

A close-up photograph of a pig's face, showing its eyes, ears, and snout. The pig is light-colored with dark eyes and a pinkish snout. The background is blurred, showing other pigs in a farm setting.

**SEGES Innovation P/S**

## **Pig nutrition – digestibility – pig production in Denmark**

Agro Food Park 15

March 21, 2024

Uffe Pinholt Krogh, Chief researcher, Livestock, SEGES Innovation P/S

STØTTET AF

**Svine**afgiftsfonden

# Agenda

- My background
- Pigs – SEGES Innovation P/S
- Pig Nutrition - Digestibility
- Danish Pig production



# My background

## Education and employment

- Agrobiologist
- Aarhus University, Denmark
- INRAE, France
- SEGES Innovation P/S, Denmark



## Fields of interest

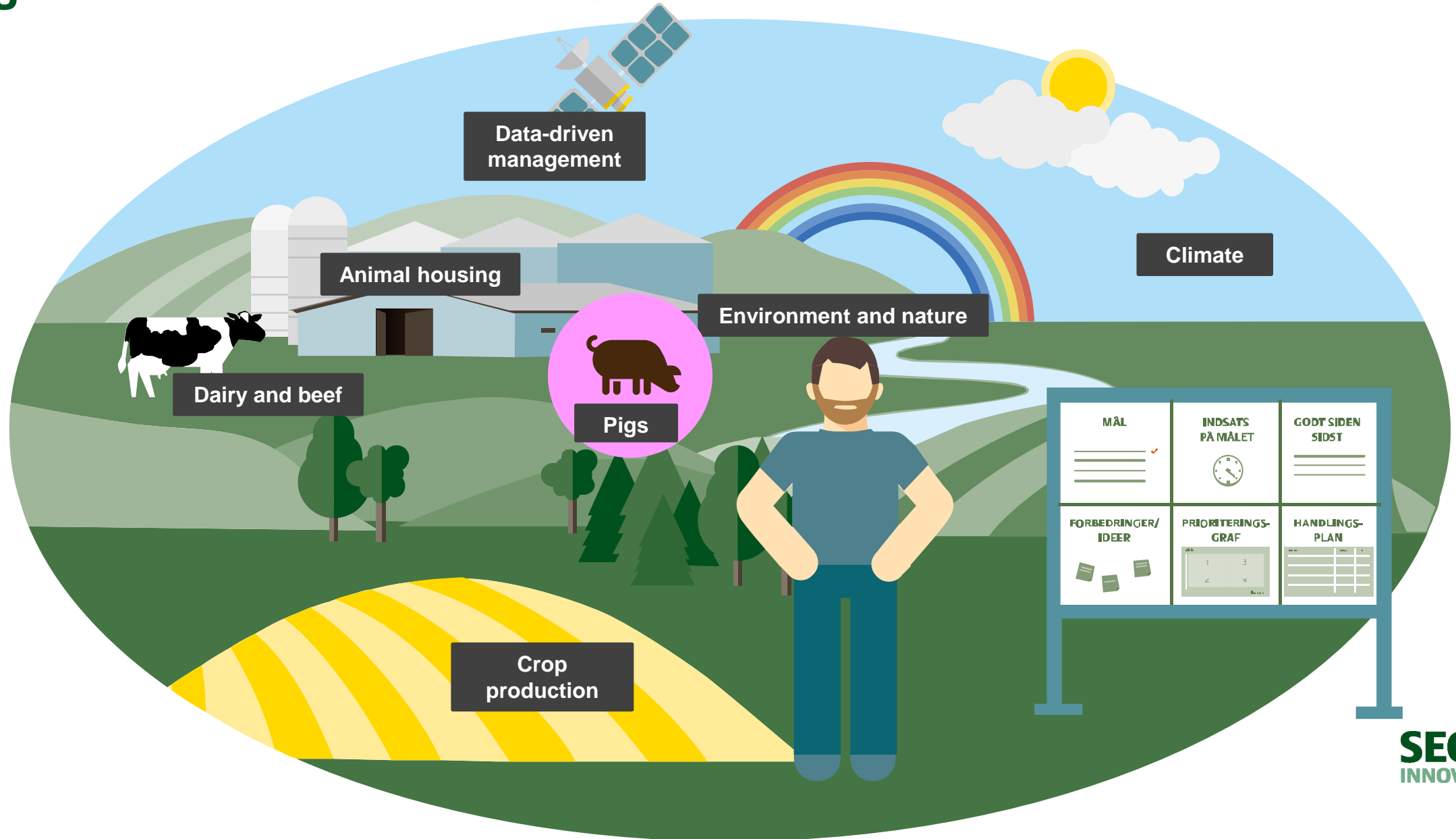
- Pig nutrition:
  - Feed evaluation
  - Nutrient requirement of pigs

# Pigs – 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.

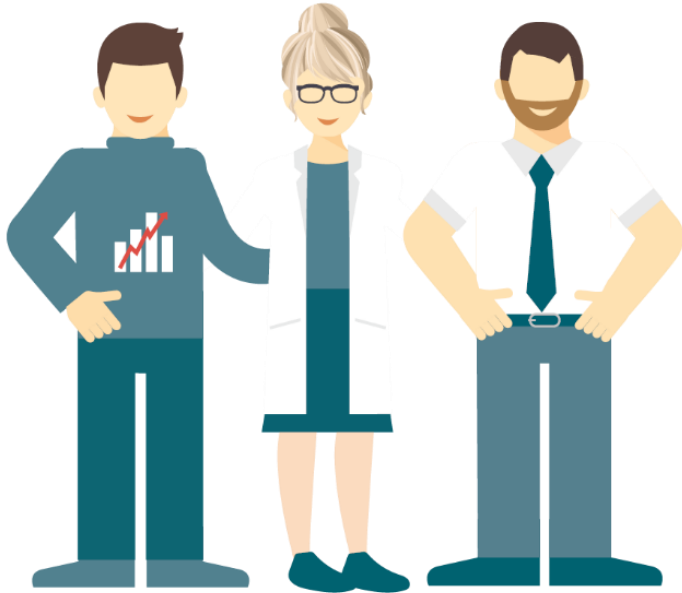


# Pigs – SEGES Innovation P/S



# Pigs – SEGES Innovation P/S

- We connect science to practical farming



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# Agenda

- My background
- Pigs – SEGES Innovation P/S
- **Pig Nutrition - Digestibility**
- Danish Pig production



# Pig Nutrition

## Departments

- **Livestock** 
- Crops and environment
- Climate and sustainability
- Data driven management software
- Marketing

## **Livestock (≈ 110 employees):**

- **Pigs** (≈ 50 employees)
  - Nutrition
  - Environment
  - Management and housing
  - Health
- **Dairy and beef** (≈ 45 employees)
  - Health & production
  - Breeding
  - Milk quality
- **Horses** (≈15 employees)
  - Registration and advisory
- **Poultry** (1 employee)



# Pig Nutrition



Karoline Blaabjerg



Per Tybirk



Niels Morten Sloth



Thomas Bruun



Uffe P. Krogh



Sally Hansen



Sabine S Grove



Gunner Sørensen



Camilla Kaae Højgaard



Anna Krog

# Pig Nutrition

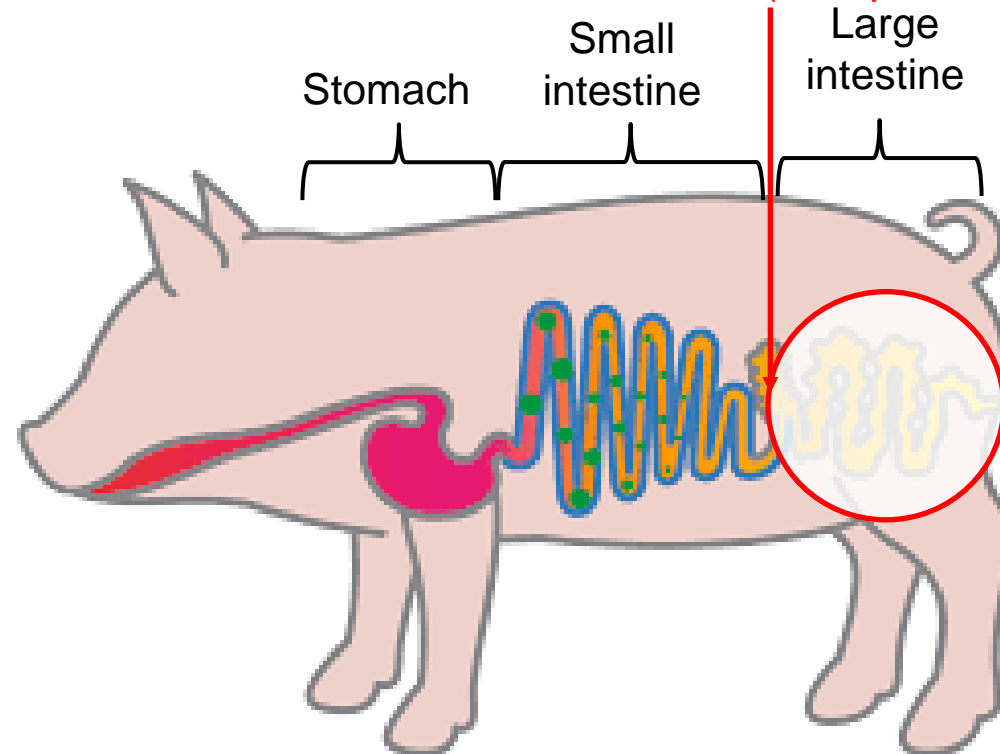


# Pig Nutrition

- Ileal digestibility  
(Protein and amino acids)
- Surgical insertion of T-cannula



