

# NUTRIENT REQUIREMENT STANDARDS

This is the 25th edition of the Danish nutrient standards.

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## The Danish feed evaluation system

The Danish feed evaluation system, revised in 2002, 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 weaners, growers and finishers) and FU<sub>sow</sub> (feed units for sows).

In practice, energy evaluation in Denmark is based on:

1. Chemical analyses of water, ash, crude protein and crude fat
2. In vitro digestibilities 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.

Energy content per kg diet of a normal complete diet:				
	Feed unit	MJ ME	MJ NE	MJ physiological energy
Lactation diets	1.06 FU <sub>sow</sub>	13.3	9.6	7.9
Gestation diets	0.99 FU <sub>sow</sub>	12.6	8.8	7.4
Weaner diets, 6-9 kg	1.18 FUgp	14.4	10.5	8.7
Weaner diets, 9-30 kg	1.17 FUgp	14.1	10.4	8.6
Finisher diets, 30-100 kg	1.07 FUgp	13.4	9.6	7.9

# Amino acids

The standards for amino acids are shown in Tables 1-4 - a safety margin is not included. The standards for weaners, growers and finishers are based on ad libitum feeding or on approximate ad libitum feeding. Standards for lactating sows are adapted to prolific sows with a minimum feed intake of 7 FUsow in peak lactation (d 12-28). Standards for gilts are based on restricted feeding and the goal is that gilts be inseminated in their second heat when they are approx. 8 months old and weigh approx. 135-150 kg. Boars' amino acid requirement for sperm production is covered if they are fed according to the standards for gestating sows.

The standards are based on an economically optimum standard, as a standard for maximum productivity would increase feed costs more than can be covered by productivity improvements. For gilts, the standards are based on a desire to reach a maximum daily gain of approx. 725 g to achieve the above goal.

Tables 1, 2, 3 and 4 show the minimum crude protein content in pig feed. A minimum content serves as a guarantee against inaccuracies in feed formulation. Table 1 furthermore provides the limit for maximum digestible protein in weaner feed to ensure that only the amount protein necessary is used as high protein levels may increase the risk of diarrhoea outbreaks.

**Table 1.** Amino acid standards for weaners, g digestible per feed unit (FUgp).

Interval, kg	6-9 kg	9-15 kg	9-30 kg	15-30 kg	% of lysine*
Lysine	11	10.5	10.5	10.5	100**
Methionine	3.5	3.4	3.4	3.4	32
Methionine +Cystine	5.9	5.7	5.7	5.7	54
Threonine	6.7	6.4	6.4	6.4	61
Tryptophan	2.3	2.2	2.2	2.2	21**
Isoleucine	5.8	5.6	5.6	5.6	53
Leucine	11.0	10.5	10.5	10.5	100
Histidine	3.5	3.4	3.4	3.4	32
Phenylalanine	5.9	5.7	5.7	5.7	54
Phenylalanine+tyrosin	11.0	10.5	10.5	10.5	100
Valine	7.4	7.0	7.0	7.0	67
Crude protein, minimum	145	140	140	142	-
Crude protein, maximum	158	152	154	156	-

\* It must be ensured that the composition of ideal protein is met if lysine levels / weight intervals differ from those in the table.

\*\* The amino acid standards present the level that, under normal price conditions, guarantees maximum gross margin in herds with normal, healthy pigs. Research demonstrates that maximum productivity is obtained by increasing the lysine standard by approx. 7-10% (corresponding to 11.8 (6-9 kg) and 11.6 (9-30 kg) g standardised digestible lysine, respectively, per feed unit including the above profile for all essential amino acids). This is expected to improve FCR and daily gain by 1-2%.

Research also demonstrates that maximum productivity is obtained when the tryptophan standard is increased from the current approx. 21% to 22% of the lysine standard corresponding to approx. 0.21 g digestible tryptophan more than stated in the table.

