

# Facilities for digestibility trials at SEGES Innovation

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STØTTET AF  
Svineavgiftsfonden

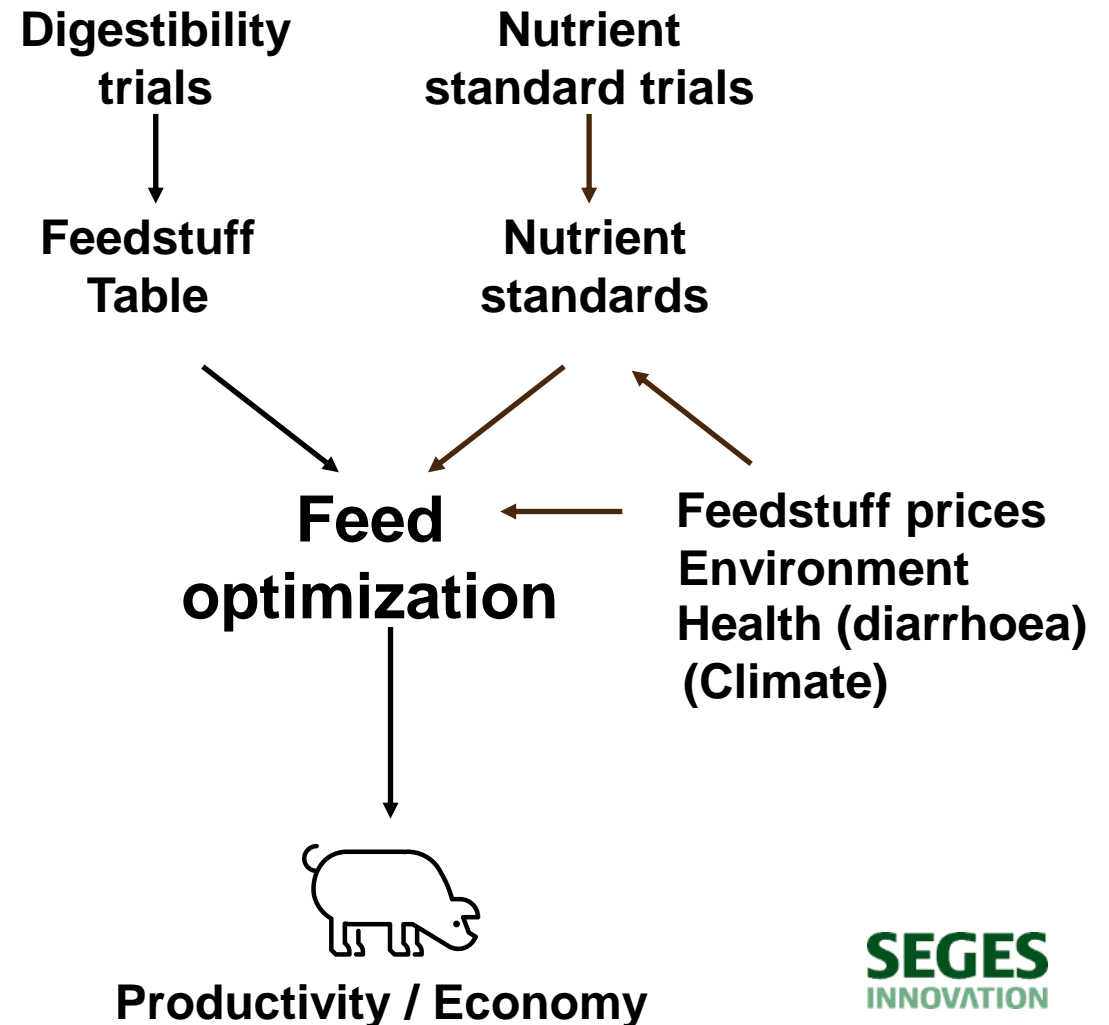
**SEGES**  
INNOVATION

# Why are we interested in the digestibility of feed ingredients?

- Digestibility values are key values for optimizing diets.
- Feed makes up around 70% of the costs in Danish pig production.
- Large amounts of feed – even small differences in digestibility have an impact on the economy and also on the climate and environment at industrial level.
- Climate agenda
  - Focus on replacing soybean meal with alternative protein sources with a lower climate footprint.
  - Ensure updated and solid digestibility values for alternative protein sources to avoid loss of productivity and feed utilization.