**T-cannula in Ileum**  
(Last part of small intestine)



**Mikrobial turnover of:**  
**- Protein og amino acids**  
(Not useful for the pig)

# Pig Nutrition

- **Ileal digestibility (Protein and amino acids)**
  - Surgical insertion of T-cannula



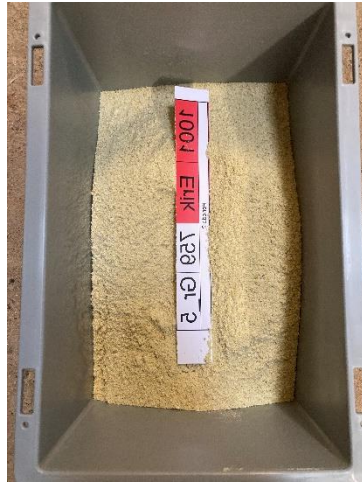
# Pig Nutrition

- Ileal digestibility (Protein and amino acids)
  - Surgical insertion of T-cannula



# Pig Nutrition

- Ileal digestibility (Protein and amino acids)
  - Feed sampling



 eurofins

Chemical analyses  
on laboratory

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# Pig Nutrition

- Ileal digestibility (Protein and amino acids)
  - Collection of ileal content



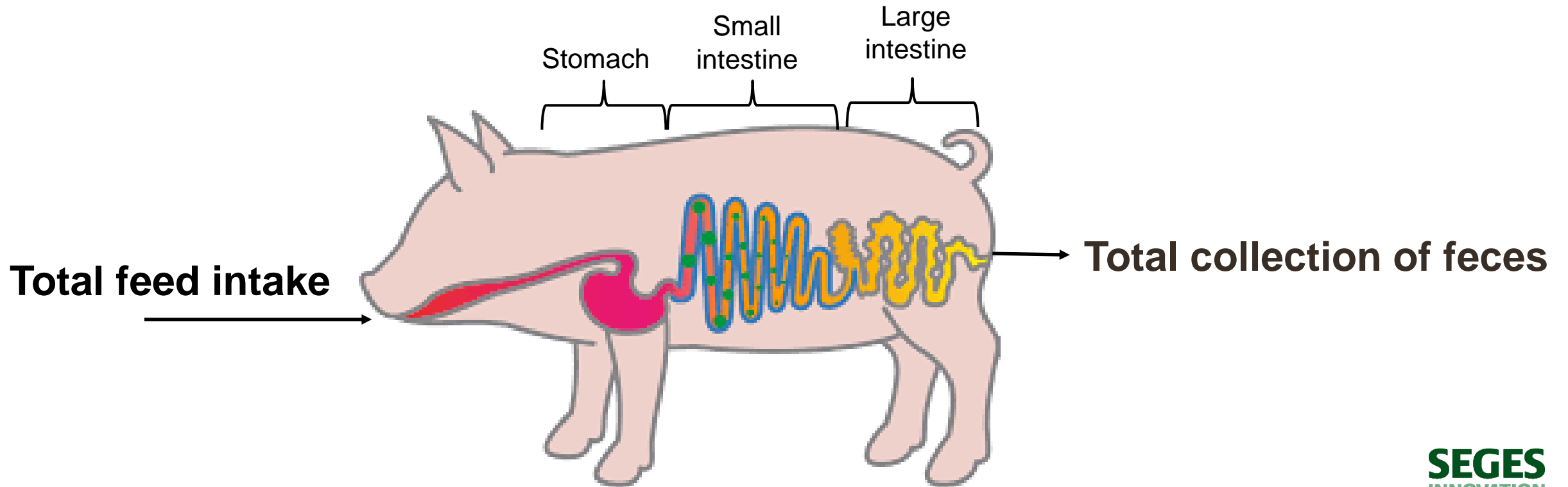
 eurofins

Chemical analyses  
on laboratory

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# Pig Nutrition

- Fecal digestibility (minerals - P)





# Pig Nutrition

- Fecal digestibility and nutrient balances



# Pig Nutrition

- **Chemical composition**

- Tørstof
- Protein
- Amino acids
- Minerals

- **Digestibility**

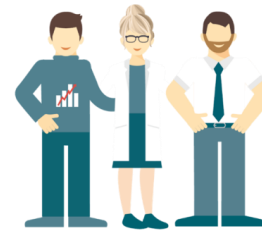
- Ileal: Protein og amino acids
- Fecal: Mineral (P)

**Used to compose diets for pigs!**



Different types of feedstuff

- We connect science to practical farming



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# Digestibility team



# Pig Nutrition

- **Research station Grønhøj**
  - Postweaning pigs (**≈1400 pigs**)
  - Growing and finishing pigs (**≈2100 pigs**)
  - Emissions (Amonia, Methane, Nitrous Oxide) (**18 chambers**)
  - Digestibility (Ileum and total tract digestibility)

Postweaning facility



Growing and finishing facility



Emission chambers



# Pig Nutrition

## Experiments on commercial farms

- Suckling piglets
- Sows
- Postweaning pigs
- Growing and finishing pigs



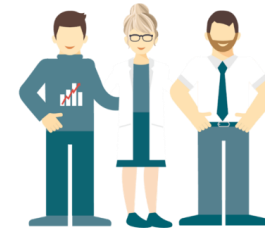
# Pig Nutrition

## Projects within:

- Feed evaluation system (Feed table)
  - Energy (Feed units)
  - Digestibility of protein, amino acids, Phosphorus
- Nutrient recommendations (nutrient requirements)
  - Protein and energy level → productivity
- Health and welfare
  - Antibiotics
  - Survival
- Climate and environment
  - Emissions