**Table 2.** Amino acid standards for growers and finishers, g digestible per feed unit (FUgp).

Interval, kg	20-45	30-45	30-55	30-110	45-110	55-110	65-110	75-110	% of lysine*
				45-65	55-75				
Lysine	9.4	8.8	8.5	7.7	7.4	7.2	7.0	6.9	100
Methionine	2.8	2.7	2.6	2.3	2.2	2.2	2.1	2.1	30
Met+Cys	5.3	5.0	4.9	4.5	4.4	4.3	4.2	4.2	56-61
Threonine	5.9	5.6	5.5	5.1	4.9	4.8	4.7	4.6	63-67
Tryptophan	1.88	1.76	1.70	1.54	1.48	1.44	1.40	1.38	20
Isoleucine	5.0	4.7	4.5	4.1	3.9	3.8	3.7	3.7	53
Leucine	9.4	8.8	8.5	7.7	7.4	7.2	7.0	6.9	100
Histidine	3.0	2.8	2.7	2.5	2.4	2.3	2.2	2.2	32
Phenylalanine	5.1	4.8	4.6	4.2	4.0	3.9	3.8	3.7	54
Phen+tyrosine	9.4	8.8	8.5	7.7	7.4	7.2	7.0	6.9	100
Valine	6.3	5.9	5.7	5.2	5.0	4.9	4.7	4.7	67
Crude protein, minimum	140	130	127	120	115	112	109	108	-

\*The standards in this table apply to FCR per kg gain in the period 30-110 kg above 2.75 FUgp per kg gain. Pig producers with feed conversion ratios between 2.66 and 2.75 FUgp per kg gain in the period 30-110 kg are recommended to raise the standard for all amino acids for all weight intervals by 2.5%. Pig producers with a feed conversion ratio up to 2.65 FUgp per kg gain are recommended to raise the standards by 5% for all amino acids. Pig producers with specialised production units with focus on a high lean meat %, eg production for the British markets, are recommended to increase the content of digestible crude protein by 5 g per FUgp for all diets used until slaughter, but not for diets for pigs below 65 kg if phase feeding is applied. Table 2a shows the standards for unity mixes according to FCR and pig price model.

\*\*It is recommended to apply the standards and profile (% of lysine) that match the weight interval in question.

**Table 2a.** Standards from 30 to 110 kg depending on FCR and production for the British market, g digestible per feed unit (FUgp).

Pig price model	Regular			For UK market		
	> 2.75	2.66 – 2.75	≤ 2.65	> 2.75	2.66 – 2.75	≤ 2.65
FUgp/kg gain						
Lysine*	7.7	7.9	8.1	7.7	7.9	8.1
Crude protein, minimum	120	123	126	125	128	131

\*incl. remaining essential amino acids in table 2 with the profile (% of lysine) matching the weight interval 30-110 kg.

**Table 3.** Amino acid standards for gilts, g digestible per feed unit.\*

Interval, kg	30-65 kg	65-110 kg	30-110 kg	Above 110 kg
Lysine	6.6	5.0	6.0	4.0
Methionine	2.1	1.6	1.9	1.6
Methionine + cystine	4.0	3.2	3.5	3.2
Threonine	4.3	3.3	4.0	3.0
Tryptophan	1.3	1.0	1.2	1.0
Isoleucine	3.7	3.0	3.5	3.0
Leucine	7.6	5.8	6.1	4.1
Histidine	2.6	2.0	2.2	1.5
Phenylalanine	3.6	3.0	3.7	2.4
Phenylalanine + tyrosine	7.5	5.8	7.0	4.6
Valine	5.0	3.8	4.2	3.5
Crude protein, minimum	110	95	100	90

\* Provided restricted feeding from no later than 65 kg. The amino acid profile is significantly below what is required for maximum gain in order to slow growth and obtain a higher degree of fattening to accommodate longevity. The amino acid profile is based on a practical evaluation ensuring that diets for gilts can also be used for other categories of pigs. If you only use gilt diets up to 110 kg, you may instead apply in the amino acid profile (amino acids in per cent of lysine) for finishers in the weight interval 75-110 kg shown in table 2.

