Housing of lactating sows

University of Leeds
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SEGES INNOVATION

The future is not ‘only’ welfare
- it is a more sustainable production

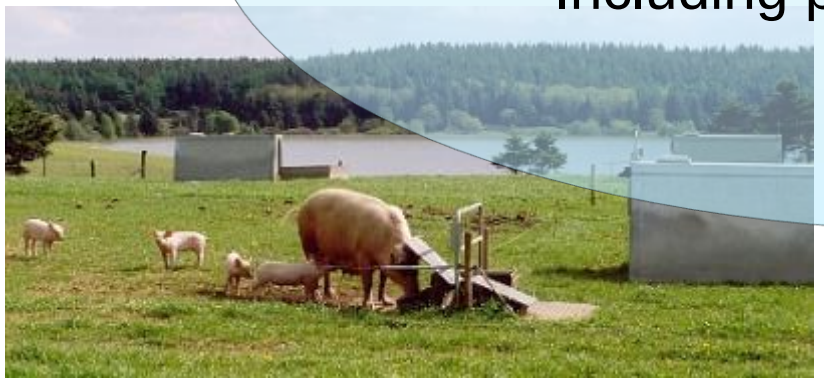
Environmental / climatic influence

Economic potential

Long term investment and daily management

Social responsibility

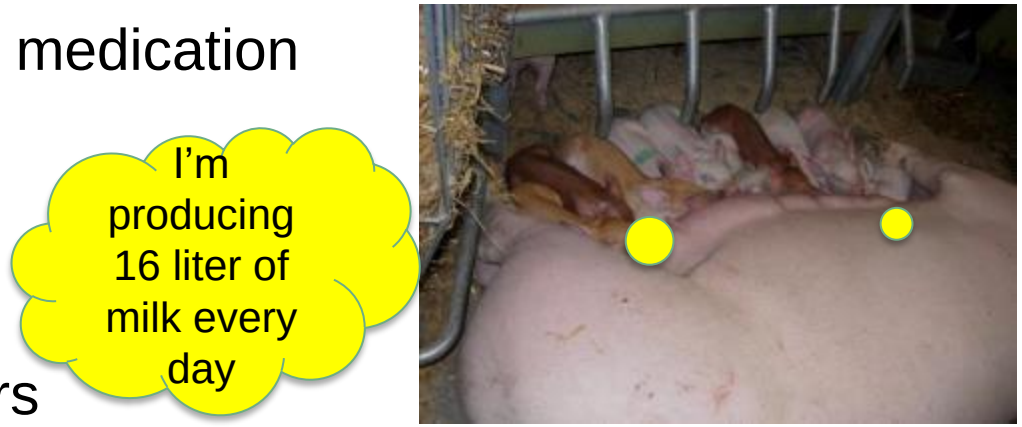
Including pig welfare



Expectations of hyperprolific sows

- We ‘want’ sows:
  i. Capable of nursing many, strong, viable piglets
  ii. To remain in the herd for >6 farrowings with high productive performance
  iii. To be resilient & require low inputs for labour & medication

- We expect sows to:
  i. Have uncomplicated farrowings
    - Despite with large litters it is a marathon of 4-8hrs
  ii. To produce large amounts of milk continously
    - 16 L/day on average
  iii. To release many fertile eggs & conceive promptly after weaning



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

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Expectations and conditions

- High expectations regarding the sows' performance
  - Must provide conditions for them to be able to meet our expectations

Housing

+

Nutrition

+

Management and produc er / barnstaff needs

+

+

Species specific needs: Meet basic requirements for welfare

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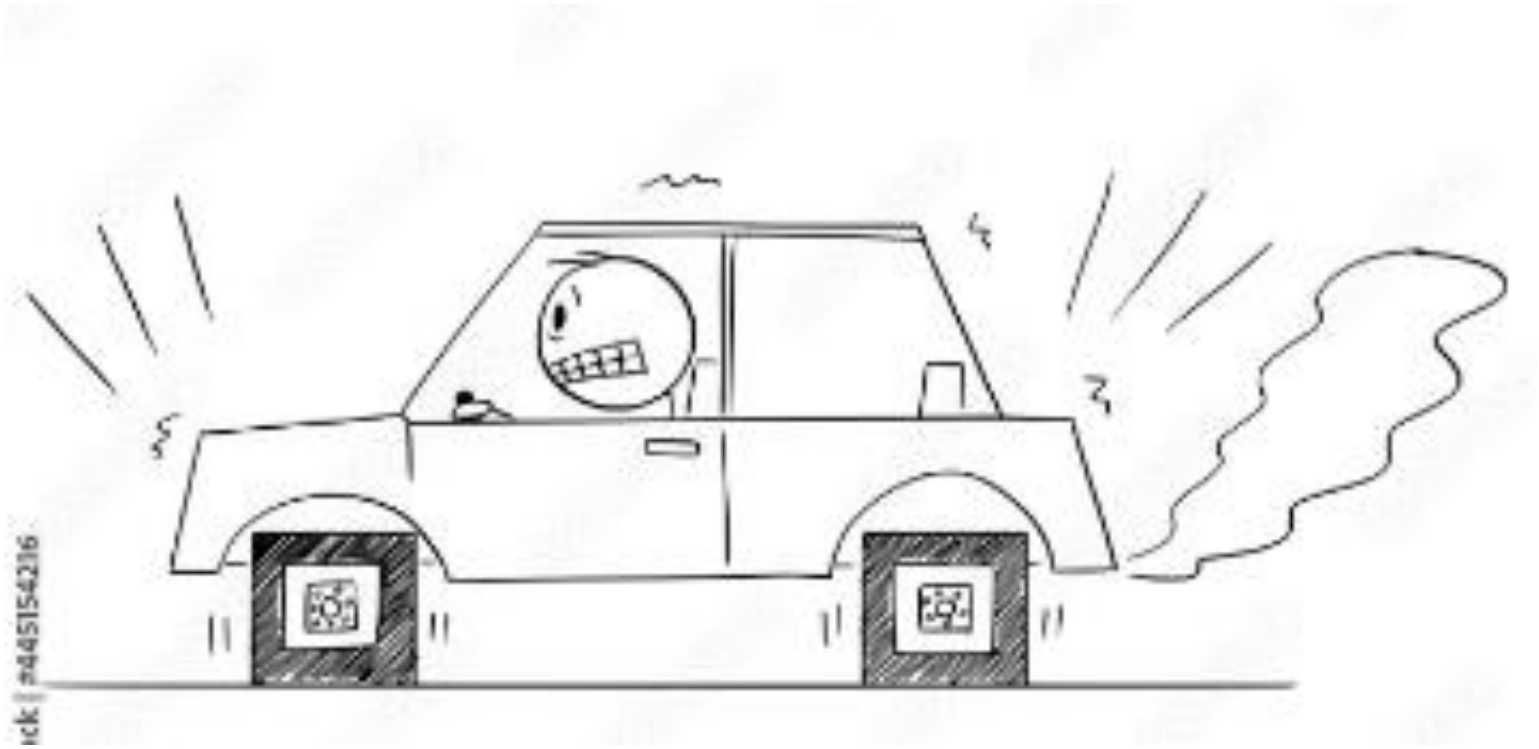
The importance of optimizing the farrowing environment

- It may sound obvious but….Get the basics right!



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Strategi and interest from society – process of implementation?

Status – number of pens for loose lactating sows:

- 2023:
  - app. 9,700 pens out of DK's app. 225,000 farrowing places (900,000 sows) are for loose sows
  - < than 10 pens installed….
- 2024
  - Installing 2562+ pens for loose lactating sows (subsidies – must be with pigs by new year)

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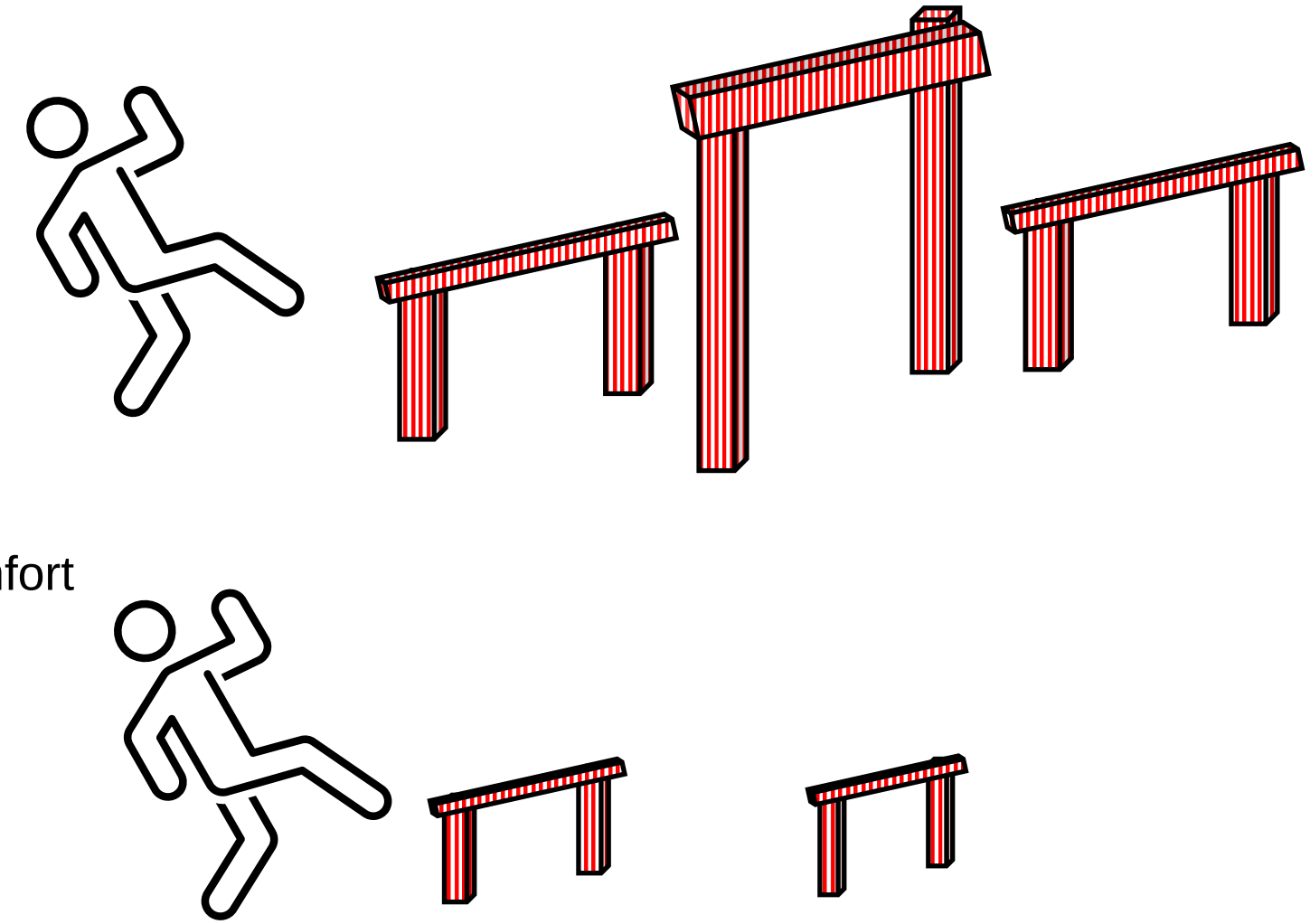
Reasons for ‘implementation’

- Barriers
  - Increased space
    - Green field or reduced herd size
  - Investment
  - Design
  - Functionality
  - Productivity
  - Stockpeople-experience and –comfort
  - ….
- *Solutions*



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Future – lactating sows are loose

Sammen om Dyrene

Aftale om dyrevelfærd 2024-2027

9. februar 2024
Regeringen (Socialdemokratiet, Venstre, Moderaterne), Socialistisk Folkeparti, Liberal Alliance, Det Konservative Folkeparti, Radikale Venstre, Dansk Folkeparti og Alternativet.