- We connect science to practical farming



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# Pig Nutrition

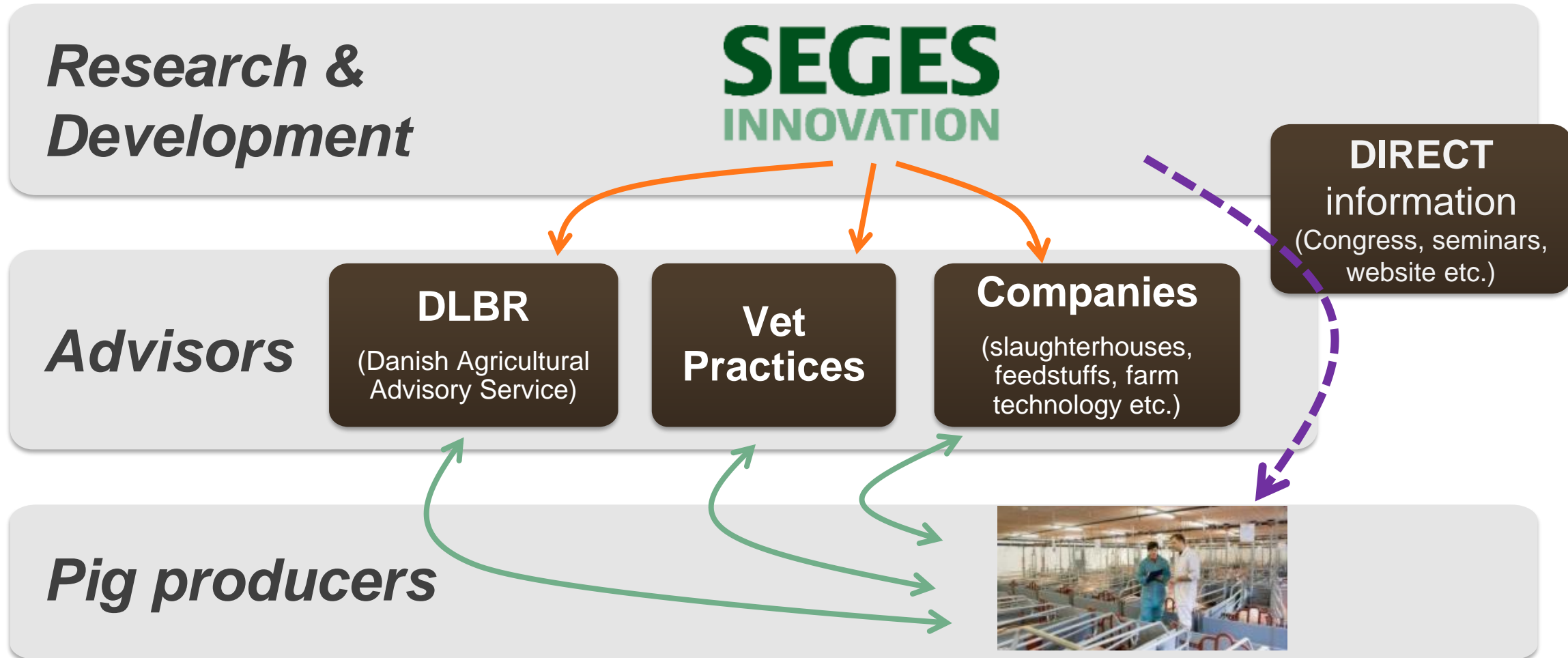
## Funding

- **National Levy funds**  
(Activities for the benefit of pig producers)
- **Other national and international funds**
- **Commercial activities**



# Pig Nutrition

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





Some examples of activities funded by

SUPPORTED BY

# Danish Pig Levy Fund

- We connect science to practical farming



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# Pig Nutrition

- Feed table

**SEGES INNOVATION KLIMAFODER database**

Blanding baseret på: Q. Ung- og sl.svin: 30-115 og 45-75 kg  
 Ret + flere indstillinger

Nulstil blanding

Fodermiddel	Andel %	Pris, kr. /hkg	Inkl. LUC %	Ekskl. LUC %
BYG, vinter, 2022	35,000	140	10,1	24,6
HVEDE, 2022	32,250	147	10	24,2
RUG, 2022	10,000	132	2,8	6,9
HESTEBØNNER, gennemsnit af høst 2012; ↓	0,000	189	-	-
SOJASKRÅFODER, afskallet toastet ↓	15,560	289	65,2	26,1
SOLSIKKEKRÅFODER, afskallet ↓	3,378	210	2,8	5,8
RAPSSKRÅFODER, lavt glukosinolatindhold ↓	0,000	219	-	-
RAPSKAGEFODER, lavt glukosinolatindhold ↓	0,000	228	-	-
VEGETABILSK OLIE OG FEDTSTOF, Palme ↓	0,420	694	2,2	4,4
VEGETABILSK OLIE OG FEDTSTOF, Soja ↓	0,420	746	4,2	1,4
LYSIN, L(sulfat)70% ↓	0,447	756	0,4	1
METHIONIN, DL 99 ↓	0,059	1840	0,1	0,1
TREONIN, L 98,5% ↓	0,122	1299	0,1	0,3
TRYPTOFAN, L 98% ↓	0,000	6224	-	-
VALIN, L 96,5 % ↓	0,000	3781	-	-
MONOCALCIUMFOS (16/22,7) ↓	0,264	633	0,2	0,6
FODERKRIDT, 36 % calcium ↓	1,476	46	1,3	3,2
NATRIUMCLORID ↓	0,394	61	0,4	0,9
Std. 0,2 % Vitamin- og mineralforblanding, SI ↓	0,195	1500	0,2	0,4
Ronozyme HiPhos GT tør, Std. dosis: 500 Fy ↓	0,015	5000	-	-
100,000				

Forside | Blandingsberegner | Fodermidler

BEREKN UDSCRIV

### Indhold af centrale næringsstoffer i blandingen

St.fordøjeligt indhold

Beregnet indhold	g/FEsv	% af lysin	Norm	% Norm
Råprotein	125	-	127	98
Lysin	8,1	100	8,4	97
Methionin	2,5	31	2,5	100
Met. + Cystin	4,7	58	4,9	96
Treonin	5,4	67	5,5	98
Tryptofan	1,63	20	1,68	97
Isoleucin	4,8	59	4,4	108
Leucin	8,8	108	8,4	105
Histidin	3	37	2,7	113
Fenylalanin	5,9	73	4,5	130
Fen. + Tyrosin	9,8	121	8,4	117
Valin	5,6	69	5,6	100

### Klimaaftryk (kg CO<sub>2</sub>-ekv)

Beregnet indhold	g/FEsv	/kg foder
Kg CO <sub>2</sub> -ekv. inkl. LUC	1,19	39,814
Kg CO <sub>2</sub> -ekv. ekskl. LUC	0,49	21,374

Hvor kommer klimaværdierne fra?

### Beregnet I-faktor

I-faktor (%)	- EFOS (%)	-
FEsv/hkg vare	- EFOSL (%)	-

### Indhold af andre næringsstoffer

Fordejeligt fosfor	2,26	-	2,4	94
Totalindhold				
Calcium	6,3	-	6,4	98
Fosfor	3,7	-	-	-
Natrium	1,5	-	1,6	93
Vit. A, 1000 IE.	4	-	4	100
Fytaseakt. FYT/kg	1,410	-	-	-
Fytaseakt. FTU/kg	-	-	-	-
Råprot	147	-	-	-
Oploselige fibre	35,9	-	-	-
Uoploselige fibre	120,6	-	-	-
Ferm. kulh. (KFM)	70,3	-	-	-
Let for. kulh. (LKF)	447	-	-	-
Tørstof	871	-	-	-

Diet composition

Standardized ileal digestible content: Protein and essential amino acids

Climate impact: CO<sub>2</sub>e

Energy content: Danish Feed Units

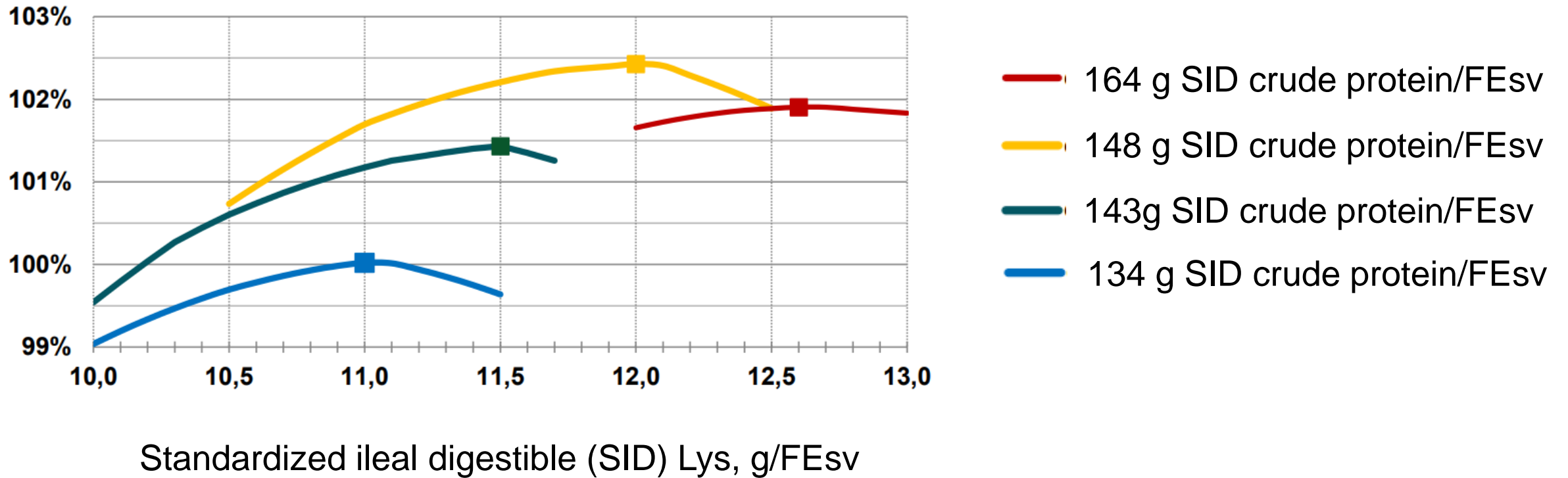
Digestible content: Phosphorus

Content of other nutrients and nutrient fractions (e.g Vitamins and minerals)

# Pig Nutrition

- Nutrient recommendations

Gross margin



# Agenda

- My background
- Pigs – SEGES Innovation P/S
- Pig Nutrition
- **Danish Pig production**



