Water supply and water quality

Vivi Aarestrup Moustsen and Hanne Maribo

Herning 25 October 2023

SEGES INNOVATION

'Water and water supply have not had enough focus"

Niels Aagaard uses 15,000 cubic meters of water every year from the local water plant.

When he expanded the production till 1,500 sows he installed a buffer tank containing 10 cubic meters corresponding to 6 hours use. The buffer tank makes sure that the pigs always has water enough.

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Today

- **How much water does the pig need?**
  - Growing pigs
  - Sows lactating (farrow section)
- **Water supply in the stable**
  - Capacity
- **Water quality**
  - Microbiology
  - Cleaning
  - Addition of acids and medicine
- **Take home**

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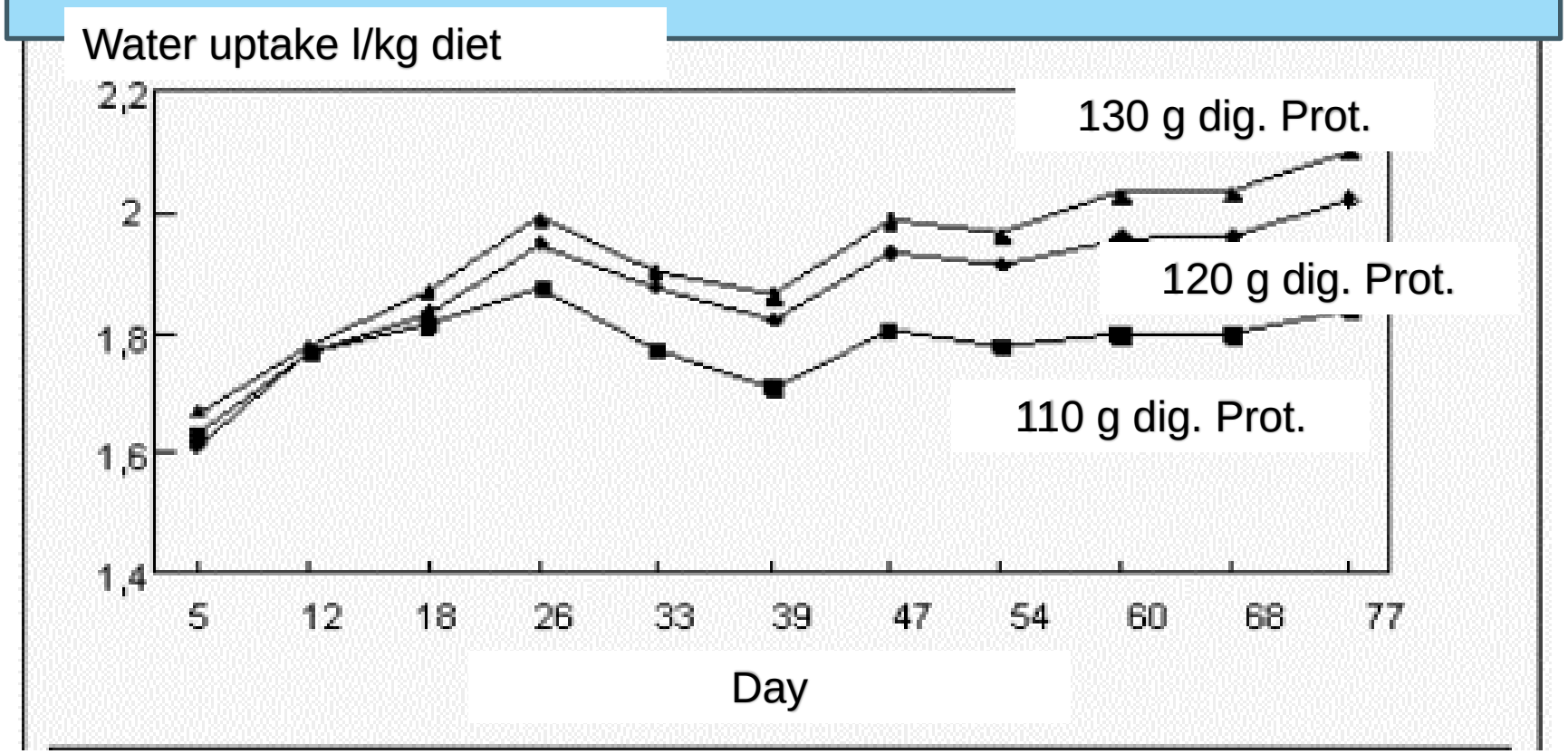
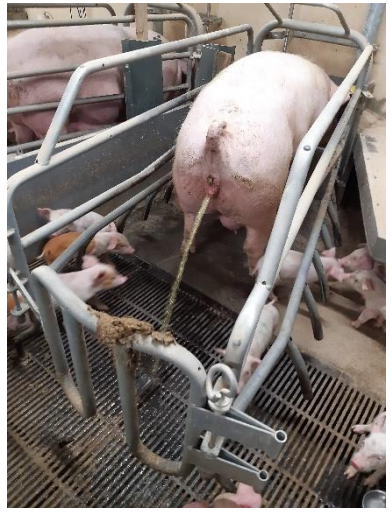
How much water does the pig need?

How much water does the pig need?

Water uptake when the protein in the diet reduces
30-100 kg (medd. 467)





More inf:
[Review: Højproduktive søers forbrug og behov for vand (landbrugsinfo.dk)]

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How much water does the pig need?

Lack of water can result in:

- Dehydration
- Lost growth
- Dark urine
- Hard faeces
- Tail biting
- Aggression
- Mortality
- Reduced milk yield
- …..

Can all pigs drink at the same time?

Type	Water need l/day
Piglets (incl. sowmilk)	1 – 2
Weaners	1 – 5
Young pigs, 15-45 kg	4 – 8
Finishers, 45-100 kg	6 – 10
Gestating sows	12 – 20
Lactating sows	25 – 35
Boars	8 – 10

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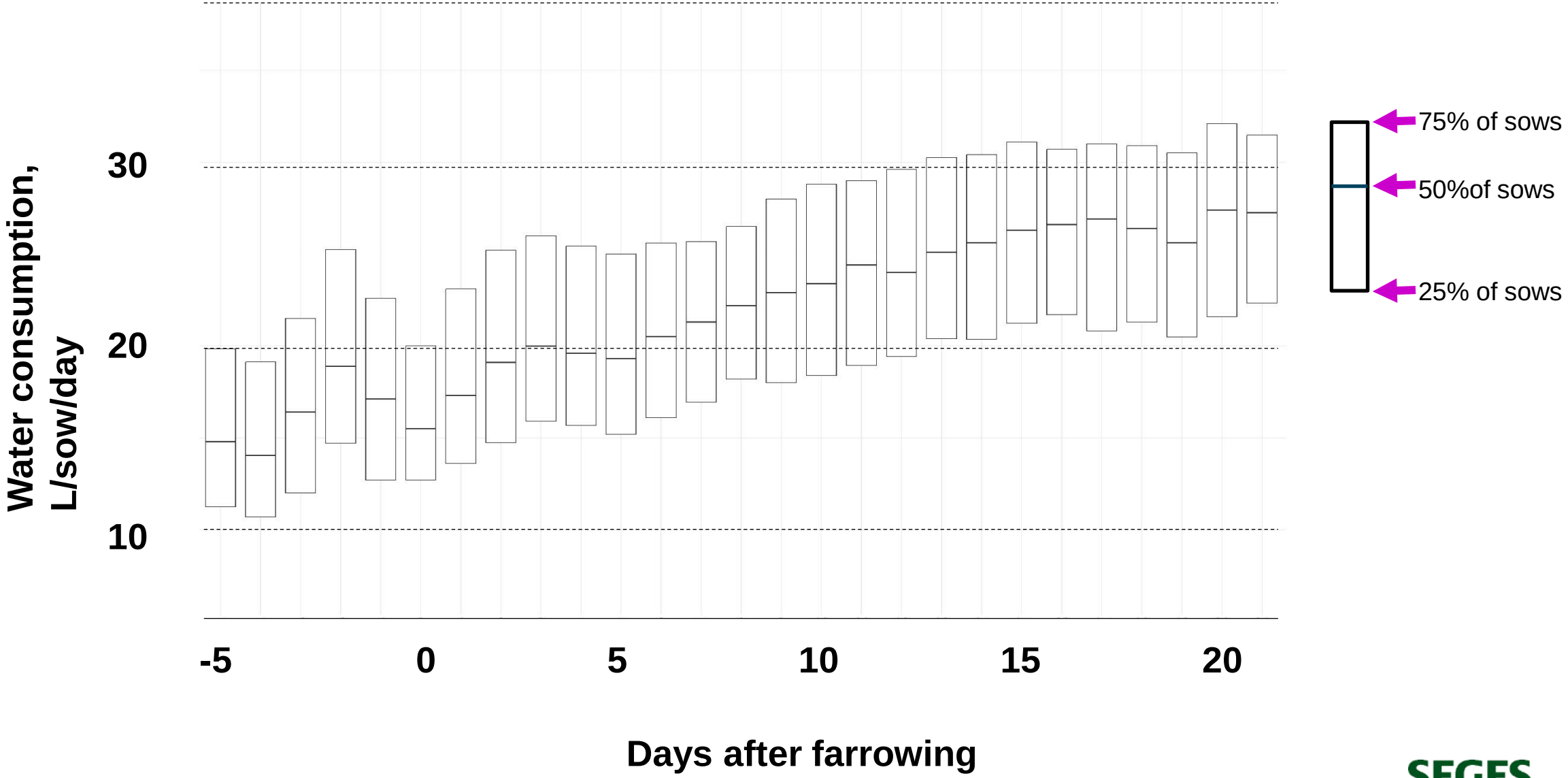
Water is important!

