# Loose housed sows

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Danish Pig Levy Fund
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# Queen: ”*We are the champions….*”

# or maybe more ”we like to be the Champions” – what does it take?

To be the best  producers of pork in the world takes:

- High performance animals
- *Optimized nutrition*
- *Professional staff (stockpeople)*
- Optimized conditions to ensure
  - High productivity
  - High welfare
  - High health

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# Hyper-prolific high performance sows

- Selection criteria for sows
  - Capable of nursing piglets
  - Low input – work
  - Low input medication
  - Long and large life performance
- We expect them
  - To have uncomplicated farrowing
    - But it is a marathon – a farrowing takes 4-8 hours
  - To produce significant amounts of milk continously
    - 16 kg/day on average
  - To release many fertile eggs

I just gave birth to 25 liveborn piglets – took 8 hours

I'm producing 16 liter of milk every day

I'm carrying 18-32 fetuses

# Optimized conditions => Optimized housing

- Today – farrowing pen – because it is where it all begins…..
  - Behaviours
  - Physical ‘needs’
  - Animal dimensions
  - Animal numbers

Also need to consider

- Caretakers work conditions
- Environmental impact
- And farm economy…

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# Behaviours

Sows

- Eat, drink and dung + urinate
  - And **not** in the same position
- Rest
- Explore
- Nestbuild
- Farrow
- Nurse
- Thermoregulate

Piglets

- Birth
- Suckle
- Rest
- Play and explore







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# Decisions before building and running afterwards

- Key decisions
- Once you've build – conditions are given - live with it….and optimize within conditions

- Start with successful implementation of higher welfare initiatives
  - Understanding:
    - What do pigs do
    - When do they do it
    - Why do they do it
    - How do they do it
    - …







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# Pig – dimensions and numbers

- Sow
  - Easy part first – numbers: 1
  - Dimensions
  - Space needed to perform behaviours
- Piglets
  - Numbers and dimensions
    - Birth
    - Litter equalization
    - Weaning
  - Space needed to perform behaviours

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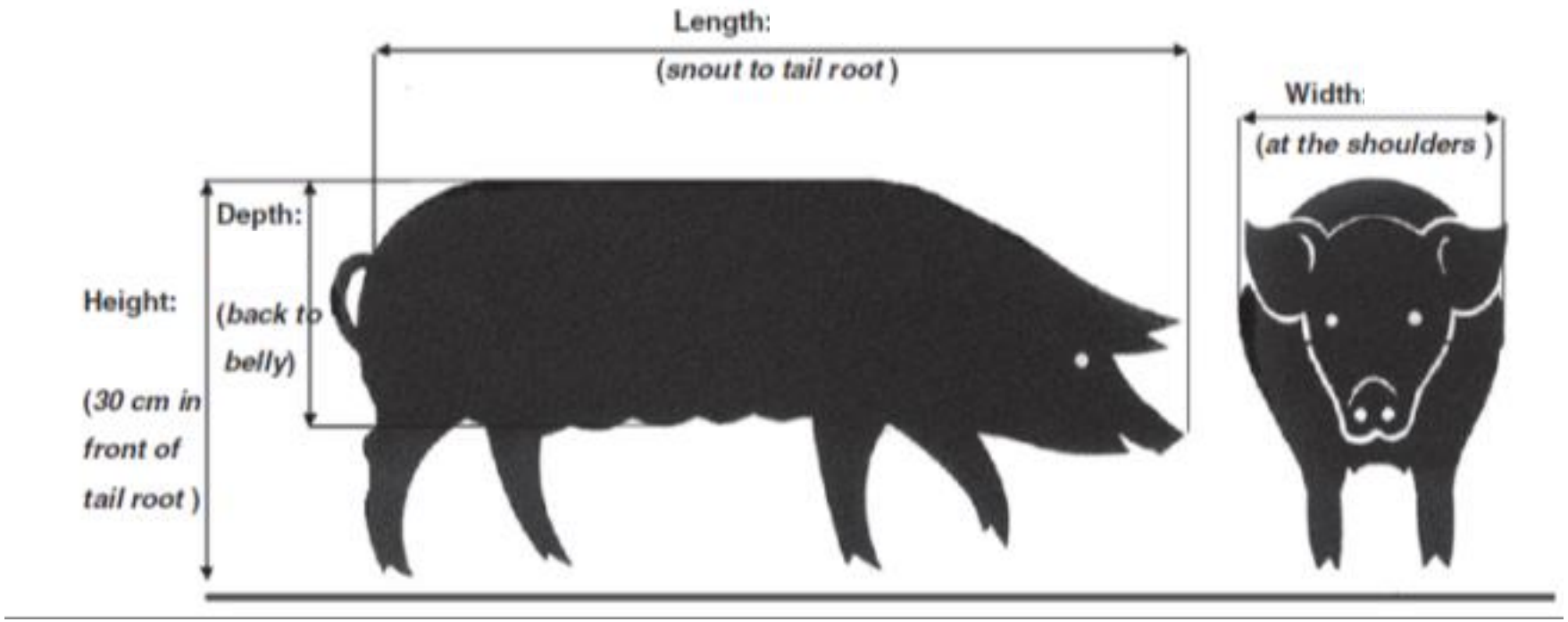
# Sow dimensions anno 2017

- 405 Danish crossbred sows from 10 commercial herds




*Modified after Moustsen et al., (2011) Livestock Science 141, 272-275*

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# Dimensions full grown sows
## Parity 5 +
## 2003 and 2017

| Year | 2003 | | 2017 | |
|---|---|---|---|---|
| Sows, no | 126 | | 103 | |
| Dimension | Ave.±se | 95% percentile | Ave.±se | 95% percentile |
| Length, cm | | | | |
| Heigth, cm | | | | |
| Width, cm | | | | |
| Depth, cm | | | | |

*Moustsen et al., (2011)*
*Livestock Science 141, 272-275*

*Moustsen & Nielsen, Meddelelse 1113*
*www.svineproduktion.dk*

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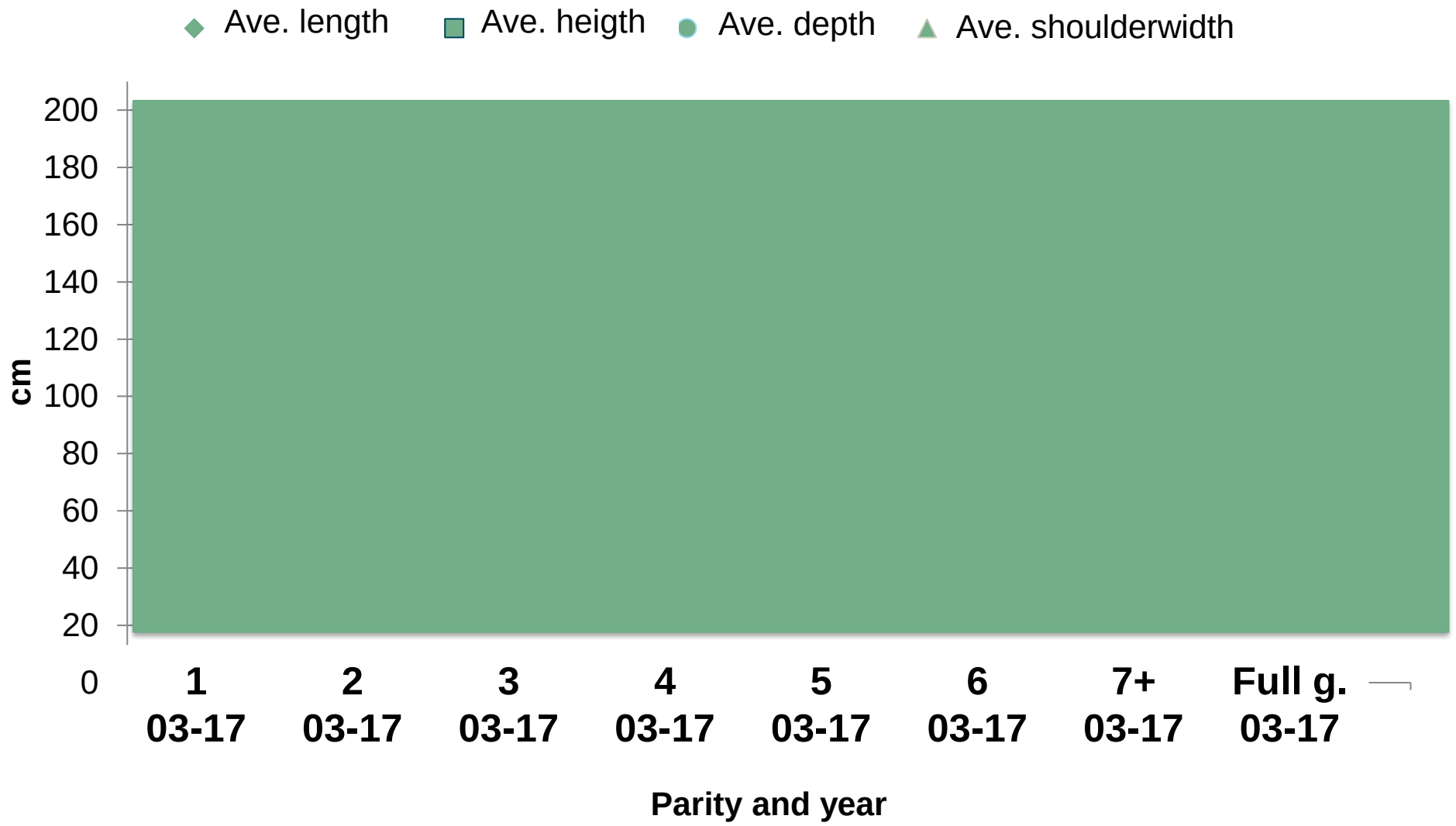
# Dimensions
# not full grown sows 2003 and 2017