**Table 4.** Amino acid standards for sows, g digestible per feed unit (FU<sub>sow</sub>).

	Gestating sows	Service unit*	Lactating sows	Lactating sows % of lysine
Lysine	3.3	5.0	7.7	100
Methionine	1.6	1.6	2.46	32
Methionine + cystine	3.2	3.2	4.6	60
Threonine	3.0	3.3	5.0	65
Tryptophan	1.0	1.0	1.54	20
Isoleucine	3.0	3.0	4.3	56
Leucine	2.6	5.8	8.9	115
Histidine	1.2	2.0	3.0	39
Phenylalanine	1.9	3.0	4.2	55
Phenylalanine+tyrosine	3.6	5.8	8.7	113
Valine	3.5	3.8	5.85	76
Crude protein, minimum	90	95	125	-

\* Empty sows from weaning to insemination.

## Minerals

Mineral standards are presented as pigs' requirements plus a safety margin. Pig producers are generally not recommended to add minerals beyond the standard. This particularly applies to calcium,

as calcium interacts with certain micro minerals, wherefore a high content of calcium may inhibit the absorption of these micro minerals.

The standard for digestible phosphorus is a minimum standard, and does thus not include a safety margin.

The mineral standards in Tables 5, 6 and 7 are presented as total amount in the feed.

Feed for boars follows the mineral standards for finishers up to 100 kg, and from 100 kg it follows the standards for gestating sows.

**Table 5.** Mineral standards for sows and gilts, total amount per feed unit.

	Sows (per FU <sub>sow</sub> )			Gilts (per FU <sub>gp</sub> /FU <sub>sow</sub> )			
	Gestating	Lactating	Service unit	30-65 kg	65-105 kg	30-105 kg	Above 105 kg
Calcium, no phytase, g	7.0	8.0	7.0	8.0	7.0	7.0	7.0
Calcium, g +60-100% phytase	6.5	7.5	6.5	7.5	6.5	6.5	6.5
Calcium, g +150-250% phytase	6.2	7.2	6.2	7.2	6.2	6.2	6.2
Calcium, g +300-400% phytase	6.0	7.0	6.0	7.0	6.0	6.0	6.0
Dig. P, g	2.0	3.0	2.3	2.7	2.3	2.5	2.0
Sodium, g	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Chloride, g	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Potassium, g	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Magnesium, g	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Iron, mg	80	80	80	80	80	80	80
Copper, mg	6	6	6	6	6	6	6
Manganese, mg	40	40	40	40	40	40	40
Zinc, mg	100	100	100	100	100	100	100
Iodine, mg	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Selenium, mg <sup>1</sup>	0.2	0.2	0.2	0.2	0.2	0.2	0.2

<sup>1)</sup> According to the Danish Feedstuff Act, diets must not contain more than 0.5 mg selenium per kg complete diet. Depending on the composition of the diet, this means that it is allowed to add 0.2-0.35 mg selenium per feed unit

**Table 6.** Mineral standards for weaners, total amount per feed unit (FUgp).

Interval, kg	6-9 kg	9-15 kg	9-30 kg	15-30 kg
Calcium, no phytase, g	7.0	8.0	8.5	8.5
Calcium, g +60-100% phytase	6.5	7.5	8.0	8.0
Calcium, g +150-250% phytase	6.2	7.2	7.7	7.7
Calcium, g +300-400% phytase	6.0	7.0	7.5	7.5
Dig. P, g	3.3 <sup>3</sup>	3.2	3.1	3.0
Sodium, g	1.5	1.5	1.5	1.5
Chloride, g	2.5	2.5	2.5	2.5
Potassium, g	2.5	2.5	2.5	2.5
Magnesium, g	0.4	0.4	0.4	0.4
Iron, mg	150 <sup>1</sup>	150 <sup>1</sup>	150 <sup>1</sup>	150 <sup>1</sup>
Copper, mg	6	6	6	6
Manganese, mg	40	40	40	40
Zinc, mg	100	100	100	100
Iodine, mg	0.2	0.2	0.2	0.2
Selenium, mg <sup>2</sup>	0.35	0.35	0.35	0.35

<sup>1)</sup> Of this min. 100 mg easily soluble iron salt.

<sup>2)</sup> According to the Danish Feedstuff Act, diets must not contain more than 0.5 mg selenium per kg complete diet. Depending on the composition of the diet, this means that it is allowed to add 0.2-0.35 mg selenium per feed unit.

