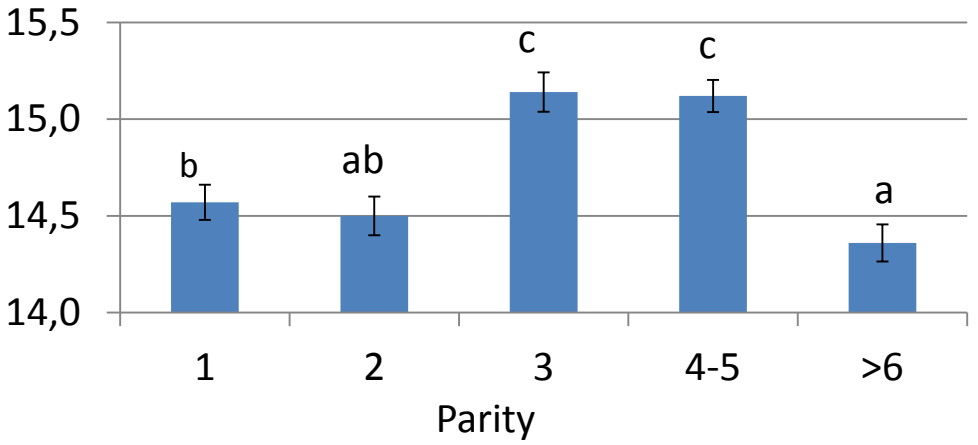


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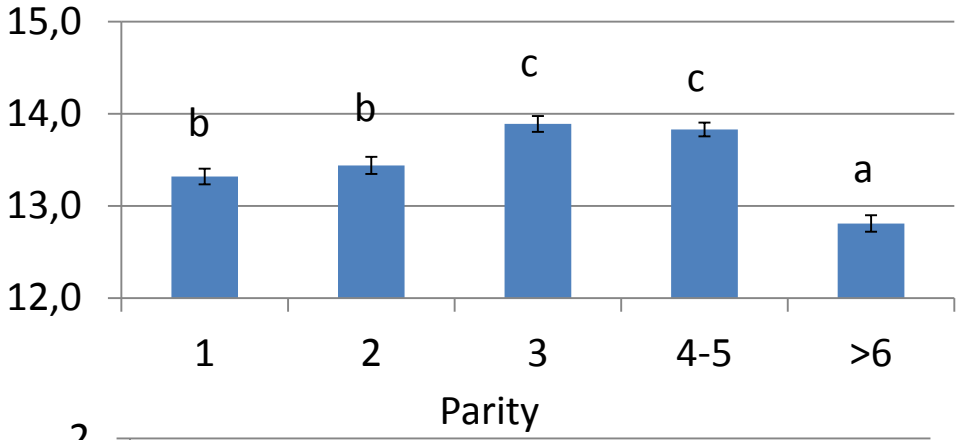


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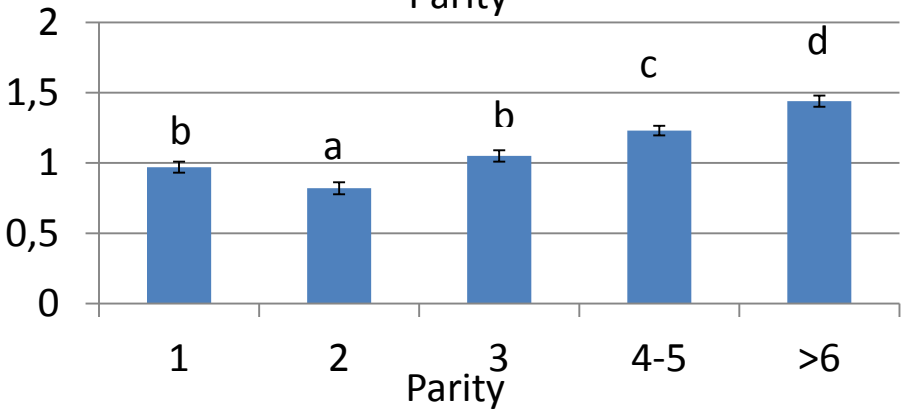