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# Besides sow dimensions - movement

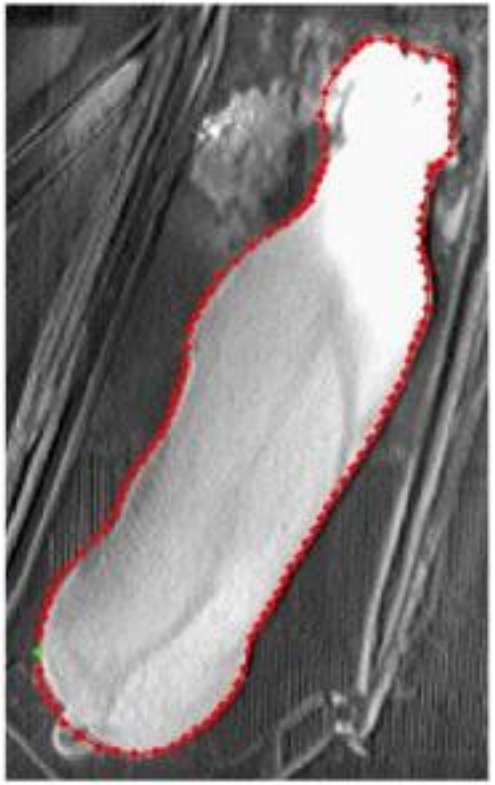

**Figure 4.**
Line around a standing sow, before movement

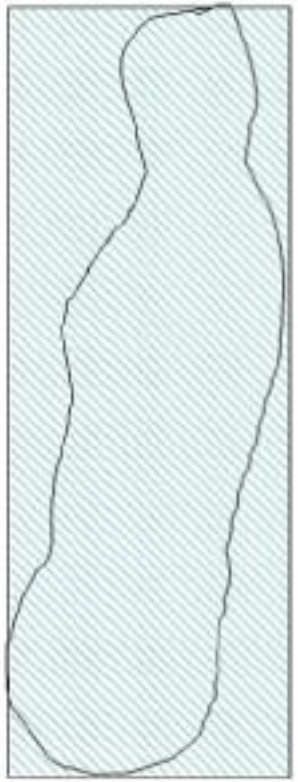

**Figure 5.**
Frame around the sow before movement was initiated

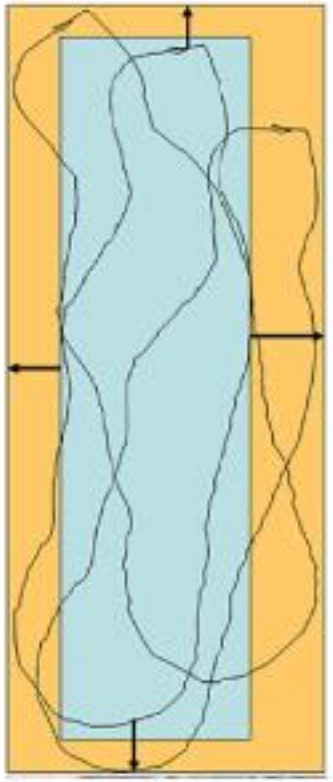

**Figure 6.**
Frame after movement – showing area used during up- and downwards movement

*Moustsen & Duus, Meddelelse 722, www.svineproduktion.dk*

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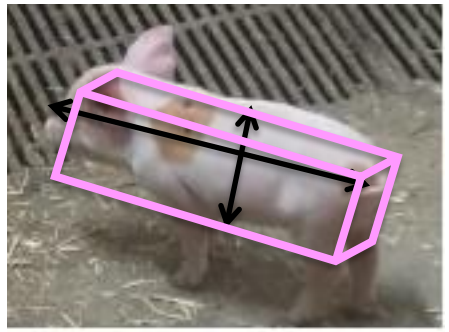
# Dimensions - piglets



**< one week:**

App. 30 cm long; 8-9 cm width; 9-10 cm depth; app. 0.03 $m^2$/pig

**App. 3 weeks:**

App. 50 cm long; 14-15 cm width; 14-15 cm depth; ca. 0.07 $m^2$/pig

**Area depends on age and numbers, m2**

| | | Number in pen | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Age | 1 | | | | | | | | | | |
| | 3 | | | | | | | | | | |

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# Dimensions – pen equipment

**Sows:**
Length
Depth
Width
Head

**Piglets:**
Length
Depth
Width
Height

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# Challenge of change – housing of lactating sows from crates to loose

- From outdoor to loose indoor or from crate to loose?
- Solid floor vs. high level of hygiene – or both?
- Large pens – large investments - few farms?
- Smaller pens – fully slatted – cheap – many farms?
- Only building once! Need to consider long term political and market situation (eg caged layers)

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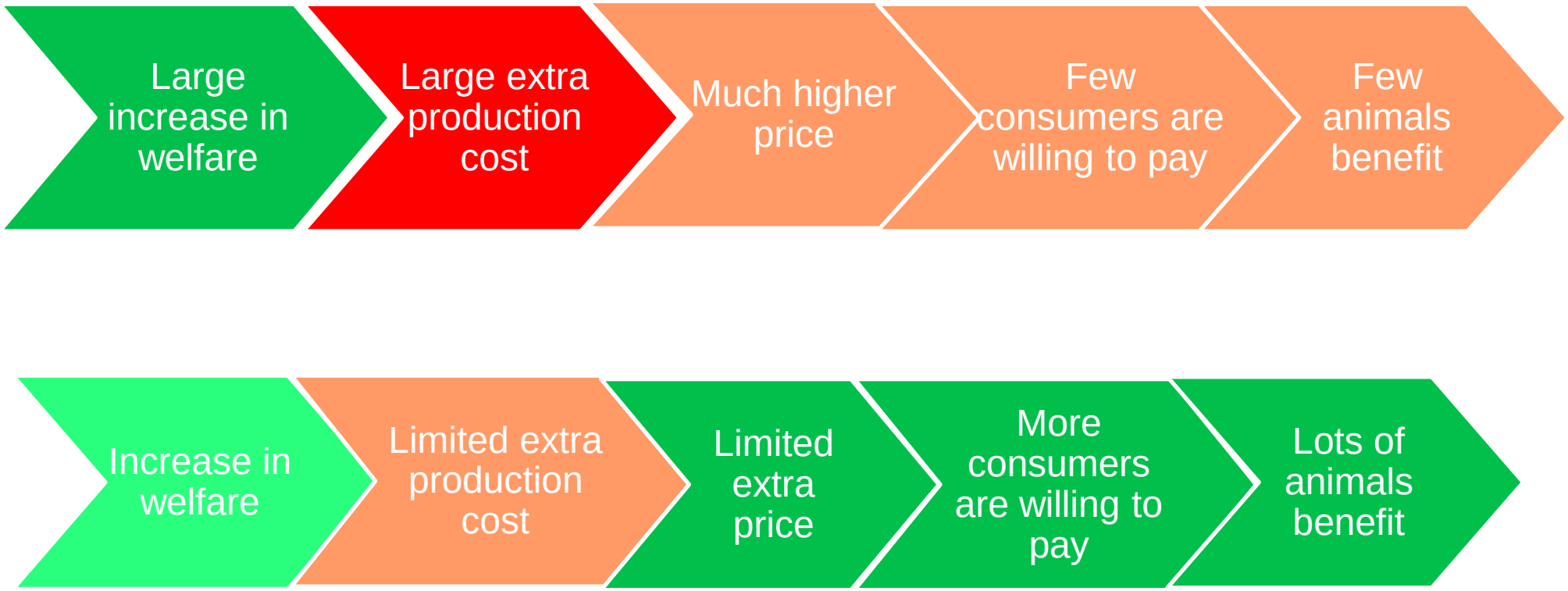
# Significant investment - Market driven