<sup>3)</sup> When a high inclusion of zinc oxide is applied (2,500 ppm zinc), it is recommended to add an additional 0.3 g digestible phosphorus per feed unit than stated in the standard. It is also recommended to continue adding phytase to weaner feed when additional zinc is added.

**Table 7.** Mineral standards for growers and finishers, total amount per feed unit.

	20-45 kg	30-45 kg	30-105 kg	45-105 kg	65-105 kg
Calcium, no phytase, g	8.0	7.5	7.0	7.0	6.5
Calcium, g +60-100% phytase	7.5	7.0	6.5	6.5	6.0
Calcium, g +150-250% phytase	7.2	6.7	6.2	6.2	5.7
Calcium, g +300-400% phytase	7.0	6.5	6.0	6.0	5.5
Dig. P, g	2.8	2.6	2.5	2.4	2.3
Sodium, g	1.5	1.5	1.5	1.5	1.5
Chloride, g	2.5	2.5	2.5	2.5	2.5
Potassium, g	2.5	2.5	2.5	2.5	2.5
Magnesium, g	0.4	0.4	0.4	0.4	0.4
Iron, mg	80	80	80	80	80
Copper, mg	6	6	6	6	6
Manganese, mg	40	40	40	40	40
Zinc, mg <sup>2</sup>	100	100	100	100	100
Iodine, mg	0.2	0.2	0.2	0.2	0.2
Selenium, mg <sup>1</sup>	0.2	0.2	0.2	0.2	0.2

<sup>1)</sup> According to the Danish Feedstuff Act, diets must not contain more than 0.5 mg selenium per kg complete diet. Depending on the composition of the diet, this means that it is allowed to add 0.2-0.35 mg selenium per feed unit.

<sup>2)</sup> It is recommended to add 70 mg zinc per feed unit to meet the standard of 100 mg per feed unit and at the time avoid exceeding the maximum limit of 120 mg per kg. If it is confirmed that the feed includes minimum 200% phytase, the addition of zinc may be lowered to 40 mg per feed unit.

As it is not possible to analyse the content of digestible phosphorus in feed, it must therefore be assessed on the basis of the total content of phosphorus. Table 8 shows the guidelines for minimum content of total phosphorus in diets containing phytase.

**Table 8.** Guiding minimum content of total phosphorus in complete diets with phytase g per feed unit.

Phytase, % of standard*	Min. content of total P when adding phytase			
	100	200	300	400
Weaners (FUgp), 9-30 kg	5.2	4.9	4.7	4.6
Growers and finishers (FUgp), 30-105 kg	4.4	4.1	3.9	3.8
Gestating sows (FU <sub>sow</sub> )	3.8	3.4	3.2	3.1
Lactating sows (FU <sub>sow</sub> )	5.2	4.9	4.7	4.6

Prerequisites of minimum recommendations: traditional diets based on grain and soybean meal in which wheat constitutes approx. 50% of the grain for sows and minimum 2/3 of the grain for weaners and finishers. Phosphorus source: monocalcium phosphate. In other types of diets, the content of total phosphorus often needs to be slightly higher to meet the standards for digestible phosphorus.

\* Phytase units in different phytase products in different inclusion rates are shown in Table 9.

**Table 9.** Phytase units in different phytase products; inclusion rates ranging from 60 to 400%.

Inclusion	Natuphos (FTU) Phyzyme XP (FTU) Ronozyme HiPhos (FYT)	Ronozyme NP (FYT)	Optiphos (OTU) <sup>3)</sup>	Axtra Phy (FTU) Quantum Blue (FTU)
60%	300 <sup>1)</sup>	Below allowed inclusion rate	150 <sup>4)</sup>	250 <sup>6)</sup>
100%	500	1,500 <sup>2)</sup>	250	400 <sup>6)</sup>
150%	750	1,875	375	600
200%	1,000	2,500	500	800
300%	1,500 <sup>5)</sup>	-	-	1,200
400%	2,000 <sup>5)</sup>	-	-	1,600

<sup>1)</sup>: Minimum inclusion allowed of Ronozyme HiPhos is 500 FYT.