- Sows
  - The body is approx. 50% water
  - If the sow loses 10% of the body water, it is fatal.
- Sow milk
  - Approx. 80% water.
- Good idea to know how much water the sow normally drinks
  - Identification of changes
- SEGES has collected data
  - Herd with dry feed
  - Herd with wet feed

SEGES INNOVATION

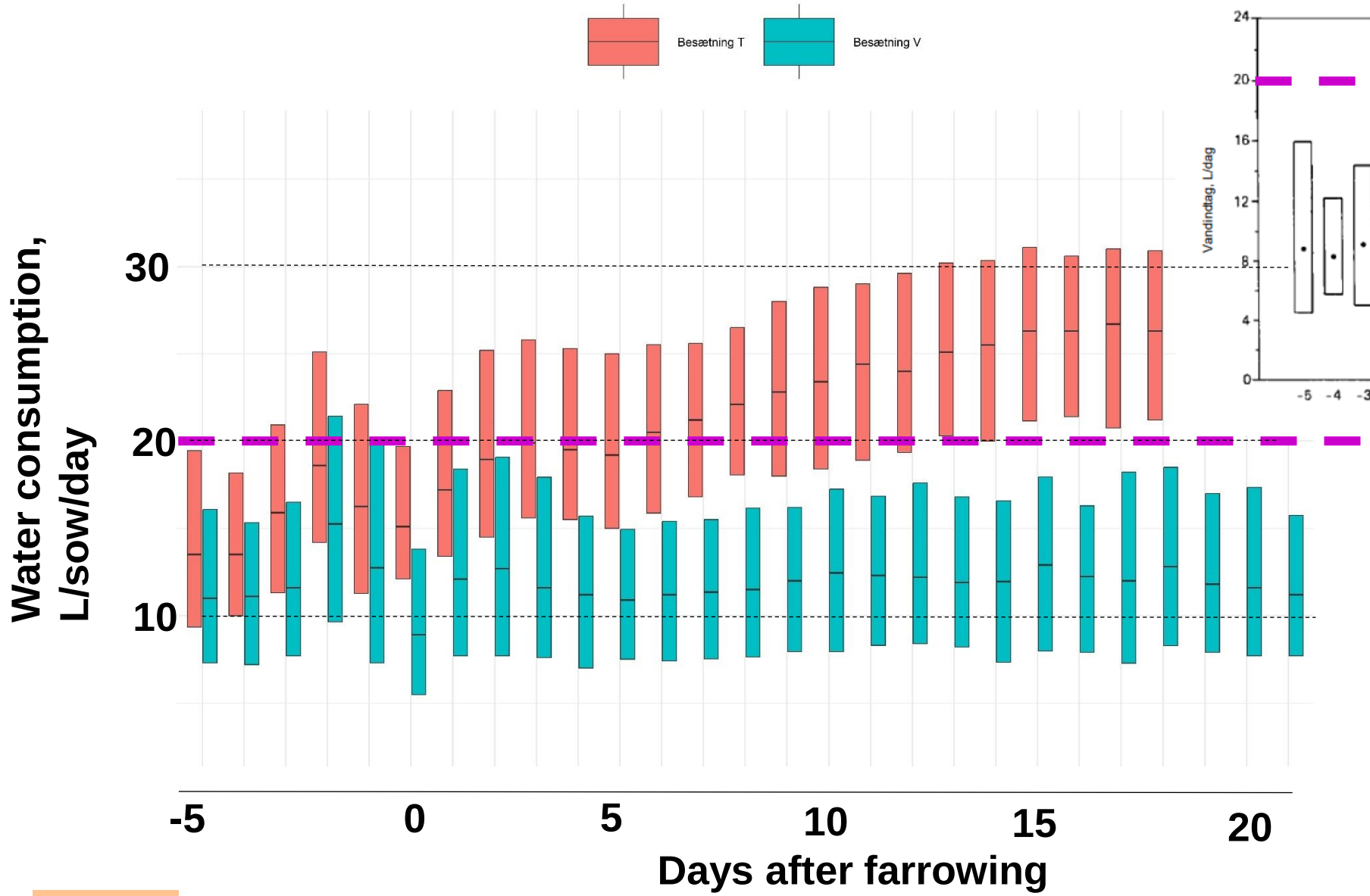
Erfaring 2303

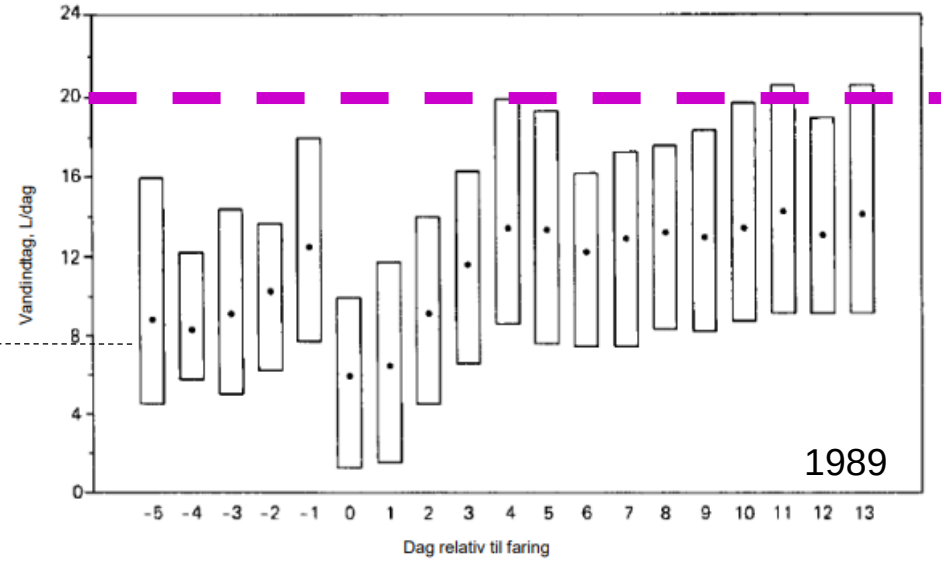
How much water did the sows drink in the herd with dry feed?



Erfaring 2303

Water consumption day -5 till day 21 (dry and wet feed)

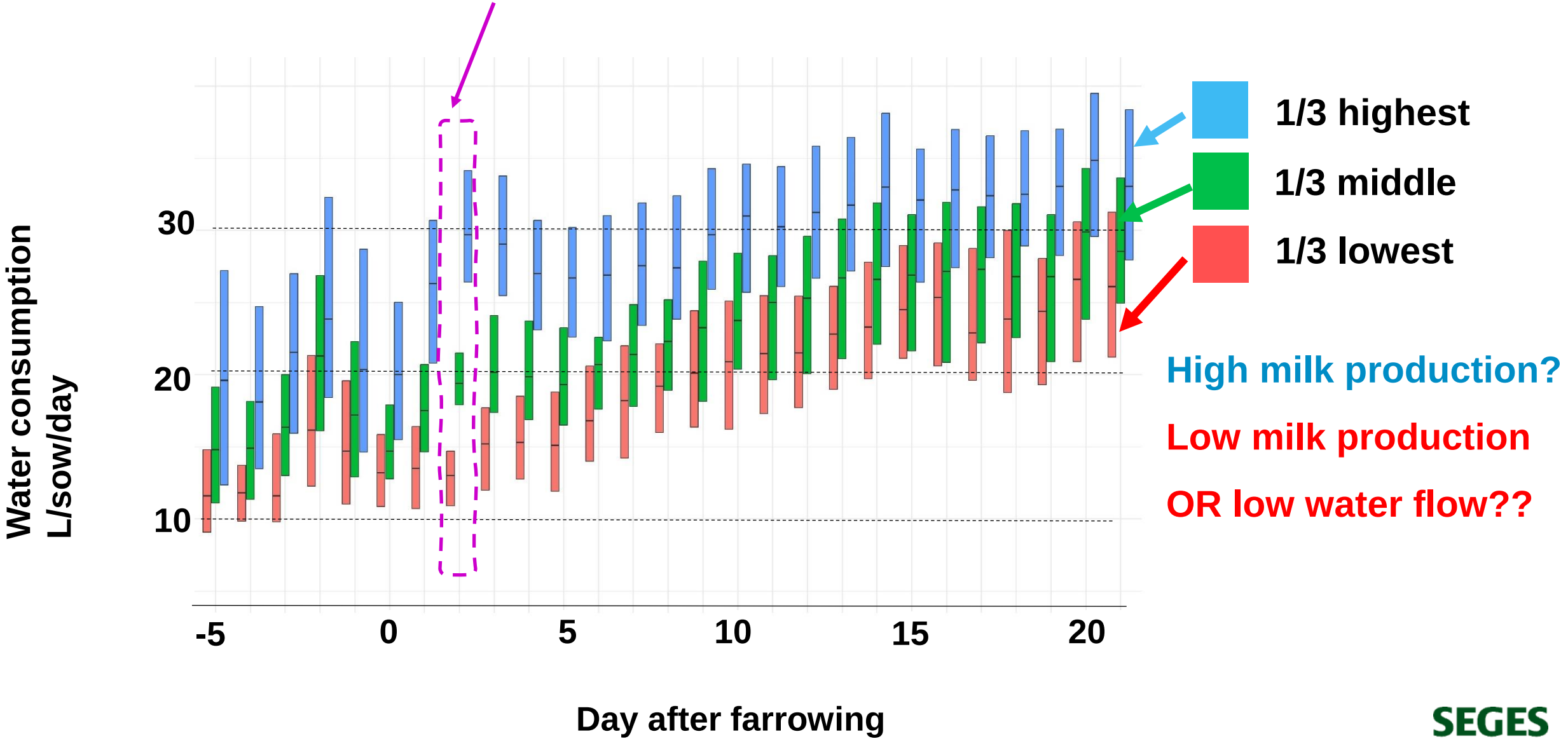




- Same curve
- Higher level
→ is the capacity OK?

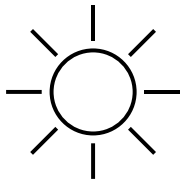
Erfaring 2303

Water consumption *day 2* after farrow. – and the rest of the lactation



Erfaring 2303

Water consumption in relation to outside temperature



Summer:

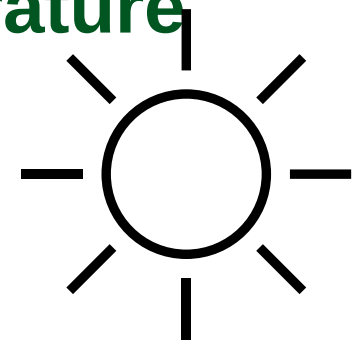
- Day temperature over 10°C;

Shift:

- Day temperature varying > & > 10°C

Winter:

- Day temperature under 10°C



Higher water consumption+10°C

Erfaring 2303

Note from data collection – potentials – overview individuals

- Drinking breaks
  - Sows given **dry feed** drink when they eat
    - If they don’t drink – they don’t eat
  - At farrowing the sow lay down
    - They do not drink!

