SEGES Innovation and Danish pig production

Agro Food Park 15

October 11, 2023

Karoline Blaabjerg, Chief Scientist, Livestock, Pigs

SEGES Innovation P/S

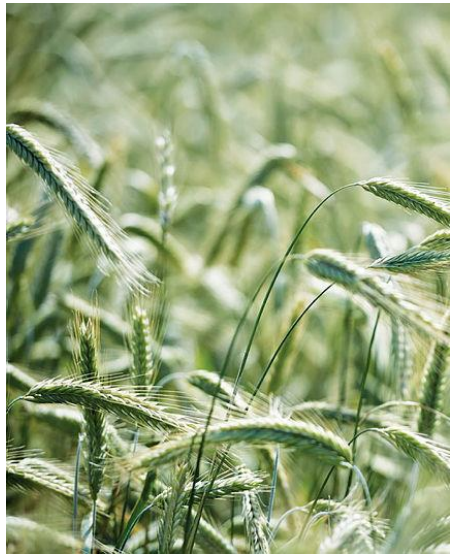
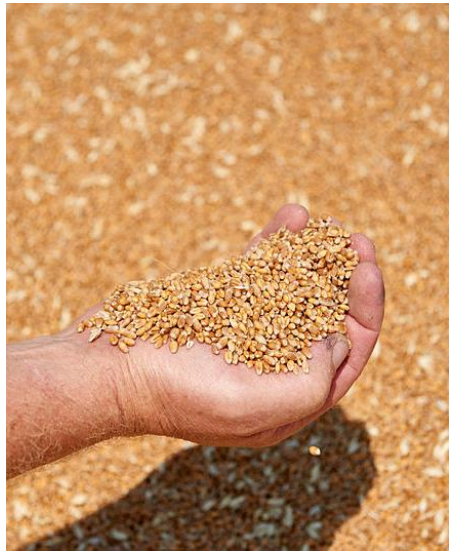
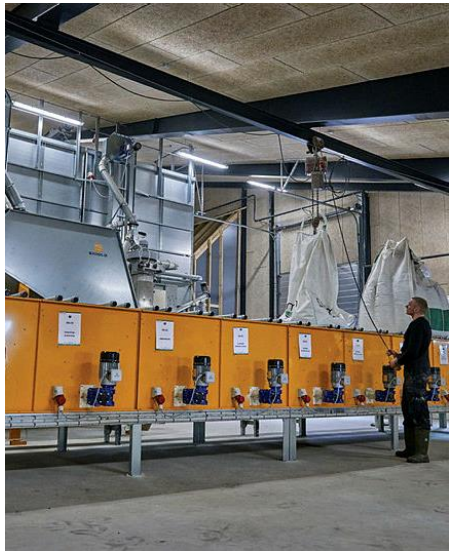
Agenda

- My background
- SEGES Innovation P/S
- Livestock Innovation, Pigs
- Danish Pig production

SEGES INNOVATION

My background

- Agronomist, Animal science
- Aarhus University, Pig Nutrition, Denmark
- Kopenhagen Fur, Mink Nutrition, Denmark
- SEGES Innovation, Pig Nutrition, Denmark


SEGES INNOVATION

SEGES Innovation P/S

- SEGES Innovation is an independent innovation company
  - We have been developing new knowledge and concrete solutions for sustainable food production for over 50 years.
  - We also translate our deep knowledge of agriculture and food into advanced software that paves the way for new possibilities.
  - Approximately 550 employees.








Who we are – our corporate video

SEGES INNOVATION

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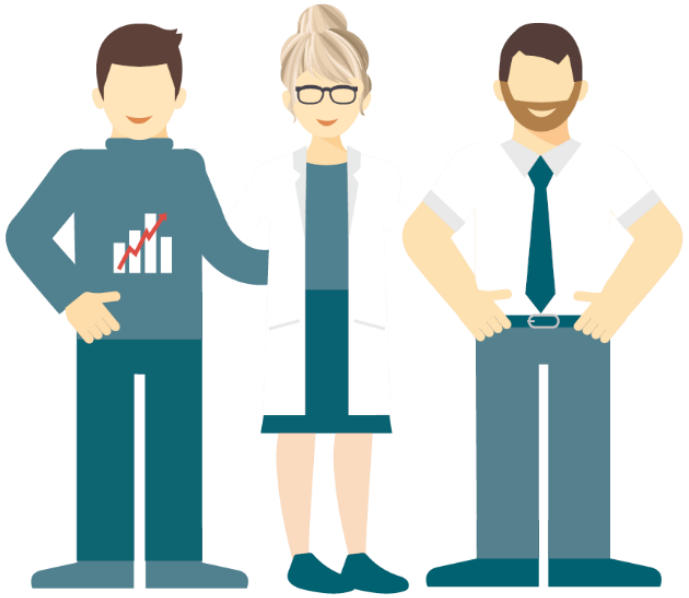
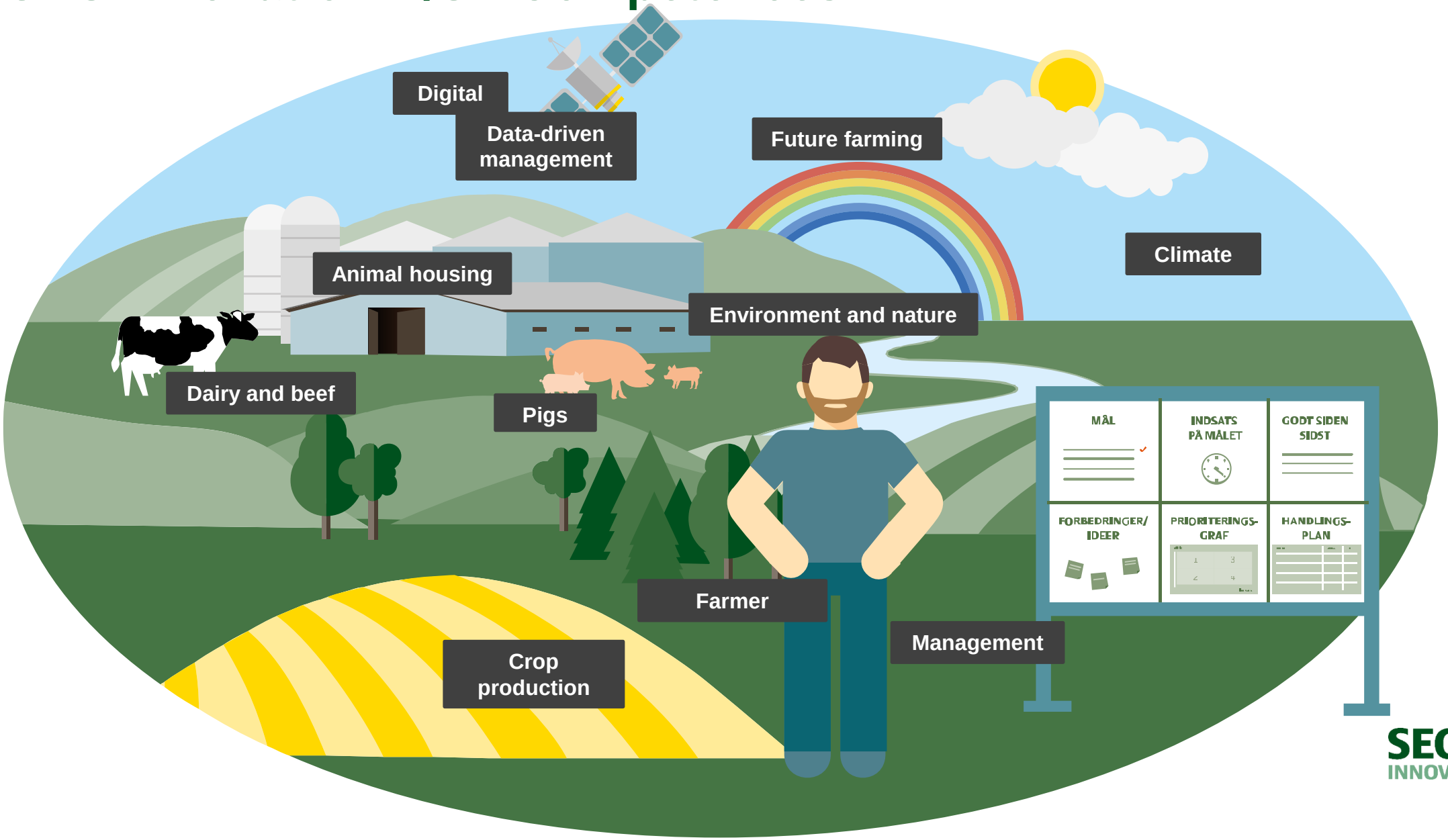
We connect science to practical farming



SEGES
INNOVATION

SEGES Innovation P/S - Competences



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SEGES Innovation – our values

- We come from many different educational backgrounds, but we all embrace a workplace culture founded on the values of courage, heart and depth.
- The gender distribution is even.
- The employee satisfaction rates high in annual reviews.

SEGES INNOVATION

Agenda

- My background
- SEGES Innovation P/S
- **Livestock Innovation, Pigs**
- Danish Pig production

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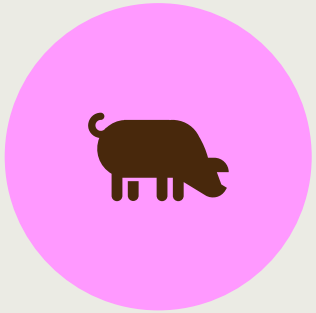
Livestock Innovation, Pig

CATTLE



PIGS

POULTRY

HORSES

SEGES INNOVATION

SEGES Innovation P/S

Innovation Departments

- **Livestock** → **Livestock (115 employees):**
  - **Pigs** (52 emp.)
    - Nutrition
    - Environment
    - Management and housing
    - Health
  - **Dairy and beef** (46 emp.)
    - Health & production
    - Breeding
    - Milk quality
  - **Horses** (16 emp.)
    - Registration and advisory
  - **Poultry** (1 emp.)
- Crops and environment
- Climate and sustainability
- Economy and management

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SEGES Innovation

Livestock, pigs:

Projects within:

- Feeding & nutrition
- Environment
- Climate and sustainability
- Reproduction
- Management
- Pig health
- Pig welfare
- Equipment
- Housing design

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SEGES Innovation –Research station Grønhøj

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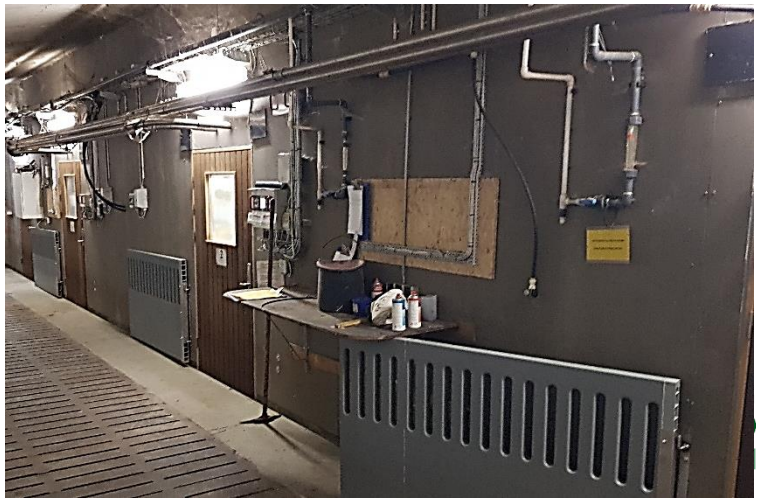
SEGES Innovation P/S – Facilities (Pig)

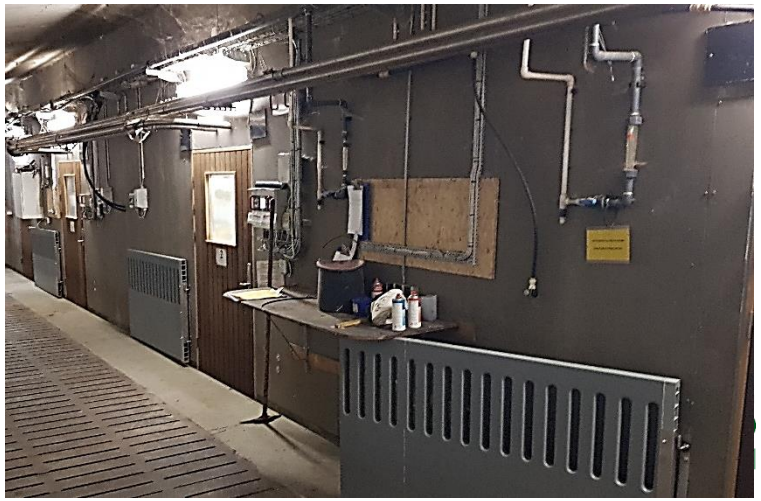
- **Research station Grønhøj**
  - Postweaning pigs **(≈1400 pigs)**
  - Growing and finishing pigs **(≈2100 pigs)**
  - Emissions (NH_4 and GHG) **(18 chambers)**
  - Digestibility (Ileum and total tract)



SEGES Innovation P/S – Facilities (Pig)

- **Research station Grønhøj**
  - Postweaning pigs **(≈1400 pigs)**
  - Growing and finishing pigs **(≈2100 pigs)**
  - Emissions (NH_4 and GHG) **(18 chambers)**
  - Digestibility (Ileum and total tract)

- **On-farm testing - commercial farms are test hosts**
  - Sows
  - Suckling piglets
  - Postweaning pigs
  - Growing and finishing pigs



Research station Grønhøj: Ileal digestibility

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Focus on implementation of new knowledge in practice - Two-level advisory system

Research & Development

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DIRECT information (Congress, seminars, website etc.)