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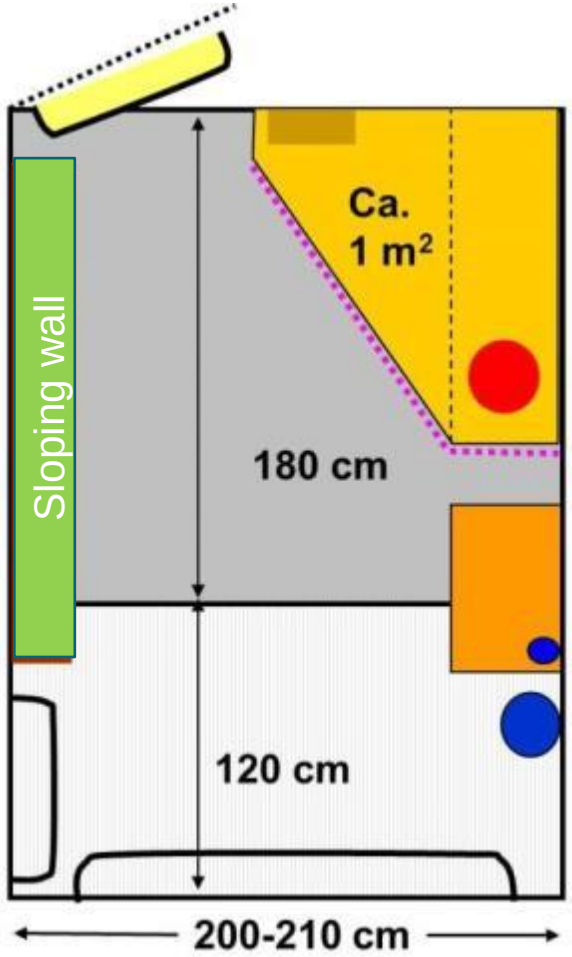
# Free farrowing

- Initially - Pen meeting needs of sow, piglet, caretakers




**1. Creep area adjacent to the pathway**

- Piglets are checked everyday
  - Safety
  - Fast
  - Limit risk of disease transfer

**2. Sow-resting area next to creep**

- The sows choose to lie next to creep
  - Partly solid floor – at least in Denmark
    - Reduce environmental impact
      - Partly solid floor is cheaper than aircleaners etc
    - Warmth – dry floors before farrowing – and piglet survival
    - Keep nestbuilding- and rooting material in pen – not in slurry

**3. The sow walks away (turns away) from feeding area, when defaecating**

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# Three commercial herds

- Ok small scale
- Three herds – results

*Piglet mortality, expressed as numbers, in crates and pens in Herds A, B and C.*
*White bars=mortality before litter equalisation, Black bars=mortality after litter equalisation. P-value for herd × housing interactions: mortality before equalisation: P =0.107; mortality after equalisation: P =0.031. Black bars with different superscripts differ (P <0.05).*

Animal (2014), 8:1, pp 113–120

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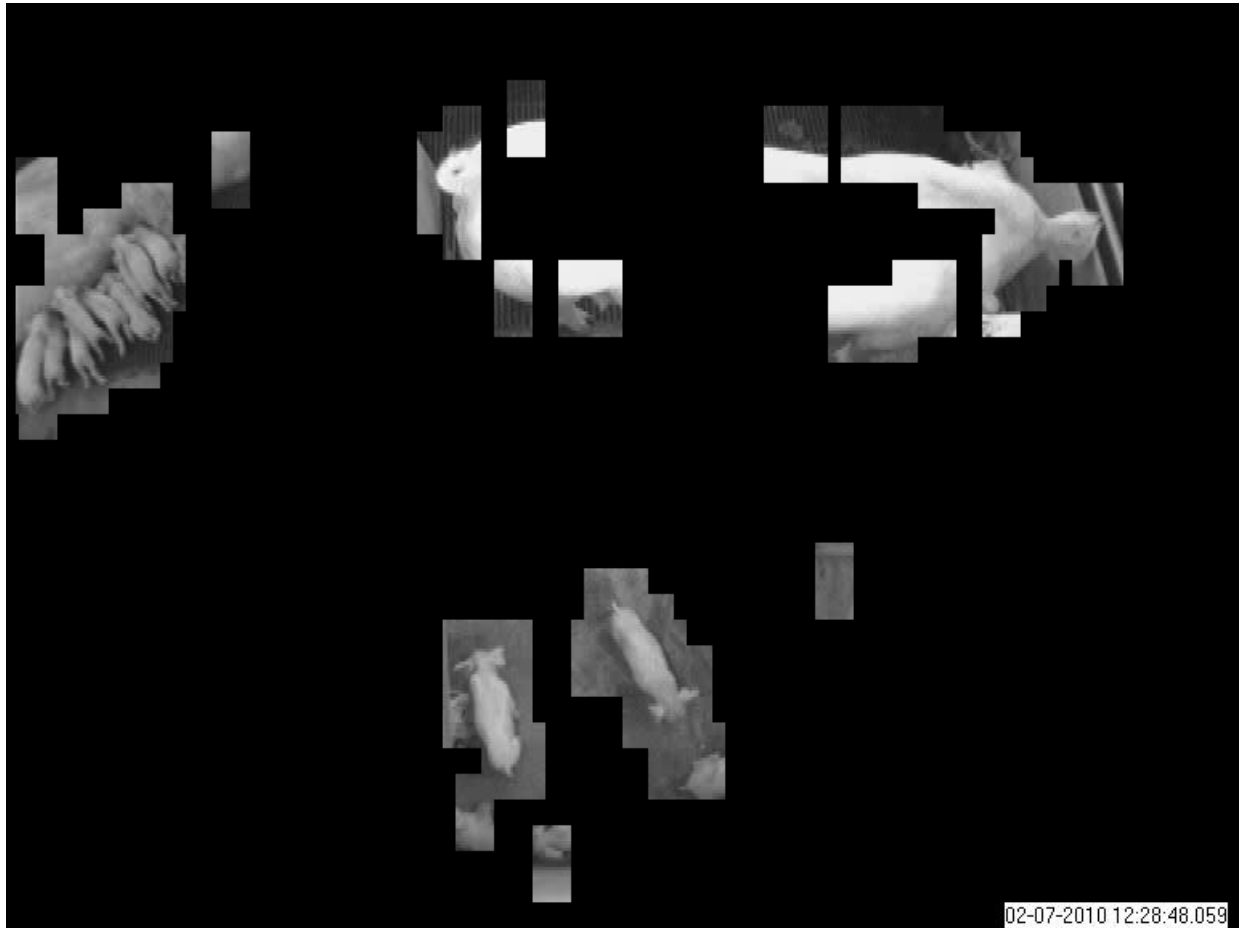
# Piglet survival

- Sow versus pig welfare
- ‘Killer’ sows
  - ~50% of the loose sows are ‘Killers’
  - ~20% of the sows in crates
- Identification of ‘Killer’ sows
  - Need to find them in time to save the piglets
  - Research-fishing-expedition (5 to 10 years??)
  - How many will we find?
  - Likely intervention = crate (50% of the sows?)




Impact of confinement?

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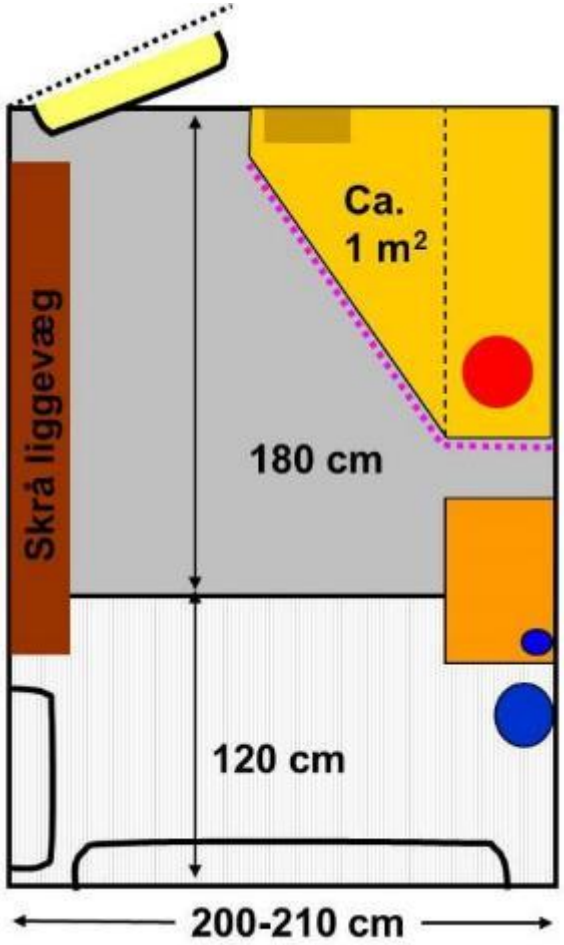
# Two designs