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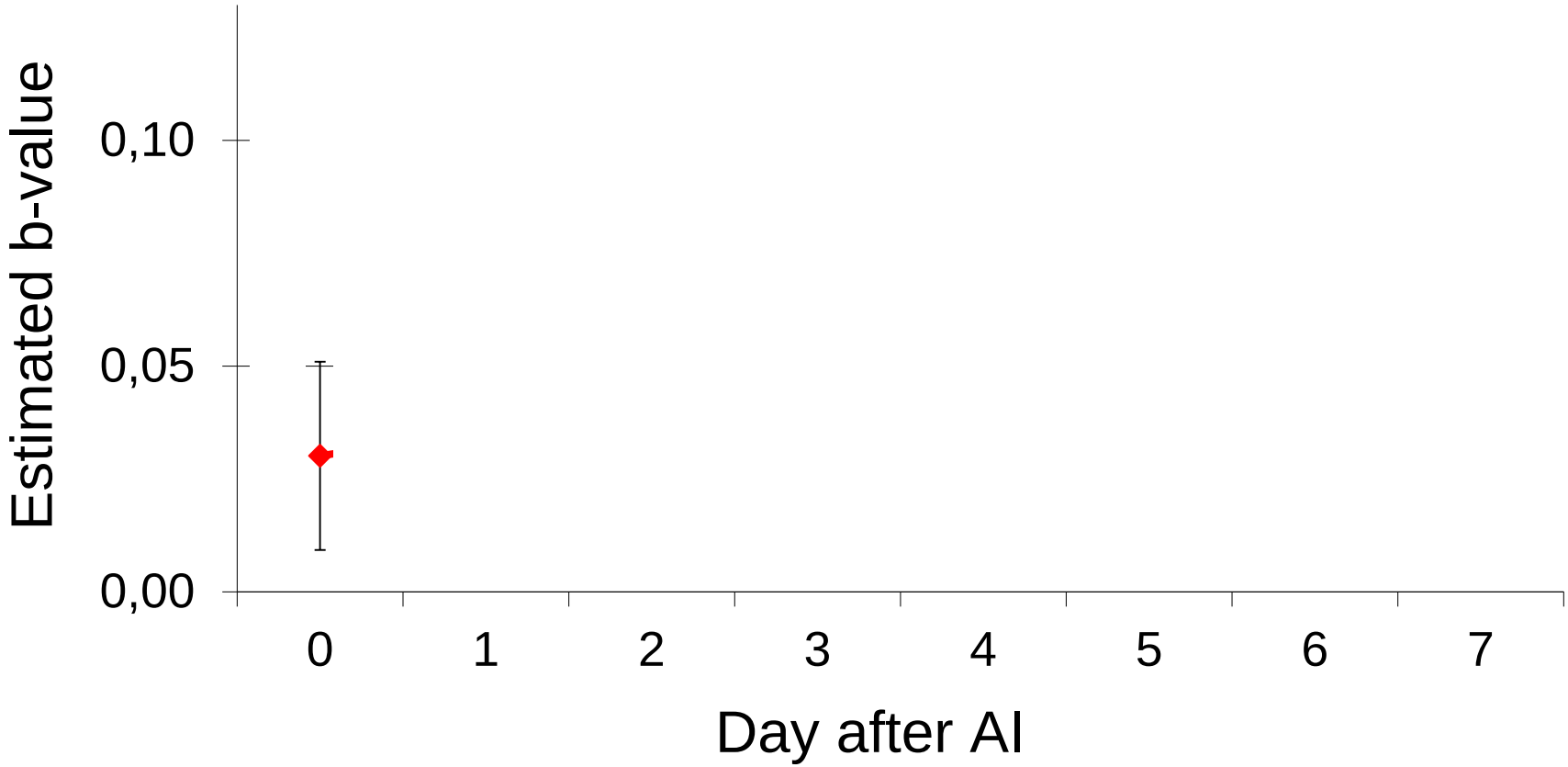
# Effect of THI after AI on litter size