Aftalens karakter
Aftalen har karakter af en stemmeaftale. Aftaleparterne er dermed enige om at stemme for de relevante lov- og bevillingsforslag, der er nødvendige for at implementere ovenstående initiativer.

31 initiativs:
#1-4: Pets
#5-11: Across species
#12-18: Pig
#19-20: Cattle
#21-27: Poultry
#28-32: Other initiatives

- **'The Pig Statutory Declaration'**
  - **Modification of the Pig Statutory Decalaration – the declaration setting the welfare standards for protection of pigs**

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The Pig Statutory Declaration

- Pen must be designed so the sow can turn unhindered.
- Pen must have a space allowance of at least 6.5 m2 including the piglet creep area.
- At least 3 m^2 of the space allowance must be solid or drained flooring.
- The freedom of movement for sows and gilts can be restricted by confinement in the period immidiately preceeding farrowing and up to four days post farrowing at the most
- In the week prior to farrowing, the sows must have access to sufficient nestbuilding material
- Transition period likely to be between 18 – 20 years

Hearing in summer/autumn 2024

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End the cage age

The 'End the Cage Age' initiative was submitted to the Commission on 2 October 2020, having gathered 1,397,113 statements of support. See press release.

In its response to the ECI, the Commission commits to table, **by the end of 2023, a legislative proposal to phase out, and finally prohibit, the use of cage systems for all animals mentioned in the Initiative**.

In particular, the Commission's proposal will concern:

- Animals already covered by legislation: laying hens, sows and
- Other animals mentioned in the ECI:rabbits, pullets, layer bree ducks and geese. For these animals, the Commission has alr Food Safety Authority) to complement the existing scientific ev conditions needed for the prohibition of cages.

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Space allowance

Space allowance and pen dimensions
Important – and irreversible decisions

- Pen - size
  - Recommendations from E
    - 7,8 m^2 ≈ piglet survivability loose farrowing at same level as permanent crating
    - 4,5-9,8 m^2 (+1,2 m^2 for piglets)
  - German requirement
    - 6,5 m^2
  - Turning space
    - At least 153 cm
    - SEGES analyzing new trial data

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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
  - Include in design and thoughts:
    - What do pigs do
    - When do they do it
    - Why do they do it
    - How do they do it
    - …

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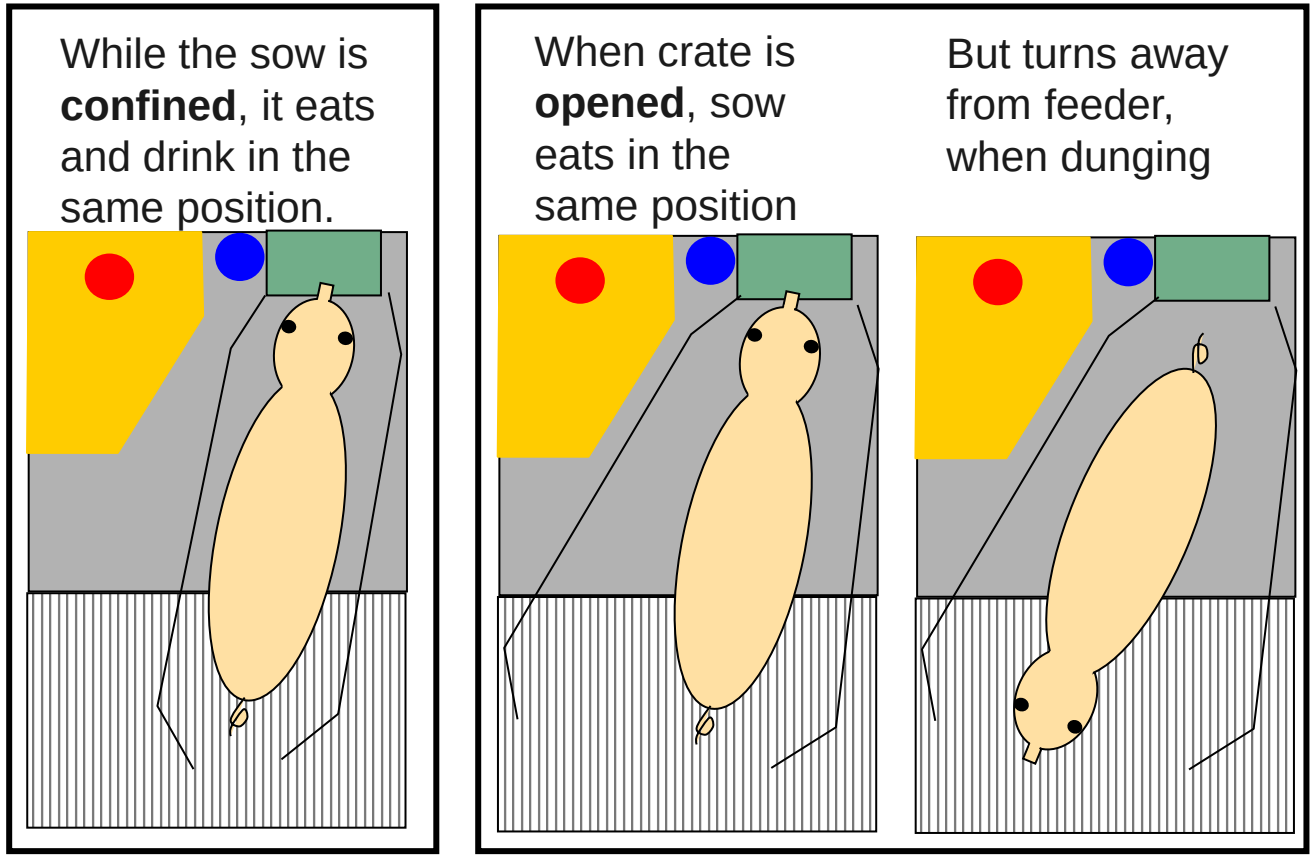
Development - 1

- Opening farrowing crates
  - They will not be opened – because of bad hygiene
    - Sows eat, drink, dung + uniate
      - But **NOT** in the same position
  - Sows need more space
  - Caretakers access to creep area



Very difficult ('impossible') to use same footprint and flooring for permant crate and for loose

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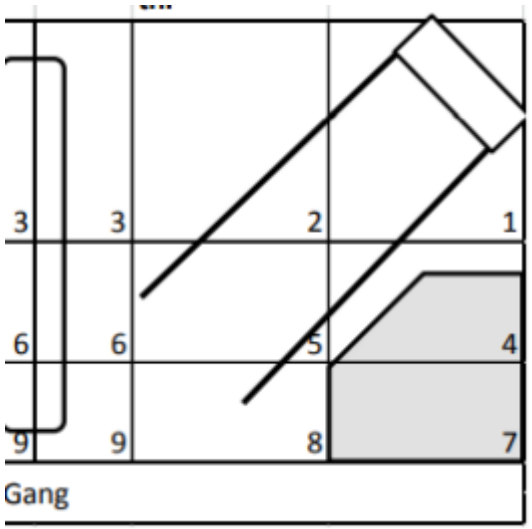
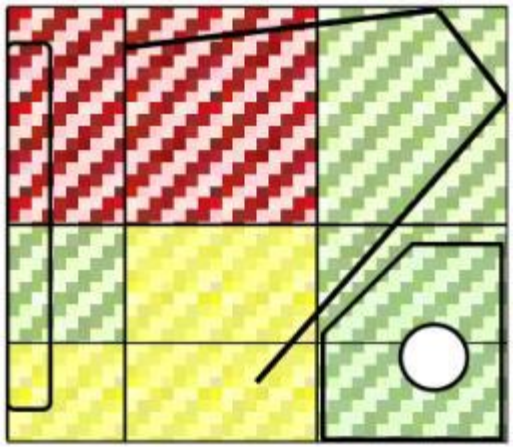
Development - 2

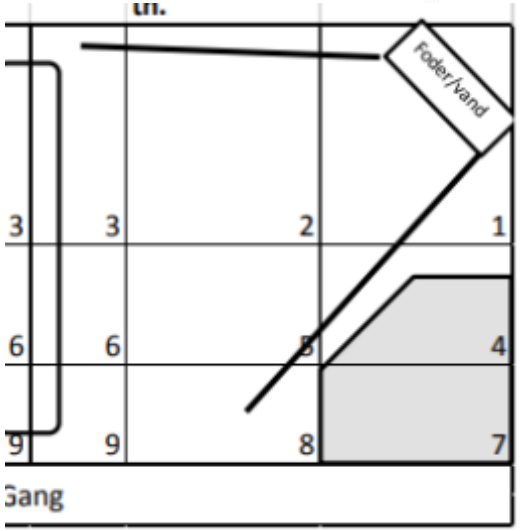
- Equalsided pens
  - 240*240
    - 2009-littersize
  - Sows dunging behaviour – fully slatted

Figur 6. So opbokset kortvarigt omkring faring.

Figur 7. Løsgående so.







Erfaring 1721

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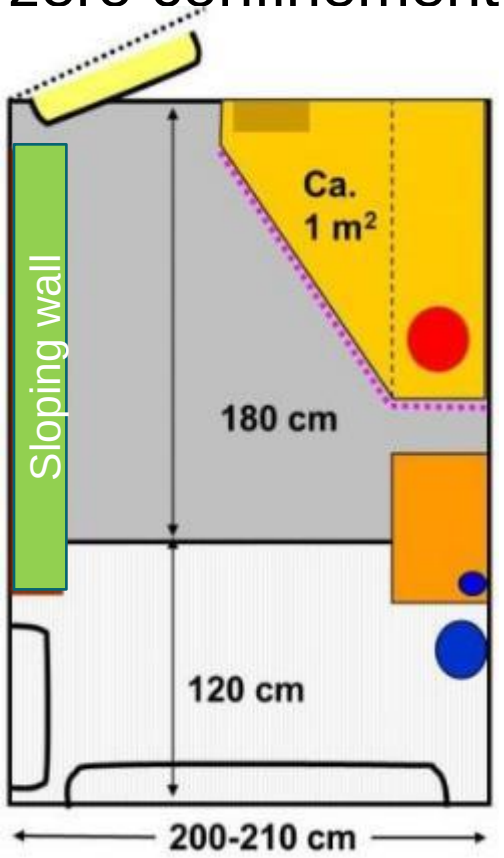
Development - 3

- Free Farrower – zero confinement



1. Creep area along passageway

- All piglets need checked upon EVERY day
  - Safe
  - Fast
  - Reduce risk of disease transfer

3. Sow walk (turn) away from feeder when dunging

2. Sow resting/nesting area next to creep

- Sows choose to lie close to piglets hule
  - Partly solid flooring (reduced slurry surface)
    - Reduce environmental impact
      - Partly solid floor is cheaper than aircleaner
    - Warm dry floors prior to / during farrowing increase piglet survivability
    - Maintain nestbuilding and rooting-/enrichment material in pen (and not in slurry pit)