# Danish pig production (In broad terms)

- **Farm**
  - Family-owned
- **Feed company**
  - Cooperatives
- **Slaughterhouse**
  - Cooperative



# Danish pig production

## Pig production in Denmark (2022):

- $\approx$  **2,400** pig producers
- $\approx$  **32 Mio.** pigs produced (7 kg)
- $\approx$  **18 Mio.** Pigs slaughtered (115 kg)
- $\approx$  **14 Mio.** live pigs exported (30 kg)
- $\approx$  **95 %** of Danish pig meat is exported to 140 countries



## Denmark

- **6 Mio.** people
- **60%** of the land is farmland

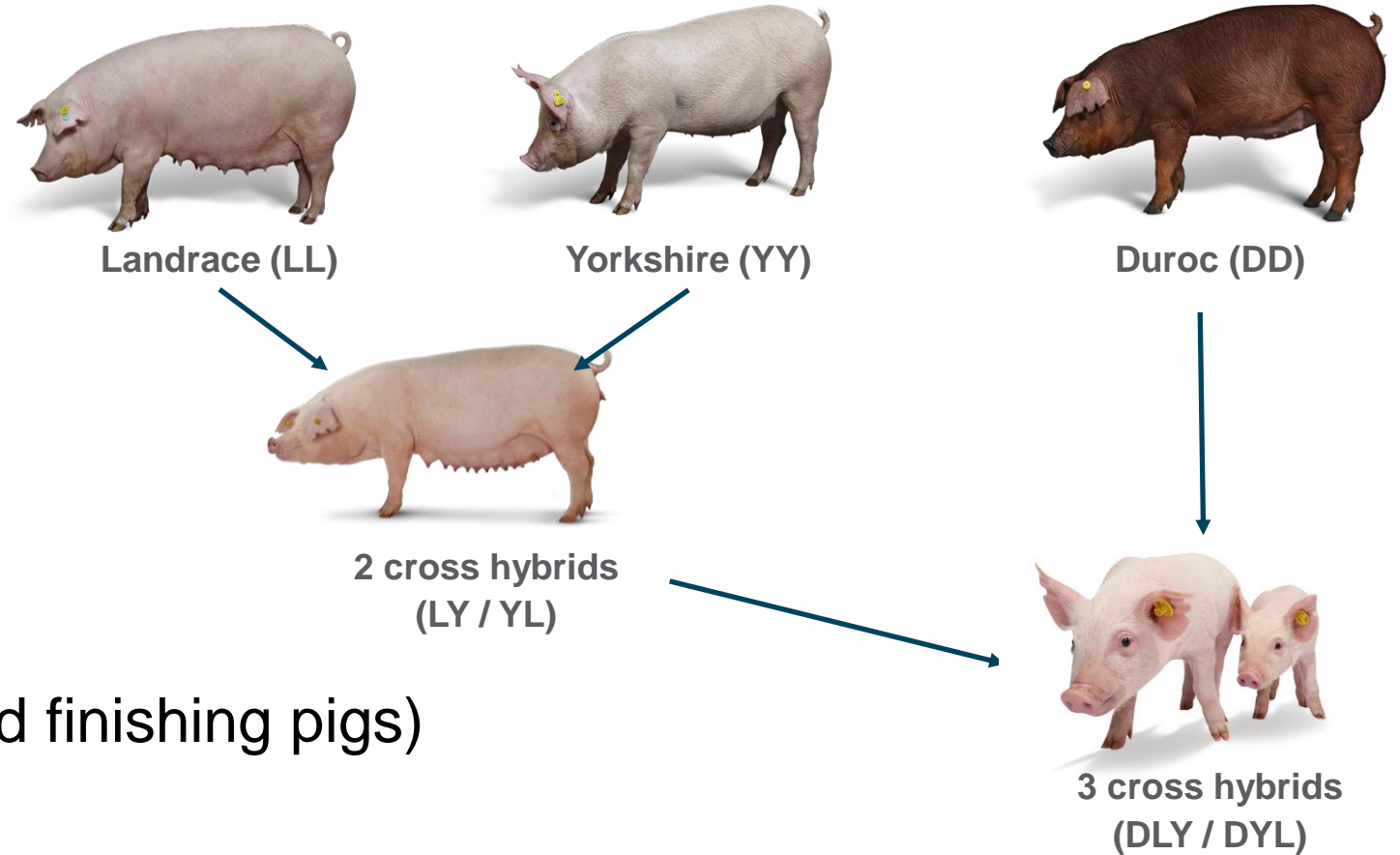


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# Danish pig production

## Common used genetics

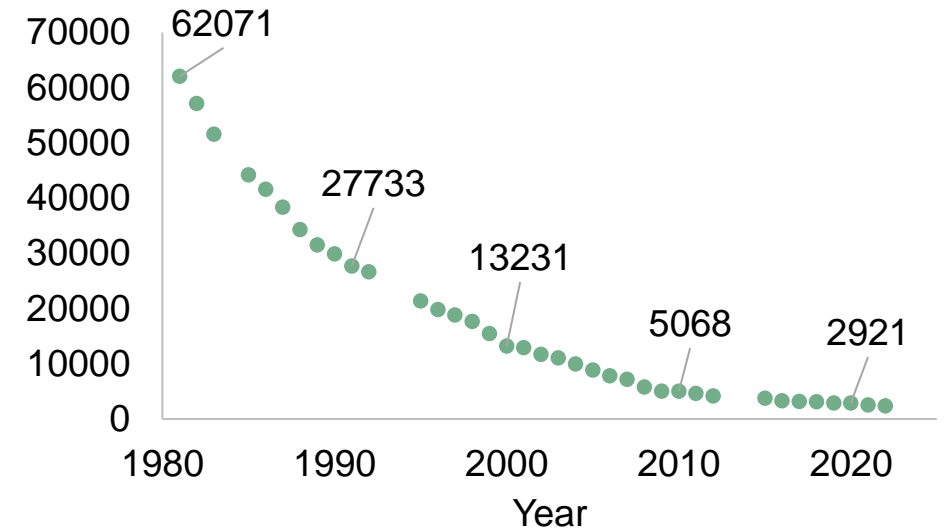
- Nucleus herds (≈ 30 herds)
- Multiplication (≈ 80 herds)
- Production herds (≈ 2300 herds, sows, grow and finishing pigs)



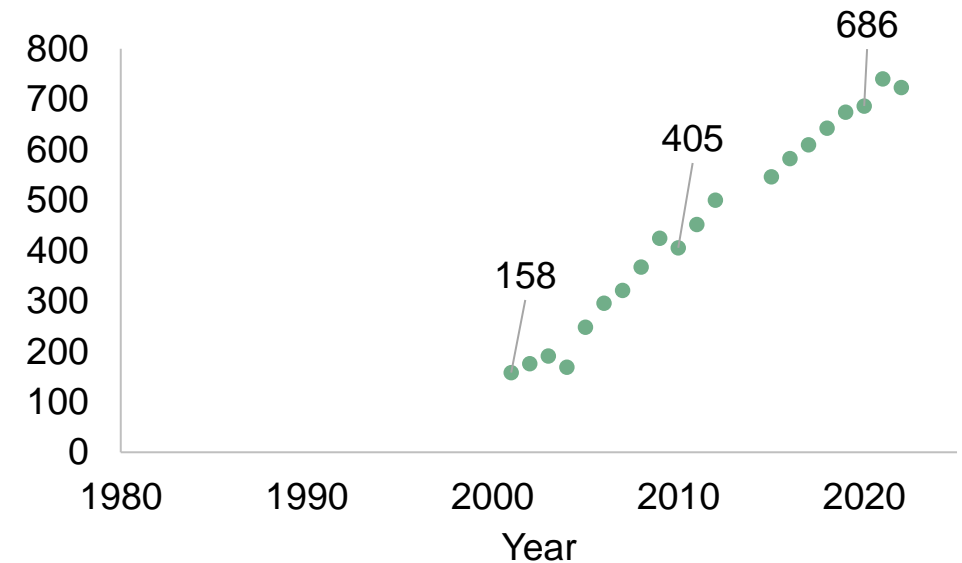
# Danish pig production

- **≈ 2400** pig farms
- **≈1300** sow herds
- **≈ 750** sows (Average herd size)