Advisors

DLBR (Danish Agricultural Advisory Service)

Vet Practices

Companies (slaughterhouses, feedstuffs, farm technology etc.)

Pig producers

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SEGES Innovation P/S – Pig Nutrition group

Funding

- **Danish Pig Levy fund**
  - Farmers – production tax
  - Activities for the benefit of pig producers
  - Supplement from Agricultural fund - Promille levy fund (toll/taxes, Government)
- **Other national and international funds**
- **Commercial activities**

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Some examples of activities funded by

SUPPORTED BY

Danish Pig Levy Fund

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SUPPORTED BY

Danish Pig Levy Fund

SEGES INNOVATION

33rd edition

Updated 28 April 2023

DANISH NUTRIENT STANDARDS

Per Tybirk, Niels Morten Sloth & Karoline Blaabjerg

SEGES Innovation P/S

SUPPORTED BY

Danish Pig Levy Fund

Main conclusion

Tryptophan standards for pigs up to 15 kg are raised from 21 to 23% of lysine. Lysine standards for growers and finishers are raised by 0.2 g/FUgp, and standards for digestible protein and valine are lowered. Iodine standards are raised for all pigs.

Revisions in 33rd edition

The **tryptophan:lysine ratio** is raised from 21 to 23% for weaned pigs up to 15 kg following results of a recent trial. The remaining standards for amino acids and protein are unchanged.

The **valine:lysine ratio** is lowered from 67 to 64% for growers and finishers and amino acid:protein recommendations are raised corresponding to an increase of 0.2 g digestible lysine and a reduction of 2 g digestible crude protein per FUgp – though only in diets with lysine standards below 9.5 g/FUgp. This is based on results of a recent trial and is the standard that generates the optimum economy at the current protein and amino acid prices and leads to a slight reduction in ammonia emissions.

The **standards for feed for pigs for the UK market and other specialised productions** no longer apply as average lean meat percentage is now so high that with the current payment models there is no benefit in adding extra protein.

The **iodine standards** are raised from 0.2 mg/FUgp for all pigs to 0.3 mg/FUgp for weaned pigs and finishers and to 0.5 mg/FUsow for gestating sows and to 1.0 mg/FUsow for lactating sows. The extra iodine is a cheap insurance and with the new recommendations iodine supply will be sufficient in feed containing up 10% rapeseed products. It is recommended to increase iodine by 50% in feed containing more than 10% rapeseed products.

The Danish feed evaluation system

The Danish feed evaluation system is based on the physiological energy value of nutrients and on the standardised digestibility of these nutrients. In 2002, the old feed unit was replaced by two new feed units: FUgp (feed units for weaned pigs, growers and finishers) and FUsow (feed units for sows).

Energy evaluation in Denmark is based on:
1. Chemical analyses of water, ash, crude protein and crude fat
2. In vitro digestibility at ileal level and faecal level
3. Energy values of nutrients based on 'potential physiological values'.

The protein evaluation system is based on the standardised ileal digestibility of each amino acid.

Table 3. Nutrient standards - finishers.

Feed conversion, 30-115 kg	Weight interval						
< 2.6 FEsv / kg gain	**30-115**	45-115	60-115	75-115			
2.6-2.75 FEsv / kg gain	30-75	**30-115** 45-75	45-115	60-115	75-115		
> 2.75 FEsv / kg gain	30-60	30-75	**30-115** 45-75	45-115	60-115	75-115	
Standards for digestible protein and digestible amino acids, g per feed unit							% of lysine
Lysine	**8.6**	**8.2**	**7.9**	**7.6**	**7.3**	**7.1**	100
Methionine	2.6	2.5	2.4	2.3	2.2	2.1	30
Methionine +cystine	5.0	4.7	4.6	4.5	4.3	4.3	58-61
Threonine	5.6	5.4	5.2	5.0	4.9	4.8	65-67
Tryptophan	1.72	1.64	1.58	1.52	1.46	1.42	20
Leucine	4.6	4.3	4.2	4.0	3.9	3.8	53
Valine	8.6	8.2	7.9	7.6	7.3	7.1	100
Isoleucine	2.8	2.6	2.5	2.4	2.3	2.3	32
Phenylalanine +tyrosine	4.6	4.4	4.3	4.1	3.9	3.8	54
Histidine	8.6	8.2	7.9	7.6	7.3	7.1	100
Arginine minimum	5.5	5.2	5.1	4.9	4.7	4.5	100
	125	120	116	112	108	105	64
Macro mineral standards, g per feed unit							
Phosphorus	2.4	2.3	2.2	2.1	2.0	2.0	
0-100% phytase	7.2	7.0	6.8	6.7	6.6	6.6	
150% phytase	6.7	6.5	6.3	6.2	6.1	6.1	
200% phytase	6.4	6.2	6.0	5.9	5.8	5.8	
	6.2	6.0	5.8	5.7	5.6	5.6	
	1.6	1.5	1.5	1.4	1.3	1.3	
	2.7	2.5	2.5	2.3	2.2	2.2	
	2.5	2.5	2.5	2.5	2.5	2.5	
table 5	0.7	0.7	0.7	0.6	0.6	0.6	

d unit if 0-100% phytase.

Finishers

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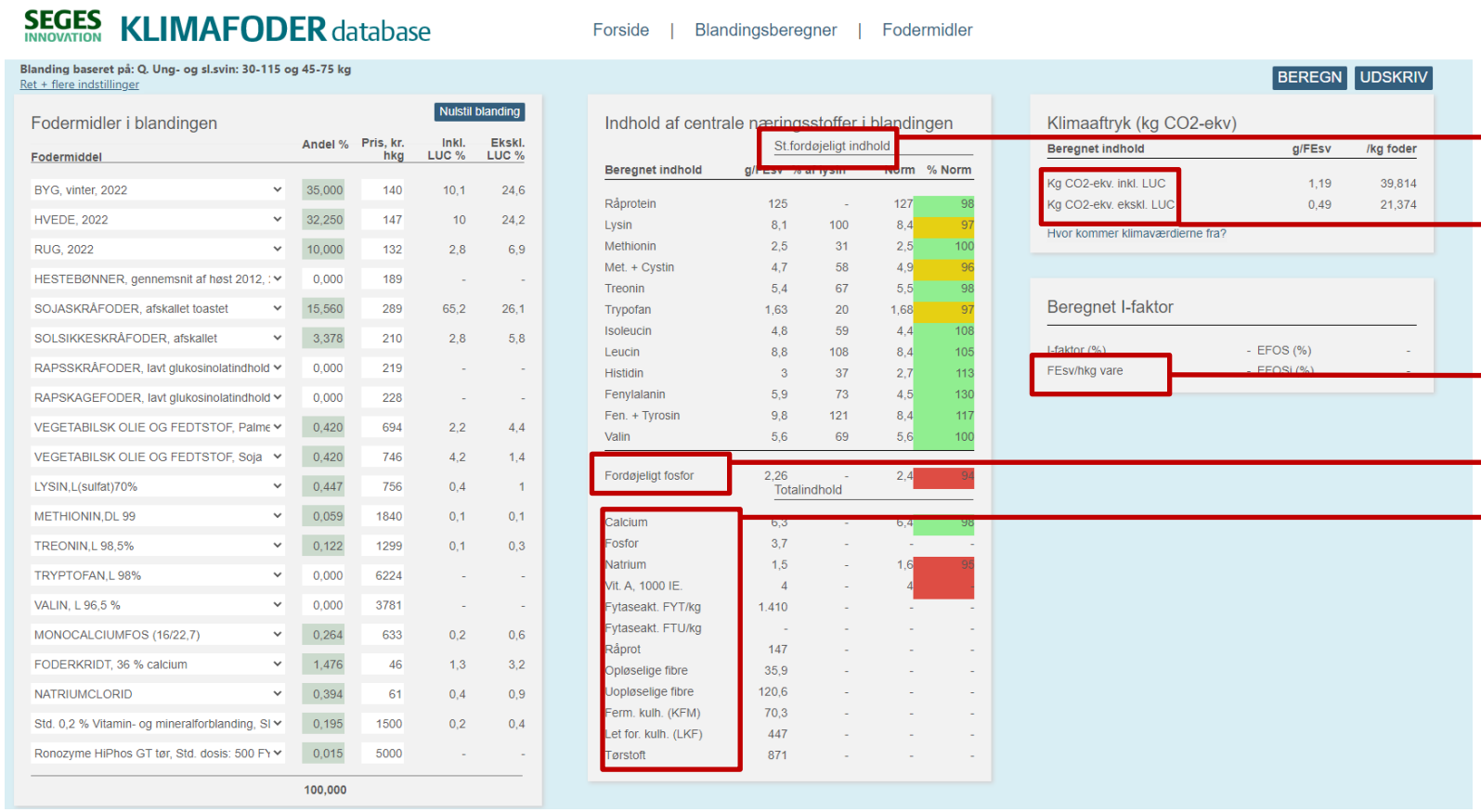
SEGES Innovation P/S – Pig Nutrition

SUPPORTED BY
Danish Pig Levy Fund

- **Online feed table** www.klimafoderdatabase.dk



Standardized ileal digestible content: Protein and essential amino acids

Climate impact: CO_2e

Energy content: Danish Feed Units

Digestible content: Phosphorus

Content of other nutrients and nutrient fractions

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Weaning piglets without the use of high levels of zinc

- Due to environmental concerns, the European Commission decided to ban the use of high levels of zinc (2500 mg Zn/kg feed) from June 2022.
- The use of zinc must then be limited to a maximum level of 150 mg/kg feed.
- Feeding piglets 2500 mg Zn/kg postweaning reduces diarrhea by 50%.
- Several activities have focused on how to phasing out the use of high levels of zinc (2500 mg Zn/kg) postweaning with out increasing the use of antibiotics.