<sup>2)</sup>: It only takes 1,250 FYT to obtain an effect corresponding to 100%, but the lowest inclusion allowed is 1,500 FYT per kg feed.

<sup>3)</sup>: Optiphos is approved in the EU according to a different analysis method, the OTU. In practice, Optiphos can be verified with the standard method (FTU/FYT), but requires minimum twice as many analysed FTU/FYT than declared OTU. Literature reviews indicate a conversion factor between OTU and FTU of roughly 2.5, but this will be determined later in an EU test made at multiple laboratories.

<sup>4)</sup>: Optiphos minimum inclusion in feed for sows and finishers: 125 OTU. Minimum inclusion in feed for weaners: 250 OTU (100%).

<sup>5)</sup>: Phyzyme only allowed in inclusion rates up to 1,000 FTU in feed for weaners and finishers, and 500 FTU in feed for sows.

<sup>6)</sup>: Axtra Phy minimum inclusion: 250 FTU. Quantum Blue minimum inclusion in feed for sows and finishers: 250 FTU. Minimum inclusion in feed for weaners: 500 FTU.

## Vitamins

Besides minimum requirements, the vitamin standards include a safety margin for maximum productivity and reproduction. The standards for certain vitamins also take into consideration maximum health to the extent that this is scientifically documented.



Contrary to mineral standards, the vitamin standards are determined in amounts **added** without regard to the vitamin content of the basic feed (cf. Table 10). This is due to the fact that the natural vitamin content of feedstuffs varies greatly and generally has a low availability. It is not recommended to add vitamins beyond the standard.

**Table 10.** Vitamin standards for pigs, amount added per feed unit.

	<b>Gestating sows. Gilts above 105 kg. Service unit</b>	<b>Lactating sows</b>	<b>Weaners approx. 6-9 kg</b>	<b>Weaners approx. 9-30 kg</b>	<b>Finishers 30-105 kg. Gilts up to 105 kg</b>
Vitamin A, i.u.	8000	8000	8000	5000	4000
Vitamin D <sub>3</sub> , i.u.	800	800	800	500	400
Vitamin E, i.u.	40	165	140	140 *)	40
- as <i>dl-alpha-tocopherol</i> , mg	36	150	130	130 *)	36
- corresponding to vitamin E (all-rac acetat), mg	40	165	140	140 *)	40
- corresponding to vitamin E (RRR), mg	27	111	94	94 *)	27
- corresponding to vitamin E (RRR acetat), mg	29	121	103	103 *)	29
Vitamin K <sub>3</sub> , mg	2	2	2	2	2
Thiamine (B <sub>1</sub> ), mg	2	2	2	2	2
Riboflavine (B <sub>2</sub> ), mg	5	5	4	4	2
Pyridoxine (B <sub>6</sub> ), mg	3	3	3	3	3
Niacine, mg	20	20	20	20	20
Biotin, mg	0.2	0.2	0.2	0.2	0.05
D-Pantothenic acid, mg	15	15	10	10	10
Folic acid, mg	1.5	1.5	0	0	0
Vitamin B <sub>12</sub> , mcg	20	20	20	20	20

\*) When using a diet from 20 to 30 kg, vitamin E content can be reduced to the level that applies to finishers. 130 mg (as *dl-alpha-tocopherol*) per FUgp were documented in the period 6-20 kg.

## Diarrhoea and weaners - recommendations

Trial results and experience from practice demonstrate that the risk of diarrhoea outbreaks among weaners increases if the pigs are fed high-protein feed.

Recent trial results demonstrated that diarrhoea outbreaks among weaners increase when the content of calcium (in the form of feed lime) in the feed increases. Pig producers experiencing a high frequency of diarrhoea outbreaks in their herd when observing the standards may benefit from

lowering the content of protein, amino acids and calcium as shown in Table 11. It is recommended to maintain the same amino acid profile in per cent of lysine as in the standards. It is recommended to go below the standard only for the period strictly necessary. The recommendations shown in Table 11 are expected to lower daily gain by approx. 2.5% and FCR by approx. 1% compared with the standards - provided all amino acids comply with the recommendation. Otherwise further reductions in productivity must be expected.