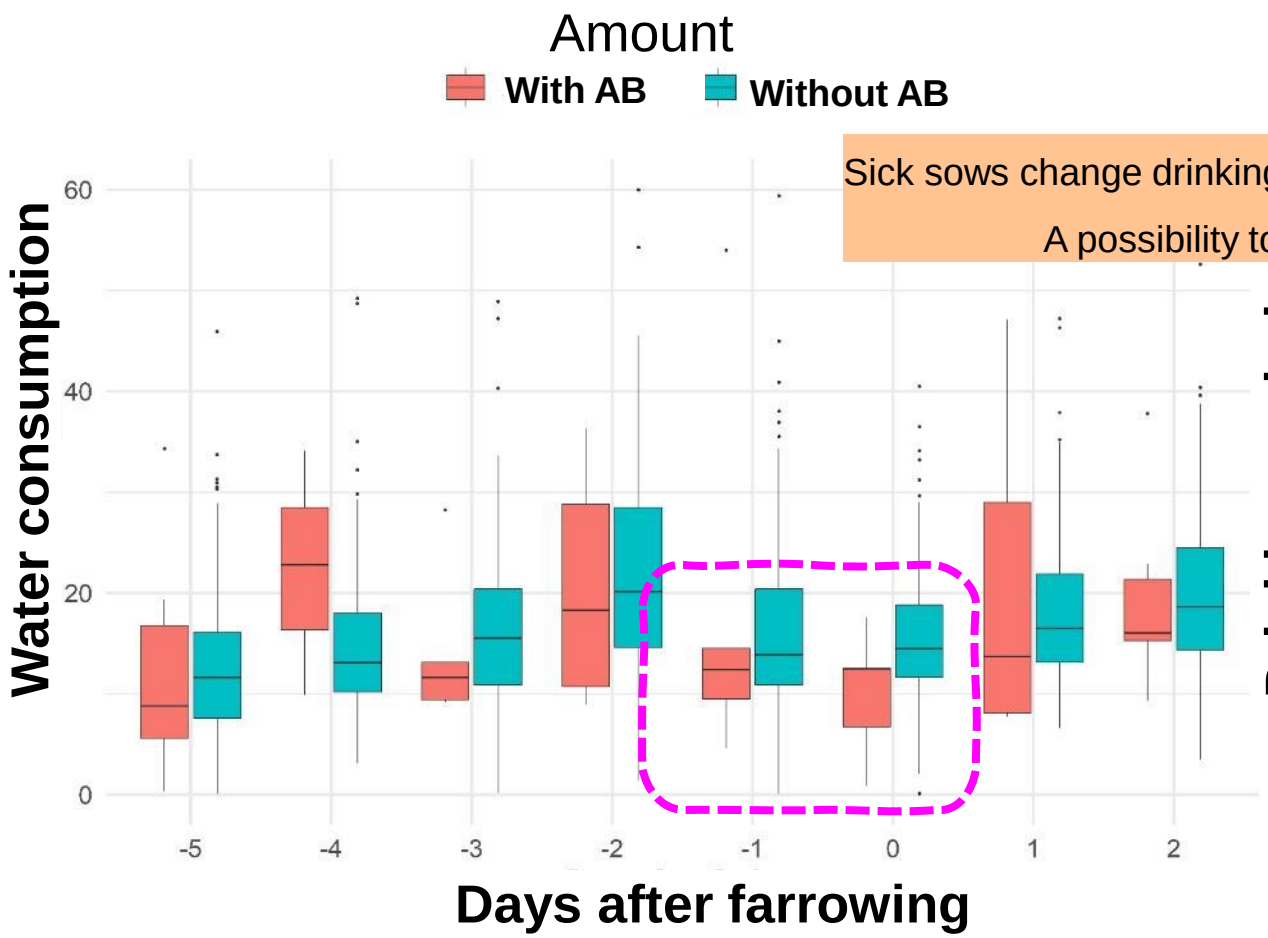
Erfaring 2303

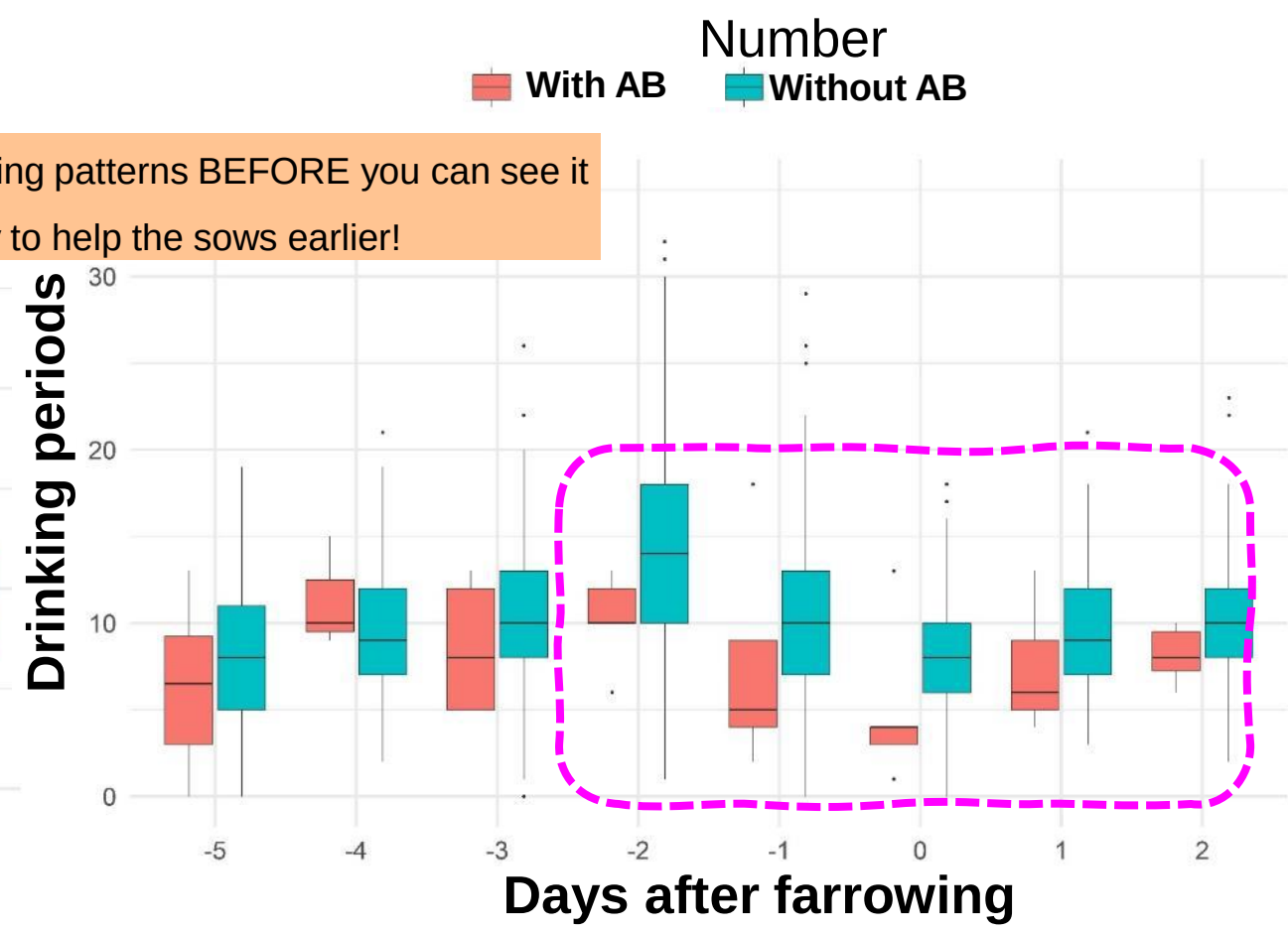
The sows change drinking behaviour before they get sick
(dry feed)

Treatment:
The sow was treated with antibiotics arround farrowing – or two days after.

Sick sows change drinking patterns BEFORE you can see it

A possibility to help the sows earlier!





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Erfaring 2303

Water supply – what are the needs?

Is the water supply OK? And for all pigs

- The lactating sow
- The section with lactating sows
- All farrowing sections
- Gestating sows
- Weaners
- For wet feed
- Soaking the stables
- The seasonal variation

Is the capacity for water good enough for all pigs?
– turn some handles?
– change routines?

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How to calculate?

Water quick tool_water consumption estimate

Number of productive sows	1.493	Estimated daily water consumption	66.435	Liters	66	m^3	English
Weaned piglets per sow per year	36	Peaking consumption total	2.157	l/m	36,0	l/s	
Weight span of weaner	7-25 kg	Peaking waterflow circuit 1	2157	l/m			
		Peaking waterflow circuit 2	0	l/m			
Weight span of finishers	Up to 115 l	Peaking waterflow circuit 3	0	l/m			
		Peaking waterflow circuit 4	0	l/m			
Climate zone	1				5 weeks v		

	Quarantine	Boars	Young sows	Sows for service	Gestation	Farrowing	Weaners	Finishers	Delivery
Select view of pig groups	Include	Include	Include	Include	Include	Include	Include	Exclude	Include
Split of the pigs	30-60 kgs	1,2% of sows	60-120 kgs	Week cycle	Week cycle	Week cycle	Week cycle	Week cycle	Week cycle
Automatically generated weekflow	150	18	240	405	852	426	7.235	15.039	251
Adjusting pig quantity manually (pcs)	0	-6	40	-350	300	-80	1200	-15039	30
Quantity of pigs	**150**	**12**	**280**	**55**	**1.152**	**346**	**8.435**	**0**	**281**

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Water consumption tool

Conumer											Consumer total
Feeding principle	l/m	22	27	151	25	1037	339	62	90	67	1.820
		Dry ad lib	Dry restric	Dry ad lib	Dry ad lib	Dry restri	Dry restri	Dry ad lib	Liquid	Dry restri	
Sprinkling	l/m	0	12	45	3	56	-	65	0	14	194
		No	Yes	Yes	Yes	Yes		Yes	Yes	Yes	
Soaking	l/m	8	-	-	-	-	32	24	0	16	80
		Yes					Yes	Yes	Yes	Yes	
Cooling pads	l/m	1	0,2	2,7	0,6	11,1	7,3	0,0	0,0	2,7	25
		Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	
High pressure cooling	l/m	0,6	0,1	2	0	7	5	10	0	2	27
		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
High pressure cleaning	l/m	25					25	25	25	25	125
		Yes					Yes	Yes	Yes	Yes	
	l/m										

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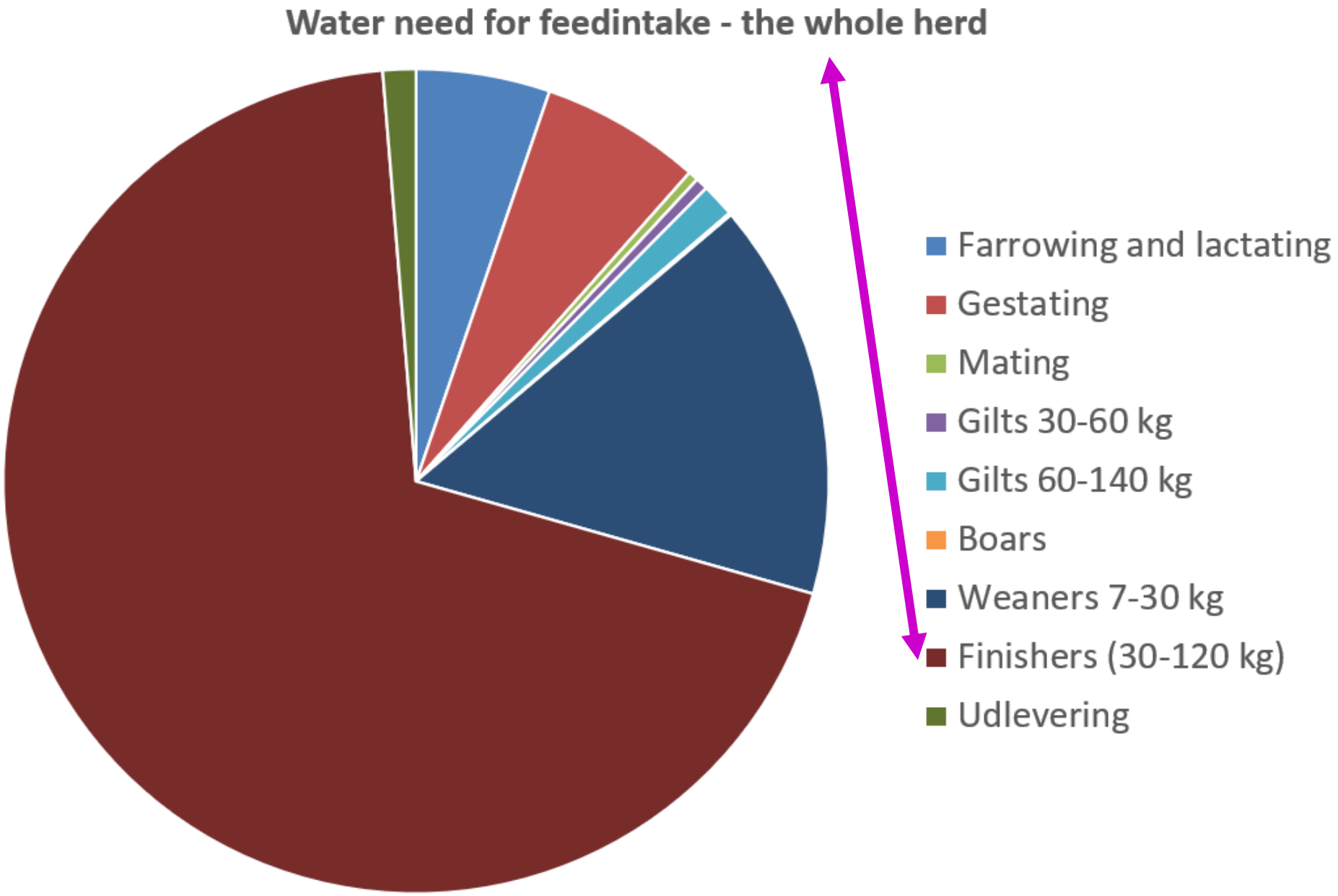
Water need for feed intake – the entire herd