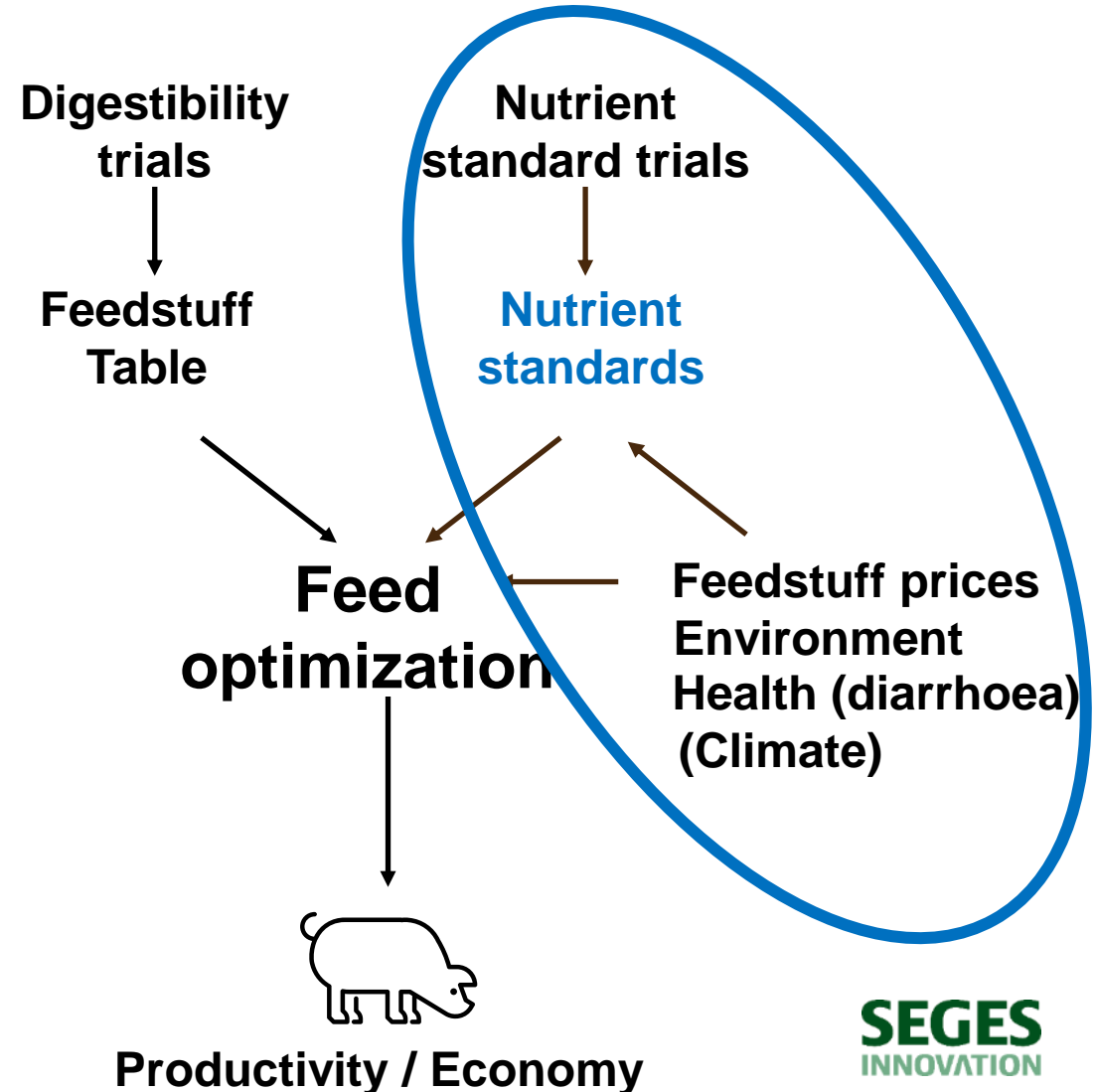
# Digestibility values are key values in the Danish Feedstuff Table

- Digestibility values
  - Are key values for optimizing diets
- Feedstuff Table
  - >90% of the pig feed in Denmark is optimized based on values in the Feedstuff Table.
  - Updates of nutrient content and digestibility values are implemented immediately in practice.