No. of pig farms in Denmark



Herd size, # sows

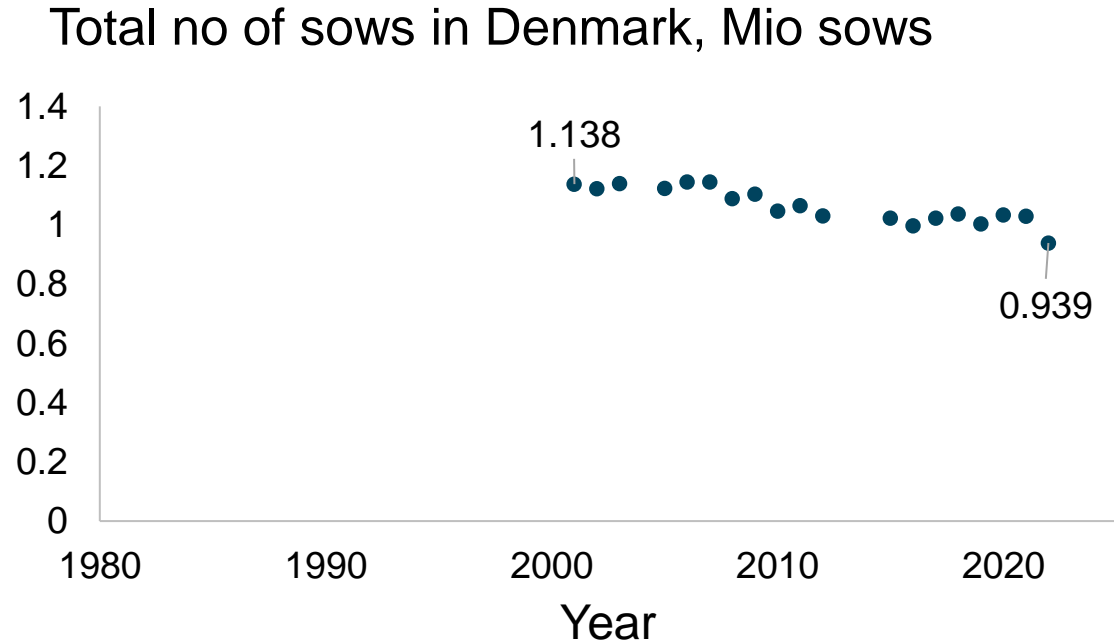
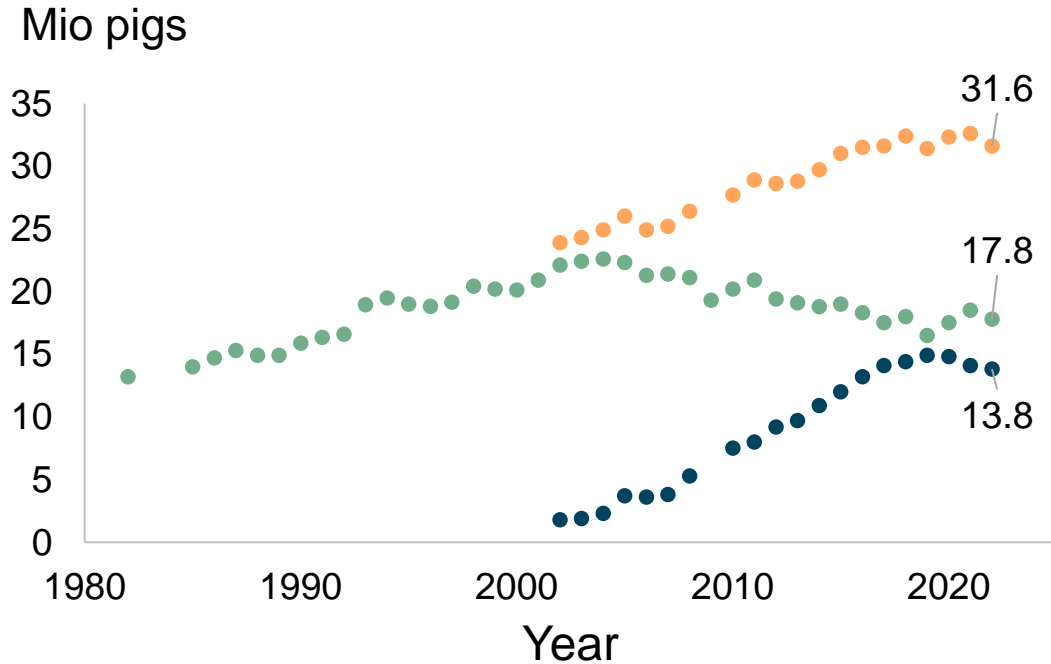


Sources: Danish\_Agriculture\_&\_Food\_Council (2023). "Statistics 2022 - Pig meat." Danish agriculture & Food Council.

Hansen, C. (2023). "Landsgennemsnit for produktiviteten i produktionen af grise i 2022. SEGES Svineproduktion, Axelborg, København, Danmark."