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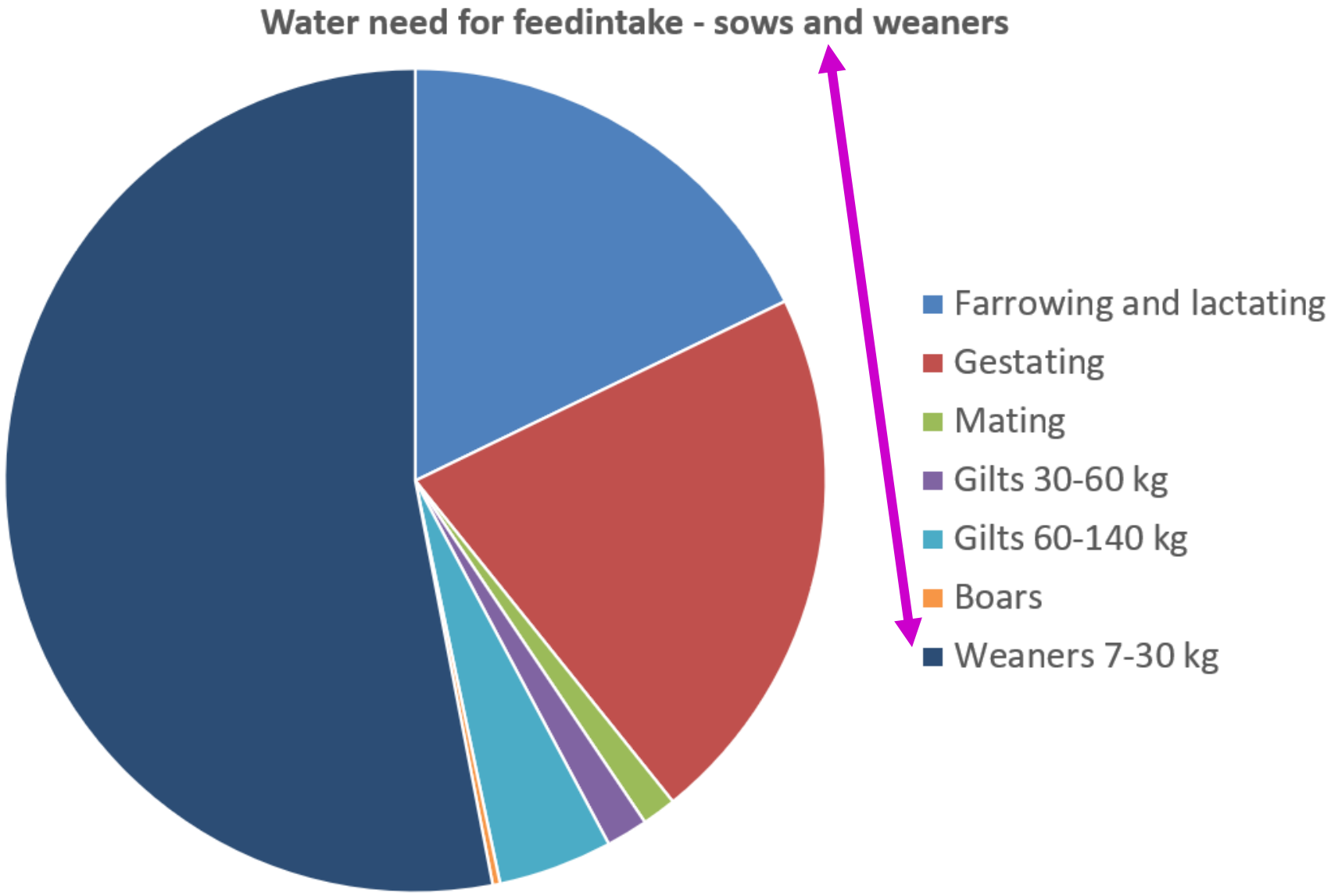
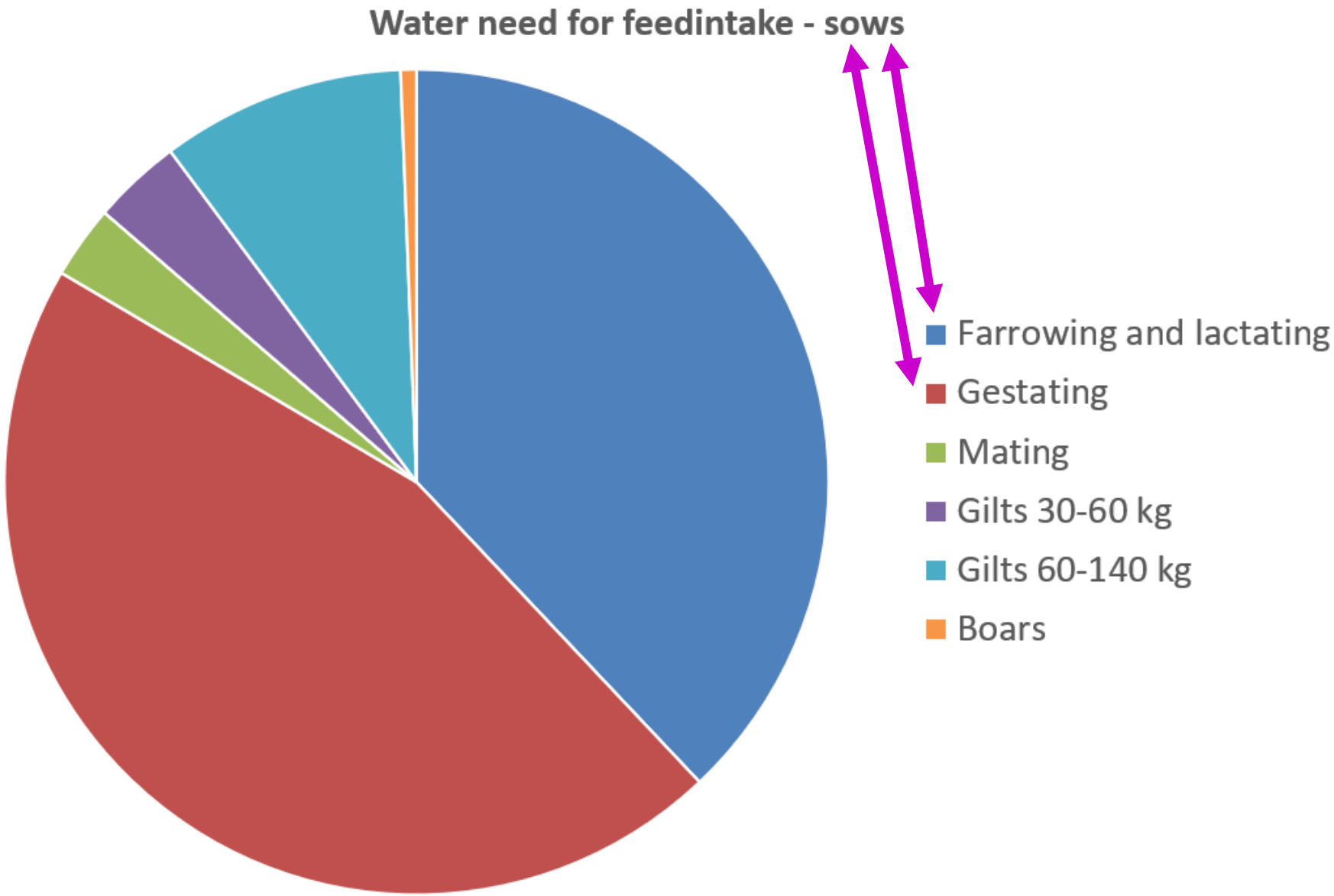
Water need for feed intake – sow and weaners