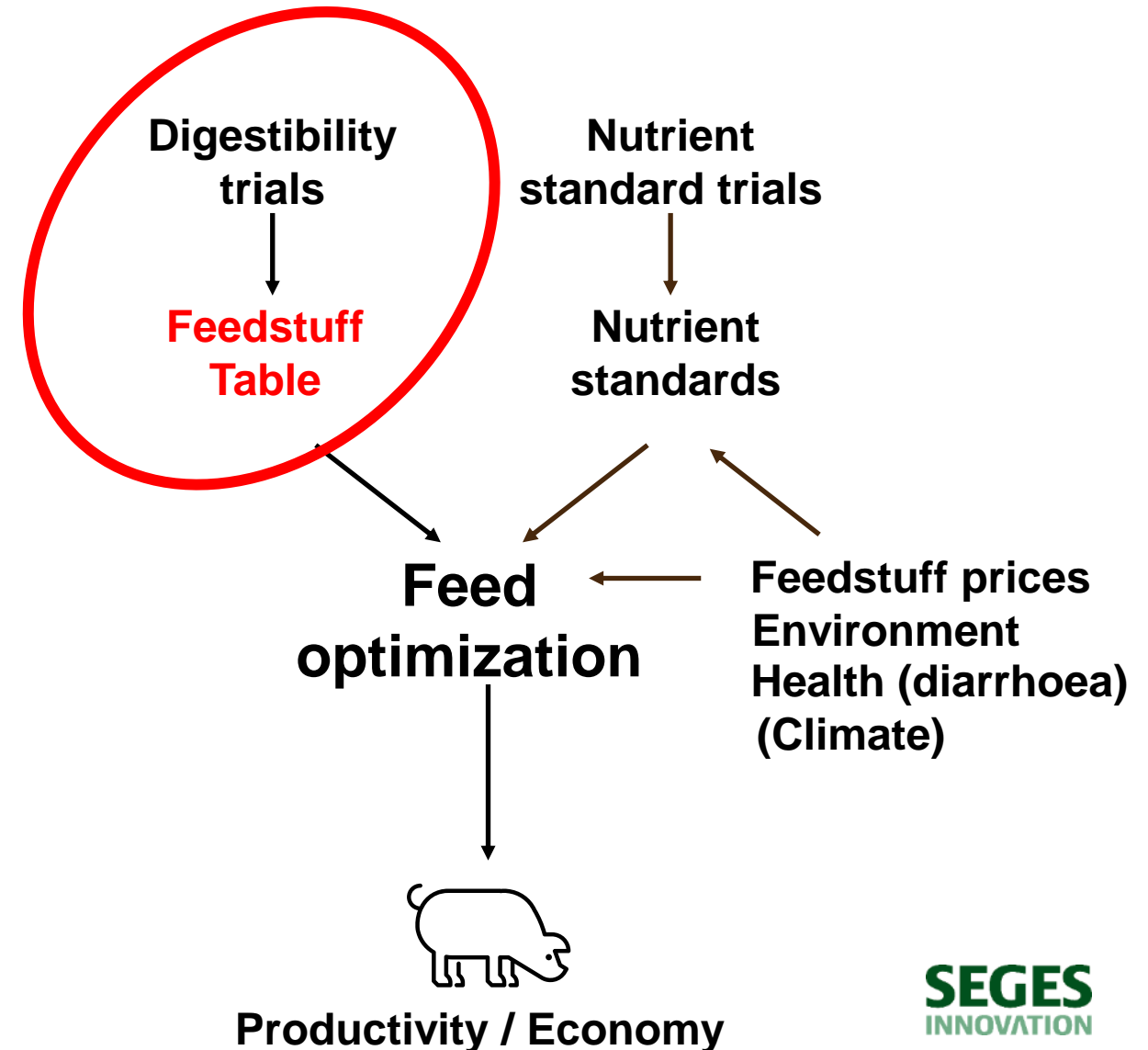
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# Feedstuff Table

## Digestibility coefficients:

- Basis for the Danish feed evaluation system
- **Ileal** digestibility
  - describes the nutritional value of the feed ingredient's **protein and amino acid content**.
- **Fecal** digestibility
  - describes the nutritional value of the feed ingredient's mineral content (**phosphorus**).
- Update of the Feedstuff Table
  - Nutrient content - annually
  - Digestibility values