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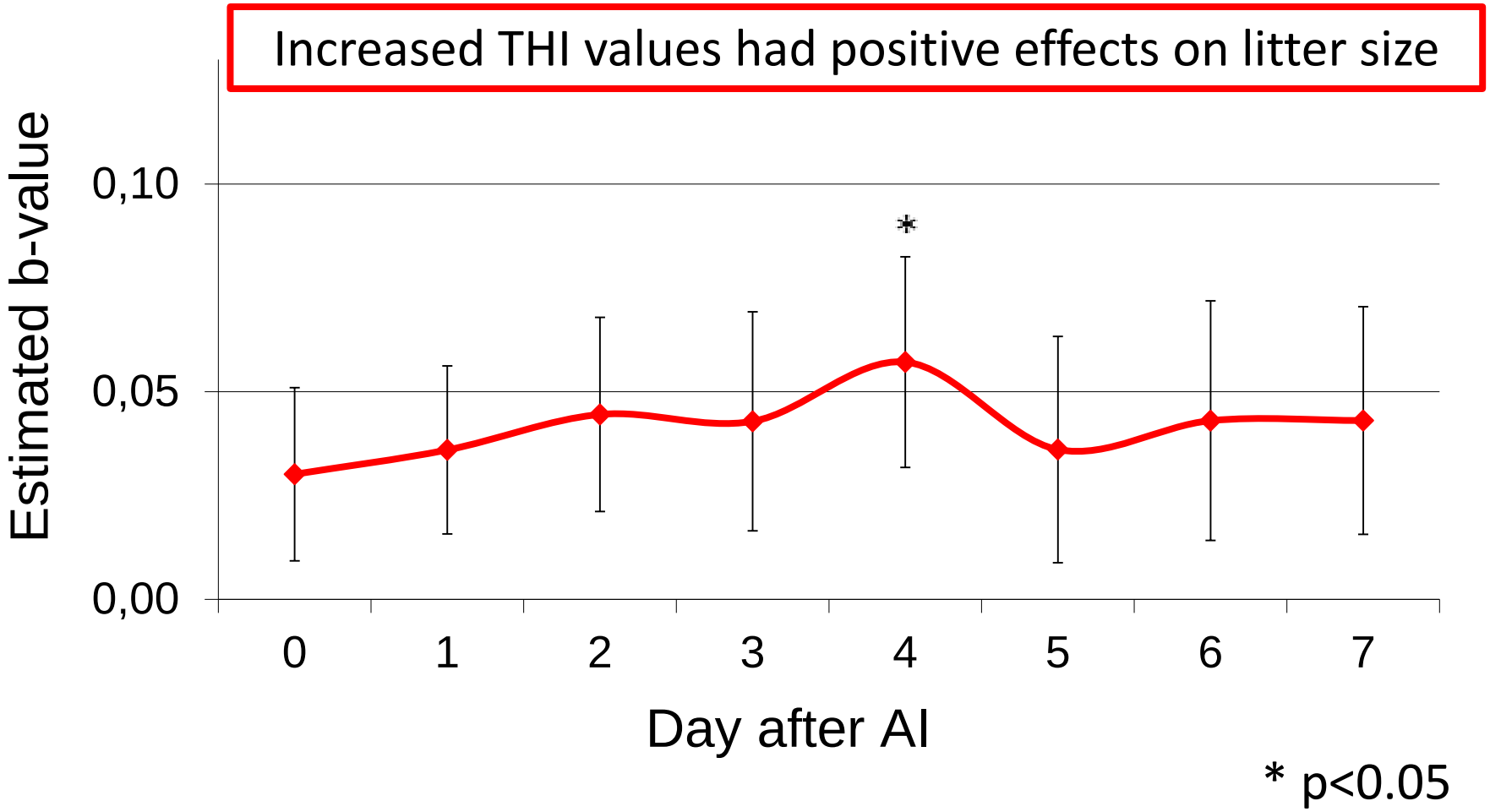
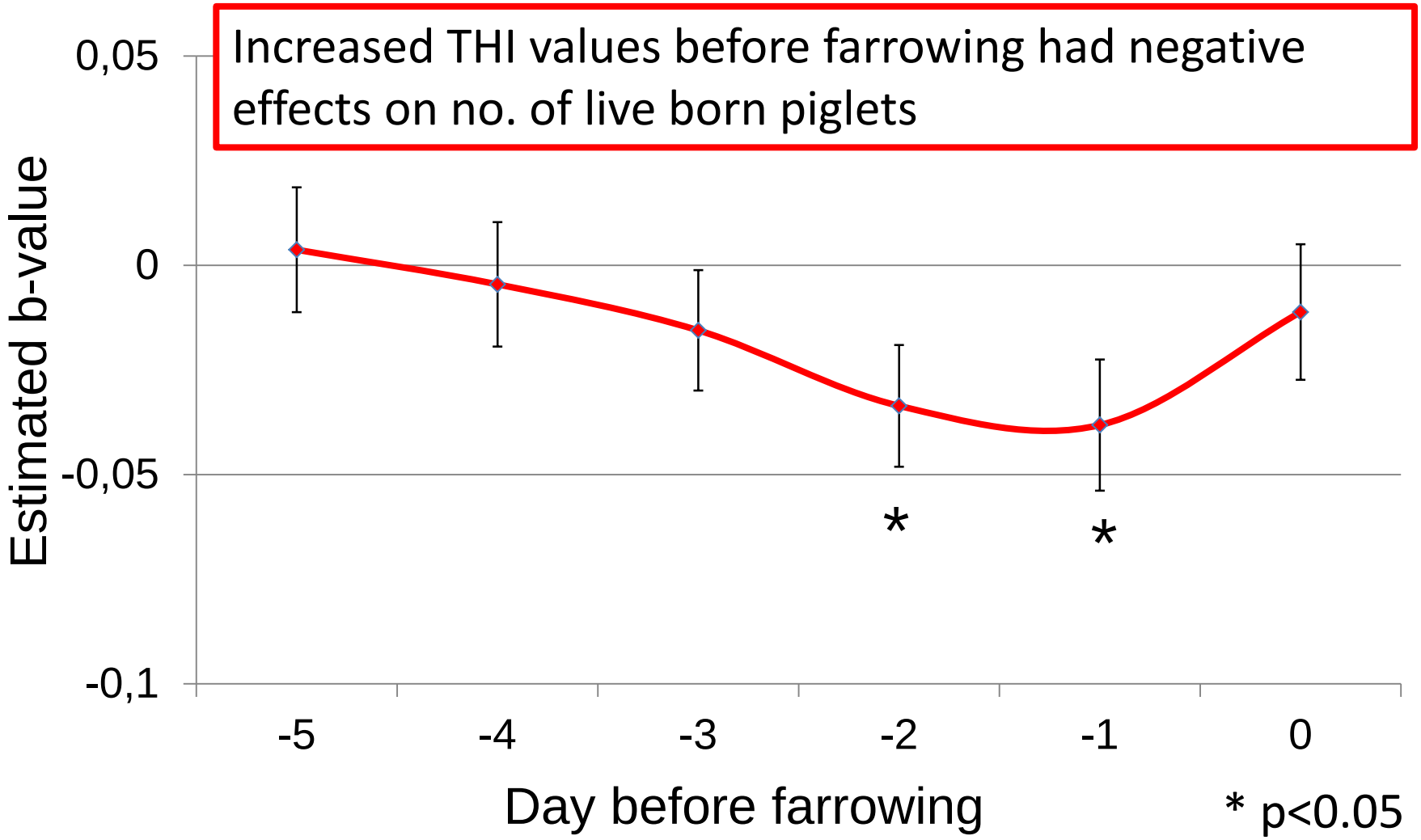