Water need for feed intake – sows



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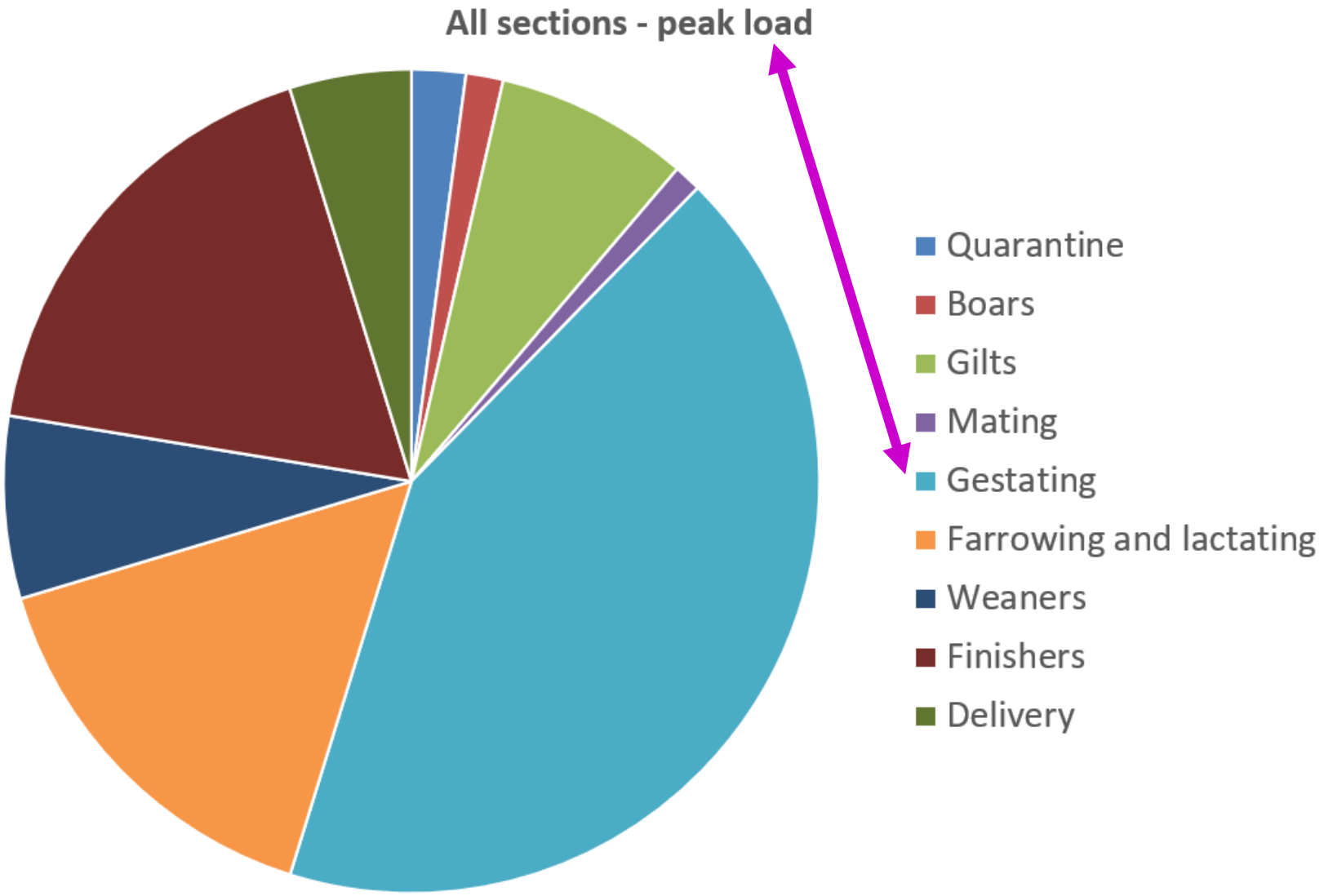
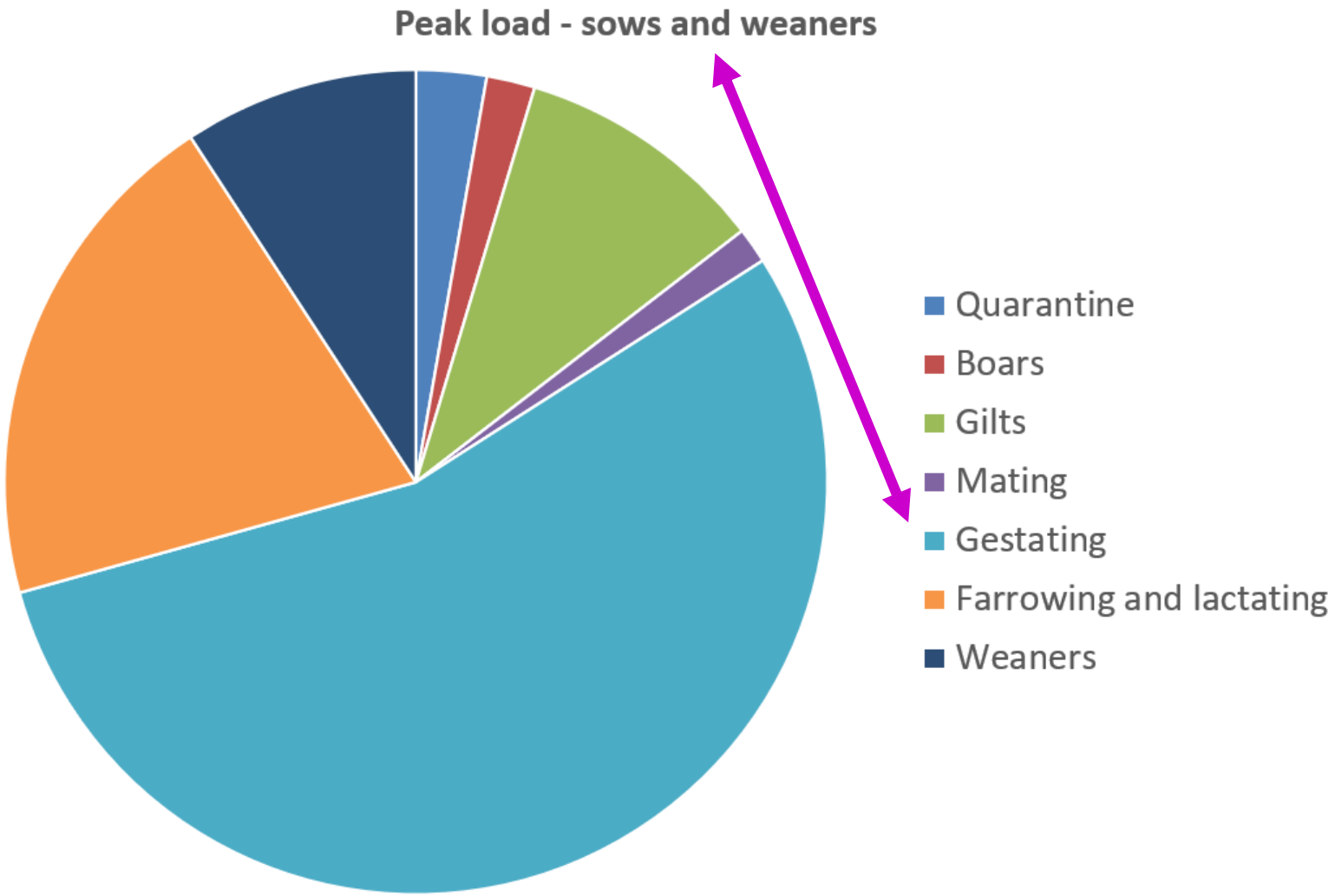
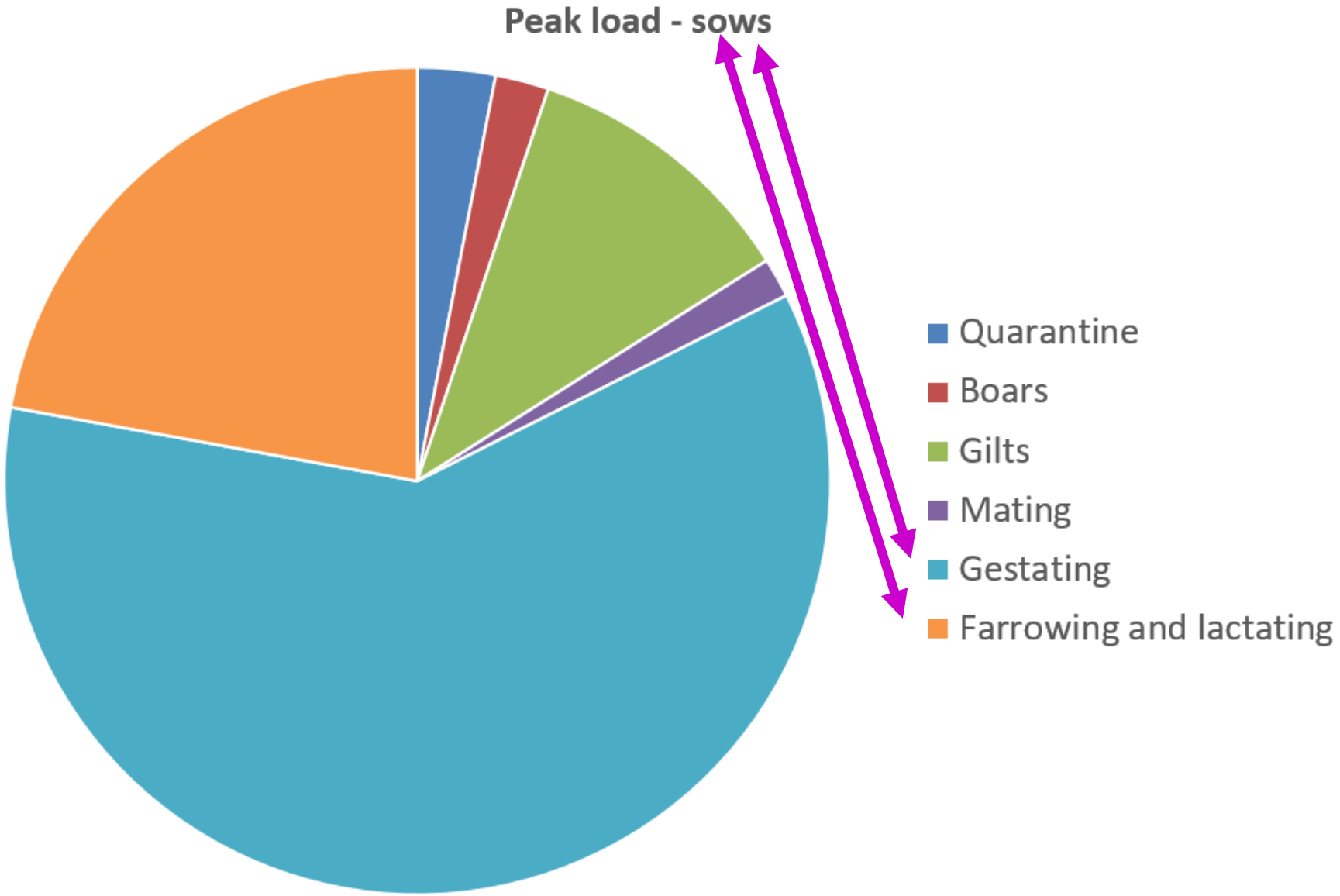
Distribution – pig groups – peak load