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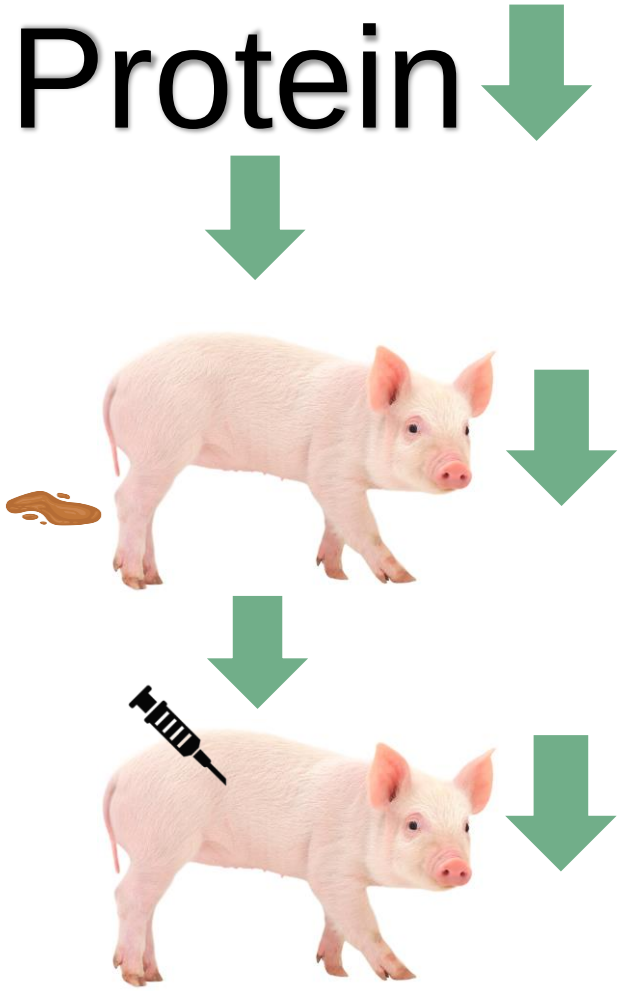
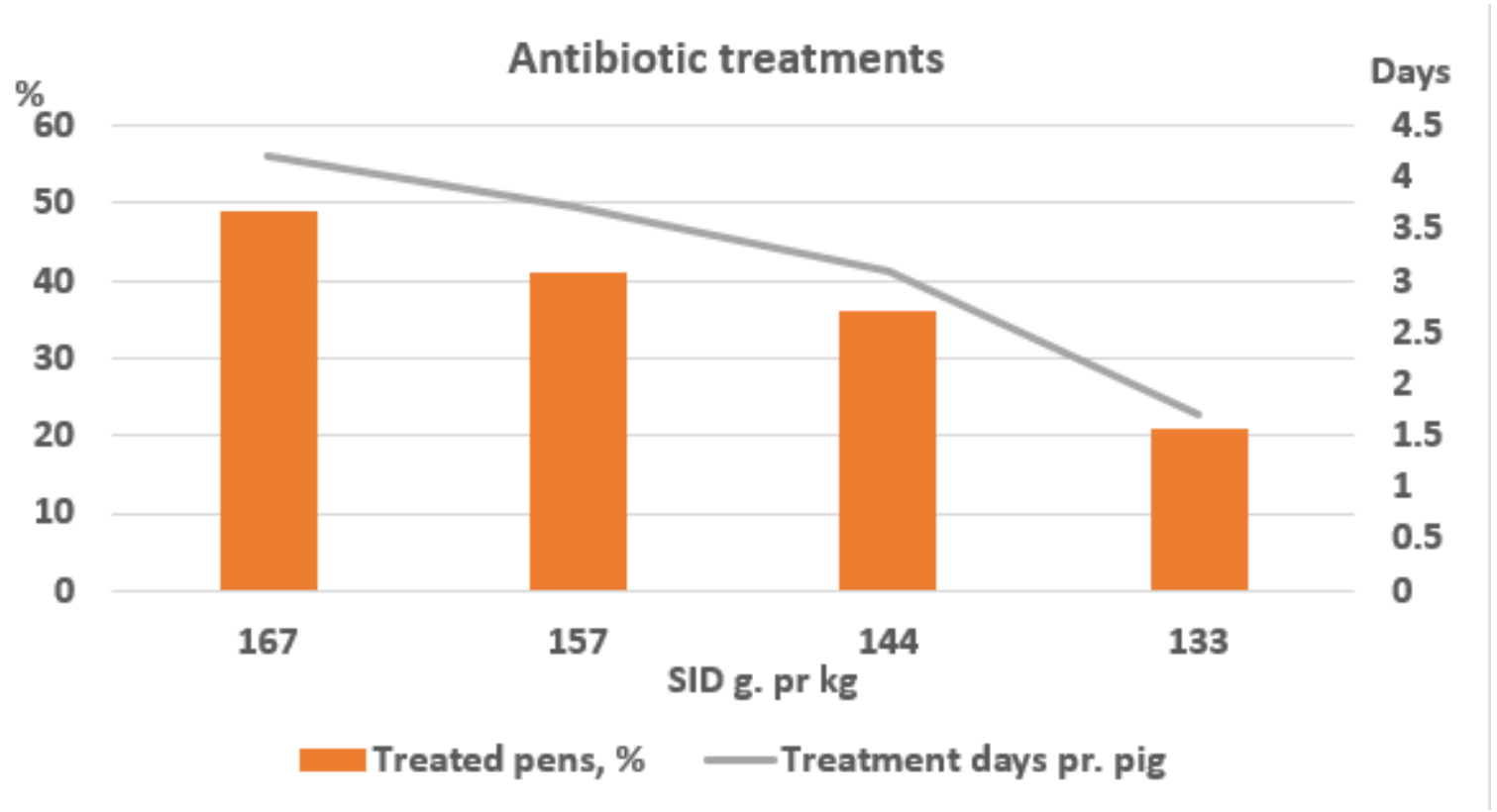
Less protein => less diarrhea

- Low protein diets reduce diarrhea and thereby antibiotic treatments, but low protein diets also reduce daily gain.





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Medd. 1175, Kjeldsen N.J, Lynegaard J., Bache J.K. 2019 Link
Medd. 1203, Kjeldsen N.J, Grove S.S., Bache J.K. 2020 Link

Experiment 3

- 4 levels of protein

H = High
M = medium
L = low
LL = very low

- 5 levels of added amino acids
  - Including lysine, methionine, treonine, tryptofane and valine
    - 100% = level of international standard for the five amino acids
    - >100% = above the international standards for the five amino acids

- Lysine / leucine is an indikator of level of all 5 amino acids compared to leucine

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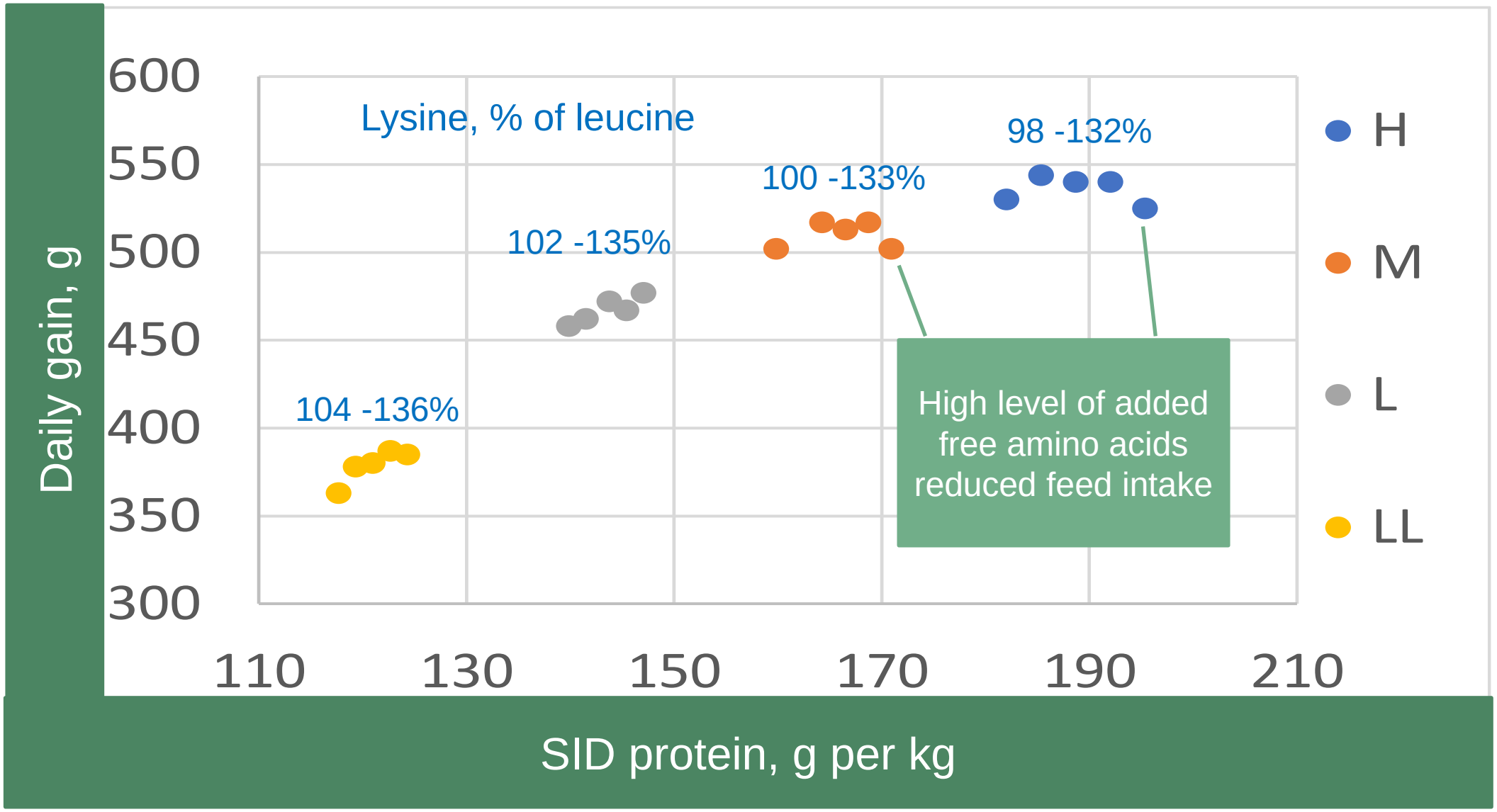
Daily gain, experiment 3



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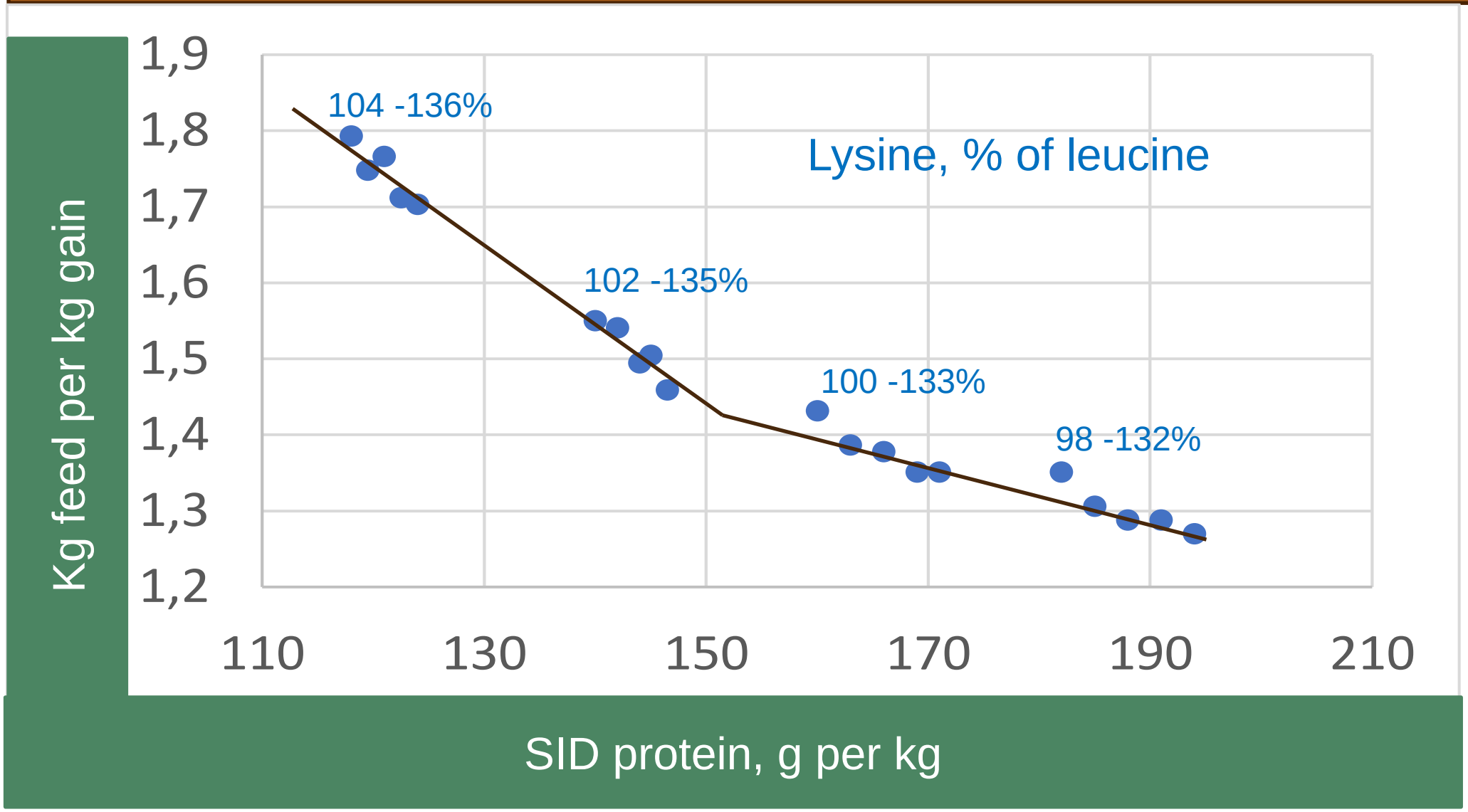
Feed conversion as function of digestible protein, exp. 3