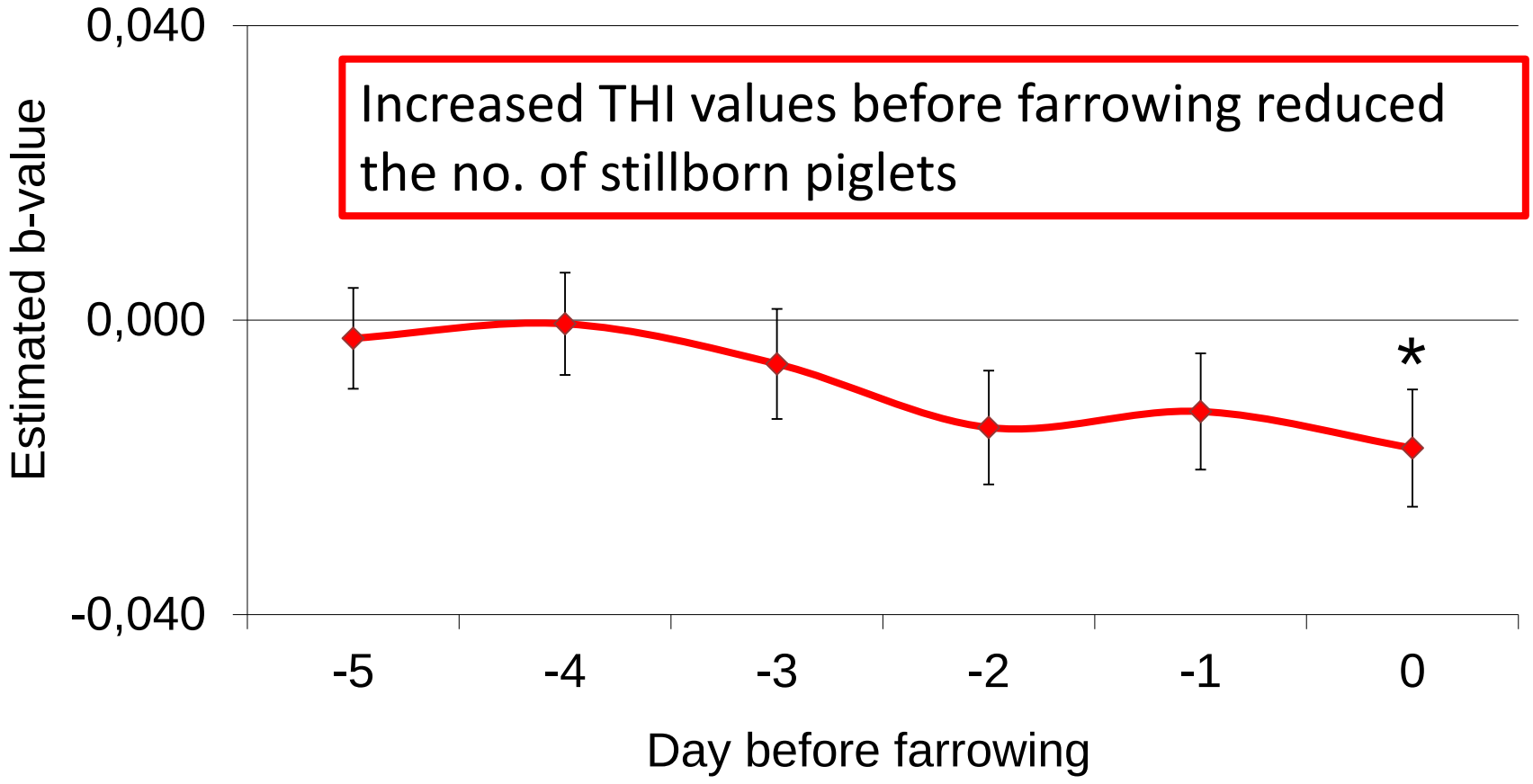