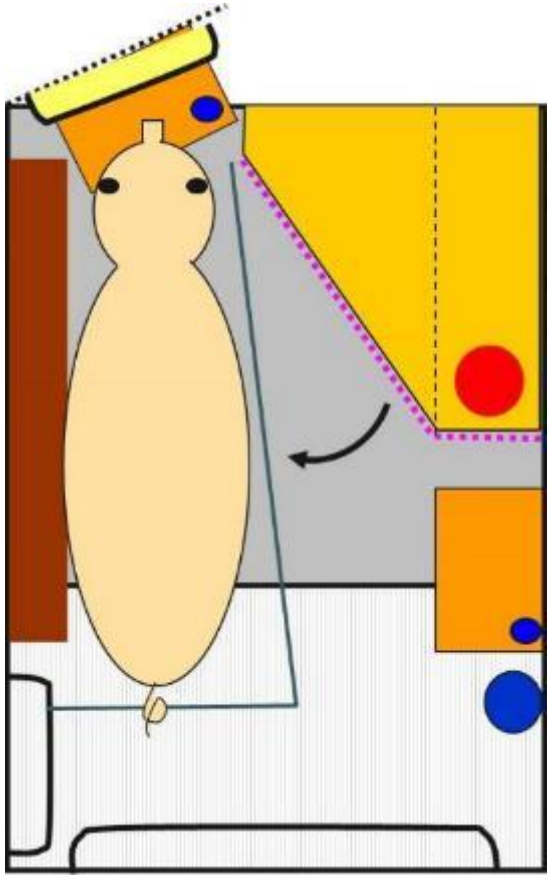
# Two pen designs

FF = Free Farrowing




AU/DAWS/PRC +

SWAP = Sow Welfare And Piglet protection



UCPH/PRC

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# Impact of SWAP on sow movement?

- Before farrowing – nest building period
  - No difference in duration of nest building period
  - No difference in duration of nest building per hour
- After farrowing
  - The sows were lying lateral majority of the time
  - >110 minuts out of 120 minuts observed (4 x daily)

No difference between loose and confined
- in pens designed for loose housed sows

Hales et al., 2014

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# Impact of swap on salivacortisol-level (stresshormon)?

Hales et al., 2014

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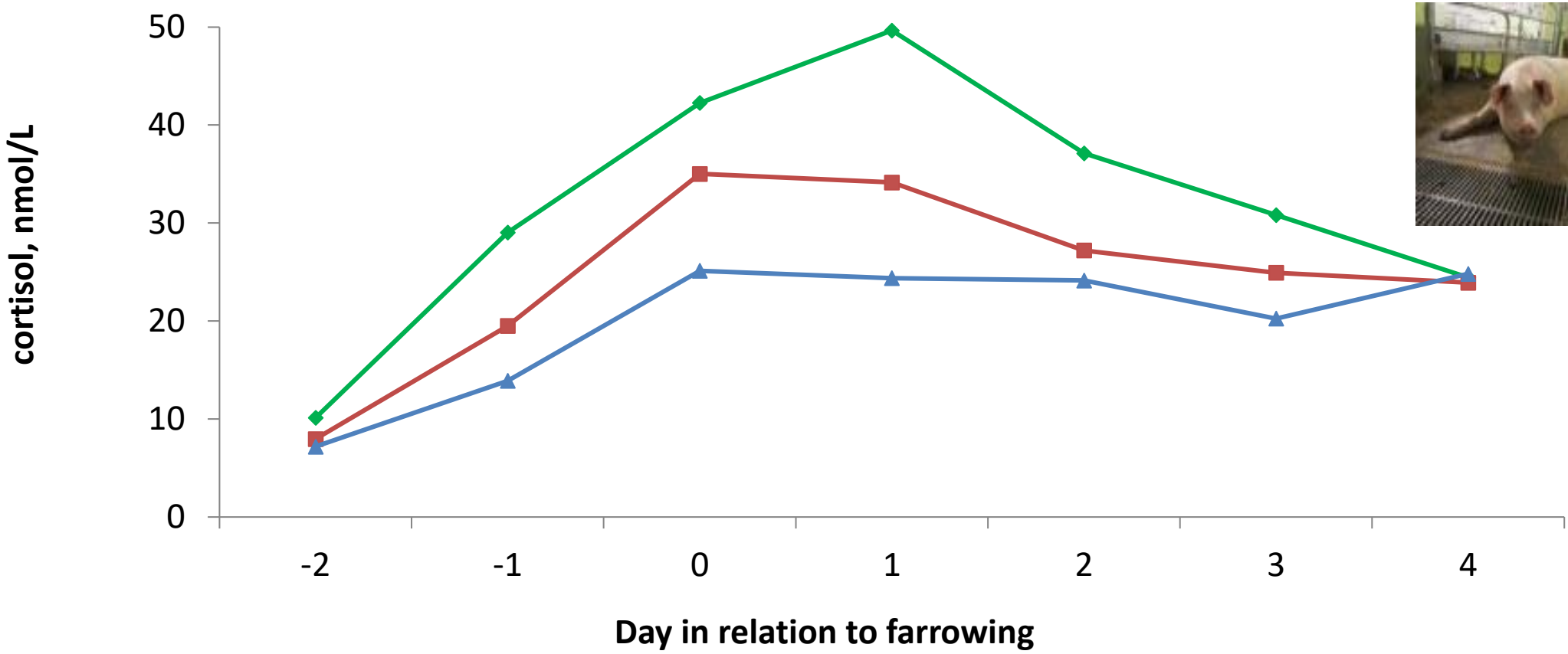
Hales, 2015

# Cortisol

**LC: Loose-Confined:** *Loose D114 gest until finished farrow then confined day 4 post farrowing*

**LL: Loose-Loose:** *Loose D114 gest until day 4 post farrowing*

**CC: Confined-confined:** *Confined D114 gest until day 4 post farrowing*



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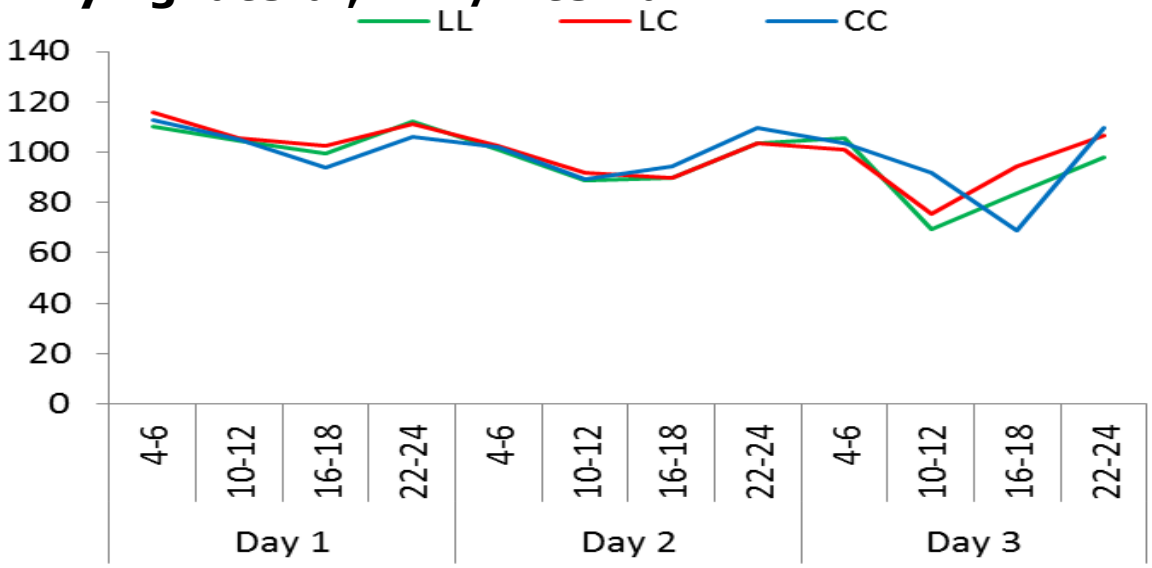
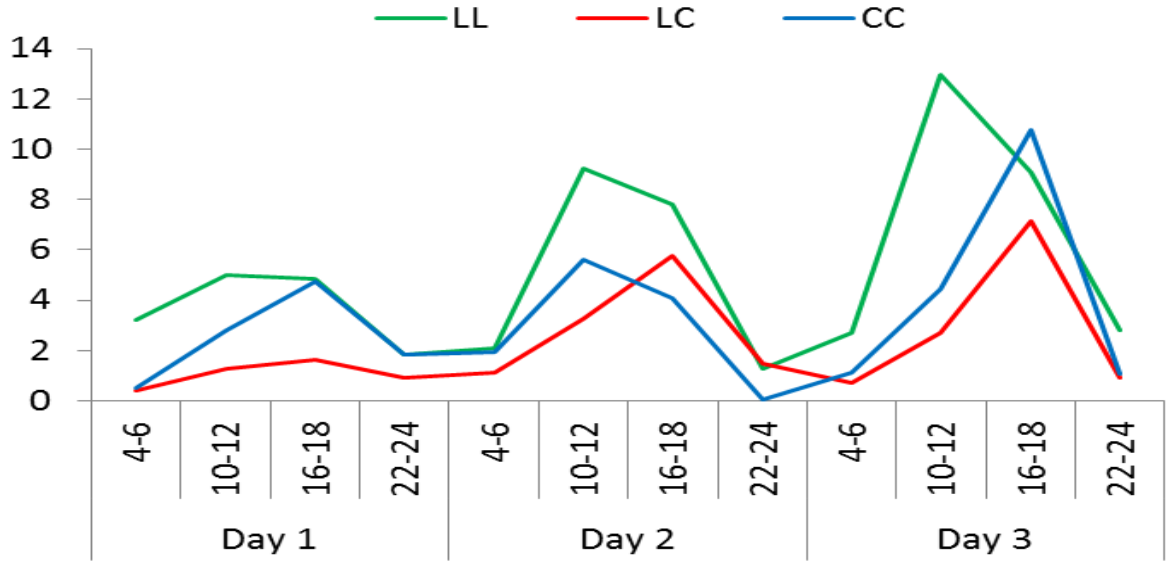
# Sows postures