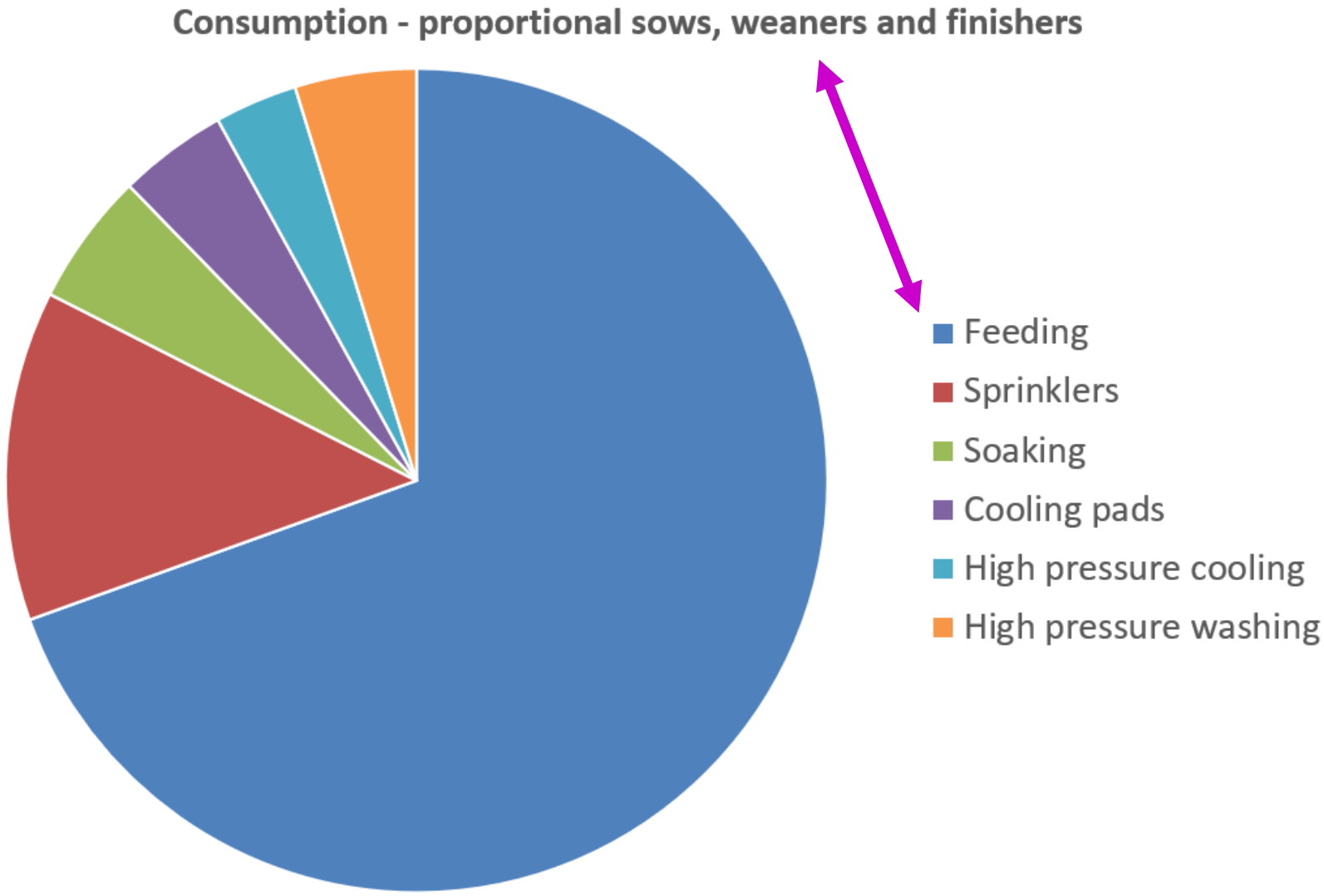
Distribution – pig groups – peak load



Distribution – pig groups – peak load

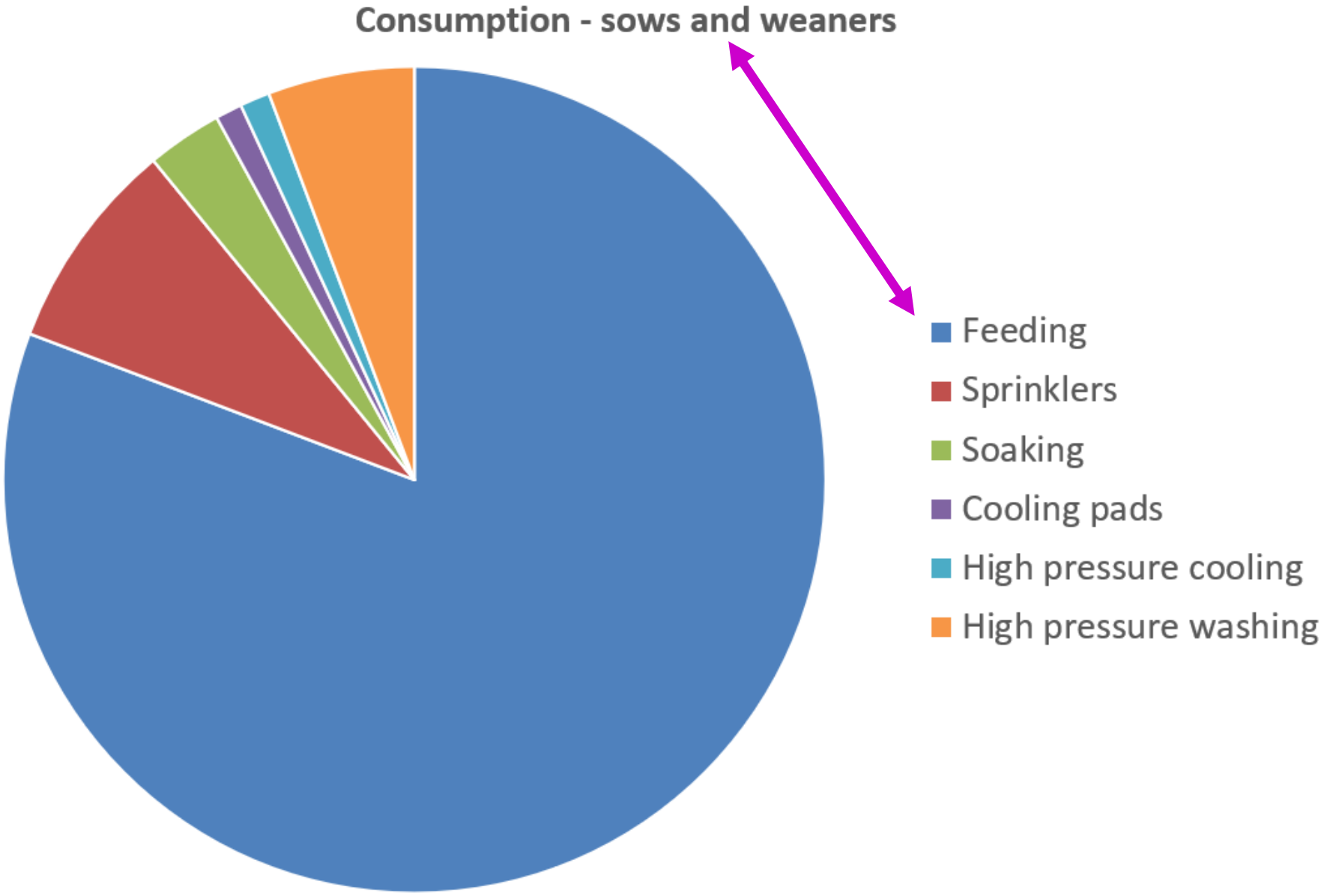


Distribution – consumption – peak load



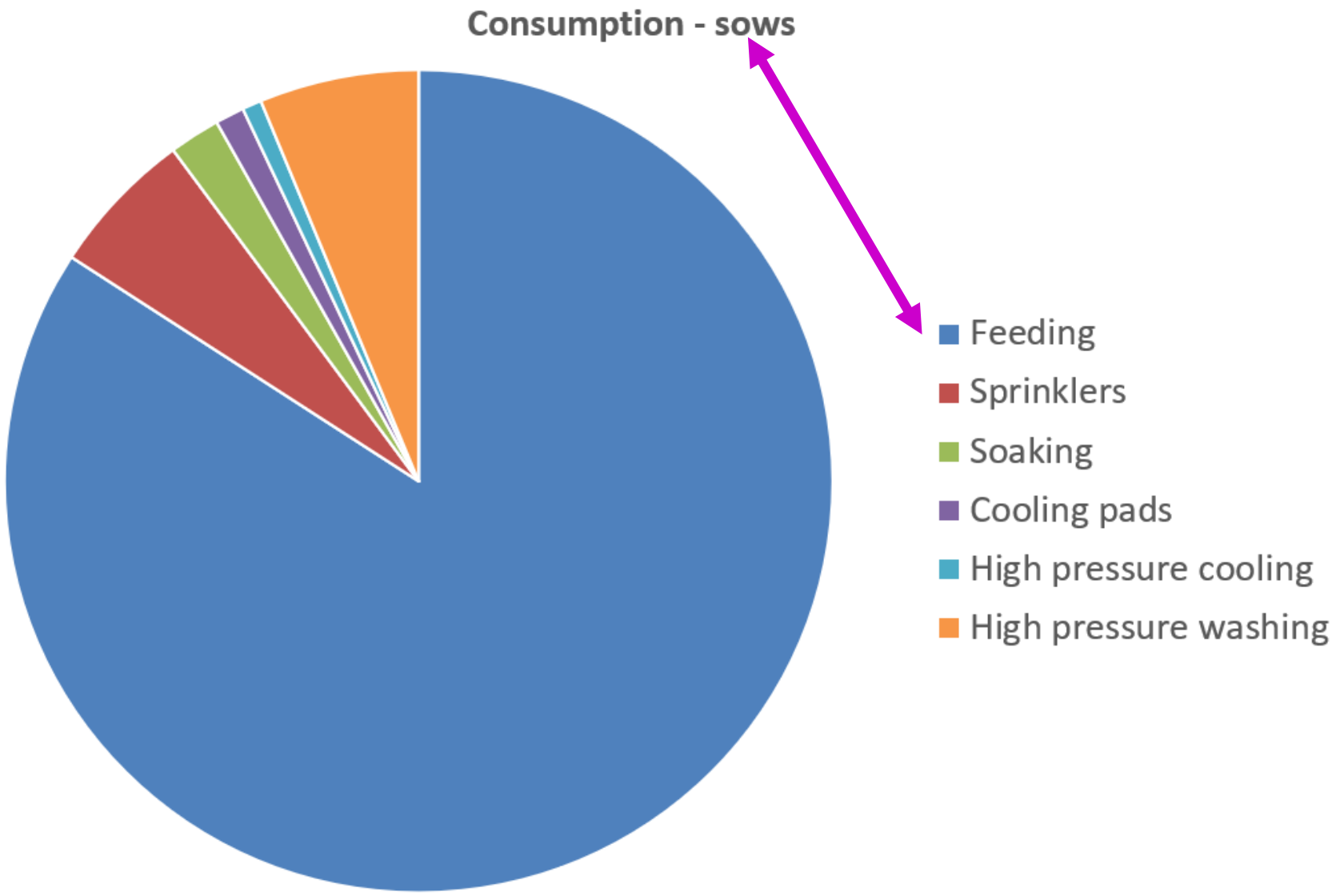
SEGES INNOVATION

Distribution – consumption – peak load



SEGES INNOVATION

Distribution – consumption - peak load



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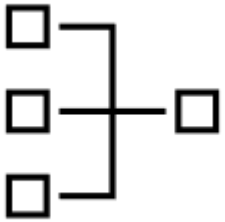
If the capacity is too low?

- **Thinking about the routines**
  - Do you need to soak when the sows are fed?
- **Which pigs need water at the same time?**
  - Gestation sows – if all are fed at the same time
  - Possibilities to divide the feeding of different sections?
- **Need for more water lines?**
- **Buffer tank**
  - Can a buffer tank cover soaking and or washing?
  - Can a buffer tank cover mixing of wet feed?




SEGES INNOVATION

Water quality

Why is water quality important?

- Drinking water is an important nutrient for pigs
- Clean and enough water.
- The quality must be OK – like for humans.

What to investigate?