* p<0.05

# Effect of THI before farrowing on live born piglets

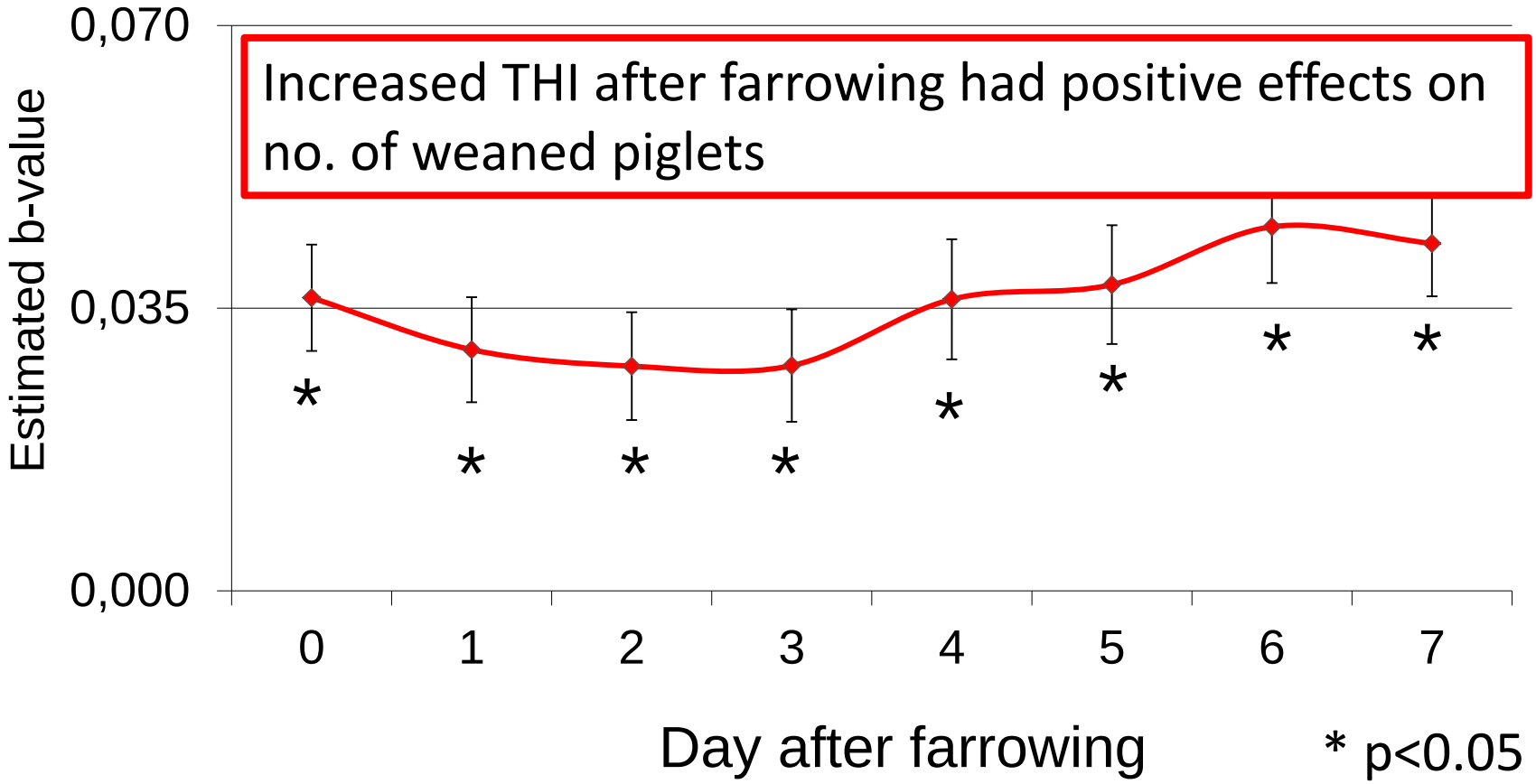


# Effect of THI before farrowing on stillborn piglets

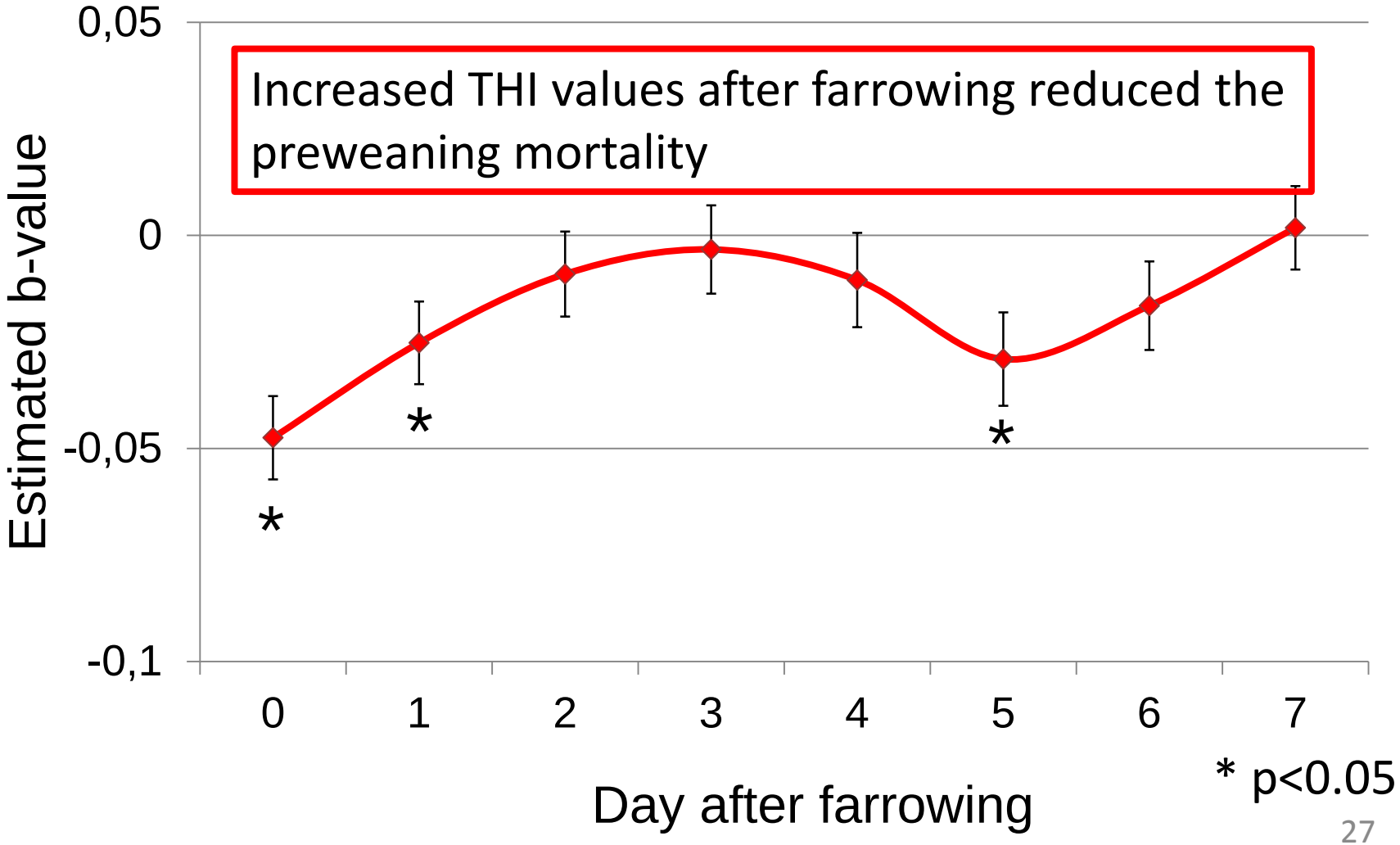



* p<0.05

# Effect of THI after farrowing on weaned piglets



# Effect of THI after farrowing on preweaning mortality



# Summary

- THI had effects on the reproductive performance in sows
- Sows:
  - Less live born piglets
  - Less stillborn piglets
- Piglets:
  - Increased no. of weaned piglets
  - Lower preweaning mortality

# Conclusions

→ Piglets‘ performance increased with higher THI-values

→ Higher THI-values negatively affected reproductive performance of the sows at the time of farrowing

## We acknowledge:

The studied farms.