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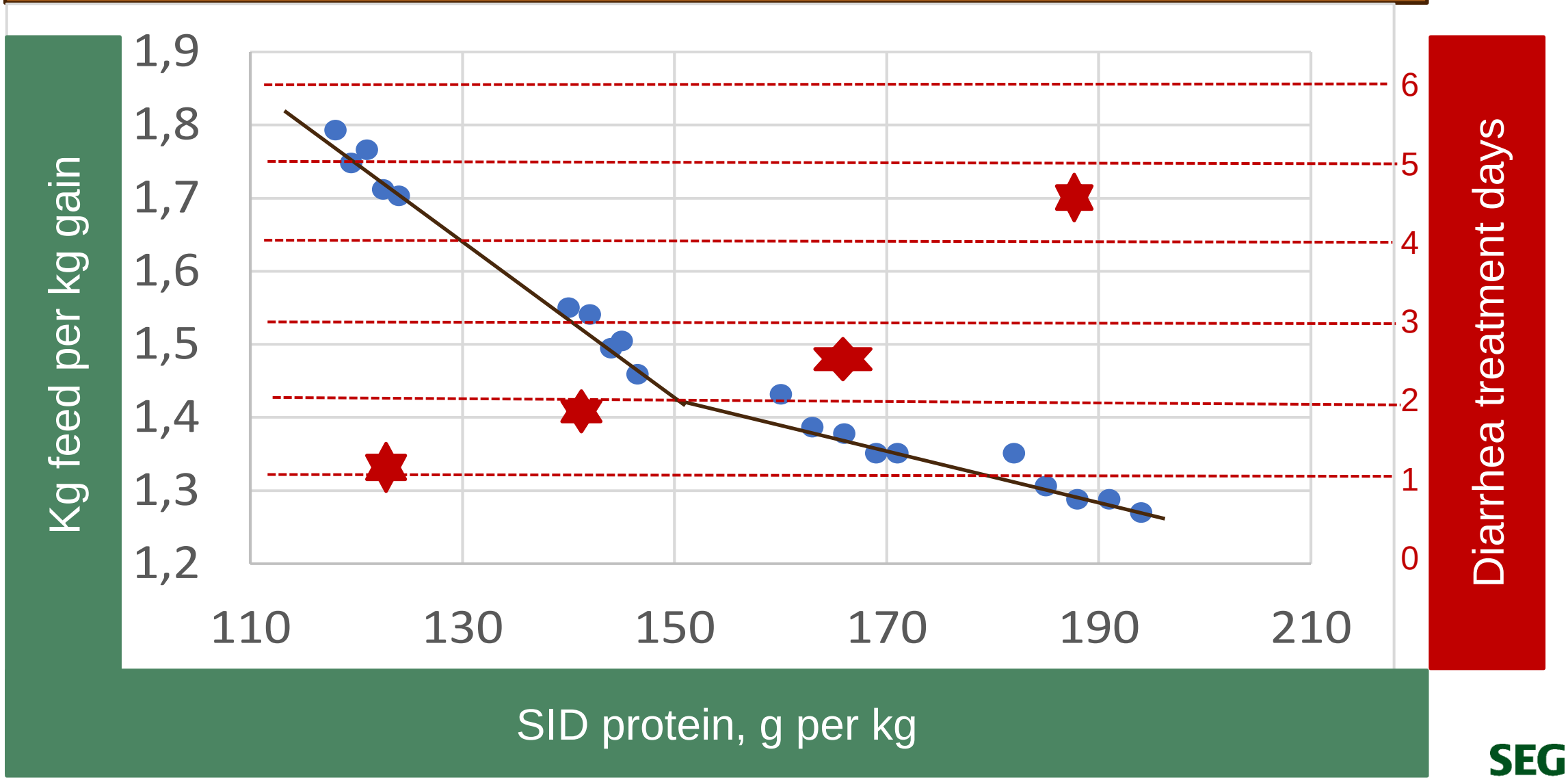
Feed conversion + diarrhea as funktion of digestible protein, exp. 3



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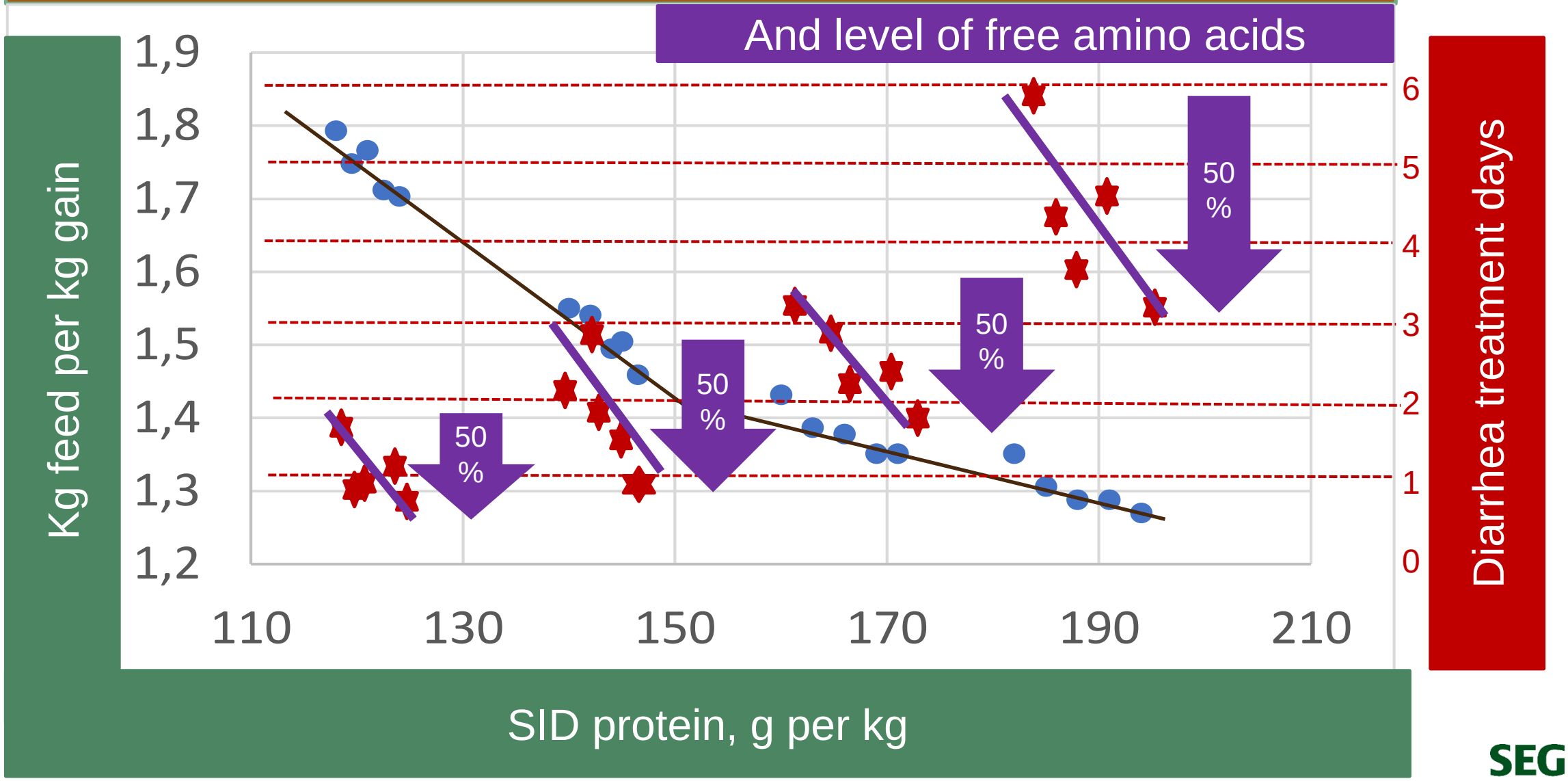
Feed conversion + diarrhea as funktion of digestible protein



SEGES INNOVATION

Agenda

- My background
- SEGES Innovation P/S
- Livestock Innovation, Pigs
- **Danish Pig production**

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Danish Pig production (In broad terms)

- **Farm**
  - Family-owned
- **Feed company**
  - Cooperative
- **Slaugtherhouse**
  - Cooperative

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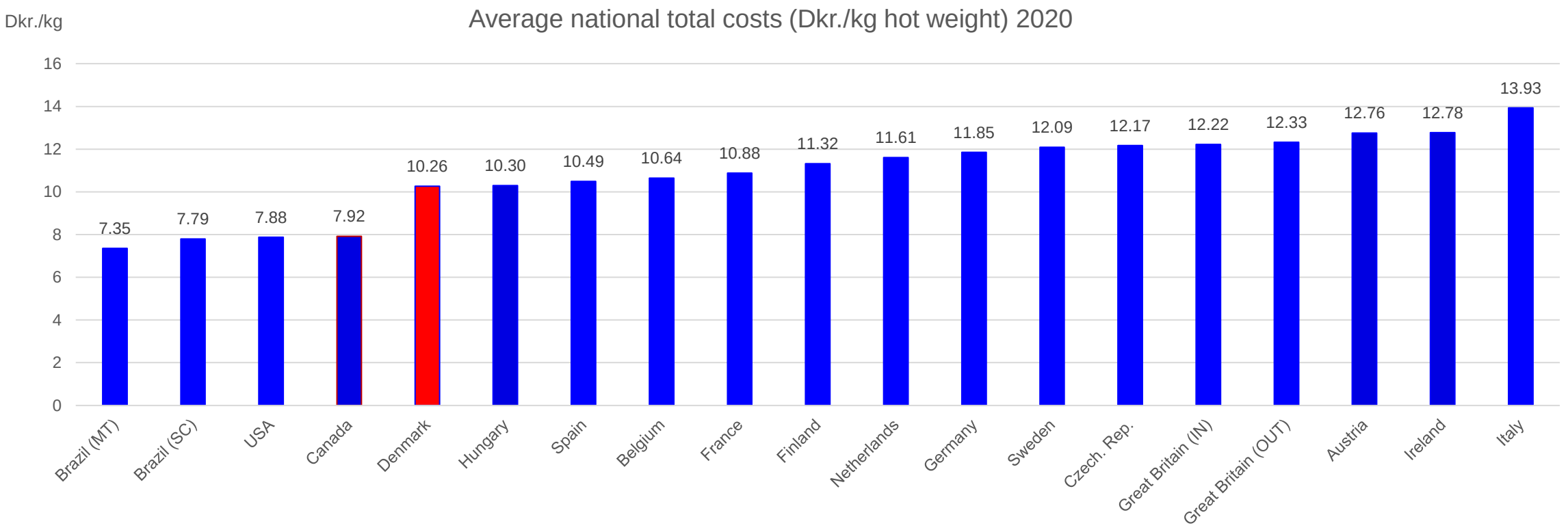
Danish pig production (2022)

- **Pig production in Denmark:**
- **2,400** pig producers
- **31.8** Mio. pigs produced
- **14** Mio. live pigs exported
- **95**% of Danish pig meat is exported to 128 countries

- **Denmark:**
- **6** Mio. people
- **60**% of the land is farmland
- **1/3** the area of Illinois

Source: Danish_Agriculture_&_Food_Council (2023). "Statistics 2022 - Pig meat." Danish agriculture & Food Council.