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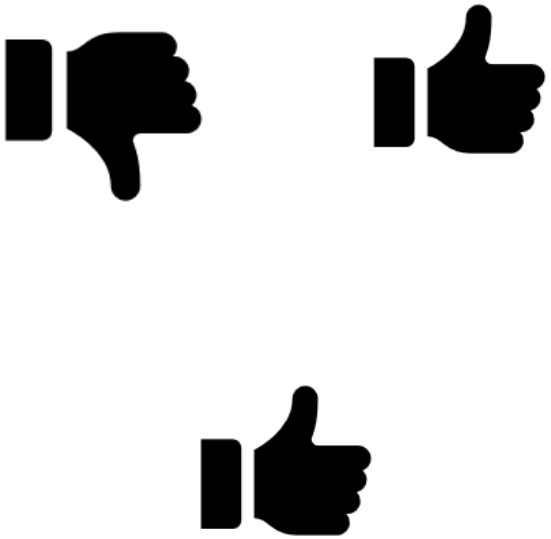
Spatial dimensions



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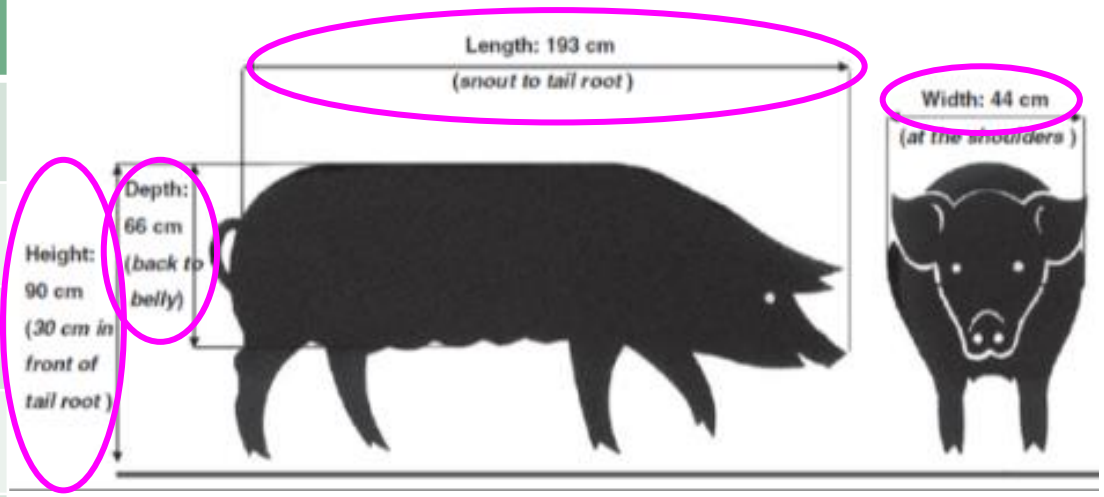
Sow dimensions

Danish crossbred sows in commercial herds in 2017

Year	2017	
Sows:	N = 103, ≥ parity 5	
Dimension	Ave. ± s.e.	95% percentile
Length, cm	192 (±0.6)	203
Height, cm	90 (±0.4)	96
Width, cm	43 (±0.5)	48
Depth, cm	65 (±0.6)	72



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

Moustsen & Nielsen, Meddelelse 1113, www.svineproduktion.dk
Nielsen et al. (2018), Livestock Science 209, 73–76.

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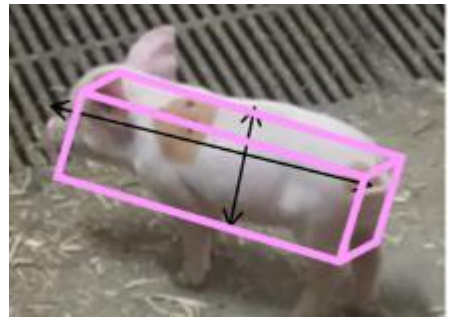
Piglet dimensions



	Age	
Dimensions (cm)	< 1 week (n = 42)	3 weeks (n = 65)
Length	31.3	44
Height	17.8	24.5
Width	7.3	11.5
Depth	8	12.5
Piglet weight (kg)	1.4	5
Space/piglet (m^2)	0.02	0.06

Data: SEGES pig production

Total area (m^2) required: space at maximum piglet age & number housed within the pen

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Beyond static sow dimensions: space for movement

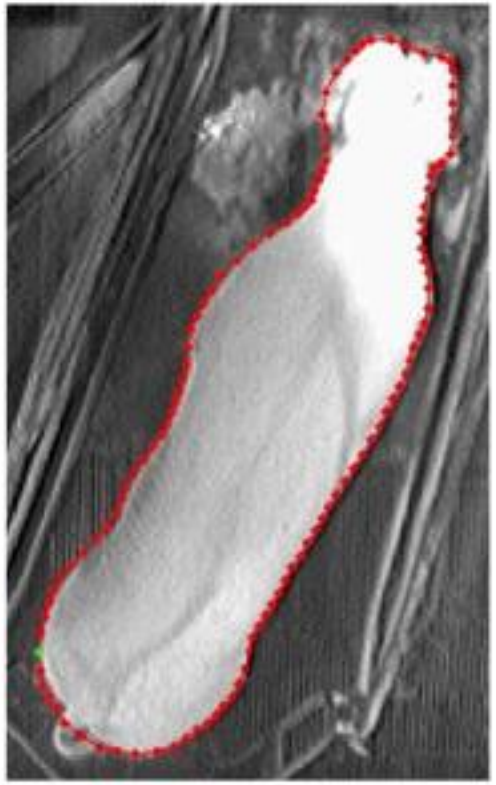

Figure 1.
Line around a standing sow, before movement

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

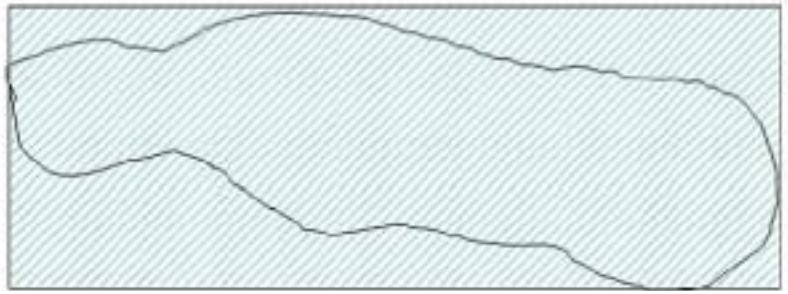

Figure 2.
Frame around the sow before movement was initiated

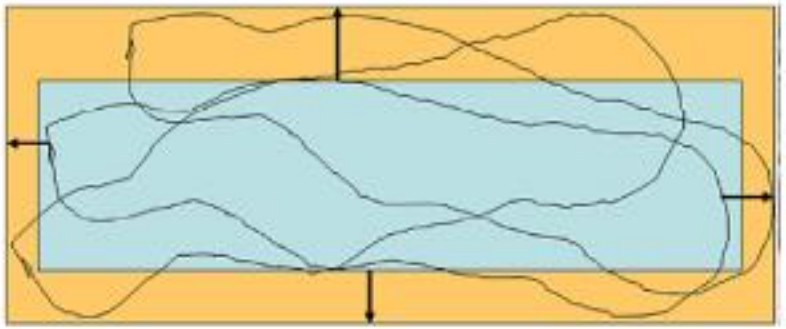

Figure 3.
Frame after movement – showing area used during manourvers to rise and lie down

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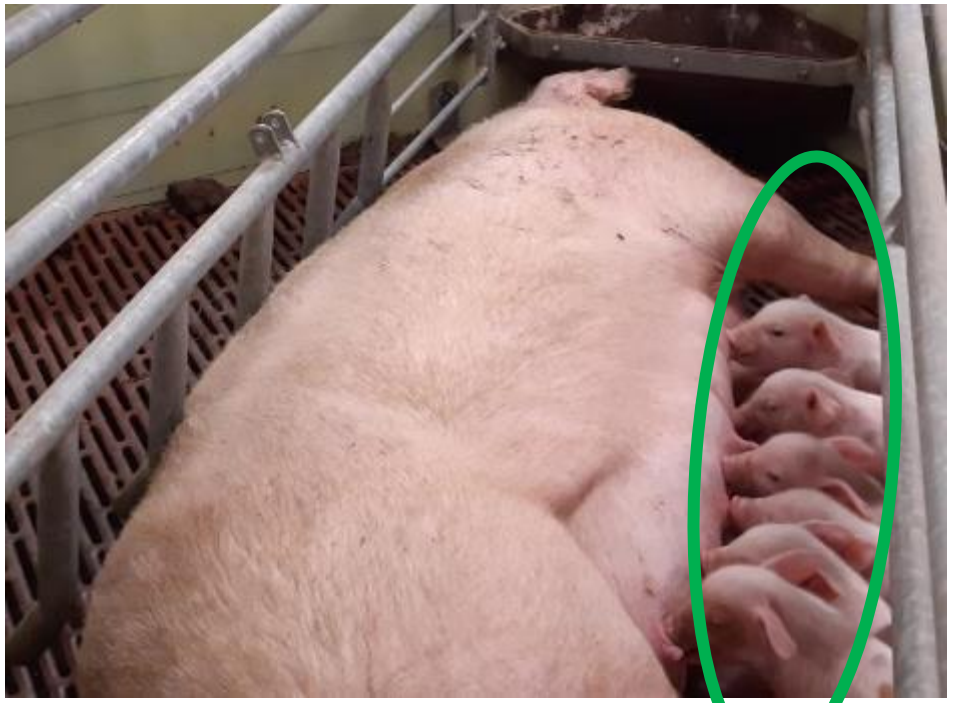
Dimensions – pen equipment

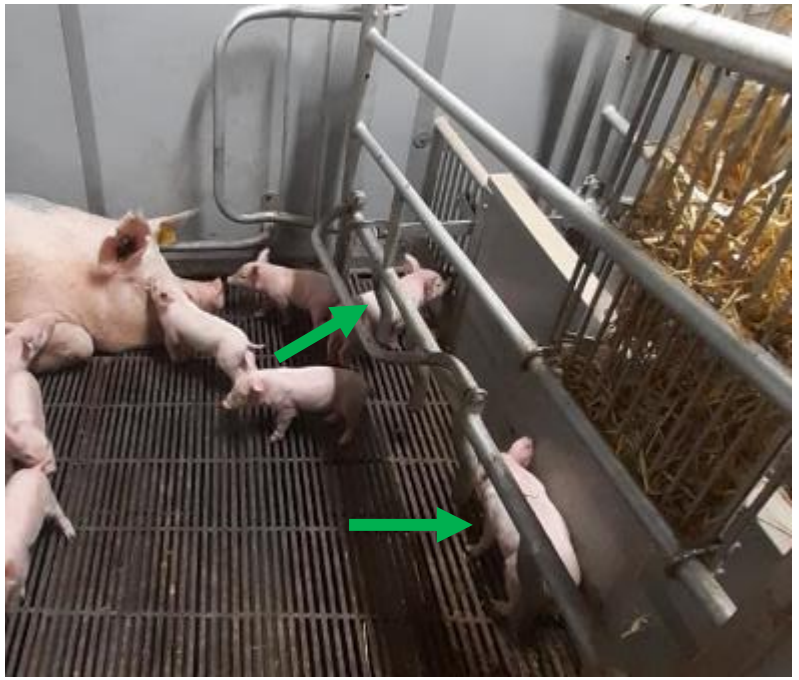
Sows:
Dunging
Lying
Thermoregulate
…

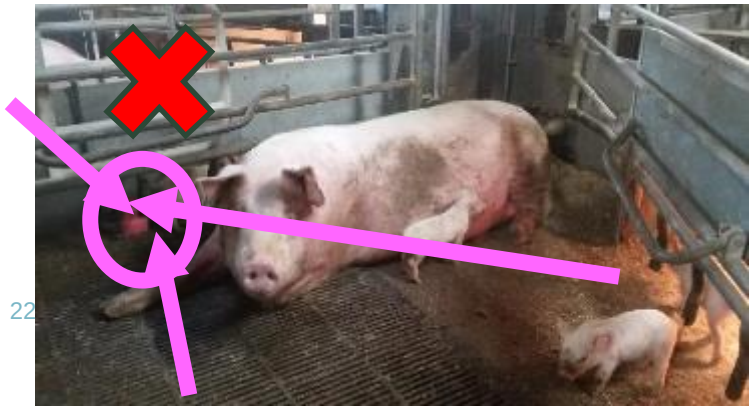
Piglets:
Shoulder width
Safety zones
…..