- There are limits for nitrat, nitrite, ammonium, iron (*svineproduktion.dk*)
- It is important to know the level of germs and coliform bacteria
- In the following I will only talk about bacterial contamination.

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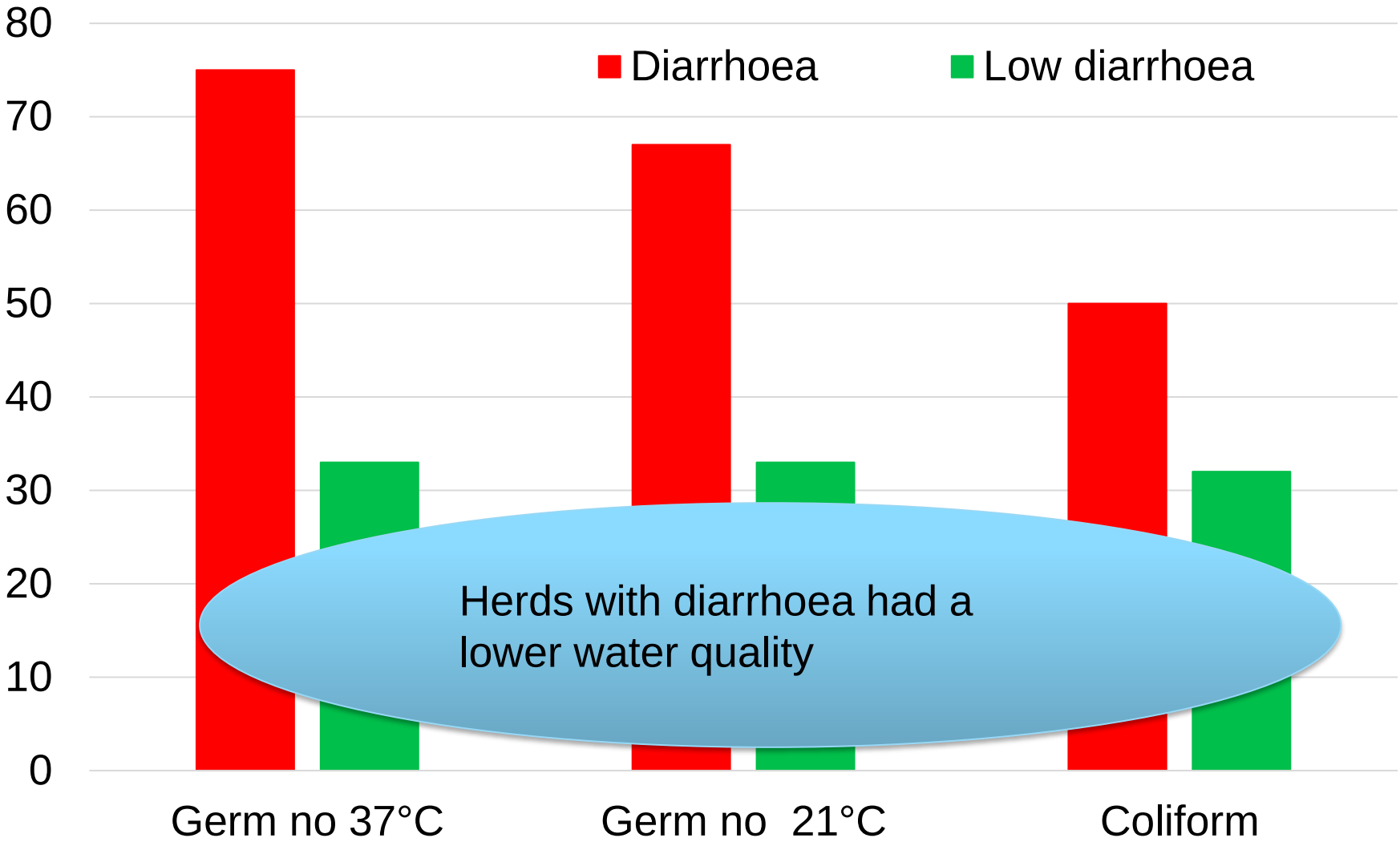
Earlier investigations – diarrhoea and water quality

- 21 he



NOTAT NR. 0223 (2002)

Clean water gave improved results – is your water system OK?

Changing the water system:
More direct flow
No blind ends – with “sleeping” water
Gave positive results and better effect of acids and medicine

Foto: Arkivfoto Foto: Søren Tobberup Hansen.

SEGES INNOVATION

Where is it a problem?

- Drinking water can often contain germs and in worst case colibacteria.
- Pigs are pigs.
  - They mess around in the manure and plays with the water pipes – they push bacteria in the water pipes.
- High temperature in the farrowing and weaner section = growth of bacteria.
- Small pigs have lower immunity - they do not need extra bacteria from the water.
- Sick pigs drink, they do not eat!

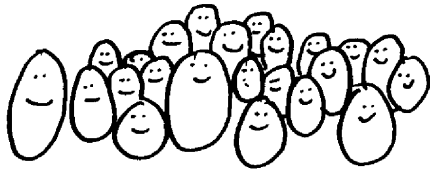
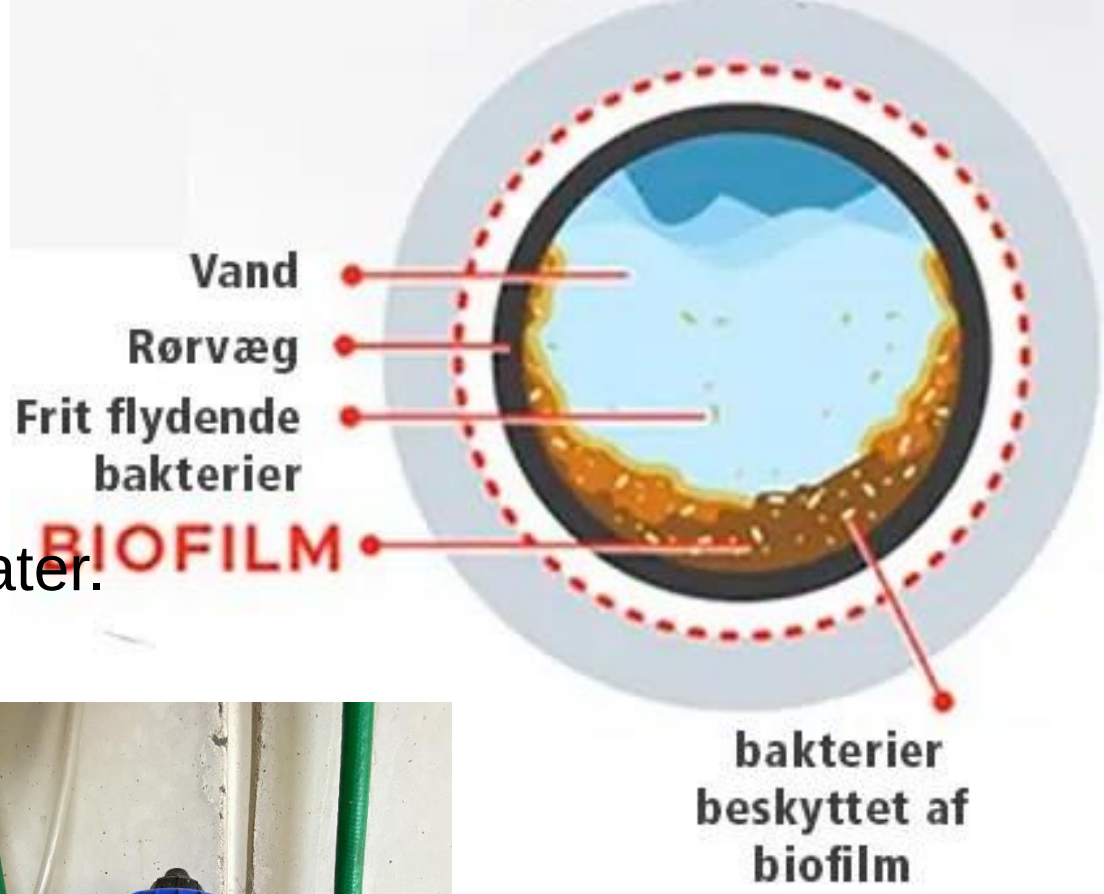


Foto: Hanne Maribo

Micro-/biofilm

- **Microfilm is built in the water pipes**
- Deposit and growth of bacteria.
- Microfilm reduces water flow.
- Stops drinking nipples.
- Risky when medicine & acids are given in the water.
  - NO blind ends.
  - Large flow.
  - Clean the pipes in the section between each batch.

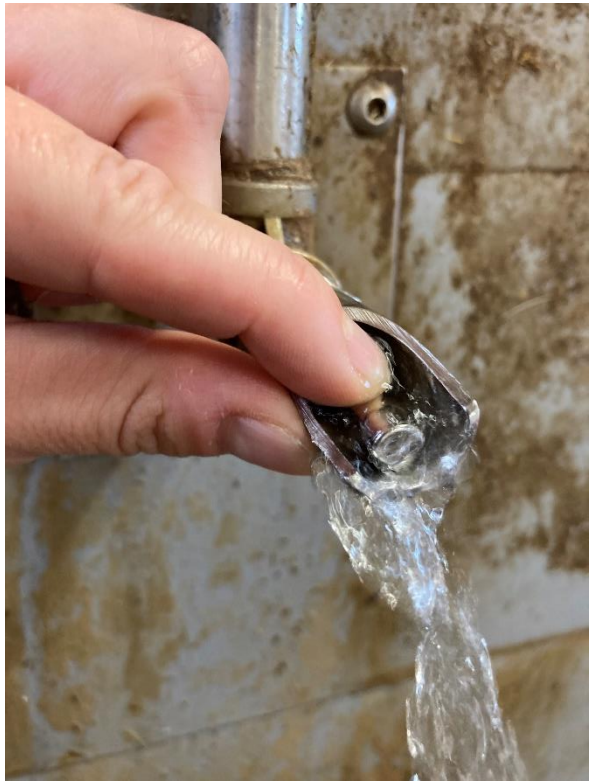


SEGES INNOVATION

Analysis of water quality

- Several methods:
  - *Test kit to be used in the stable.*
  - *Send water samples to an approved laboratory.*
  - *The price of analysis for germ and coli at an approved laboratory is approx. 450 kr.*
  - *Directions for sampling water can be found at Svineproduktion.dk*

- **Sampling where?**
- Where you have the smallest pigs and lowest water flow.
- Where the pigs drink.
- Eg. before insertion of the weaners.
  - After a week.
  - In the farrowing section – before the piglets starts to drink (7-10 days).



Analysis of water quality

Coli bacteria:

- Coli bacteria in drinking water = pollution with manure
- Coli bacteria in drinking water is no go!
- **< 100** coli bacteria pr. 100 ml OK to swim in.
- **>1000** no swimming.