Average national total costs (DKK/kg hot weight) 2020 (InterPIG 2020)



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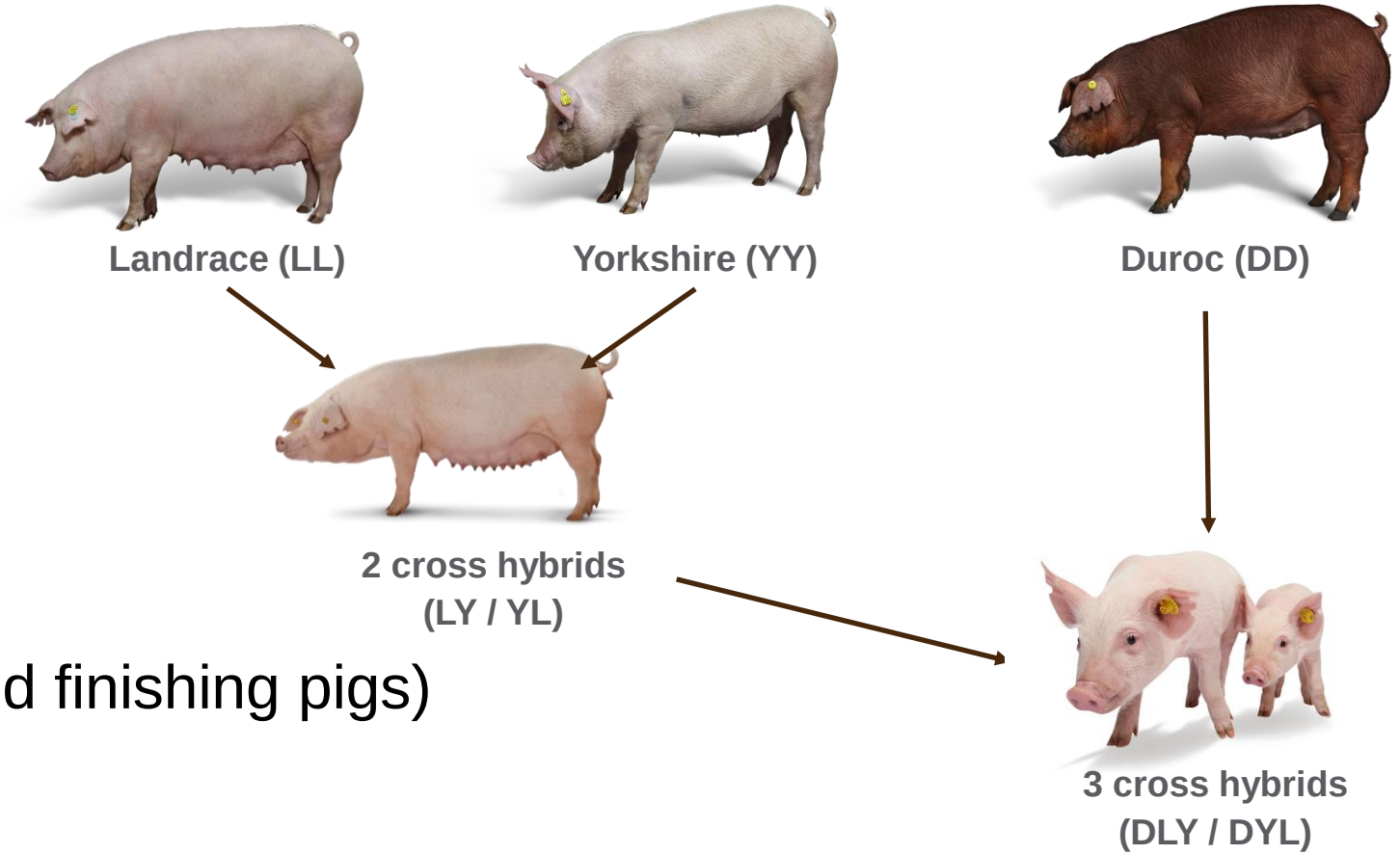
Danish pig production

Common used genetics

- Nucleus herds
  (≈ 30 herds)
- Multiplication
  (≈ 31 herds)
- Production herds
  (≈ 2400 herds, sows, grow and finishing pigs)



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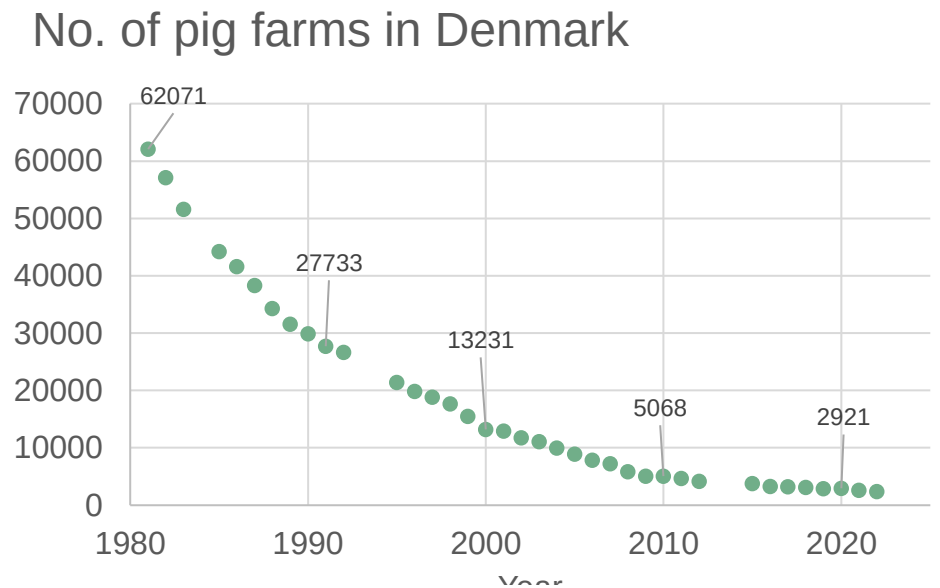
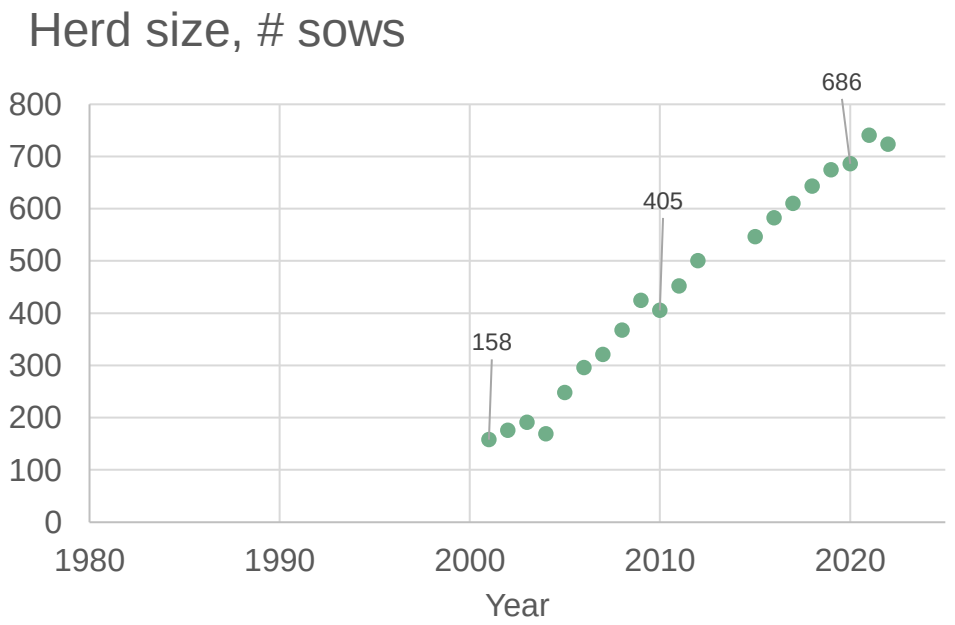
Danish pig production (2022)

- **≈ 2400** pig farms
- **≈1300** sow herds
- **≈ 720** sows (Average herd size)





Sources: Danish_Agriculture_&_Food_Council (2023). "Statistics 2022 - Pig meat." Danish agriculture & Food Council.
Hansen, C. (2023). "Landsgennemsnit for produktivitet i produktionen af grise i 2022. SEGES Svineproduktion, Axelborg, København, Danmark."

SEGES INNOVATION

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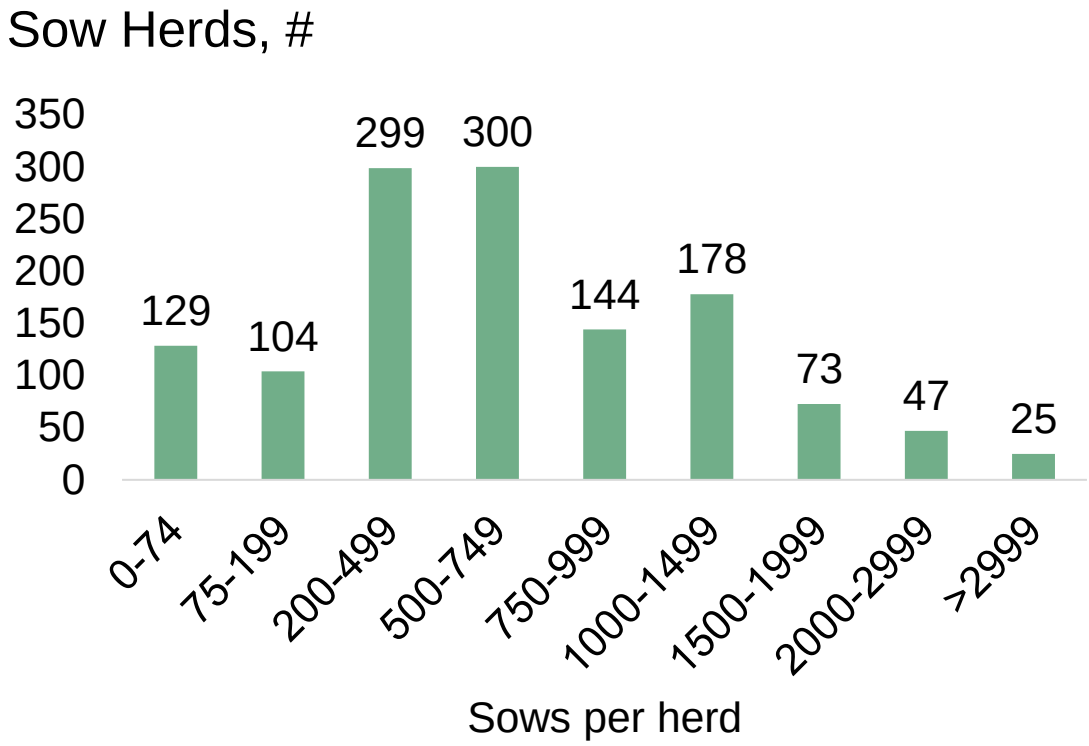