‘Ideal’ pen size - space for piglets

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





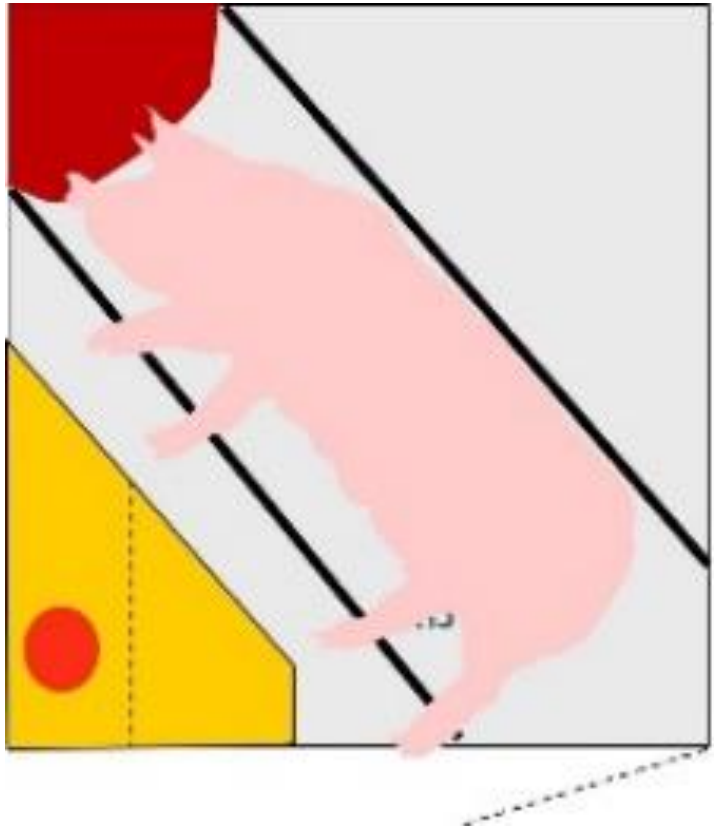


Sows’ confined for the first days post farrowing

Read more in Erfaring 2308

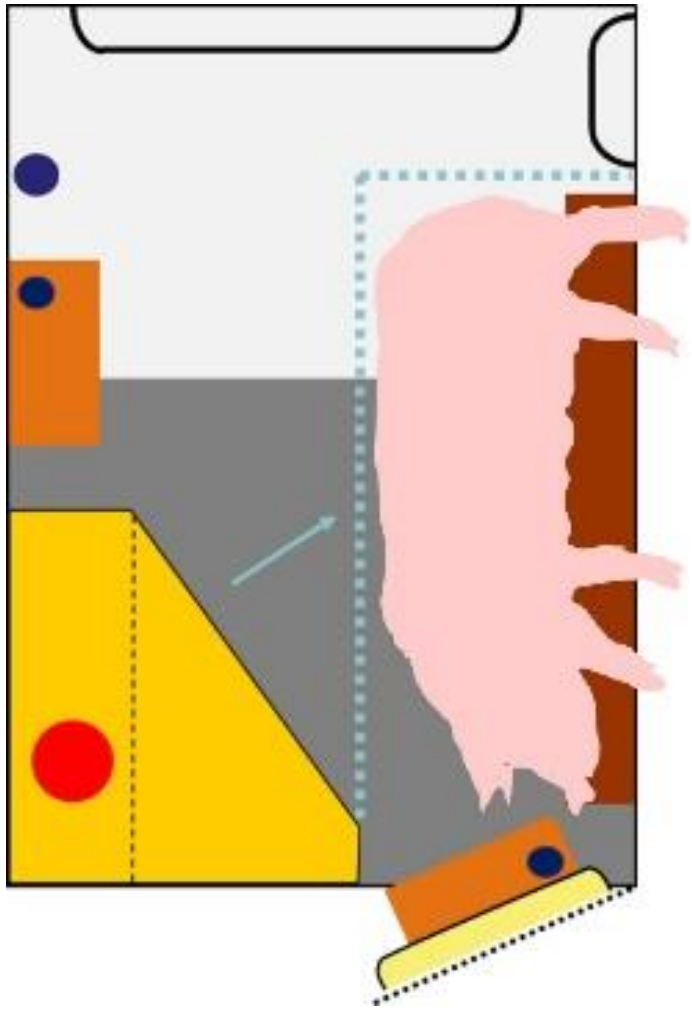
Equalsided pen

– Sow is lying diagonally when confined



Rectangular pen

– Sow is parallel with pen side when confined



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Space – temporary confinement and loose

SEGES INNOVATION

24

‘Ideal’ pen size – space for the sow

- Sows’ dimensions
  - Minimum

- Planar width – turning space
  - Minimum
  - Ease of movement

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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Turning

- Later pregnant sows
  - Parity two or older (11 sows <= parity 4; 15 sows >= parity 5)
- Test pen
  - 120-140-160-180-200-220 cm
- Turning
  - Initial – one turn to ‘understand’ the principle
  - Thereafter - random order of pen dimensions
  - Three turns per pen dimension
- Registrations on site
- Videorecording (few/some turns missing)
- Automatized analysis (including neural network)

How much space needed to turn……















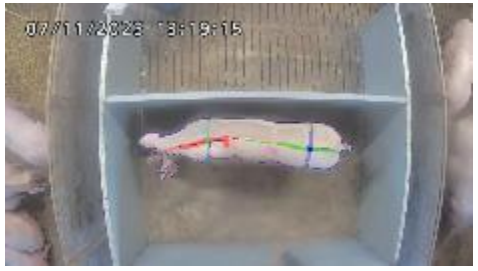


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Turning – preliminary analysis

- On site registrations
  - Sow: Parity, weight, length, depth, width
  - Complete/uncomplete turn
  - Start and stop of each turn
- Automated analysis
  - Number of pictures (≈ estimated time per turning)
  - Angle 1
  - Angle 2
  - Distance

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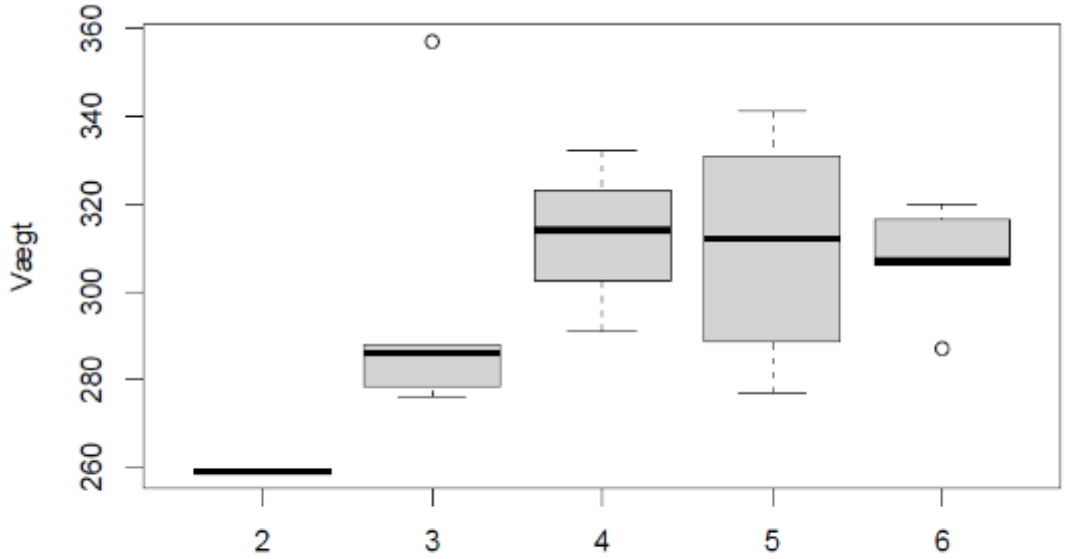
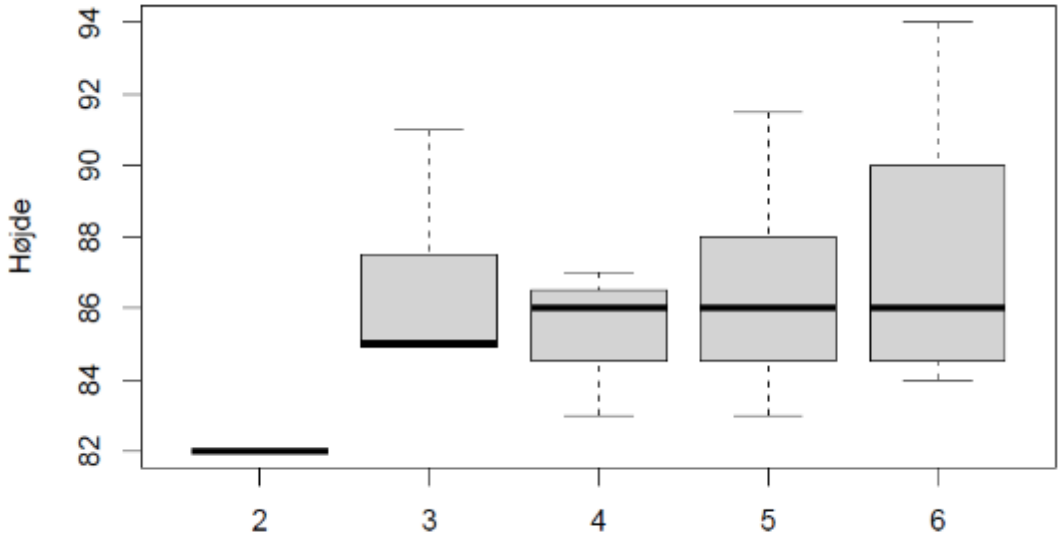
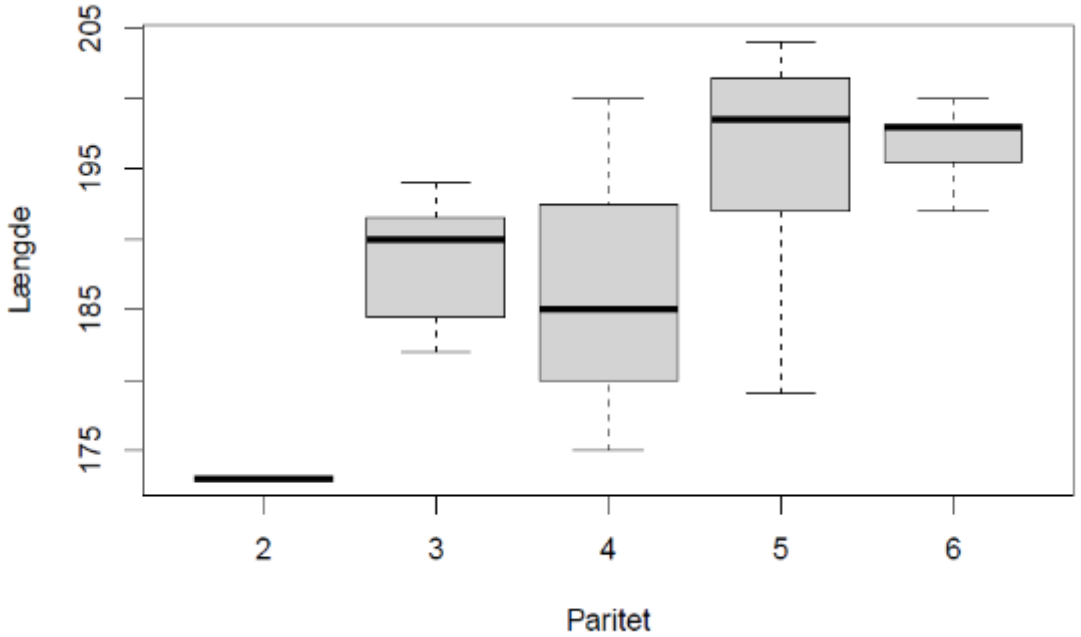
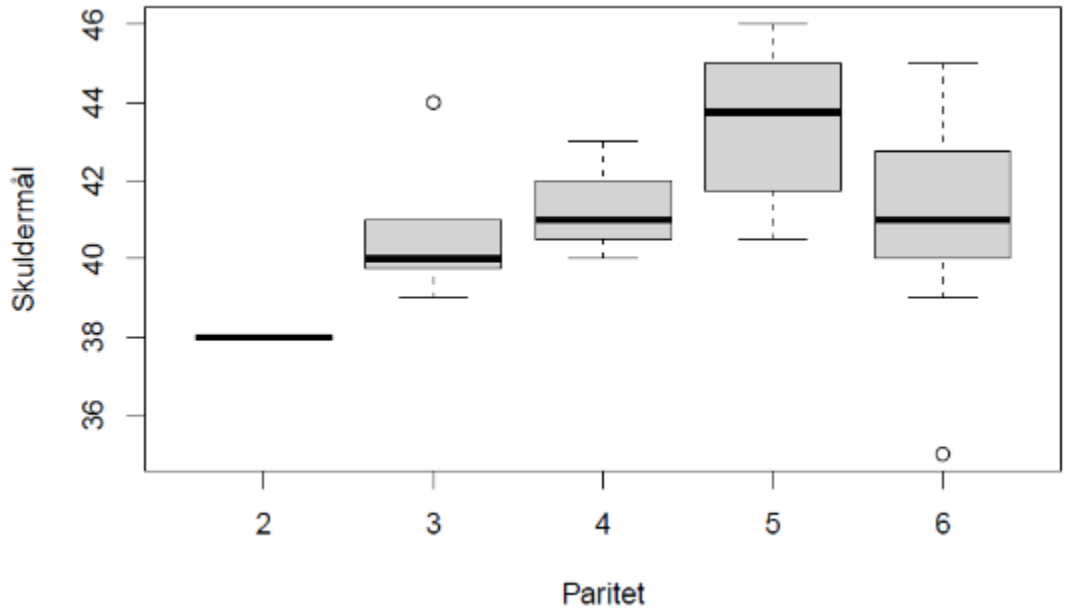
Turning – preliminary results (1)