Tabelværdi for BYG, vår, 2024

### Kemisk indhold

	Pct. af varen	Pct. af tørstof	Analyser bag tallene		
			Antal	Std.afv.	Rev.år
Tørstof	85.0		28	0.9	2024
Råprotein	8.4	9.9	28	0.5	2024
Råfedt	2.3	2.7	14	0.1	2024
Råaske	1.8	2.1	14	0.1	2024
Træstof	4.8	5.6			2020
Jodtal		120			

### Energi

EFOS		83.6	14	1.5	2024
EFOSi		78.8	14	1.1	2024
EFNi, pot.		90.0			
I-faktor <sup>1)</sup>		94.26	14		2024
FE-korrektionsfaktor <sup>2)</sup>		1.00			
		i varen	i tørstof		
FEsv, pr. 100 kg	102.5	120.6	14	2.0	2024
FEso 2023, pr. 100 kg	102.6	120.7	14	1.7	2024

### Aminosyrer

	Pct. af råprotein	Faktor*	g pr. kg vare	St. ford., g pr. kg vare	Analyser bag tallene		
					Antal	Std.afv.	Rev.år
Lysin	3.95	0.94	3.31	2.31			2024
Methionin	1.75	1.08	1.47	1.18			2024
Cystin	2.47	1.03	2.07	1.59			2024
Treonin	3.54	0.95	2.97	2.10			2024
Tryptofan	1.37	0.96	1.15	0.82			2024
Isoleucin	3.64	1.00	3.06	2.27			2024
Leucin	6.91	1.01	5.81	4.35			2024
Histidin	2.32	1.00	1.95	1.45			2024
Fenylalanin	4.68	1.04	3.93	3.03			2024
Tyrosin	3.19	0.97	2.68	1.93			2024
Valin	5.20	0.96	4.37	3.11			2024

Table values for spring barley, 2024

### Fordøjeligheder

	FK
Råprotein (standardiseret)	74.2
Råfedt (reelt fordøjet)	90
Fosfor, 0 enheder fytase tilsat	43
Fosforfordøjelighed afhængigt af %XX% opløsning fytase i forhold til standarddosis **	
60%	49
100%	52
150%	54
200%	55
250%	56
300%	57
350%	58
400%	58

### Kulhydrater

	g/kg tørstof
Organisk stof	979
Letfordøjelige kulhydrater	635
Fermenterbare kulhydrater	67.1
Stivelse	604
Sukker	21
Opløselige fibre	56
Uopløselige fibre	165

### Mineraler

	Pr. kg vare	Pr. kg tørstof	Analyser bag tallene		
			Antal	Std.afv.	Rev.år
Calcium, g	0.42	0.49	14	0.0	2024
Fosfor, g	3.00	3.53	28	0.3	2024
Natrium, g	0.11	0.13	14	0.0	2023
Klorid, g	1.60	1.89	14	0.2	2018
Kalium, g	3.81	4.48	14	0.5	2023
Magnesium, g	1.03	1.21	14	0.0	2023
Svovl, g	0.94	1.10			
Jern, mg	47.9	56.4	14	9.3	2023
Kobber, mg	2.56	3.01	14	0.6	2023
Mangan, mg	11.1	13.1	14	0.8	2023
Zink, mg	29.0	34.1	14	4.4	2023
Jod, mg	0.00	0.00			2020
Selen, mg	0.03	0.04			2020

# Use of the digestibility facilities

- **Danish Feedstuff Table**

- **Now:** digestibility coefficients are based on values from the literature.
- **Future:** digestibility coefficients will be based on a combination of values from SEGES trials and the literature.

- **Constant development**

- Feedstuff Table – update
- New feed ingredients and crops
- Processing of feed ingredients
- Feed additives – e.g. enzymes