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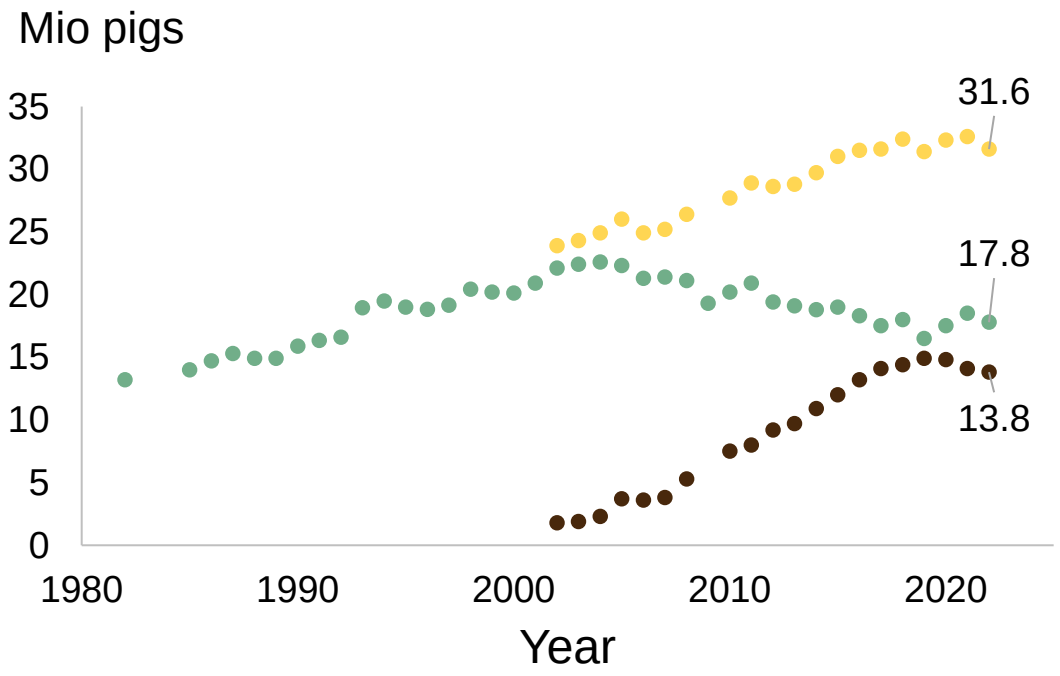
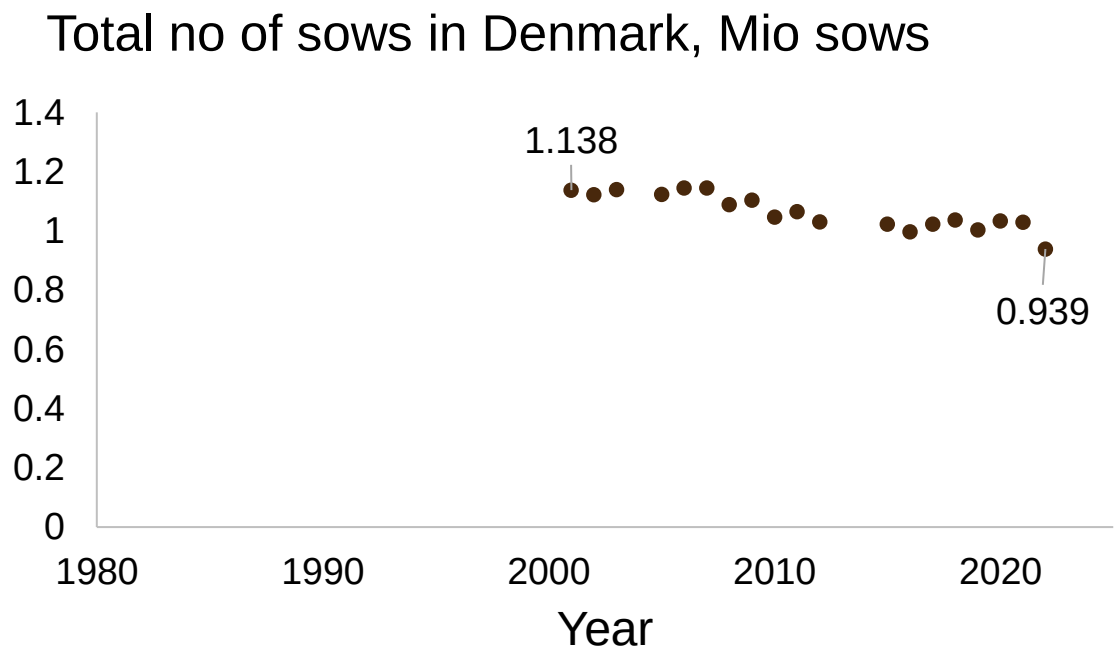
Danish pig production (2022)





- Slaugthered pigs
- Export of live pigs
- Slaugthered + Exported pigs

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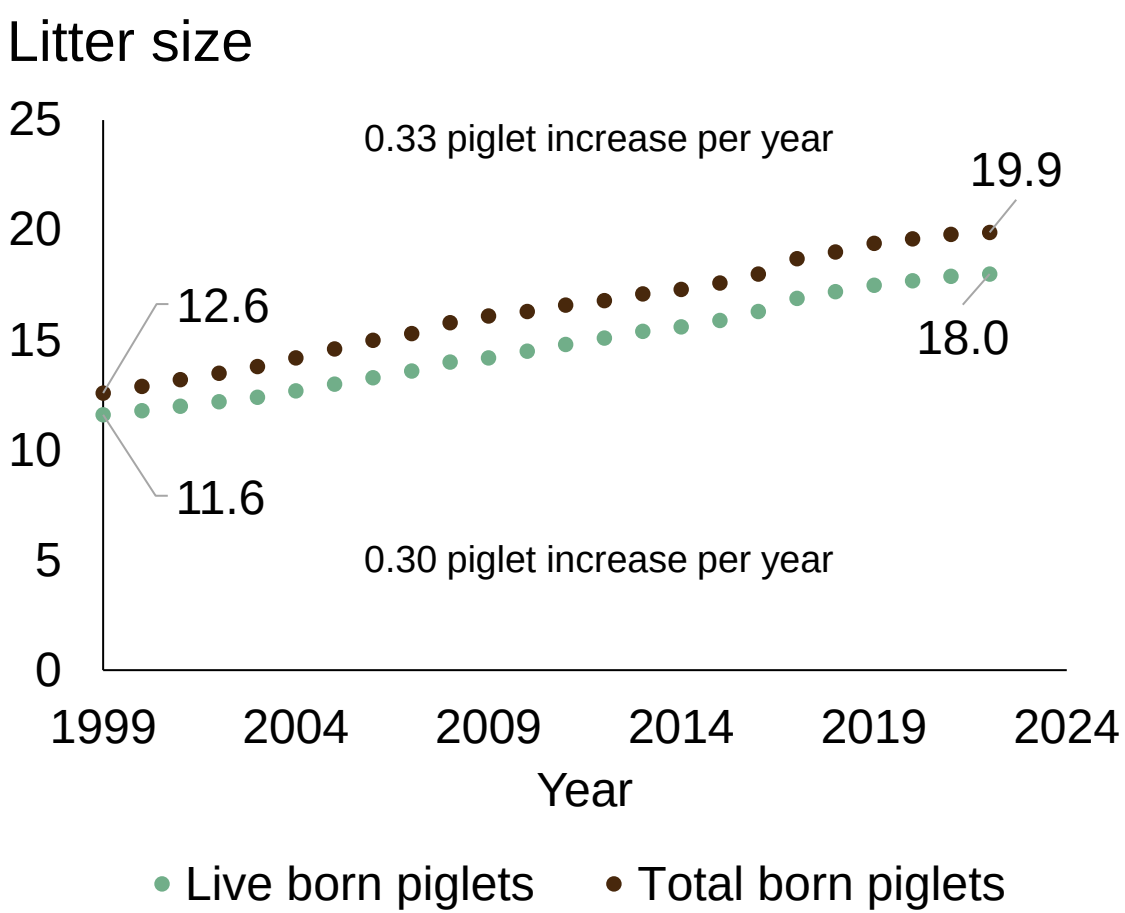
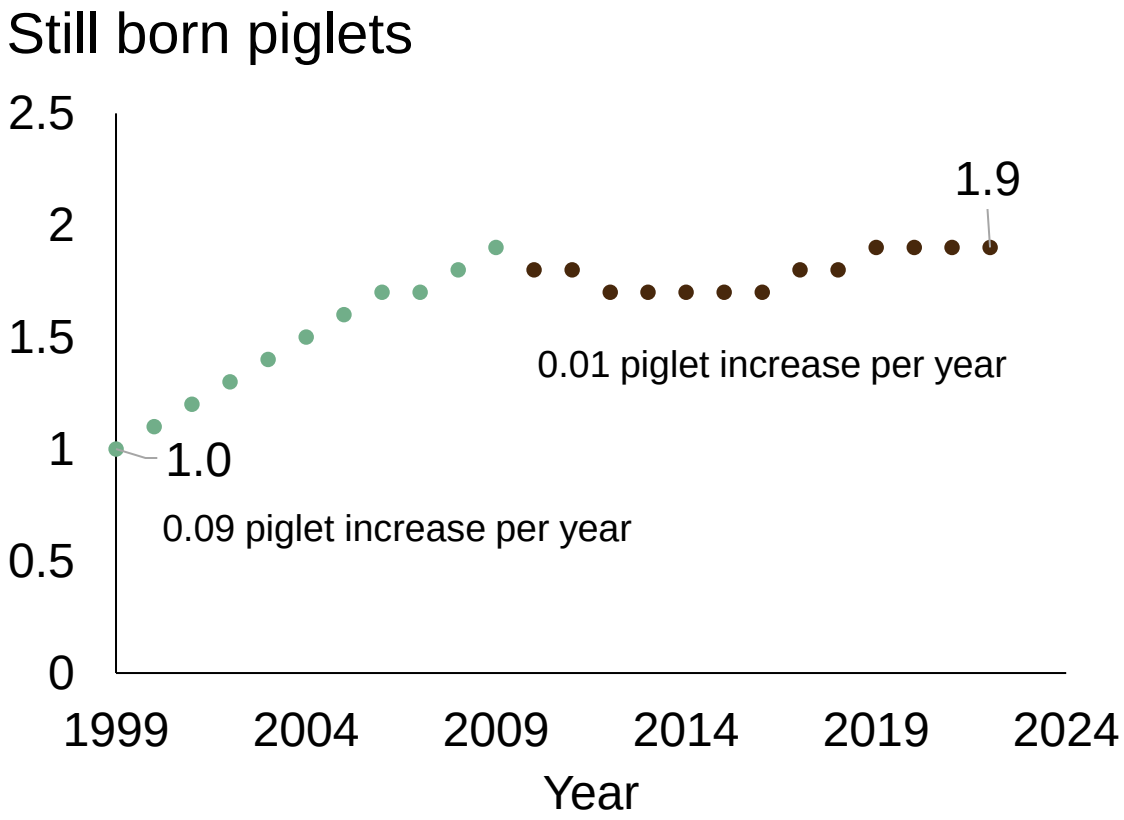
Sources: Danish_Agriculture_&_Food_Council (2023). "Statistics 2001-2022 - Pig meat." Danish agriculture & Food Council.
Hansen, C. (2023). "Landsgennemsnit for produktivitet i produktionen af grise i 2022. SEGES Svineproduktion, Axelborg, København, Danmark."

Danish pig production (2022)

Productivity, sow herds



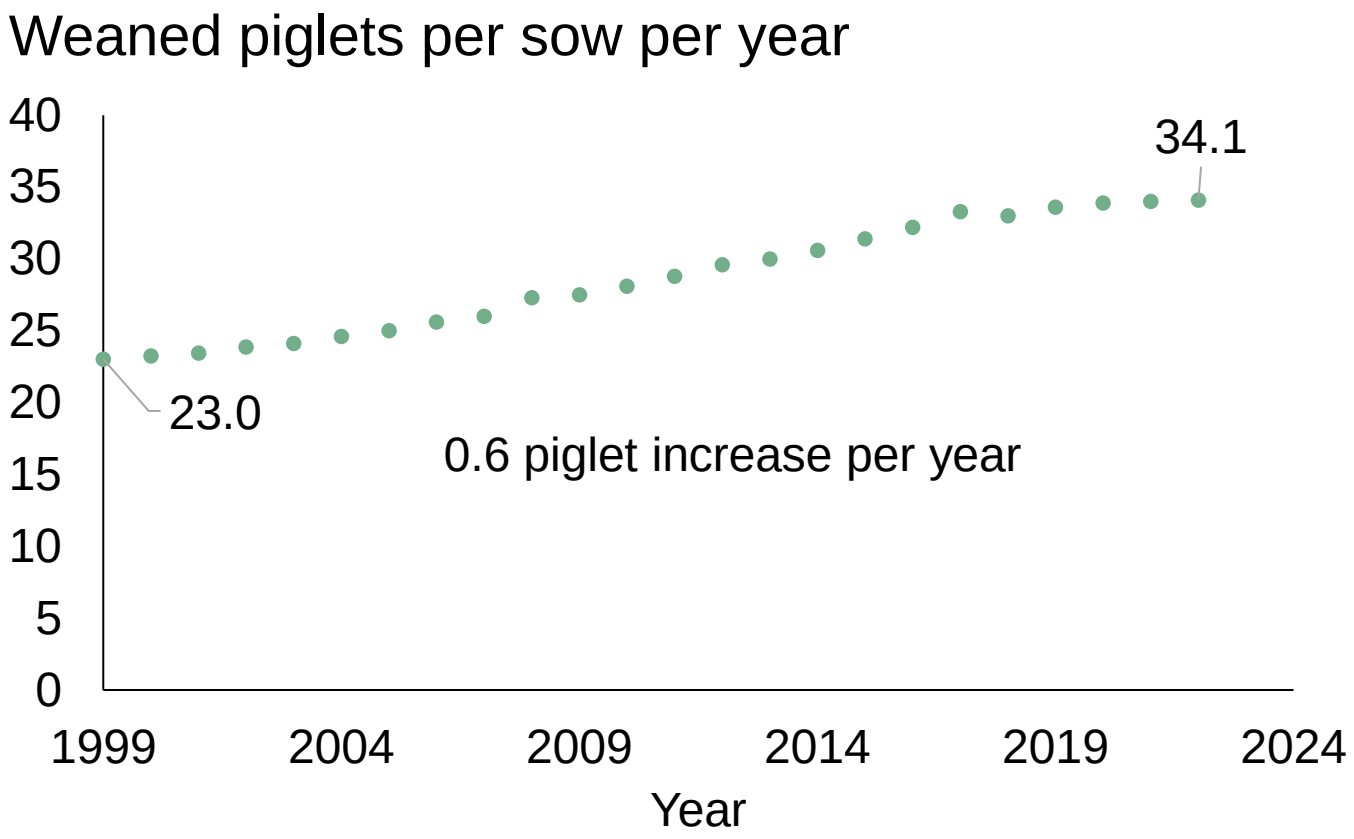


SEGES INNOVATION

Source: SEGES_Innovation (1999-2022). "Combination of key figures of average productivity in Danish swine herds between 1999 and 2022 " SEGES Innovation P/S, Aarhus, Denmark.