**Lying lateral, min/interval**




**Standing, min/interval**




Hales, 2015

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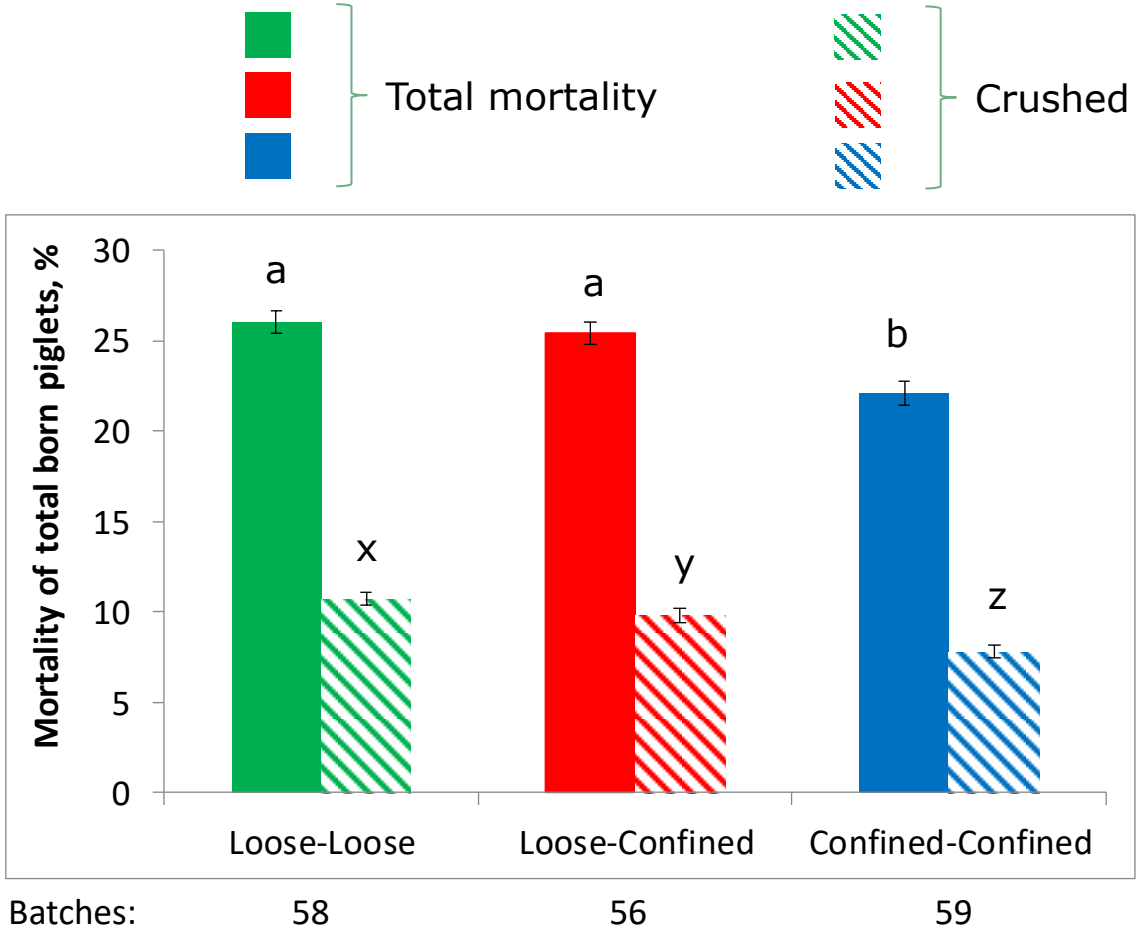
# Piglet mortality - impact of confinement




Hales, 2015

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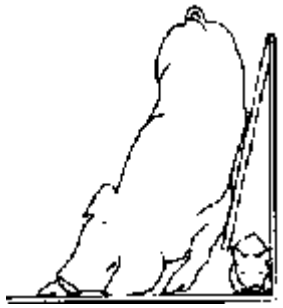
# Farrowing unit – loose sows

- Two kinds of pen design

SWAP = Sow Welfare and Piglet protection

FF = Freedom farrowing



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# The future is not ‘only’ welfare
# - it’s a more ***sustainable*** pork production

Environment / climate impact

Social responsib

- Incl. animal welfare

Business earnings

# Critical points

## Before investment

- Decision making
- Key decisions

## Daily management

- Calm handling of sows
- Use of confinement

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# Why can’t we just….

- Why not just open up the crate?
  - The sows need more space – they cannot turn around unimpeded in an open crate
  - The sows turn away from feeder (and resting areas) when dunging

- Why not just copy pen designs from Norway, Sweden or Switzerland
  - They use zero-confinement – so ‘only’ need to design for loose sow
  - Increased litter-size leads to increased need for management in the first few days
    - Use confinement

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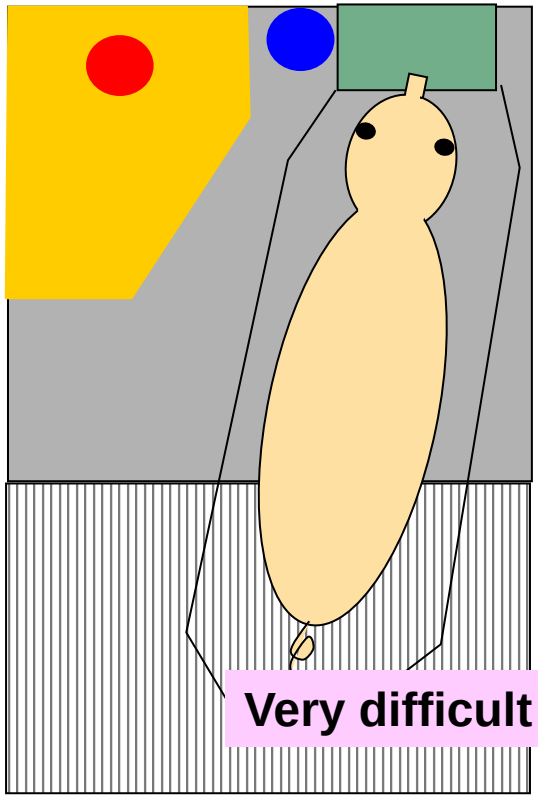
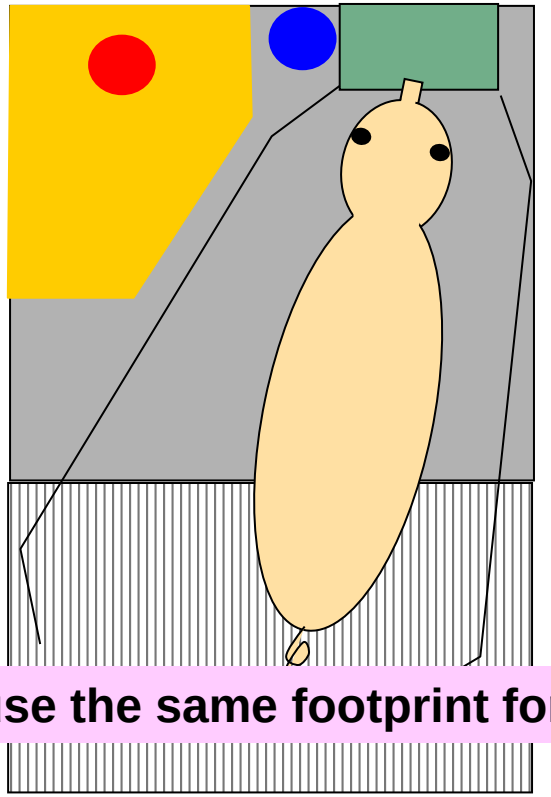
# Can we prepare pens with crates?