GEFÖRDERT VOM

Bundesministerium für Bildung und Forschung

Projektträger Jülich Forschungszentrum Jülich

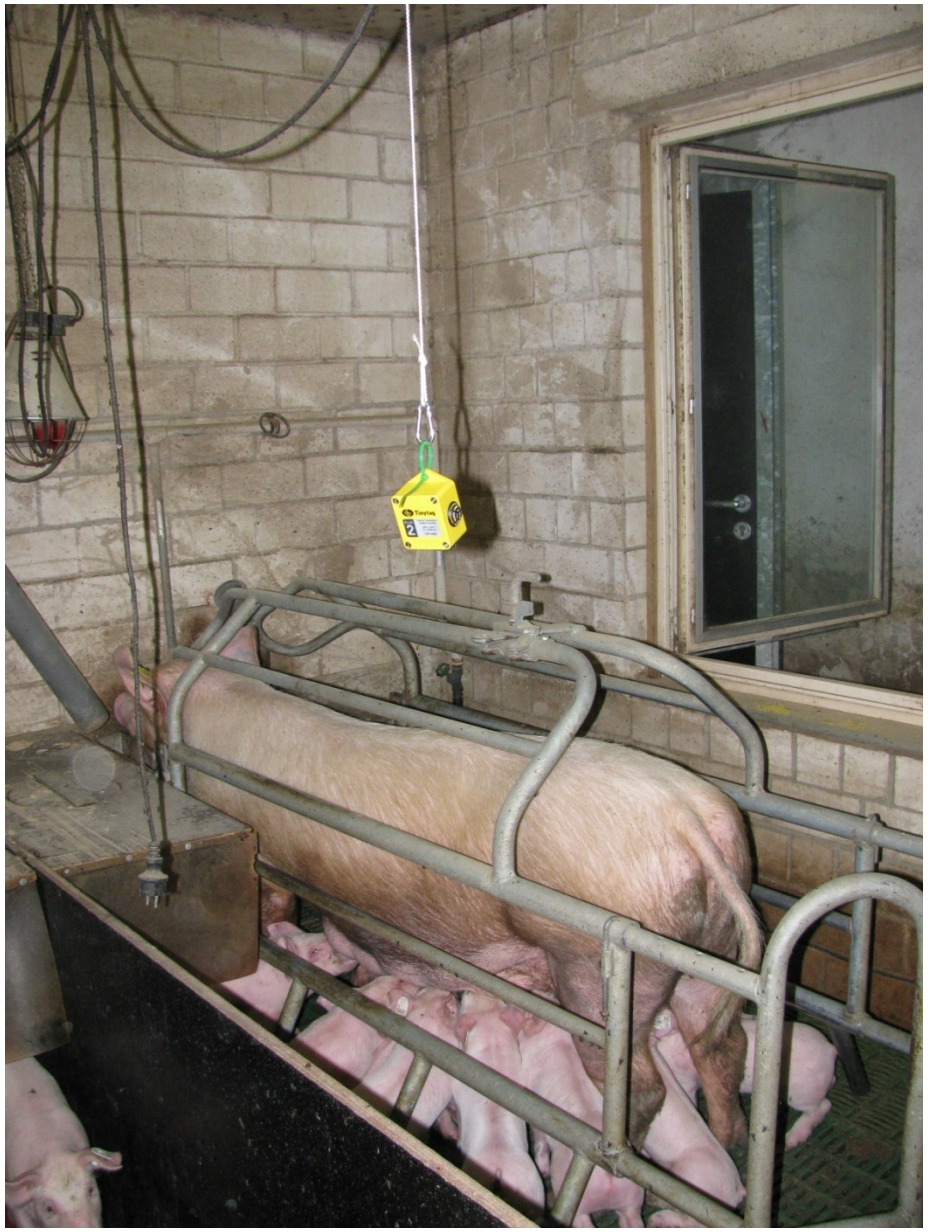
# Thanks for your attention !

# Reproductive performance of the studied farms (N=6)

| Parameter | Mean | Range |
|---|---|---|
| Farrowing rate (%) | 71 | 64 - 81 |
| Live born piglets (n) | 13.6 | 13.1 - 14.6 |
| Piglets weaned/litter (n) | 11.6 | 10.9 - 12 |
| Piglets weaned/sow / year (n) | 27.8 | 26.2 - 30 |
| Preweaning mortality (%) | 15 | 9.1 - 18.1 |
| Weaning -to-service interval (d) | 5.2 | 4.7 - 5.5 |
| Returns-to-service (%) | 7.7 | 3 - 14 |
| Replacement rate (%) | 46 | 35 - 62.2 |
| Litters per sow (n) | 4.8 | 3 - 5.7 |
| Lactation days (d) | 22.8 | 19.3 - 27.4 |

# Background

- Heat stress in sows: combination of temp and RH !
- Temperature-humidity index
- Thresholds for heat stress in sows?
- Causes seasonal infertility and decreases reproductive efficiency
- Feed intake reduced by up to 50% (Collin et al., 2001)
- Effects of heat stress greatest during lactation (Williams et al., 2013)
- Different thermal-neutral zones of sows and piglets

# Production cycle

- Servicing compartment
  - Single gestation crates until 4 weeks after AI
- Waiting compartment
  - Groups of 10 to 80 sows until 1 week prior to farrowing
- Farrowing compartment
  - Single farrowing crates; weaning after 21 -28 days