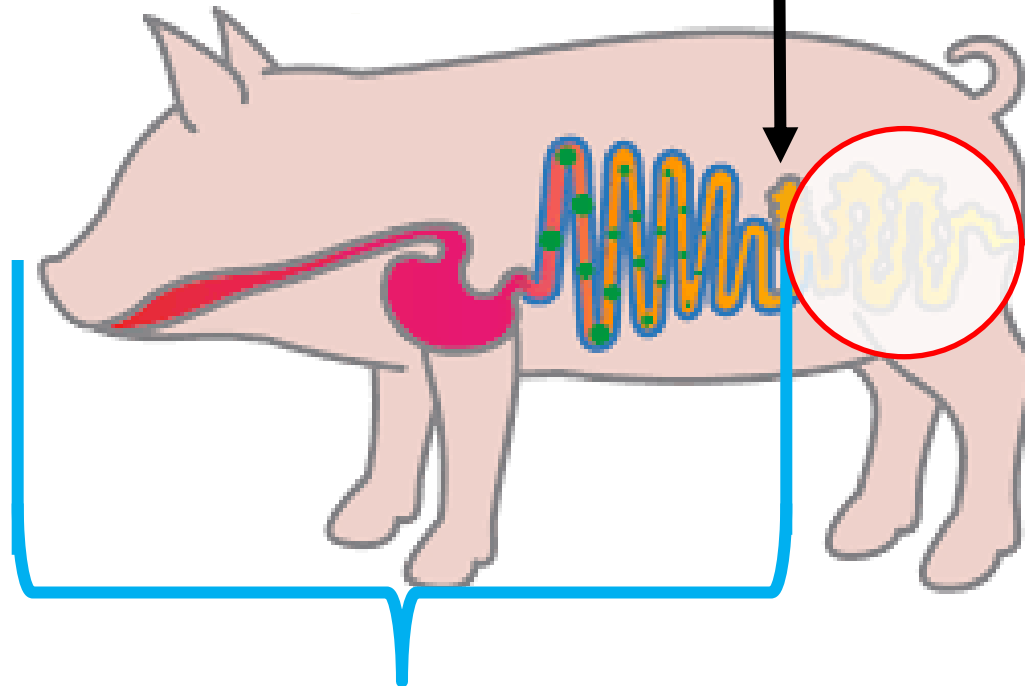


# Digestibility trials – Research station Grønhøj





# Two types of digestibilities



**Microbial metabolism of protein and amino acids**  
(does not benefit the pig)

**Protein and amino acids**



**Ileal digestibility**

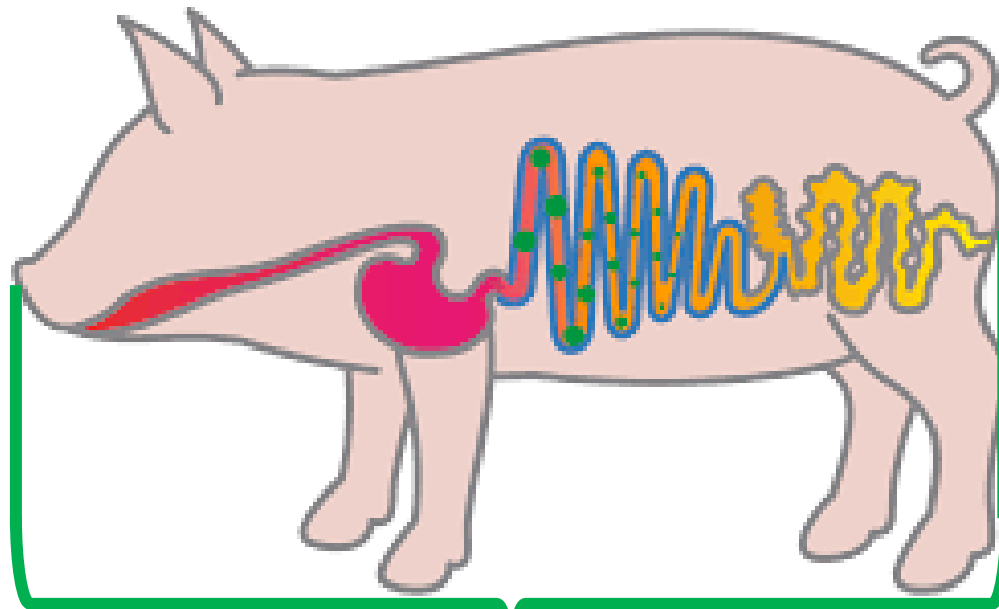
- Intake via feed – excreted in ileal digesta (i.e. before transition to cecum and colon)
- Used for protein and amino acid digestibility