The answer is ‘no’

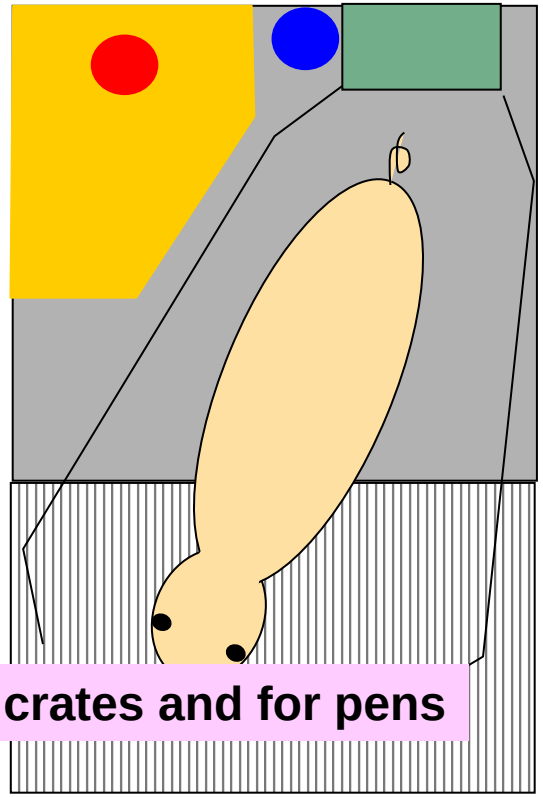
While the crate is **closed**, the sow eats and defaecates in the same position.



When the crates is **open**, the sow continues to eat at the trough.



But turns away from the trough when defaecating.



**Very difficult to use the same footprint for crates and for pens**

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# The sow is/will be loose most or all of the time

Farrowing crate
– confined sows

Farrowing pen
– loose sows


Use temporary confiment –

BUT in a pen *designed* for

a loose sow

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## Initial key decisions

- Pen size
- Pen layout
- Flooring
- Handling of manure/slurry
- Zero- or temporary confinement (TC)


# Other key decisions

- Litter size in pen
- If TC - how and when to confine
- Nesting material and amount
- Enrichment
- Weaning age

SEGES INNOVATION

## Initial key decisions

### ‘Irreversible’ decisions

- Pen size
- Pen layout
- Flooring
- Handling of manure/slurry
- *Zero- or temporary confinement (TC)*

# Other key decisions

- Litter size in pen
- If TC - how and when to confine
- Nesting material and amount
- Enrichment
- Weaning age

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# Options or alternatives

- Zero-confinement (free farrowing)
  - Common in countries with legislative enforcement
  - Used in research such as the UMB-pen and PigSAFE
- Temporary confinement (free lactation)
  - Accepted in countries with up-coming legislative enforcement
  - Two categories of pens
    - Designed for loose sows – with an option to confine
      - SWAP; ProDromi;
    - *Farrowing crate that can be opened*

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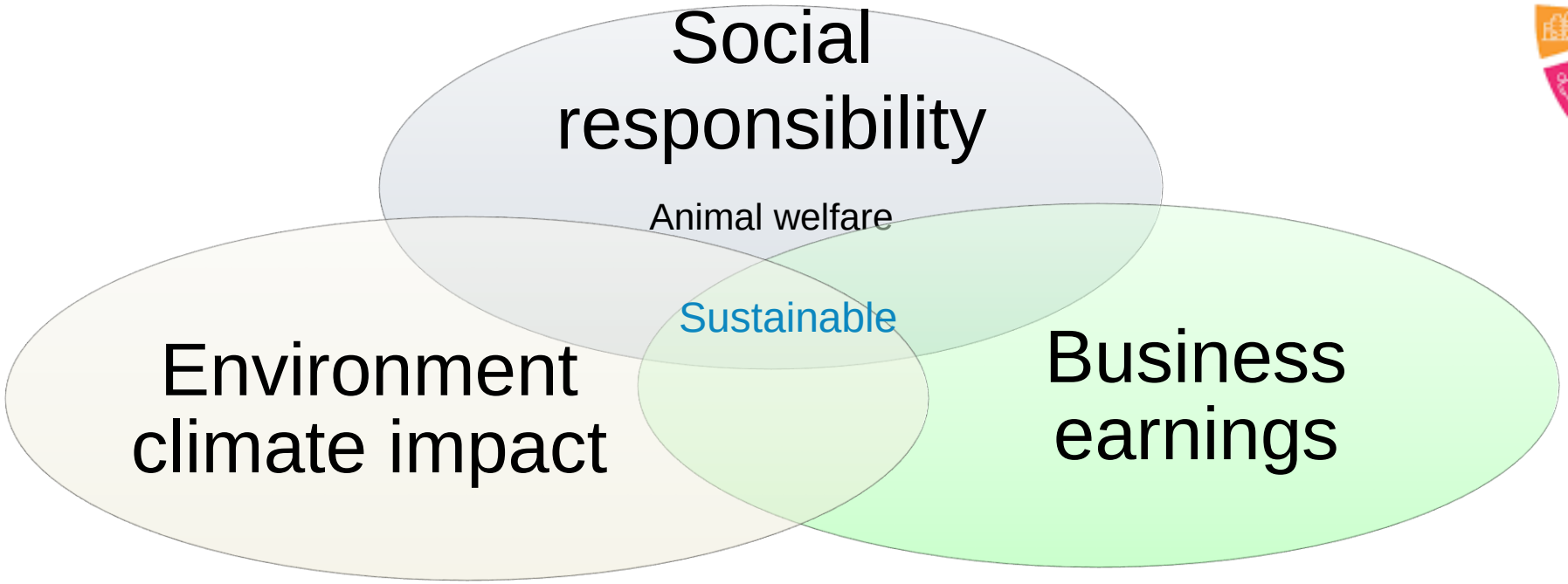
# A more sustainable Danish pork production




SUSTAINABLE DEVELOPMENT GOALS

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# From animal welfare to sustainability

‘We’ want

- Space
- Cleanliness
- Low input labour
- Healthy piglets

‘However:

- Space
  - Larger surfaces - increase emissions
- Cleanliness
  - If slatted floor – increase emissions
- Low input labour
  - If slatted floor – increase emissions
- Healthy piglets
  - If slatted floor – increase emissions

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# Space – dilemma between space for welfare and risk of emissions

- Austria
  - 5.5 $m^2$/sow
- Germany
  - 6.5 $m^2$/sow
- It’s not as simple
  - Is there a perfect size?
    - Key decisions
  - Solid or partly slatted floor?
- Examples
  - Square pens (equal sided)
    - Fully slatted floor
  - Rectangular pens
    - Dimensions – pen
      - Fixed width
      - Fixed length
      - Fixed ratio width/length
    - Dimensions flooring (solid / slatted)
      - Within each of the above designs
        - Fixed ratio solid/slatted floor
        - Fixed depth of slats of 100 cm
        - Fixed depth of solid of 200 cm