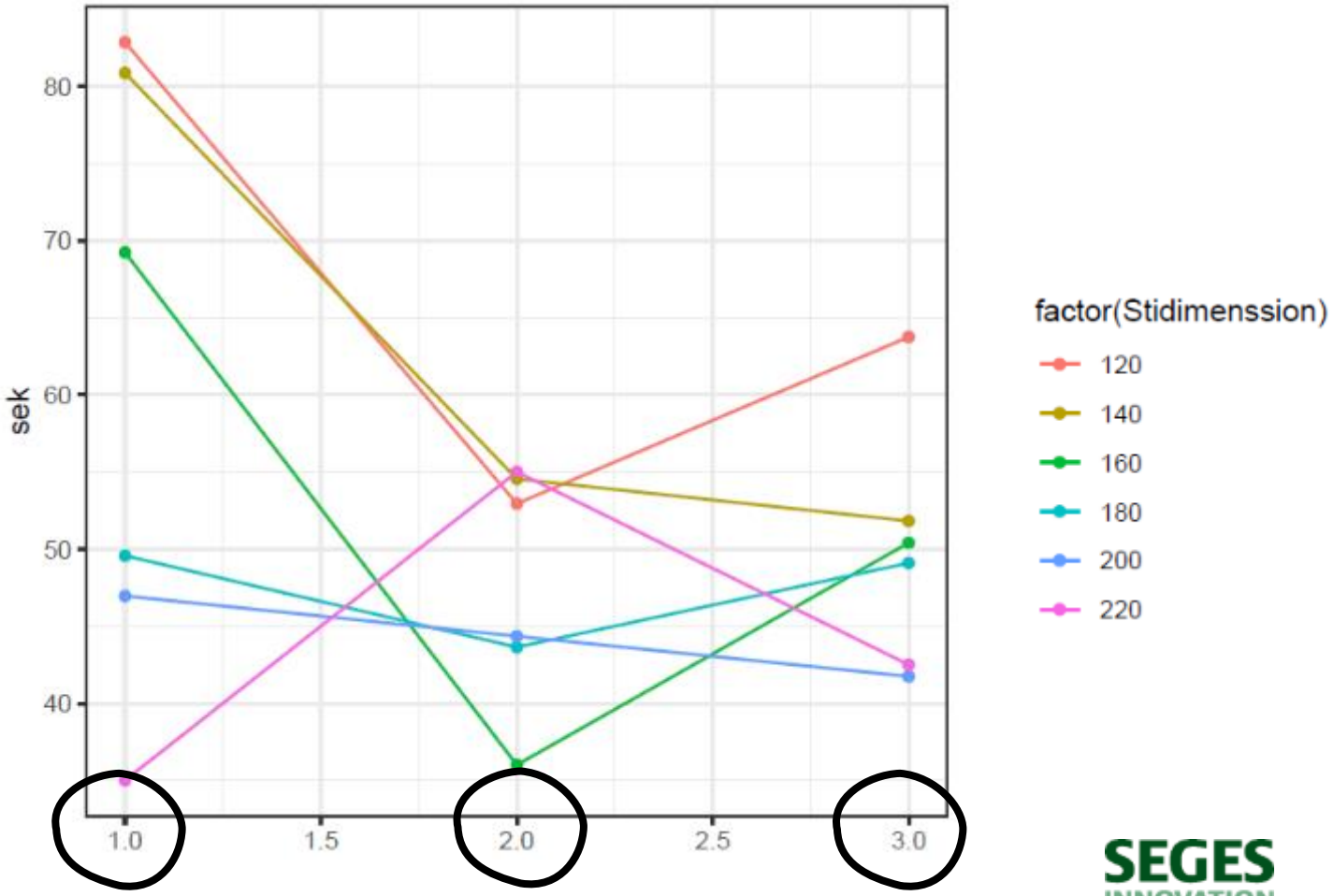




Turning – preliminary results

Stidimenssi	120	140	160	180	200	220
n	22	23	26	23	23	25

```
##       Stidimenssion
## obs    120 140 160 180 200 220 Sum
##   0      1   0   0   0   0   0   1
##   1      3   0   1   1   0   0   5
##   3     13  20  20  20  20  19 112
##   Sum   17  20  21  21  20  19 118
```



SEGES INNOVATION

R

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Filter | Cols: « < 1 - 50 > »

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Console | Terminal | Background Jobs