Foto: Colourbox

Analysis of water quality

Germ no (in Danish: kimtal):

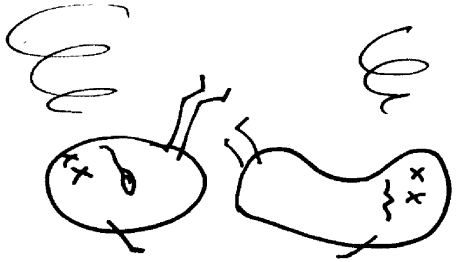
- Tells you how many bacteria there are in the sample but not which.
  - A high number of germs indicates pollution of the water with bacteria
- Harmless bacteria are naturally in the in groundwater and surface water.
- The law says that drinking water (local or central):
- Germ no (kimtal) ABOVE = 200 pr. ml – boil the water before you use it (human).
- **Values below 200 germs pr. ml not harmful for humans or pigs.**

SEGES INNOVATION

Foto: Colourbox

Earlier investigations EAW equipment (= *ECA-water*)

- EAW is produced from a saturated salt solution by “electrophoresis”
- Saltwater is split into two components:
  - **Anolyt** the activated solution with Cl-ions, hypochloric acid
  - **Katolyt** contains Na-ioner, not used.
- **Anolyt was added the drinkingwater for weaners**
  - Germs and coli bacteria was reduced to **null** at 10% EAW added.
  - Control: germs = 3500 - 2,8 mill pr. ml and >25 coli bacterias pr. ml.
- Pigs had a better productivity the first two weeks.

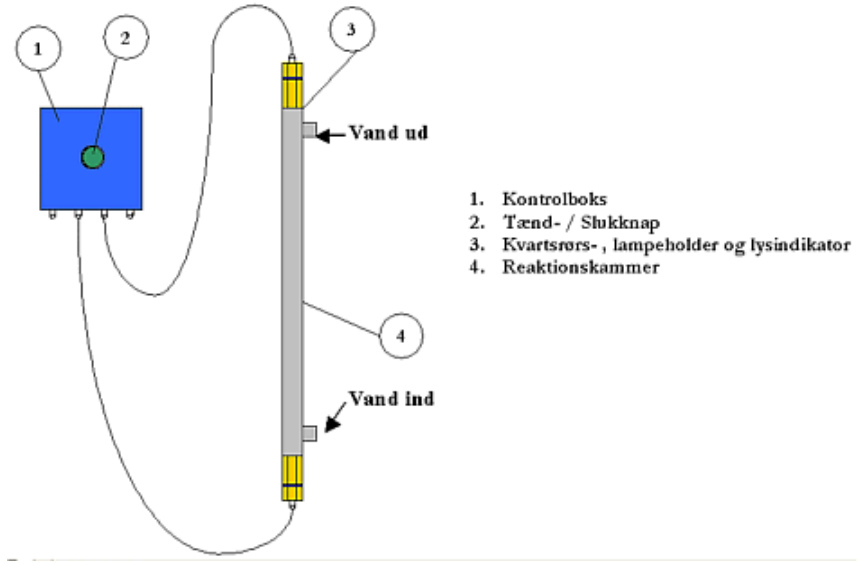


MED NR. 578(2002)

Foto: Hanne Maribo

Earlier investigations

- **Ben Rad** put on the central water supply. The water passes a ”pipe” and free hydroxyl radicals are made by a photo catalysis.
- Germ and coli was overall not affected very much.
  - The level of germs and coli bacterias, measured in the stable was high.
- Pigs having “Ben Rad” water had,
  - Higher water consumption
  - 3% higher productivity than control.
  - No difference in diarrhoea or mortality.



Meddelelse Nr. 637 (2004)

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Water cleaning other methods – not tested

- Chalk removers only remove chalk
- Hydrogene peroxide in low concentration (Equipment HP-now)
  - Not approved by the authorities yet (as biocide).
  - If installed - you need an approval from the DK environmental authorities.

  - And there are many others on the market!
    - Ask for documentation of the effect – possibly contact to other farms with the equipment.
    - And make sure if you need an approval from the authorities to be legal.

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Water cleaning & effect of antibiotics (Hemonic et. Al. 2020)

French test (2017)

- 6 types of antibiotics (Amoxicillin, Colistin, Tetracyklin, Tylosin, TMP (Trimetoprim), Sulfadiazin.
  - 1) concentrated solution
  - 2) solution for the pigs.

- Disinfection method of the water:
  - Electrolysed water (ECA-water),
  - Natrium hypochlorite
  - Hydrogen peroxide.

SEGES INNOVATION

Water cleaning & effect of antibiotics (Hemonic et. Al. 2020)

- Electrolysed water reduces the efficiency of all types of antibiotics with up to 52%.
  - Colistin and Sulfadiazine in concentrated solution reduced by 11 and 20%
- **Natrium hypochlorite** did not affect the activity of the tested antibiotics.
- **Hydrogen peroxide** reduced the activity of Amoxicillin (13% conc. and 11%)

Medication by the water pipes – must only be in clean water

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Farrow section

- A clean surface does not necessarily mean clean pipes.
- Water that does not move and the temperature is high.
- Newborn piglets do not drink water but they start after 7-10 days.
- Walk through the farrowing section approx. one week after farrowing and flush the pipes. Use a clothes peg.
- **BUT** the pipes must also be cleaned and flushed before insertion of the sows.

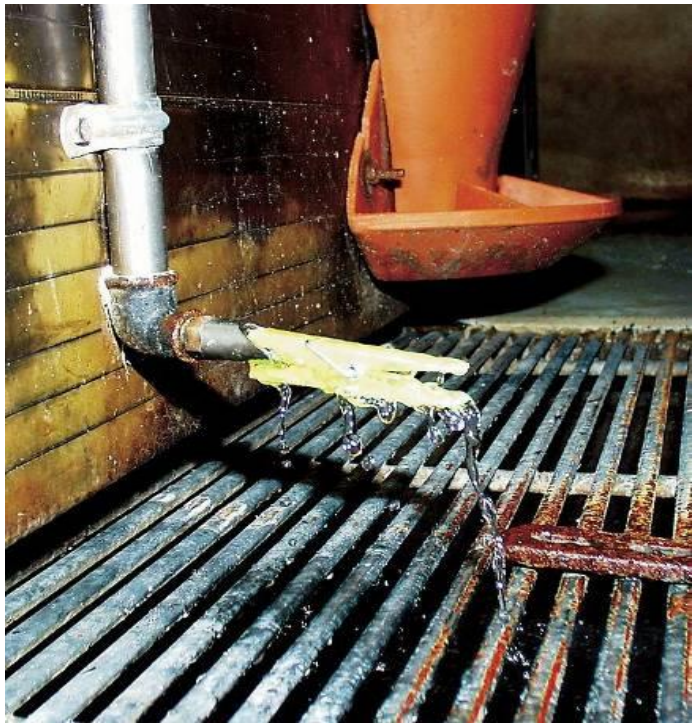

Foto: Hanne Maribo

SEGES INNOVATION

Weaner section

Dirt in the pipes - high temperatures and slow water flow.

- One of our technicians found that testing the water flow – it took 3-4 minutes before the water was cold – in a cleaned weaner section.
- **ALWAYS CLEAN THE PIPES AFTER CLEANING THE STABLES**

- Flush the pipes to get rid of the biofilm and dirt.
- Take off and clean the drinking nipples.
- Disinfect using e.g. the medicine-mixer.
- Use a colored disinfectant or add liquid color.
  - Then you can see when the disinfectant passes and leaves the system again.
  - If possible, leave the disinfectant in the pipes over night – and flush it out till you see no more color.
- AND then check the drinking nipples one more time (risk of more biofilm).

SEGES INNOVATION

How to clean the pipes?

Water cleaning equipments

- Today a lot of water cleaning equipment is offered. Most of thes
  centrally. You can buy or lease it. The equipment is exp
- Before investing - Ask for documentation for t
  has it already to hear about their exp
- I hear about:
- ”EAW”-equipme
  where installed.
- Equip
  der tecnology etc.

Cleaning the water centrally – is no guarantee for clean water for the pigs.

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Take home

- **The pigs need sufficient water.**
  - Can you eat dry oatmeal?

- **Water supply in the stable**
  - Is there flow enough to cover the need of all pigs?

- **Water quality**
  - Do you want to drink the water?
  - Medication only in water without additives.

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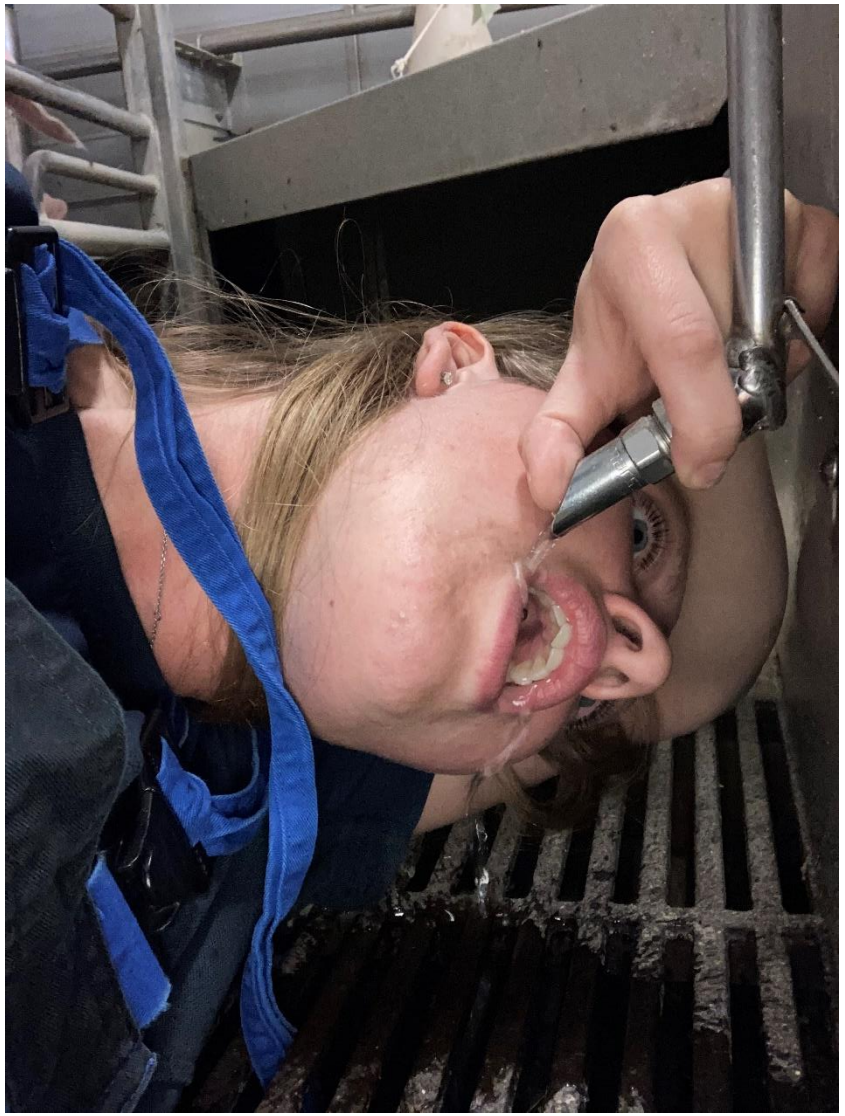
Water quality testing……..



Questions?

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