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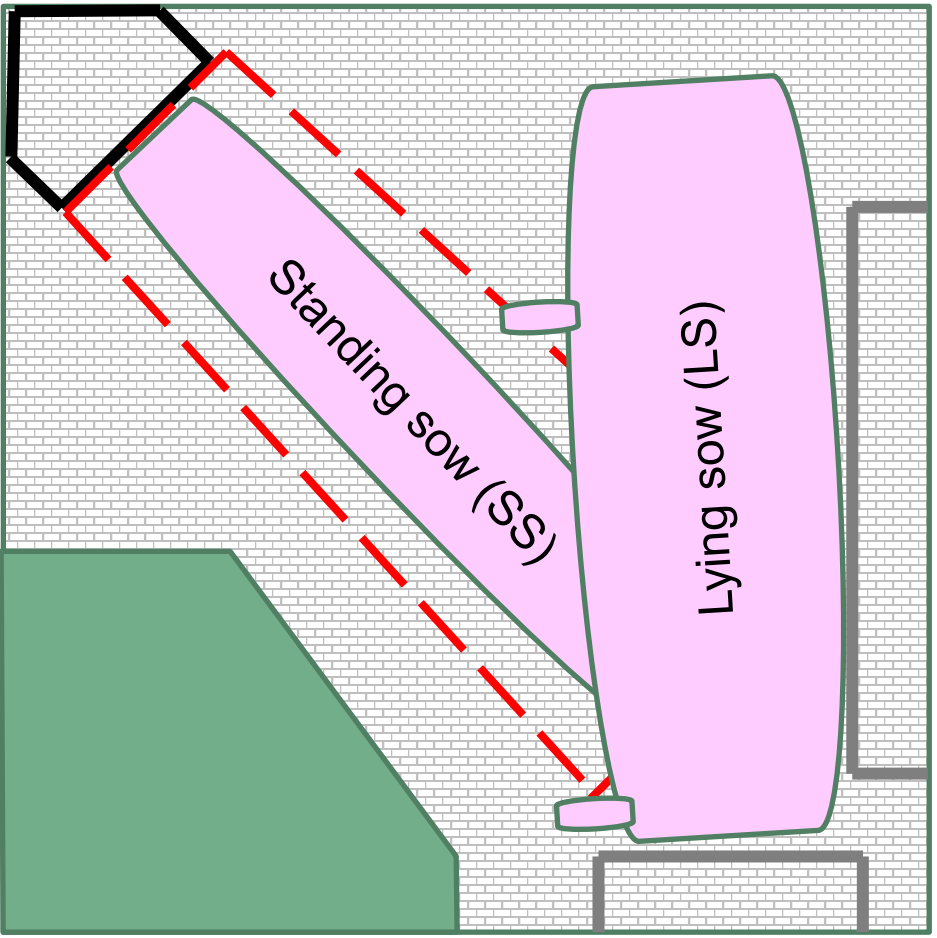
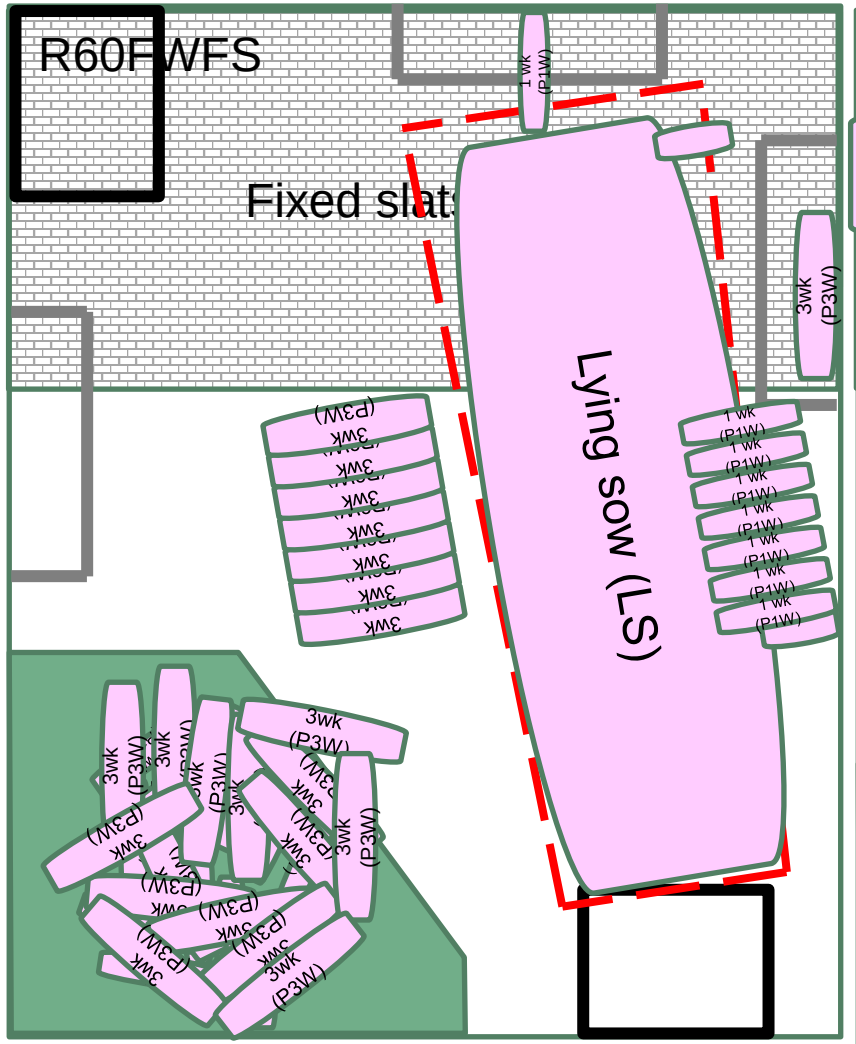
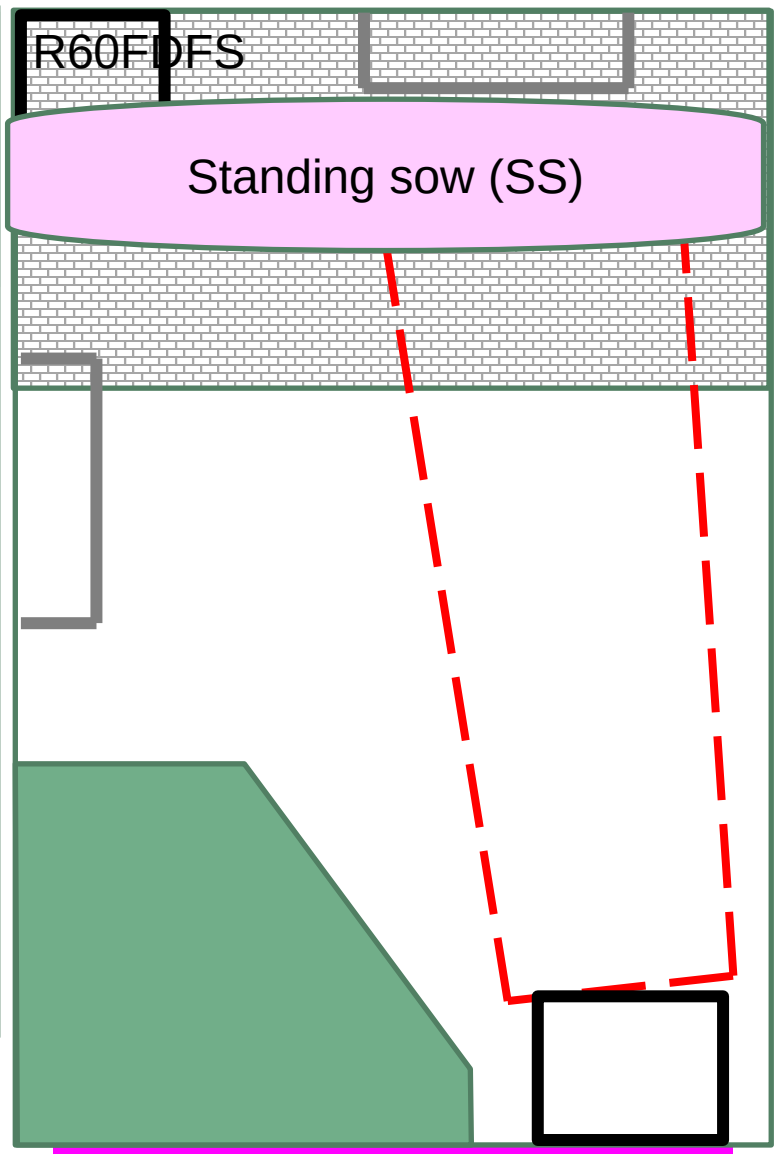
# How different can 6 m²-pens be?




Square
S60 / 245*245




Rectangular – width (220 cm)
273*220




Rectangular – depth (300 cm)
300*200

# ‘Ideal’ pen size (1)

- Sows’ dimensions


- Planar width – turning space

*Planar width of 153 cm*
*Planar area of 3.17 $m^2$*

considered necessary to allow unobstructed turning for sows with the 95-percentile weight.