# Danish pig production

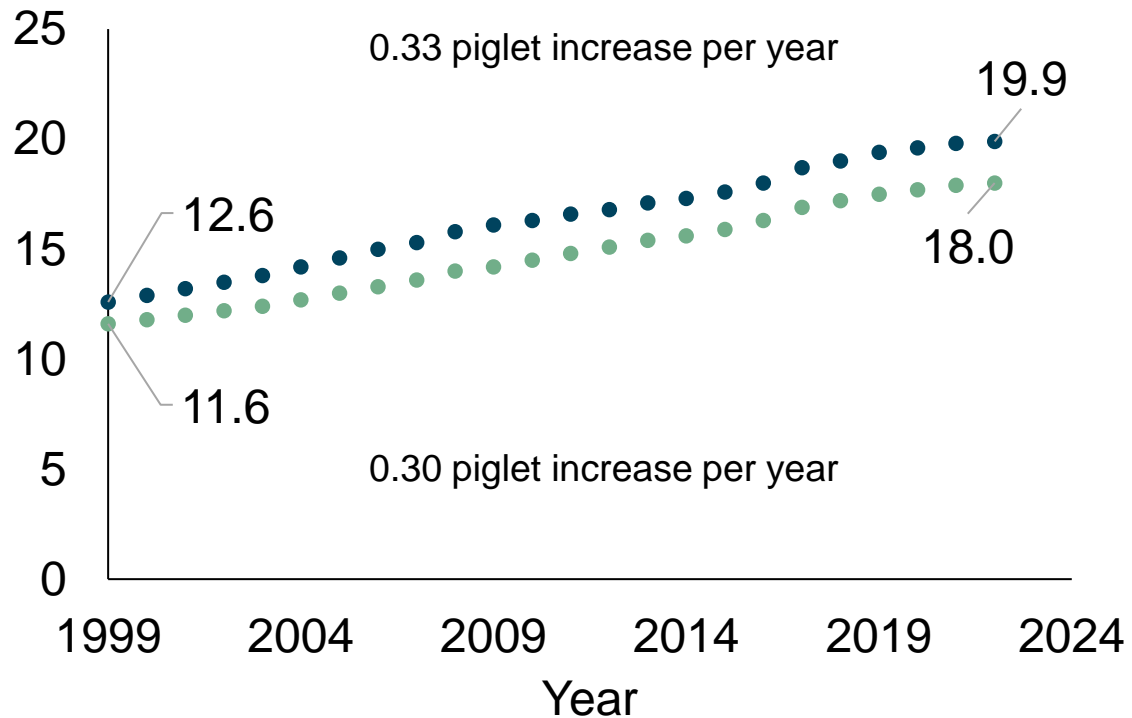


- Slaughtered pigs
- Export of live pigs
- Slaughtered + Exported pigs

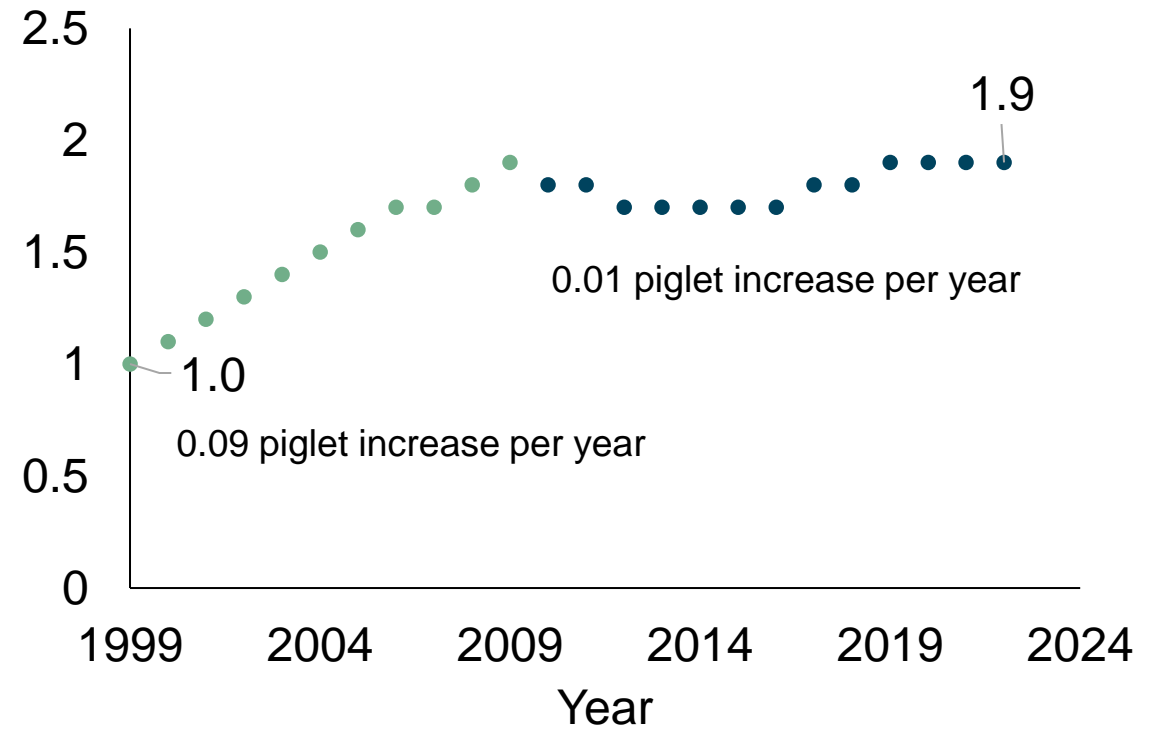
# Danish pig production

## Productivity, sow herds

Litter size



Still born piglets

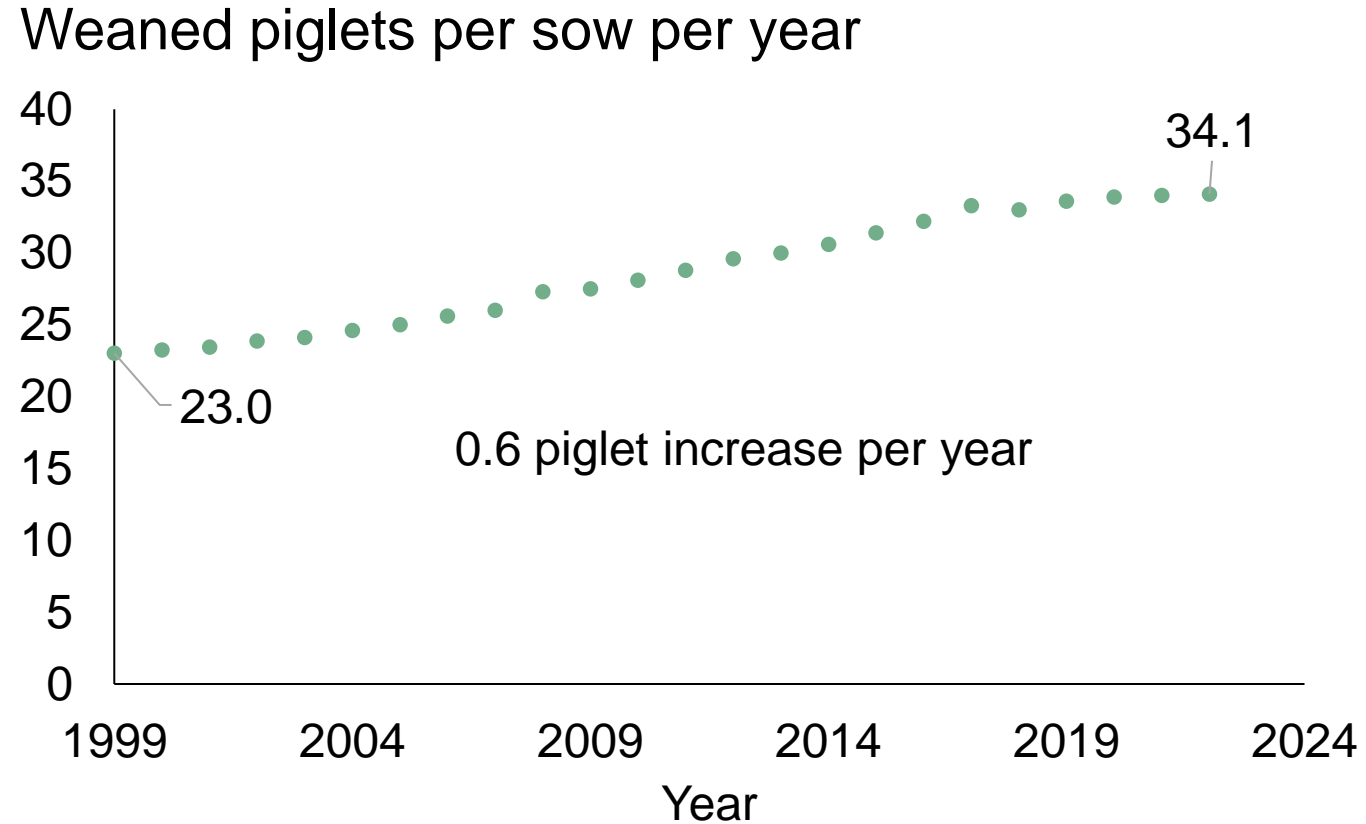


- Live born piglets
- Total born piglets



# Danish pig production

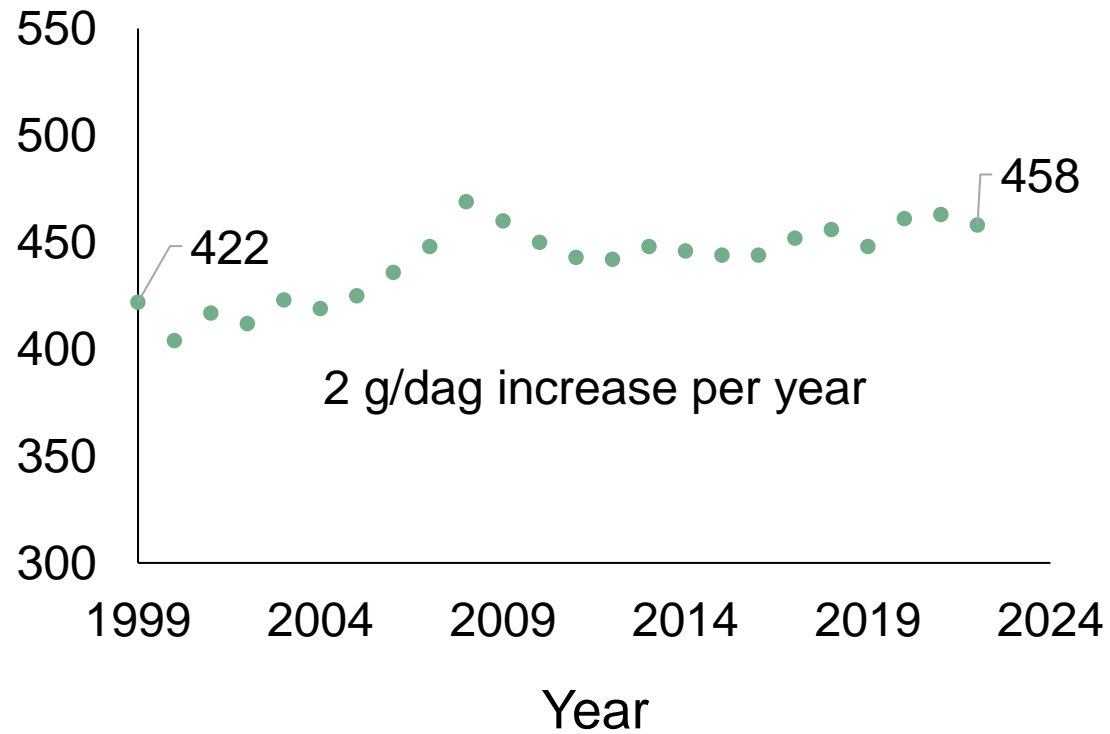
## Productivity, sow herds



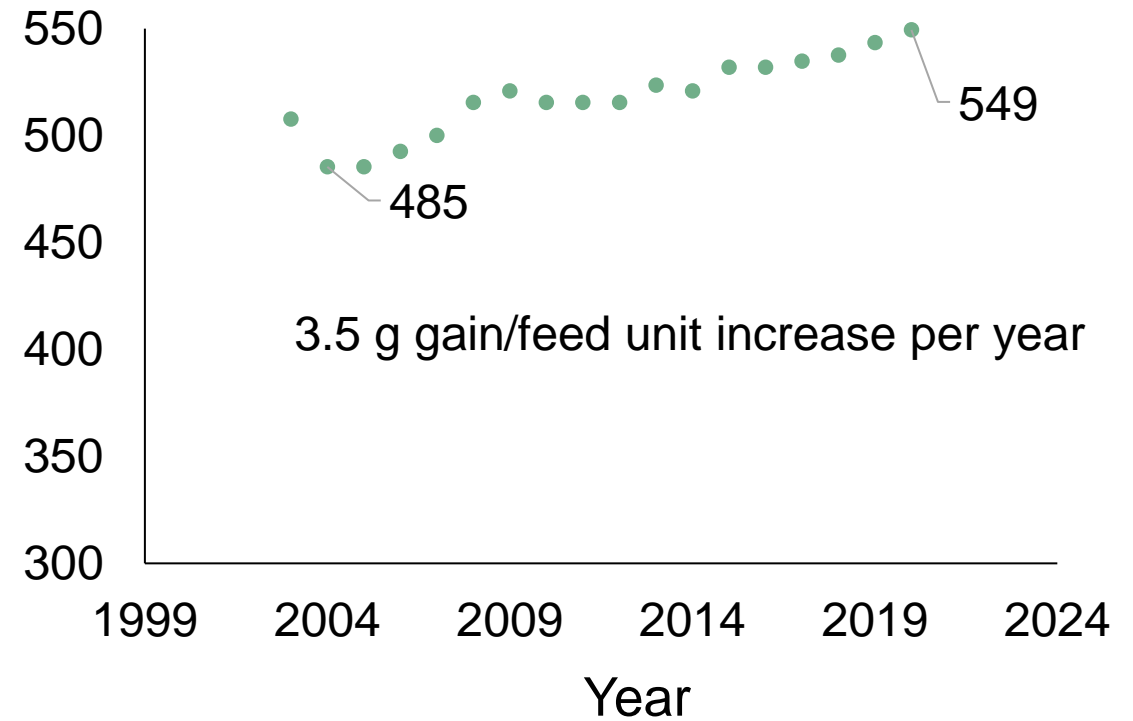
# Danish pig production

## Productivity, weaning pigs

Daily gain (7-30 kg), g/day