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+   Sys.sleep(0.5)
+ }
>
>
>
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+   PlotTing(Hej3 =Hej3,img =paste0("08h14m43s_0",i," Batch.jpg"))
```

Environment | History | Connections | Tutorial

Import Dataset | 96 MiB | List

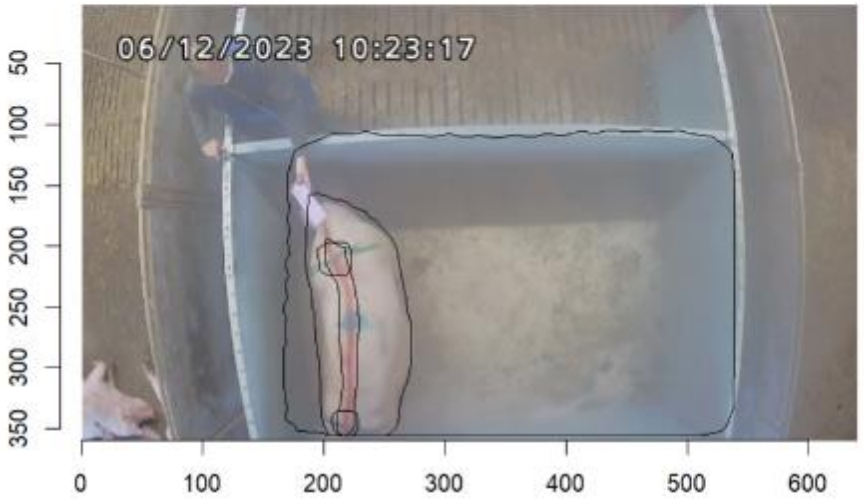
R | Global Environment

Data

AlleBil	15887 obs. of 58 variables
Angles	52432 obs. of 4 variables
Centre	104864 obs. of 5 variables
Hej3	319834 obs. of 6 variables
KrydsInfo	104865 obs. of 6 variables
RetData	52432 obs. of 17 variables

Files | Plots | Packages | Help | Viewer | Presentation

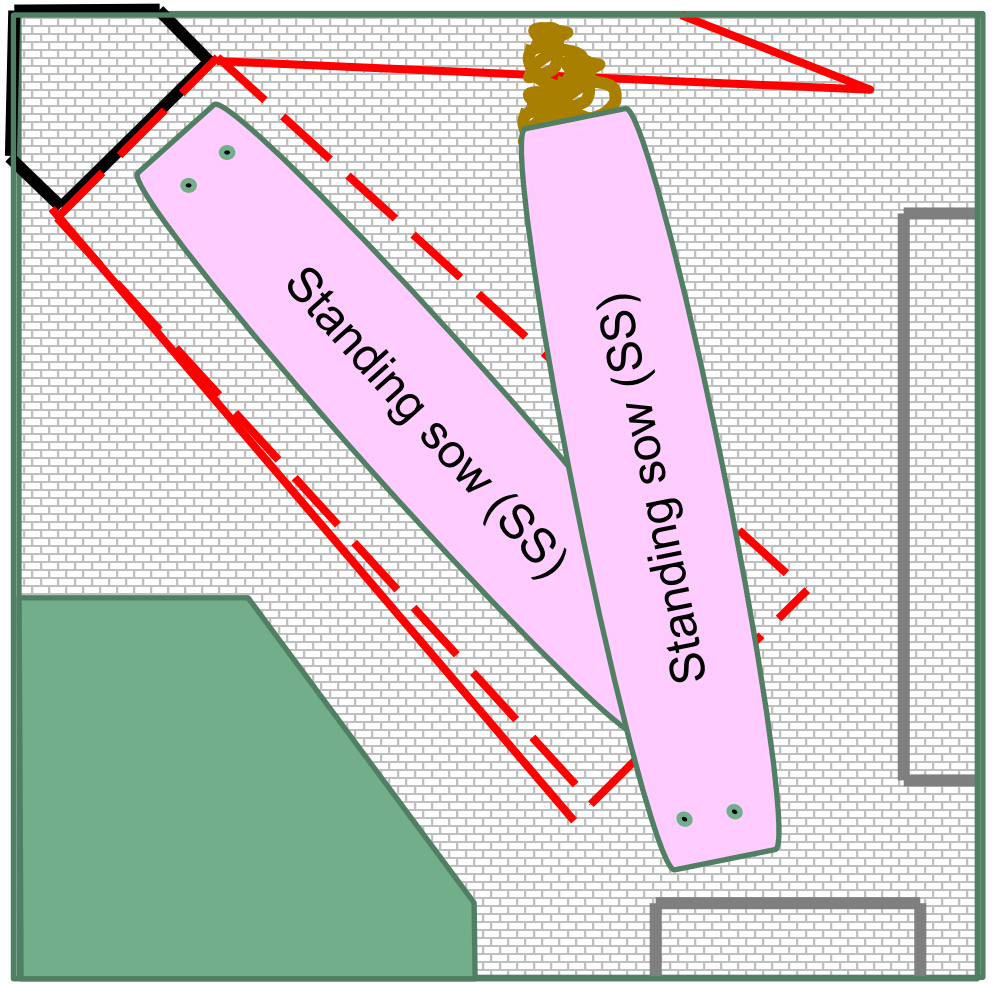
Zoom | Export | Publish



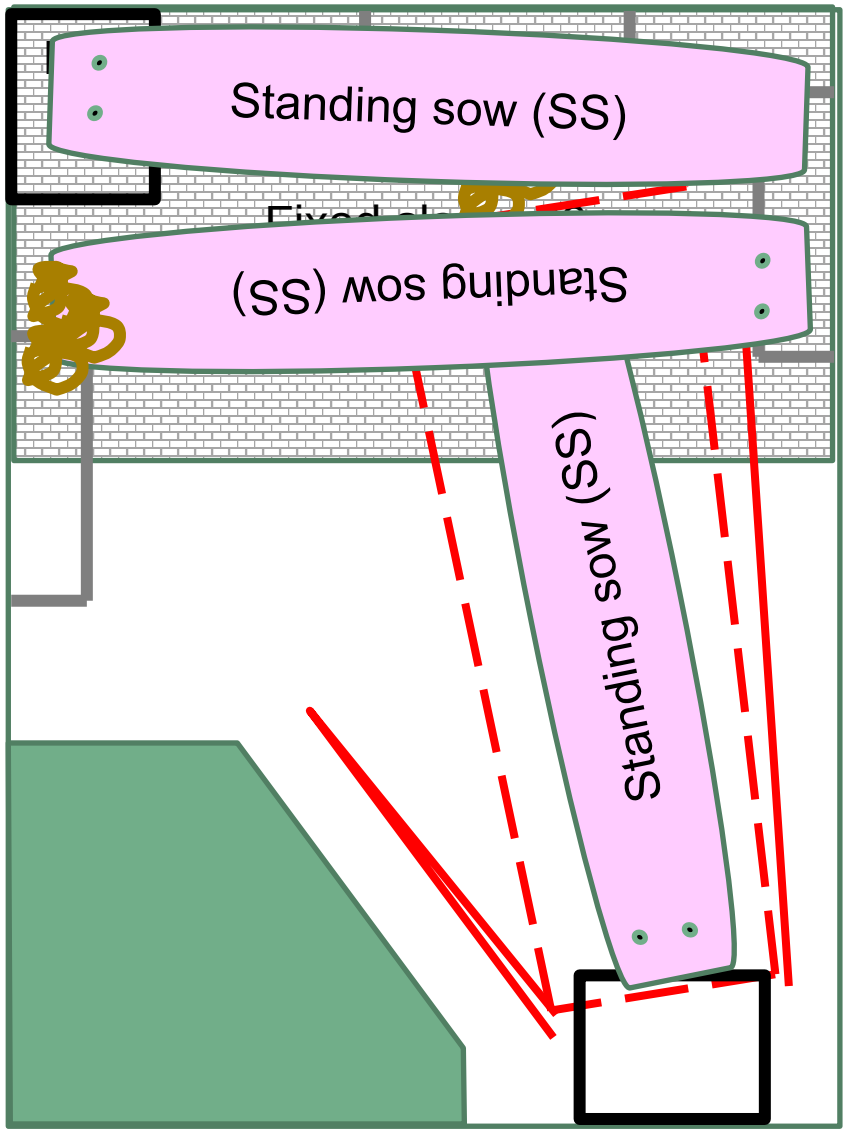
SEGES INNOVATION

Pens of 6,5 m² can be different

Equalsided pen (*255*255*)



Rectangular pen (*220*300*)



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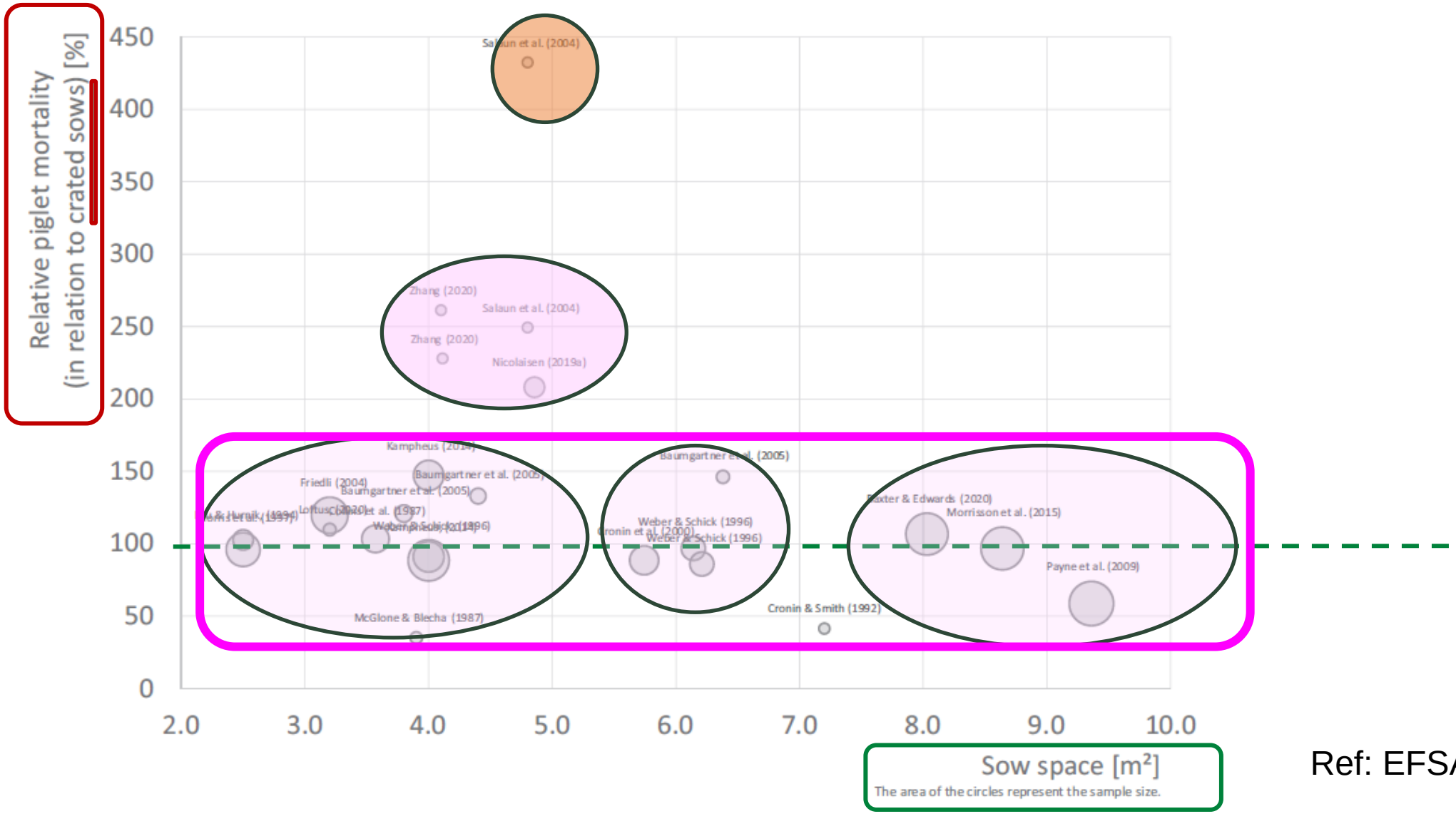
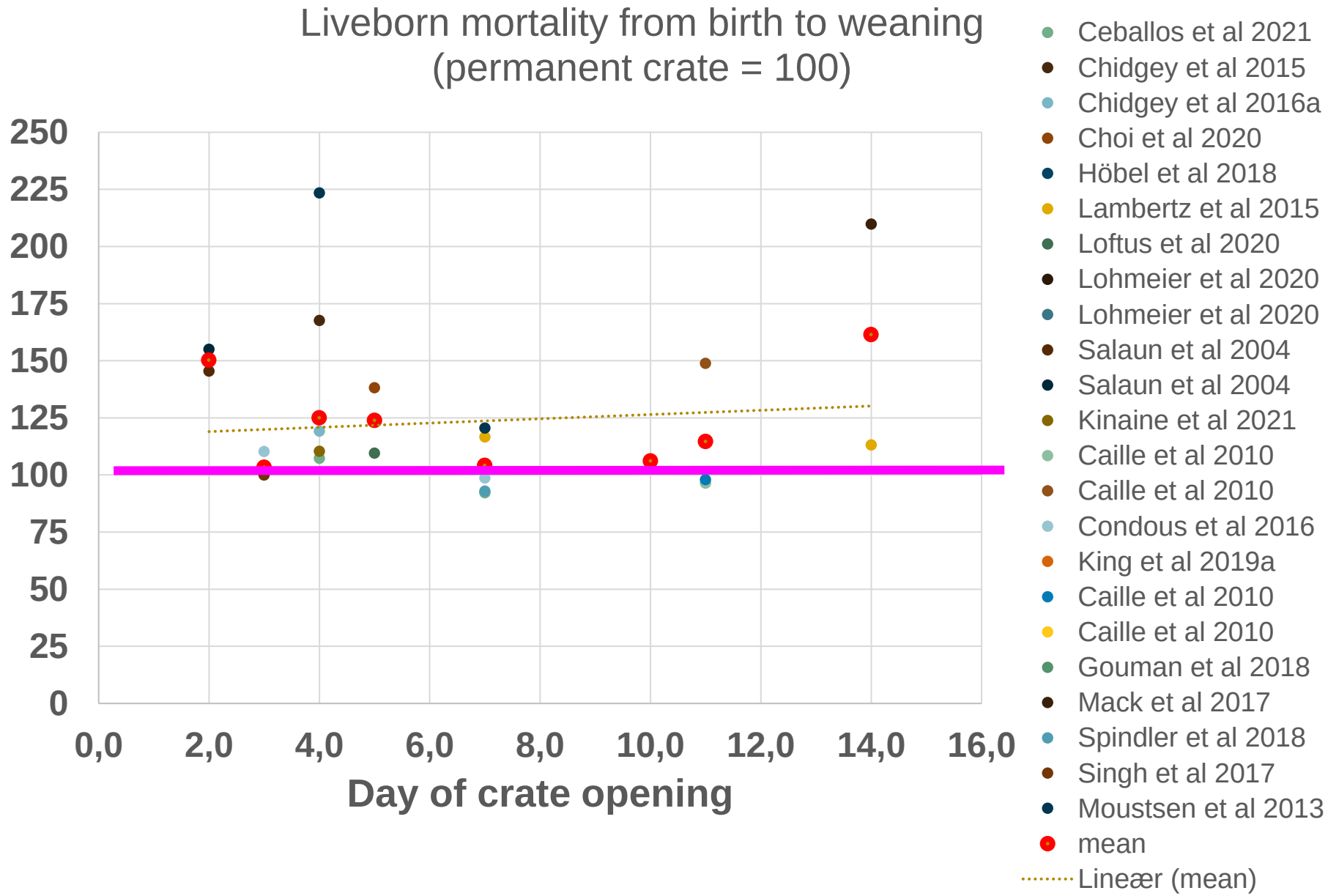
Space & piglet survivability



Ref: EFSA SO 2022

Temporary or permanent confinement



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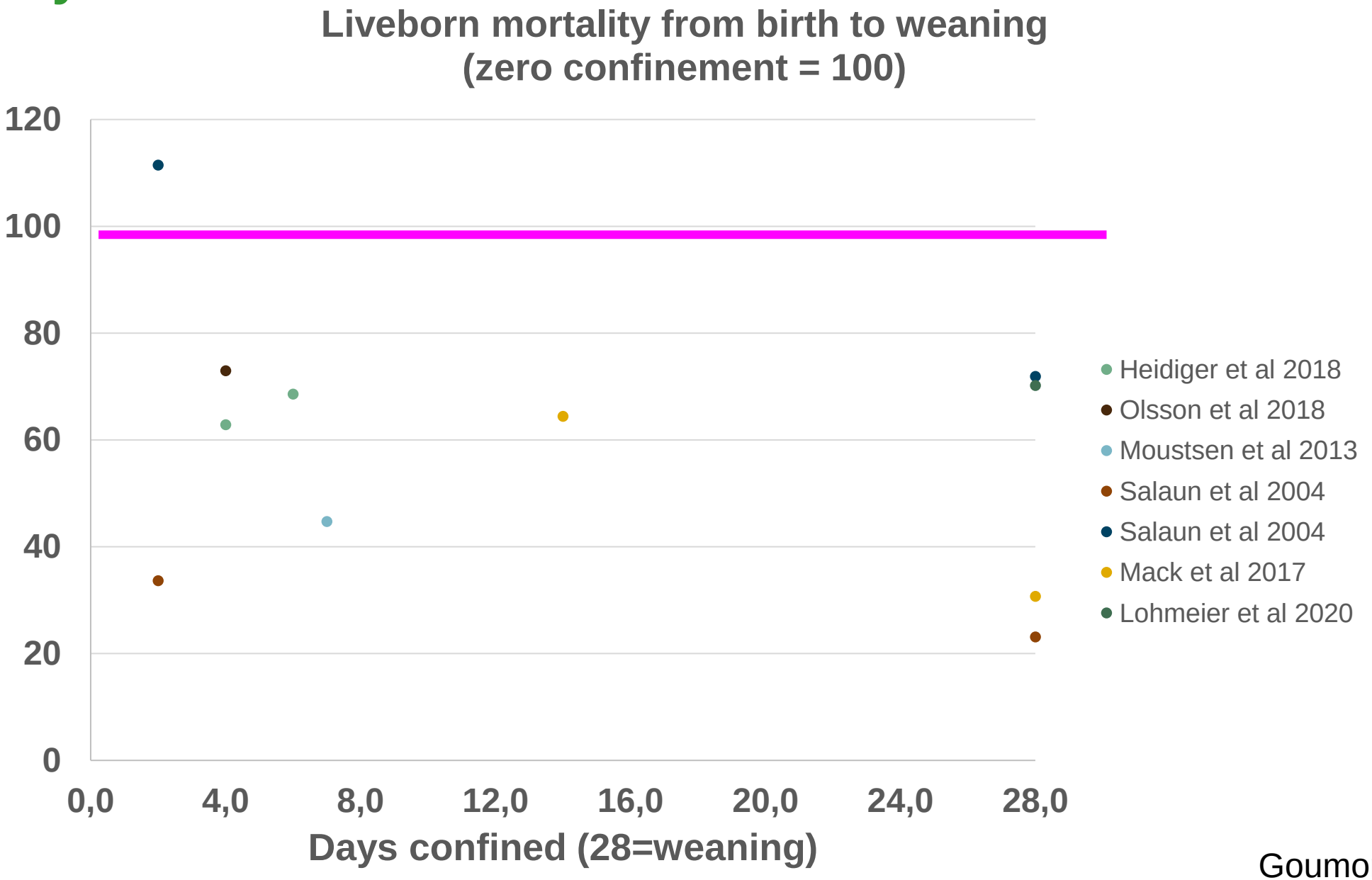
Goumon et al., 2022

Temporary confinement or zero confinement



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Goumon et al., 2022

Legal framework as it relates to space

Welfare *legislation*

- For *legislation* to be ‘meaningful’
  - Controllable
  - Sanctionable
  - → Space
- Challenge
  - Does it make a difference – outcome based?

Pen layout – work conditions

- First decision regarding design
  - Creep area along passageway
    - Safety
    - Efficency
    - Reduce risk of transferring diseases
    - Easy access
    - Worker wellbeing
      - Human – animal relationship
      - Quality of and in care

Area and pen dimensios – welfare and environment

Equalsided – fully slatted:

Solution **under** floor

Rectangular pen – option for partly solid floor:

Solution ***above*** floor

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ID / names for pens

Abbreviation which includes type (square/rectangular); space (m2); dimensions (width and depth whether fixed width. fixed depth. fixed ratio); flooring (fixed ratio (slat and solid). fixed depth slatted. variable depth slatted (=fixed depth solid)