*Needs further research*

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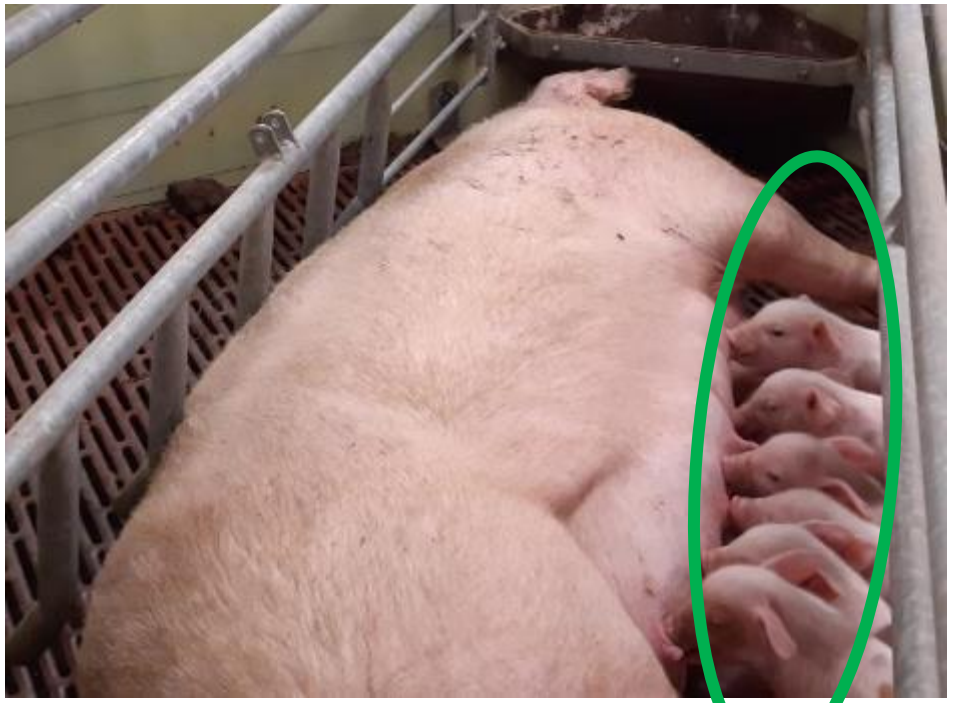
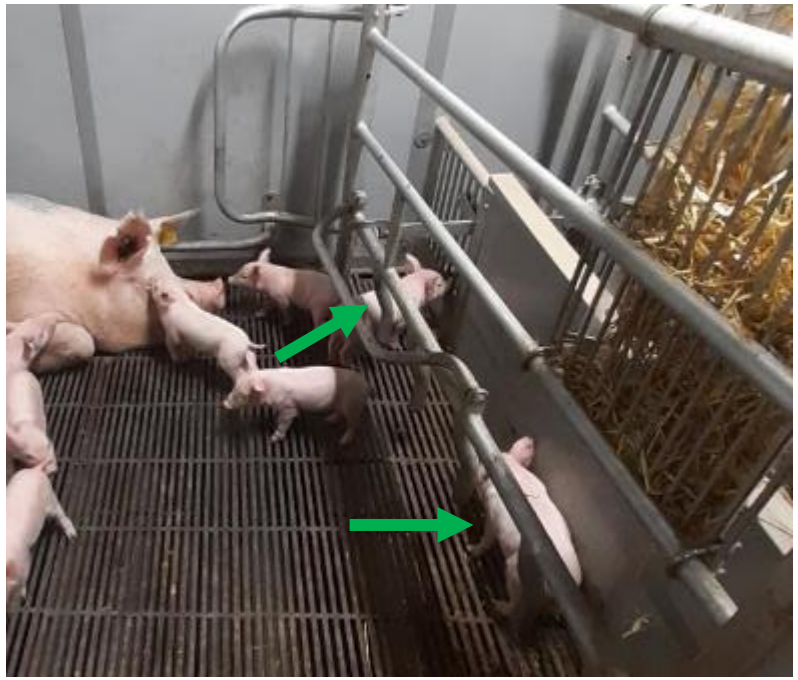
# ‘Ideal’ pen size (2)

- Dimensions*number
- Piglet dimensions
  - Birth,
  - One week
  - Four-five weeks
- Litter size in pen

- Functional areas
- Piglet safety zones





# Pen layout (1)

- First decision regarding design
  - Creep area along passageway
    - Safety
    - Efficency
    - Reduce risk of transferring diseases
    - Easy access

[FFL21 : Change experiences by a Danish farmer (openagrar.de)]

https://www.freefarrowing.org/research/references/freedom-in-farrowing-and-lactation-2021-ffl21/

**Overcoming barriers, facilitating change**


**Virtual Workshop August 12th-13th 2021**

As part of the Free Farrowing series of workshops, a virtual event (organized by FLI, SEGES, SRUC and Vetmeduni Vienna) was held over two days.

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# Confinement

- Temporary confinement – take the best of both loose and confined
  - Loose – natural behaviour, access to udder,
  - Confined – lower piglet mortality, safe work conditions
- Before farrowing - loose
  - No piglets at risk, active nest seeking and nestbuilding
  - Quiet/calm the last couple of hours
- During farrowing - confined
  - Ensure access to udder when confined
  - Recent review
    - ‘Lower’ mortality with TC than FF
    - ‘Higher’ mortality with TC than permanent C
- After a few days – loose again
  - Awareness when opening

Ref:
https://doi.org/10.3389/fvets.2022.811810

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# Daily management

- Calm calm calm
- Not just in farrowing unit
- Include ‘calmness’ in layout
  - Sections
  - Less pens per section
  - Creep alongside passageway
- Include ‘calmness’ in daily routines
  - Handling of sows and piglets

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# Critical points

- Investment
  - Design for a loose sow
    - Acknowledge key decisions and complexity
  - Ensure space for piglets
  - Include three pillars of sustainability
- Daily management
  - Calm handling
  - Optimize
    - Mindset

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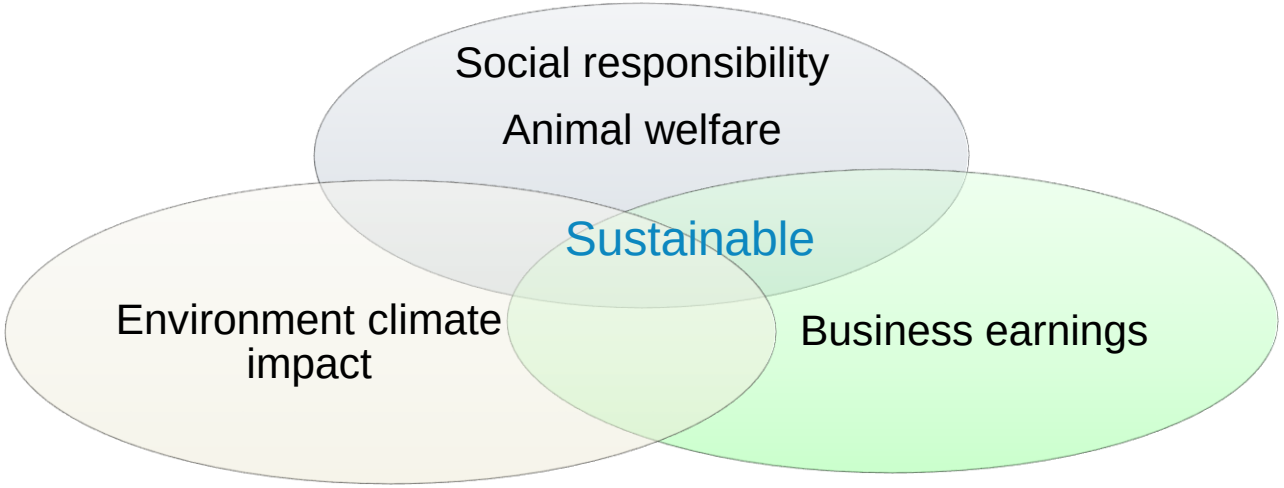
# Critical points

- Loose housing – with an option to confine
- In respect of the three pillars of sustainability
- Science based
- Work together – across borders





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# Future

- Reflections
  - German legislation
  - End the Cage Age Initiative
  - EU?
- Challenges
  - Sustainability
  - Competitiveness
- Opportunities
  - Increased milk production
  - Large litters
  - Licence to produce

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# Consider whole sow life – all sows

- Feeding, housing and handling of
  - Gilts
  - Mating sows
  - Gestating
  - Lactating

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# Think sows as high performing athletes


**‘’Prepare them to give birth to and feed many piglets**

•Conditions – our responsibility:

- *Housing*
- *Nutrition – before, during and after*
- *Physical conditions – and avoid injuries*

And not just conditions (shoes) – also tieing the shoe laces

SEGES INNOVATION

# Housing of hyper-prolific high performance sows

I just gave birth to 25 liveborn piglets – took 8 hours

I'm carrying 18-32 fetuses

I'm producing 16 liter of milk every day

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# Thank you for the attention

- Questions?

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