Danish pig production (2022)

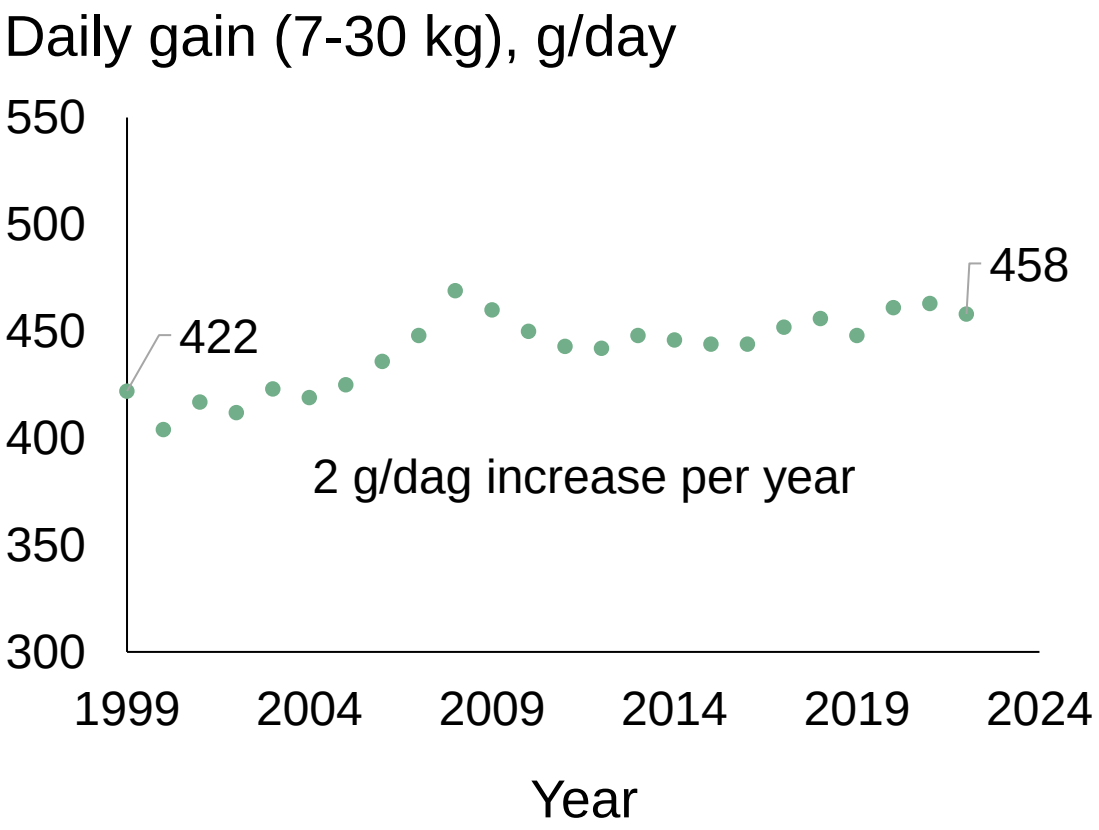
Productivity, sow herds

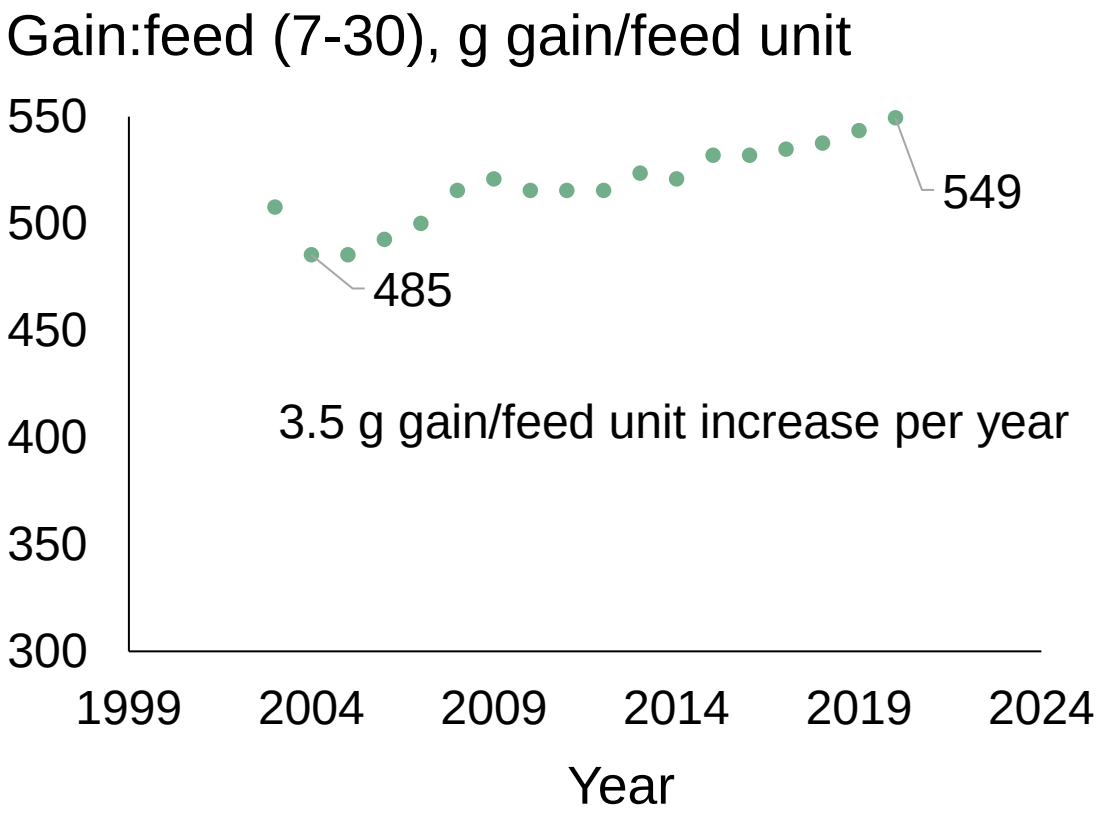


Source: SEGES_Innovation (1999-2022). "Combination of key figures of average productivity in Danish swine herds between 1999 and 2022 " SEGES Innovation P/S, Aarhus, Denmark.

Danish pig production (2022)

Productivity, weaning pigs





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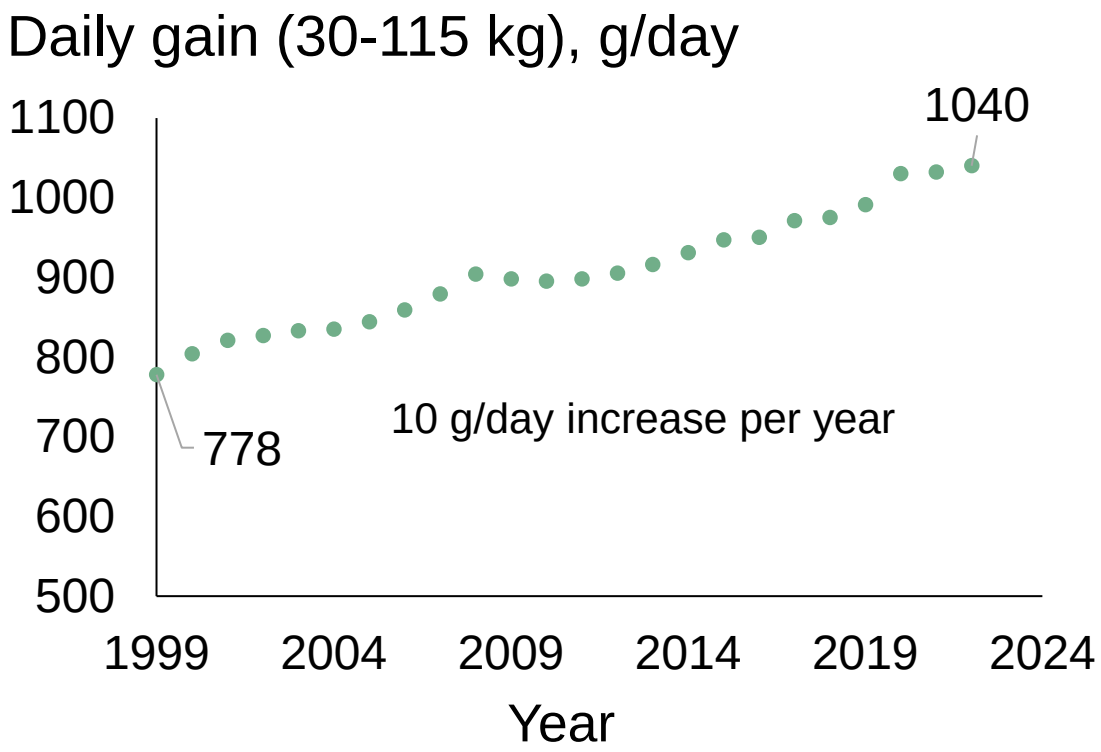
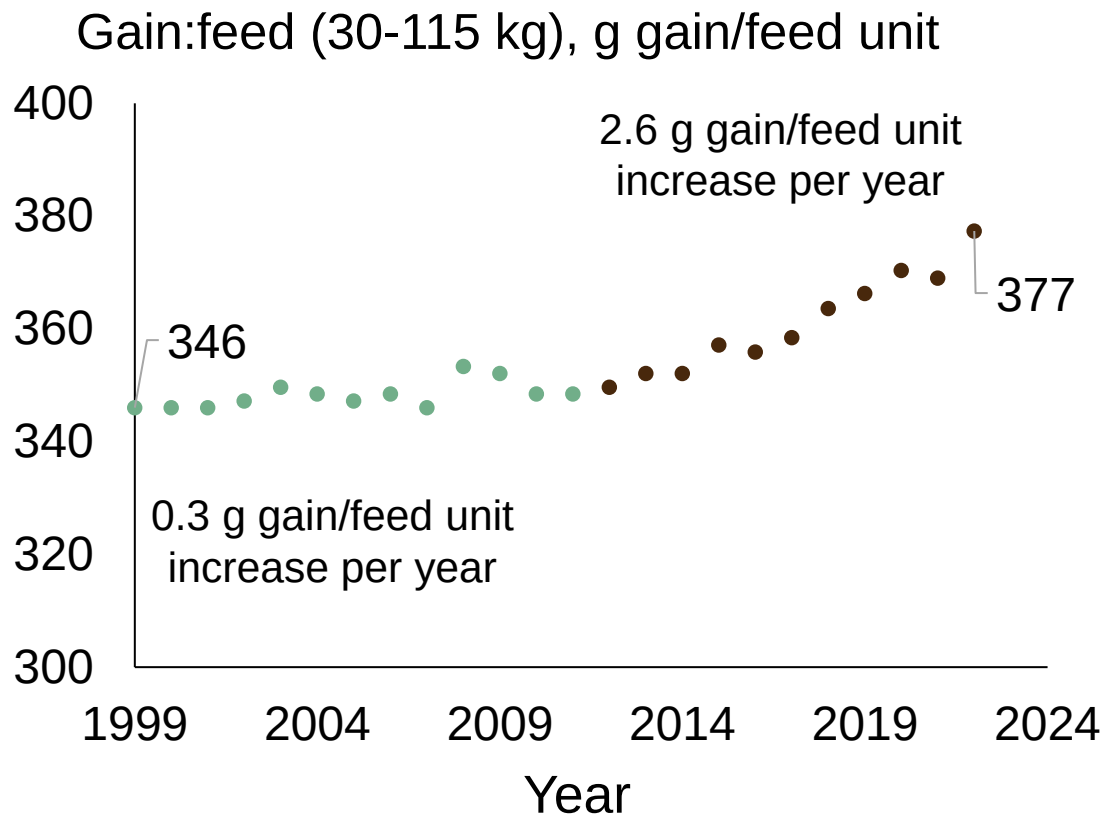
Danish pig production (2022)