ID pen					if 2/3 solid and 1/3 slats	if 100 cm slats	if 200 cm solid
	Area	depth	width				
Fixed width	5.5	2.5	2.2		R55FWFR	R55FWFS	R55FWVS
	6.0	2.7	2.2		R60FWFR	R60FWFS	R60FWVS
	6.5	3.0	2.2		R65FWFR	R65FWFS	R65FWVS
	7.0	3.2	2.2		R70FWFR	R70FWFS	R70FWVS
	7.8	3.5	2.2		R78FWFR	R78FWFS	R78FWVS
	Area	depth	Width				
Fixed depth	5.5	3	1.8		R55FDFR	R55FDFS	R55FDVS
	6.0	3	2.0		R60FDFR	R60FDFS	R60FDVS

R55FWFR:
R: **R**ectangular pen
55: Area of **5.5** m2
FW: **F**ixed pen **W**idth
FR: **F**ixed **R**atio between depth of slatted and depth of solid floor

R55FDFR:
R: **R**ectangular pen
55: Area of **5.5** m2
FD: **F**ixed pen **D**epth
FR: **F**ixed **R**atio between depth of slatted and depth of solid floor

R55FRFR:
R: **R**ectangular pen
55: Area of **5.5** m2
FR: **F**ixed **R**atio pen depth:width
FR: **F**ixed **R**atio between depth of slatted and depth of solid floor

R60FWFS:
R: **R**ectangular pen
60: Area of **6.0** m2
FW: **F**ixed pen **W**idth
FS: **F**ixed depth of **S**latted floor

R65FDVS:
R: **R**ectangular pen
65: Area of **6.5** m2
FD: **F**ixed **D**epth
VS: **V**ariable depth of **S**latted floor

R70FRVS:
R: **R**ectangular pen
70: Area of **7.0** m2
FR: **F**ixed **R**atio pen depth:width
VS: **V**ariable depth of **S**latted floor

En unik sammensat forkortelse, som inkluderede:

- S:Square eller R:Rectangular
- Arealet i stien; 55: 5,5 m^2; 60=6,0 m^2; 65:6,5 m^2; 70:7,0 m^2; samt 78:7,8 m^2)
- Stiens dimensioner; *fast bredde* (220 cm) (FW: Fixed Width); *fast dybde* (300 cm) (FD: Fixed Depth) eller *fast forhold mellem bredde og dybde* (2:3) (FR: Fixed Ratio)
- Gulvets dimensioner: fast spaltegulv (100 cm) (FS: Fixed Slatted); fast dimension på det faste gulv (200 cm) og dermed variabelt spaltegulv (VS: Variable Slats); eller fast forhold mellem spaltegulv og fast gulv (2:3) (FR: Fixed Ratio)

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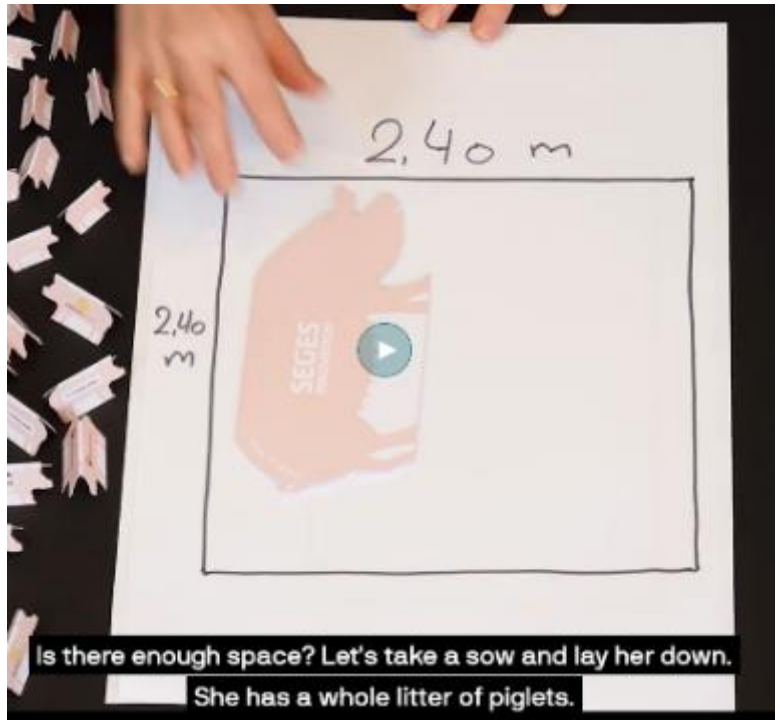
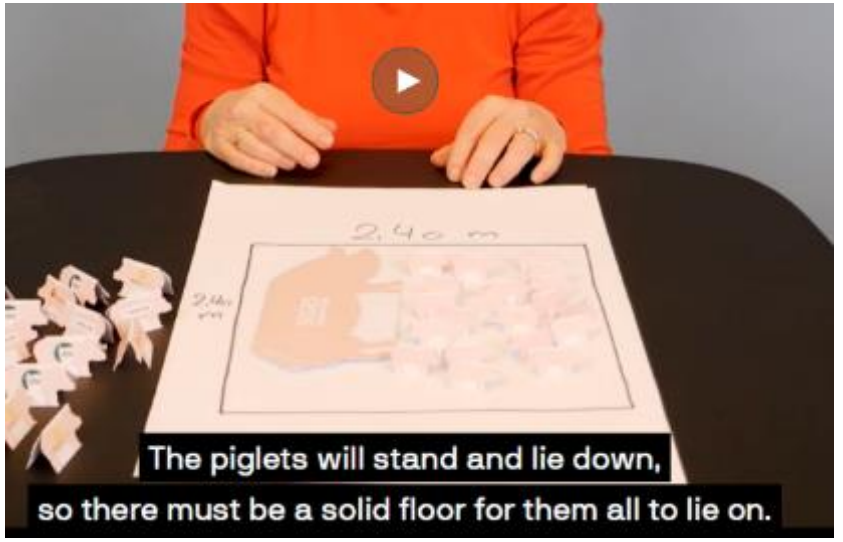
Decision support tool

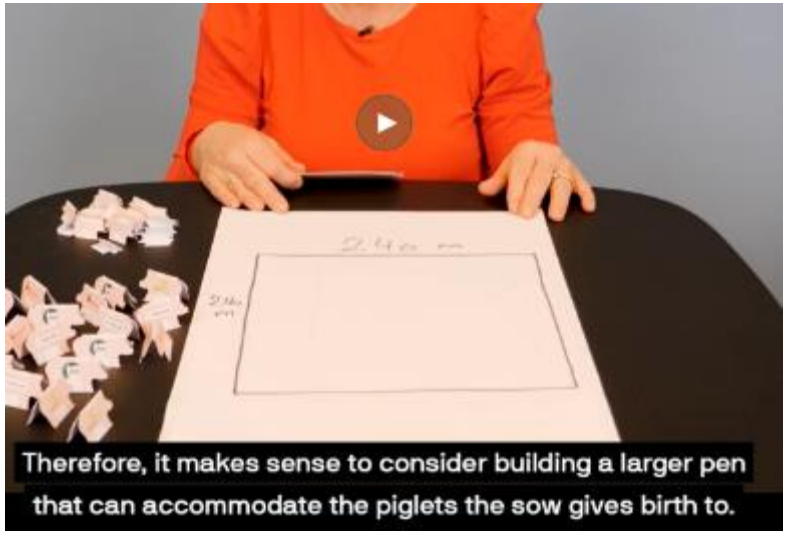
- Is the design criteria meeting the needs of the sow, piglets and caretakers?





- Papgrise og checkliste hjælper dig til bedre staldindretning - SEGES TV