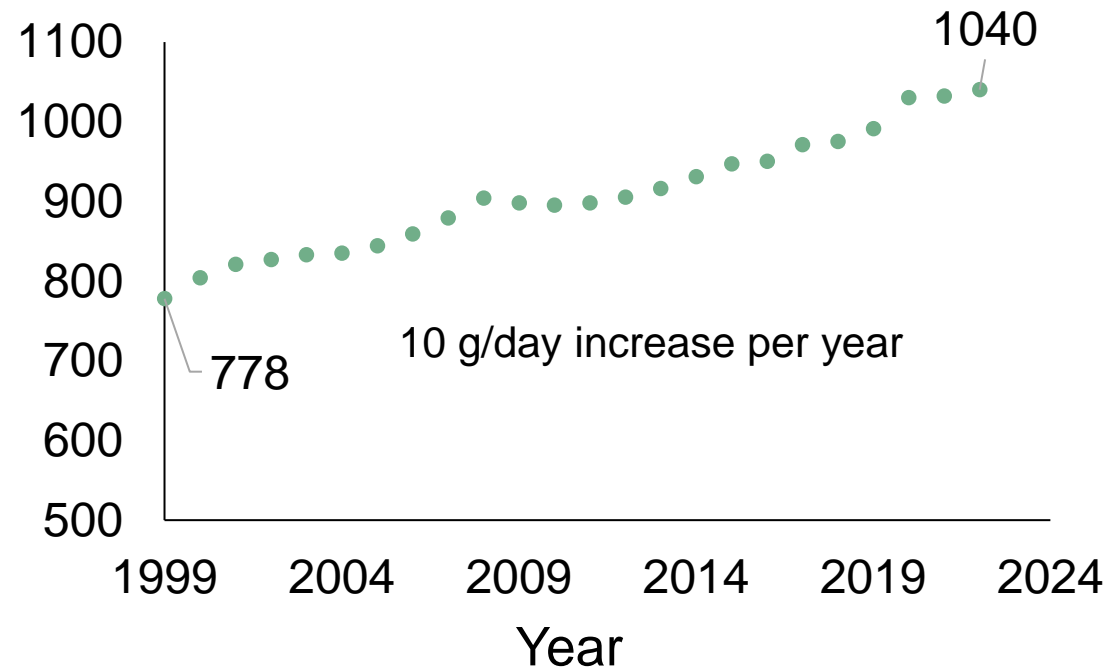
Gain:feed (7-30), g gain/feed unit



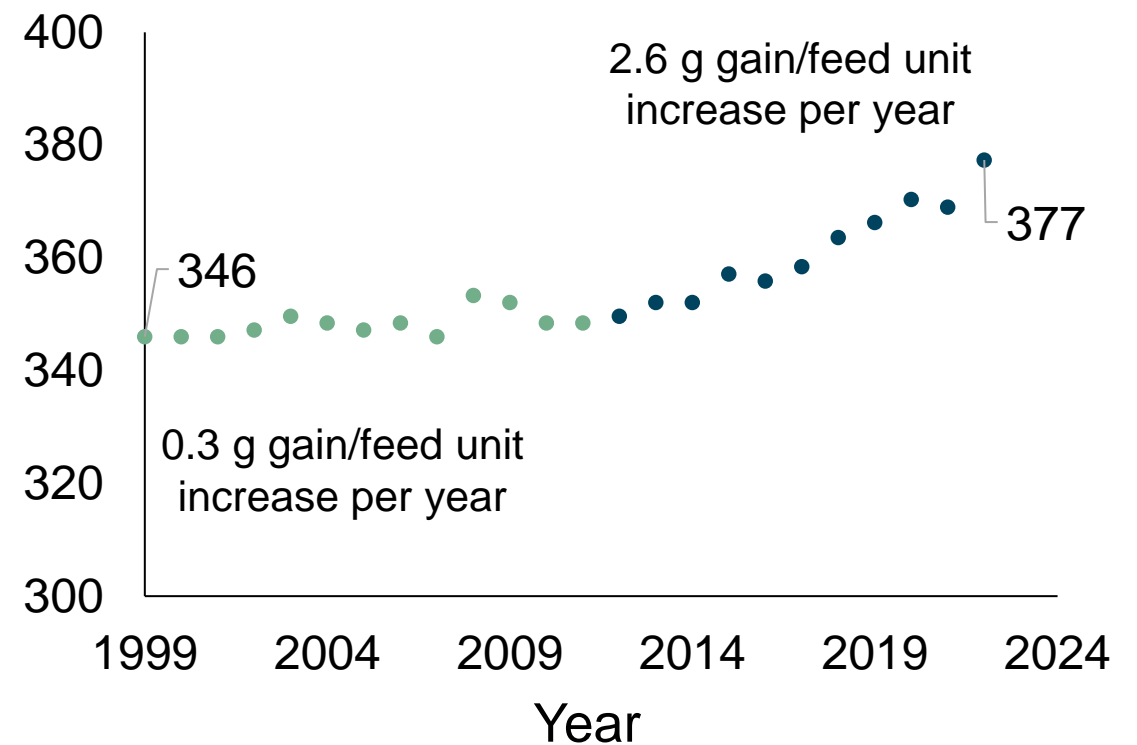
# Danish pig production

## Productivity, growing and finishing pigs

Daily gain (30-115 kg), g/day

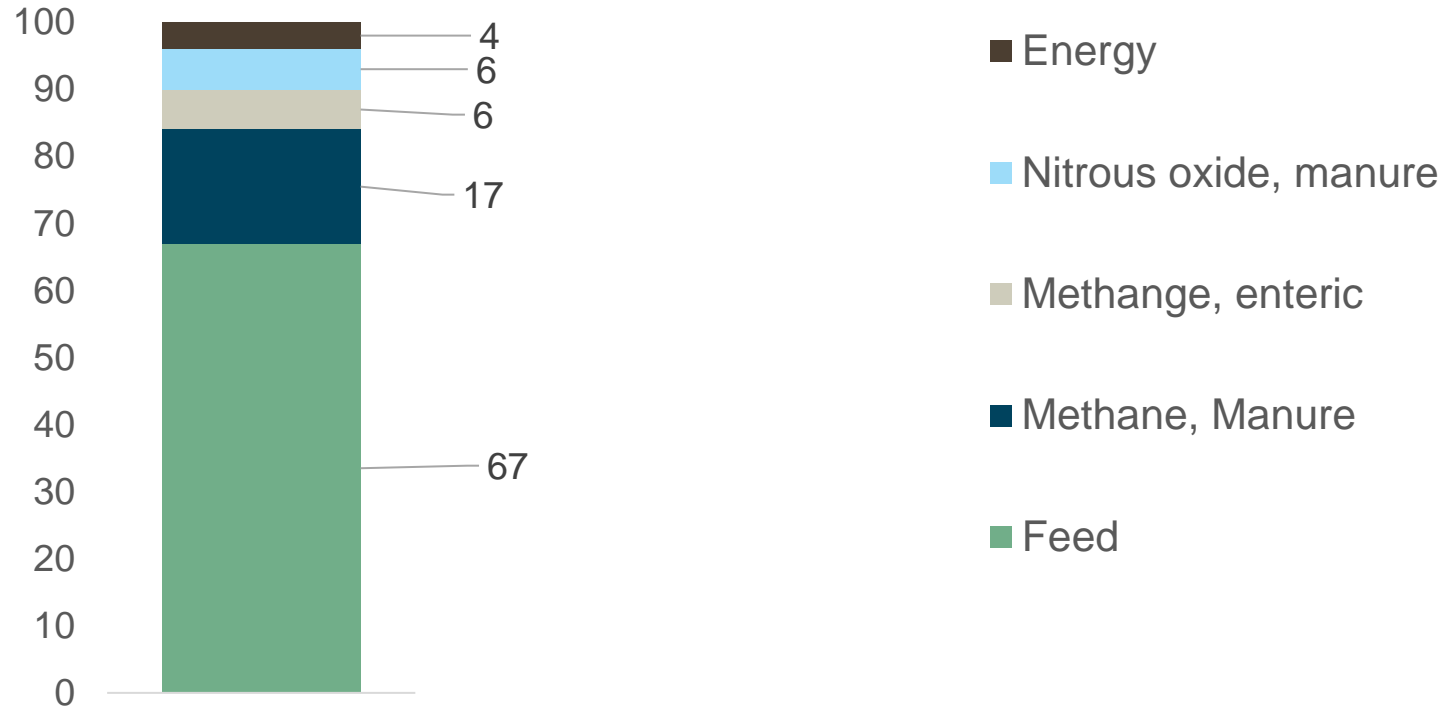


Gain:feed (30-115 kg), g gain/feed unit



# Reducing climate impact from pig production, CO<sub>2</sub>e

Climate impact of pig production, % CO<sub>2</sub>e



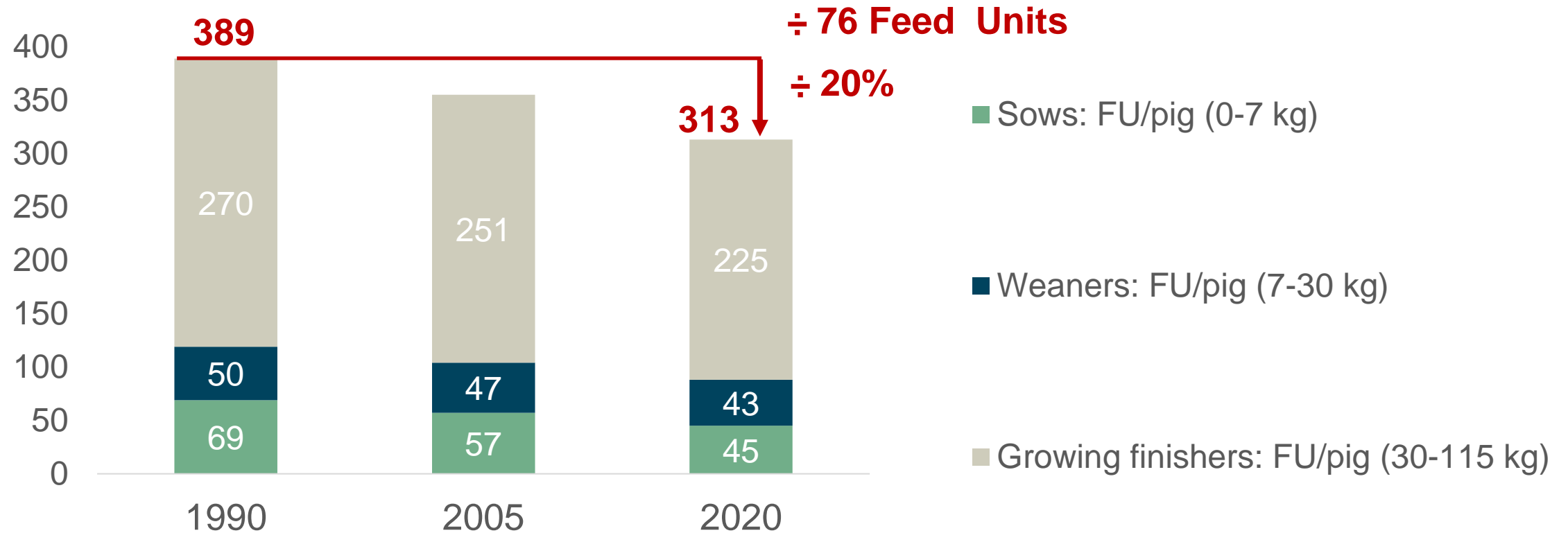
Sources: Dorca-Preda, T., et al. (2021). "Environmental impact of Danish pork at slaughterhouse gate – a life cycle assessment following biological and technological changes over a 10-year period." *Livestock Science* **251**: 104622.

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](#).

# Feed efficiency - Reducing climate impact from pig production

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

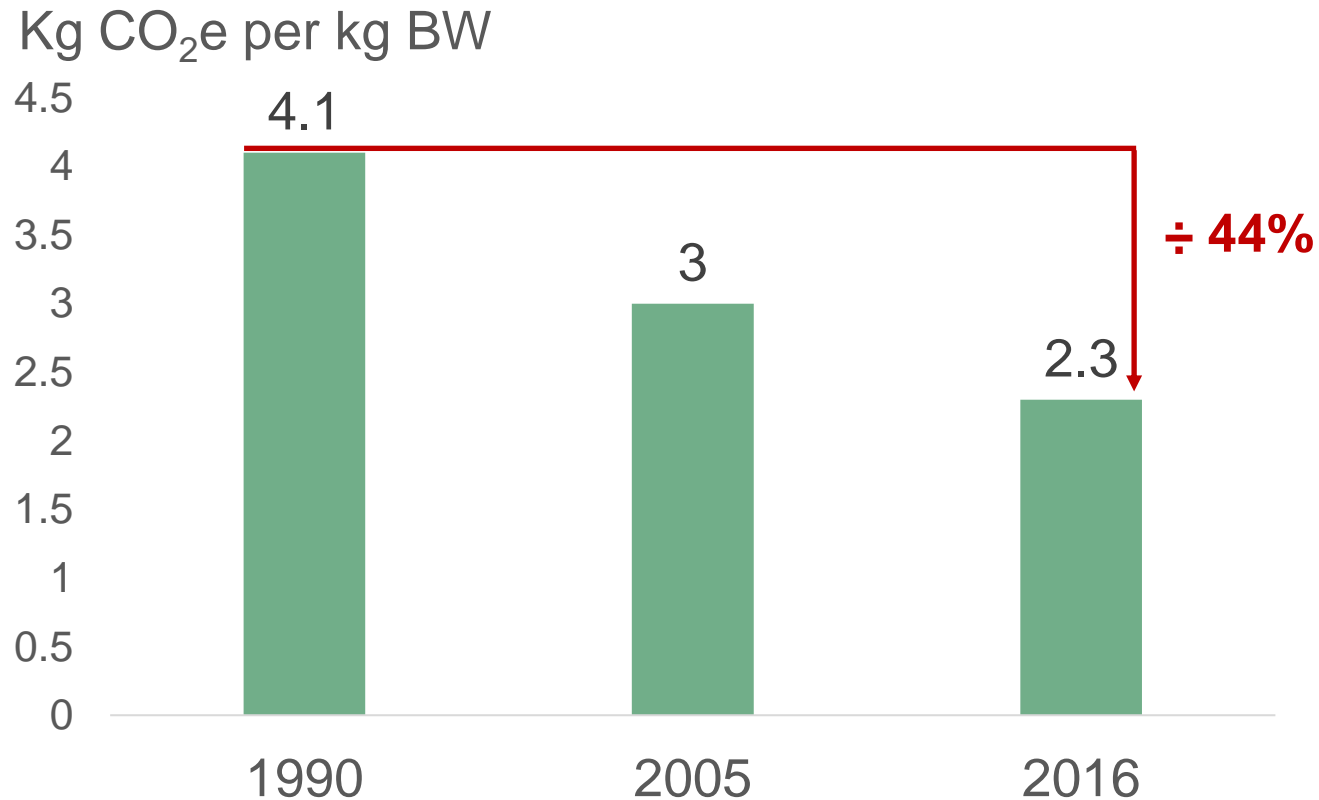
Danish feed units



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, CO<sub>2</sub>e

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.



# Contact SEGES

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