# Two types of digestibilities

STØTTET AF

Svineavgiftsfonden

**Minerals**  
(phosphorus)

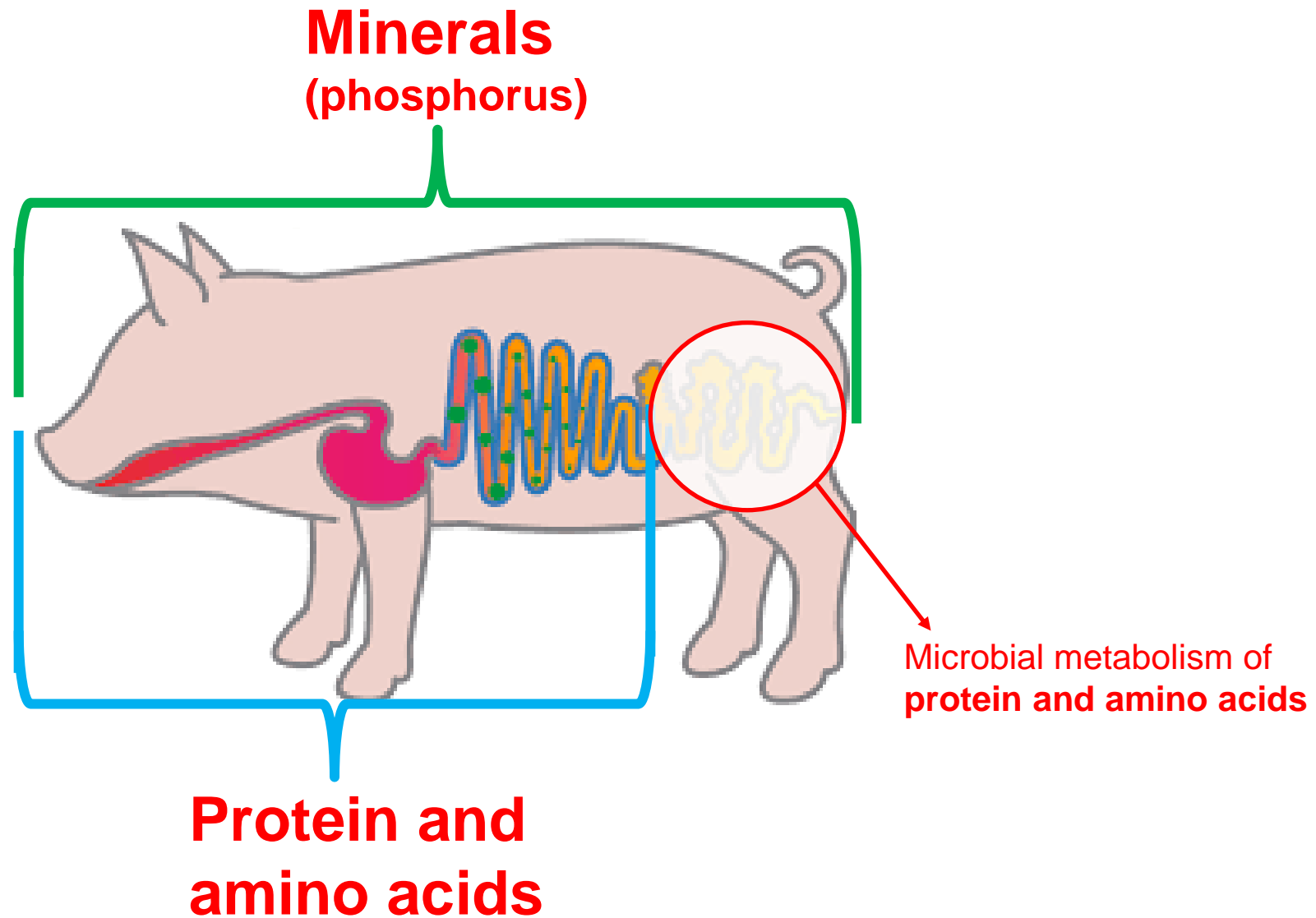


**Fecal digestibility:**

- Intake via feed – excreted in feces
- Used for phosphorus digestibility

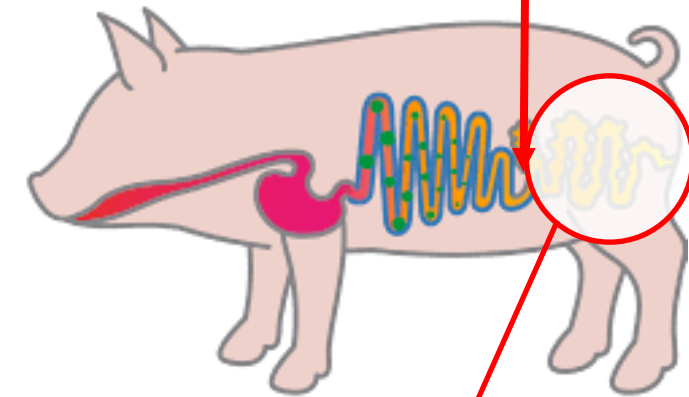


# Two types of digestibilities



# Digestibility trials – Research station Grønhøj

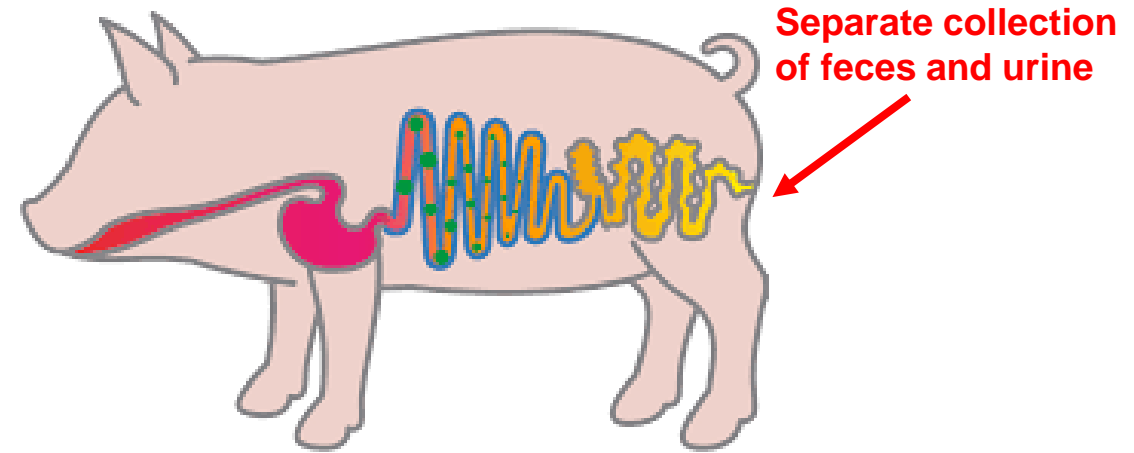
- 2022 • Ileal digestibility of protein and amino acids
- 2022 • Establishment of facilities
- 2023 • Establishment of procedures
- 2024 • Routine determination of ileal digestibilities
- 2025 • Implementation in the Feedstuff Table



**Microbial metabolism of amino acids**

# Digestibility trials – Research station Grønhøj

- 2024 • Fecal digestibility of minerals
- 2025 • Establishment of facilities and procedures
- 2025 • Routine determination of fecal digestibilities
- 2026 • Implementation in the Feedstuff Table



# Feed production – Research station Grønhøj

- Facilities for small-scale feed production
  - Small batches
  - High accuracy and precision
  - Ground diets (hammer mill)
- Pelleted diets
  - Danish Technological Institute



# Ileal digestibility of alternative protein sources

- Digestibility of protein/amino acids:
  - Faba beans
  - Dehulled faba beans
  - Rapeseed meal
  - Peas
  - Sunflower meal
  - Three different batches of soybean meal
- Standardized digestibility
  - Correction for the pig's basal endogenous loss of protein and amino acids
- Protein-free diet (N-free)
  - Cornstarch, Sugar, Oil, Cellulose, Premix, Marker.
- Implementation in the Feedstuff Table
  - 2025



## 2025: Fecal digestibility of phosphorus

- Plan: digestibility of phosphorus at high levels of phytase (600%):
  - Wheat
  - Barley
  - Soybean meal
  - Faba beans
  - Dehulled faba beans
  - Rapeseed meal
  - Peas
  - Sunflower meal
  - Monocalcium phosphate
- Standardized phosphorus digestibility
  - Correction for the pig's basal endogenous loss of phosphorus
- Phosphorus-free diet (P-free)
  - Cornstarch, Sugar, Oil, Cellulose, Premix, Marker, (Blood plasma).
- Implementation in the Feedstuff Table
  - 2026



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