Video – with English subtitles



Conclusions

- Step 1 - Animals
  - Understanding the animals needs/requirements – sufficient space….
    - Dimensions
    - Activity
- Step 2 - Animals
  - Future production
    - Loose
    - Larger litters
    - Sustainability
- Step 3 -
  - Farm staff
  - Legal framework
- Step 4 – Supporting the animals
  - Understanding the animals
    - in design and implementation for technologies
    - when providing the animals with choices
- Step 5 – and the most obvious – also needs a fresh look….
  - Feed, water, air…

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Take Home Message

- The farrowing environment sets the conditions for sow and piglet productivity and their welfare

- Set the conditions in the farrowing environment which leads to high welfare and productivity

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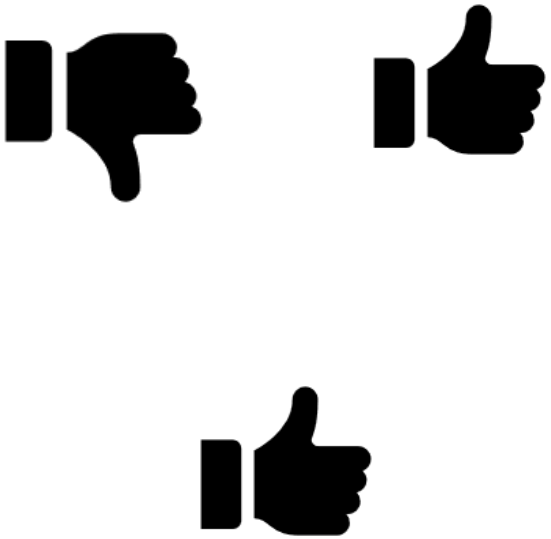
Spatial dimensions



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Early use of milk-cup?

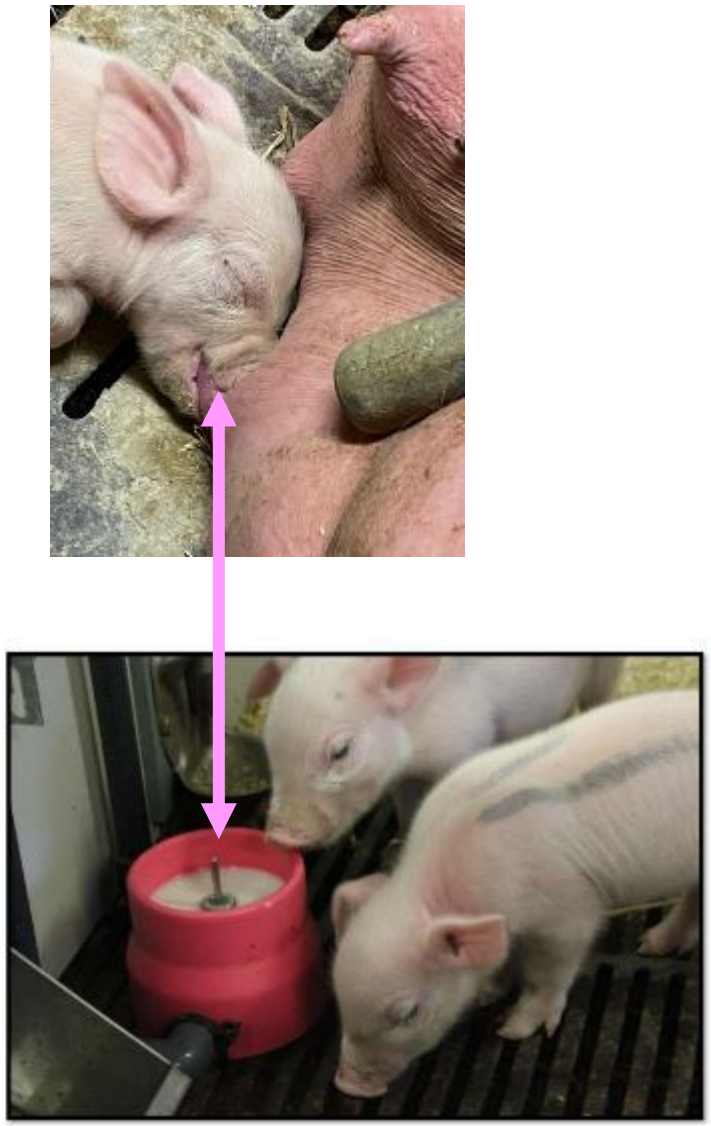

Figure 6 A milk cup was placed inside each farrowing pen. To release milk, the vertical tap needs to be pushed either to the side or downwards. (Photo: Giulia Ciarcelluti).

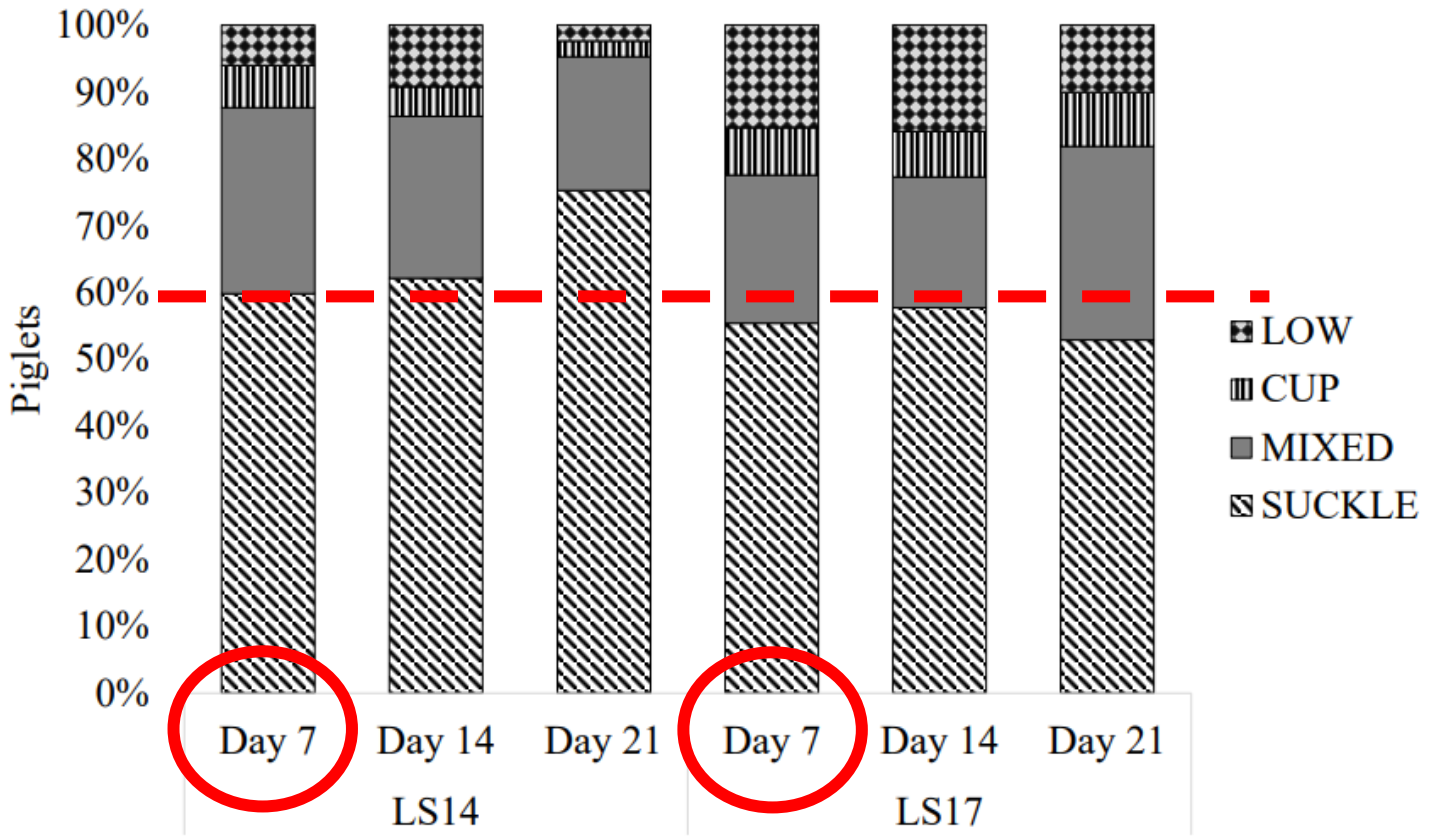

Figure 9 Percentage of piglets in each category of Nutrition Source (NS) on days 7, 14 and 21 according to the standardised litter size on day 1 of either 14 piglets (LS14) or 17 piglets (LS17). (Reproduced from paper IV).

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PhD Cecilie Kobek-Kjeldager, AU

'Pattinator' in initial trial

https://www.seges.tv/channel/27487274/svin

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Large litters – no nurse sows

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[Pattegrise dier nu på livet løs på kunstige kirtler - SEGES TV]

Choose English subtitles

Milk teats in incubators – pairs of piglets

Trial - 0-44 hours; Three incubators with two piglets each; Two teats in each incubator

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Milk teats in incubators – six piglets together

Trial – 44-76 hours

One enclosure, six piglets

Six teats and one PigLET Starter