Productivity, growing and finishing pigs





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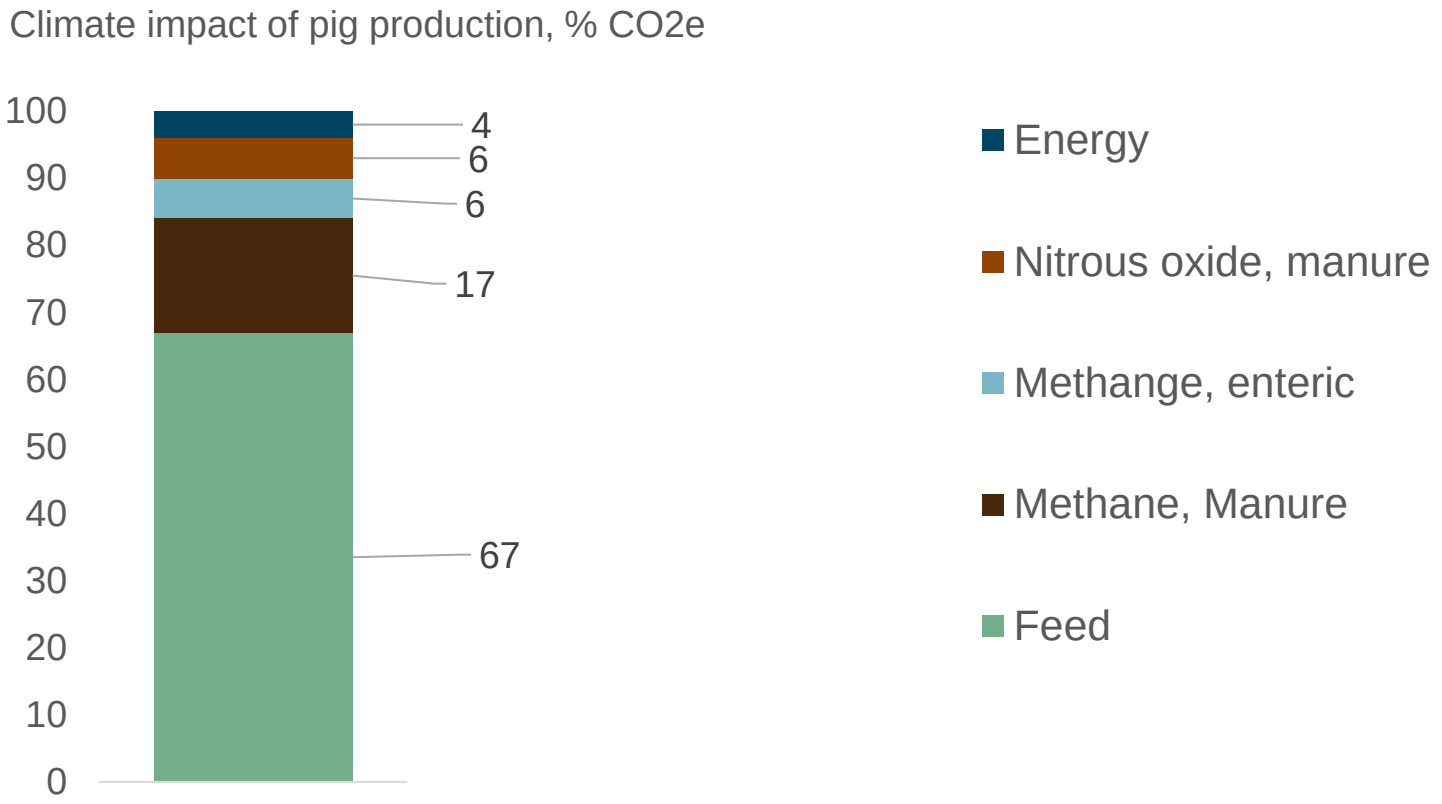
Reducing climate impact from pig production, CO2e



Sources: Dorca-Preda, T., et al. (2021). "Environmental impact of Danish pork at slaughterhouse gate – a life cycle assessment following biological and technological changes over a 10-year period." Livestock Science **251**: 104622.
Nielsen, O.-K., et al. (2021). "Denmark's National Inventory Report 2021. Emission Inventories 1990-2019 - Submitted under the United Nations Framework Convention on Climate Change and the Kyoto Protocol." Aarhus University, DCE – Danish Centre for Environment and Energy, 944 pp. Scientific Report No. 437.

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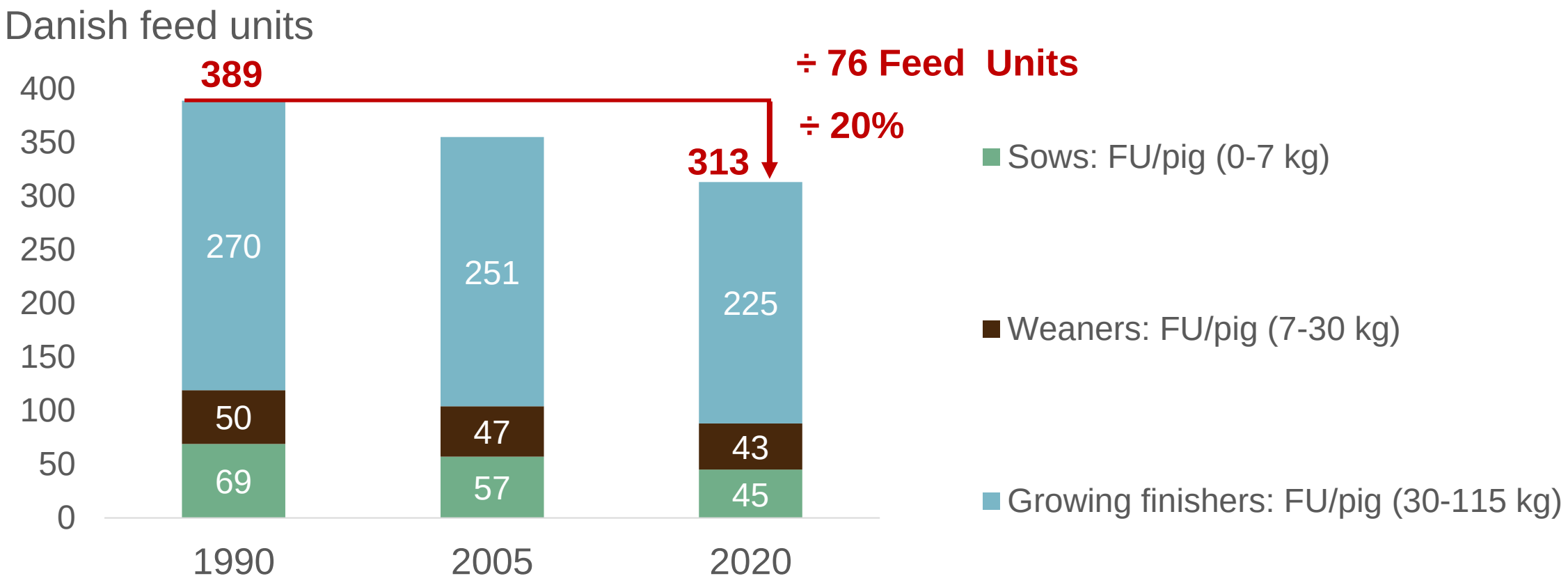
Feed efficiency - Reducing climate impact from pig production

Feed used to produce one pig (from birth to 115 kg BW)



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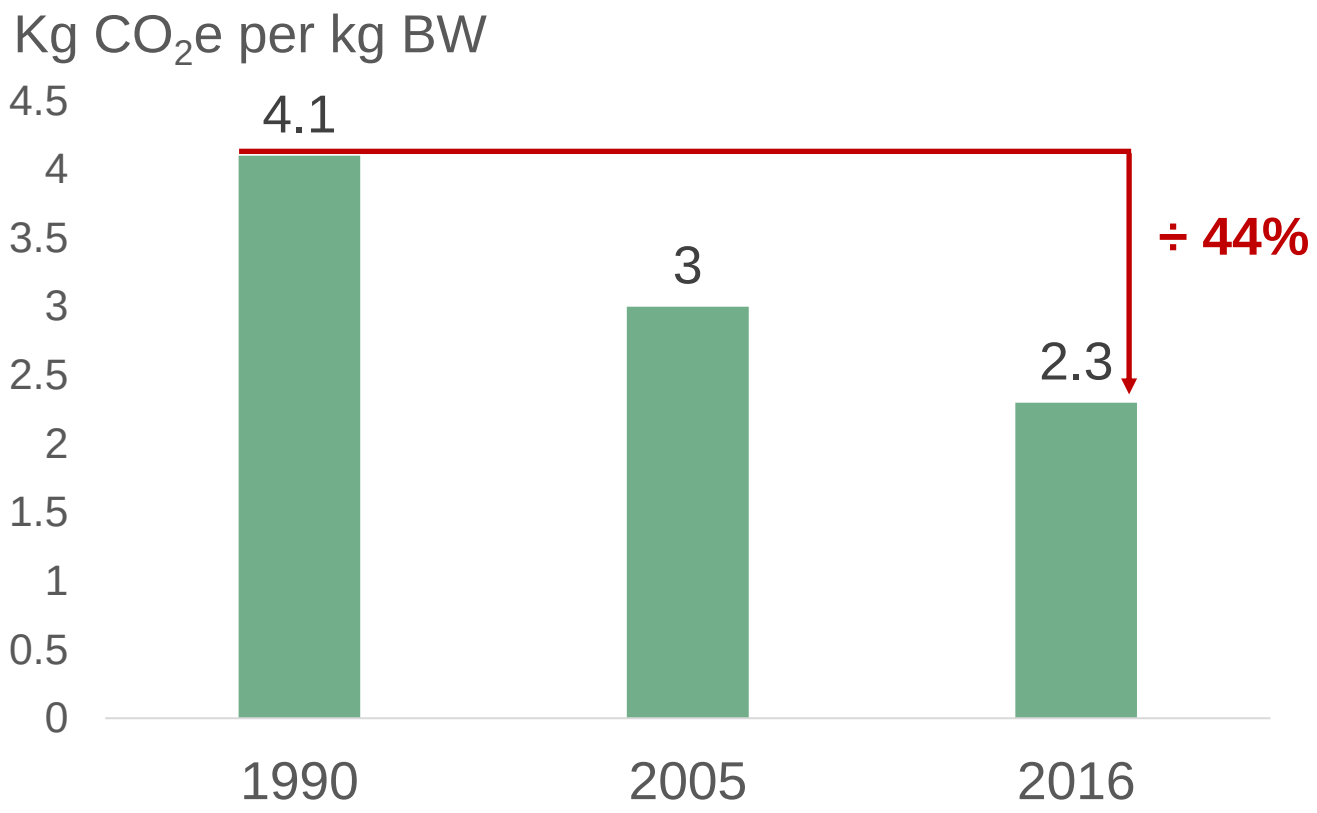
Source: Dorca-Preda, T., et al. (2021). "Environmental impact of Danish pork at slaughterhouse gate – a life cycle assessment following biological and technological changes over a 10-year period." Livestock Science **251**: 104622.

Reducing climate impact from pig production, CO2e

Climate impact per kg BW (From birth to slaughter, LCA)



Source: Dorca-Preda, T., et al. (2021). "Environmental impact of Danish pork at slaughterhouse gate – a life cycle assessment following biological and technological changes over a 10-year period." Livestock Science **251**: 104622.

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