**Table 11.** Recommended content of digestible amino acids and crude protein, and total calcium content during outbreaks of diarrhoea among weaners, g per feed unit.

Interval, kg	6-15 kg
Lysine	10.0
Methionine	3.2
Methionine +cystine	5.4
Threonine	6.1
Tryptophan	2.00
Isoleucine	5.3
Leucine	10.0
Histidine	3.2
Phenylalanine	5.4
Phenylalanine + tyrosine	10.0
Valine	6.7
Crude protein, minimum	134
Crude protein, maximum	145
Calcium, no phytase added	7.0
Calcium, +60-100% phytase	6.5
Calcium, +150-250% phytase	6.2
Calcium. +300-400% phytase	6.0

# Revision of the standards

The standards are routinely revised. Evaluations are made by representatives from The Faculty of Agricultural Sciences, Aarhus University, the University of Copenhagen, pig production advisors and SEGES Pig Research Centre.

## Amino acids:

1990:	The standards for the first five amino acids were revised according to new weaner trial results.
1991:	The standards for male pigs were reduced by 10% on the basis of new trial results. Consequently, this set of standards does not include specific standards for male pigs.
1996:	Standards were determined for the remaining six amino acids.
1998:	Standards were incorporated applicable to phase feeding.
2001:	<ul style="list-style-type: none"> <li>• The standards for methionine, methionine + cystine, and threonine for sows were revised.</li> <li>• The standards for leucine for weaners and growers, and for methionine for finishers were revised.</li> </ul>
2002:	<ul style="list-style-type: none"> <li>• The standards for threonine and tryptophan for weaners were revised.</li> <li>• New amino acid standards and recommendations for minimum content of crude protein were incorporated. This applies to the new feed evaluation system introduced in the summer of 2002.</li> <li>• The amino acid standards were changed from apparent faecal digestible to standardised ileal digestible.</li> <li>• The standards for histidine and leucine for growers (20-45 kg) were changed in the new feed evaluation system, as there was no agreement between the standards for the different weight intervals for these two amino acids.</li> </ul>
2004:	<ul style="list-style-type: none"> <li>• The threonine standard for finishers was increased and the standards for several of the amino acids were adjusted slightly, as the composition of the ideal protein for certain weight intervals was deemed illogical.</li> <li>• The weight intervals were standardized, which means that 30-100 kg is used in all tables for unity mixes for finishers.</li> </ul>
2005:	Standards were introduced for heavy pigs (slaughter weight: 110-115 kg) in the weight interval 65-110 kg.
2006:	The standard for tryptophan for weaners was revised.
2008:	<ul style="list-style-type: none"> <li>• The amino acid standards for weaners were revised and recommendations were incorporated for amino acid content in feed on farms with diarrhoea problems.</li> <li>• A maximum content of digestible protein per FUp was introduced in weaner feed.</li> <li>• The standards for methionine, tryptophan, valine and leucine for finishers were changed.</li> </ul>

	<ul style="list-style-type: none"> <li>The rule-of-thumb for the importance of amino acid deficiency was deleted.</li> </ul>
2010:	The standard for valine for weaners was revised.
2012:	<ul style="list-style-type: none"> <li>The standard for lysine for weaners was revised.</li> <li>Weight intervals in the weaner period were revised.</li> <li>Ideal protein composition was revised (isoleucine, histidine and tryptophan) for weaners.</li> <li>Guiding minimum and maximum content of digestible protein per feed unit was reduced.</li> <li>Phase feeding standards for growers/finishers were revised.</li> </ul>
2013:	Amino acid standards for lactating sows and for finishers were revised.
2014:	Amino acid standards for gilts were incorporated.
2015:	The ideal protein profile for weaner and finisher feed was revised. For weaners, the revision concerned leucine, phenylalanine and phenylalanine+tyrosine. For finishers, the revision concerned methionine, isoleucine, phenylalanine, phenylalanine+tyrosine, and valine. Furthermore, a standard for specialised production was introduced focusing on lean meat %, relevant for, for instance, producers delivering pigs for the British markets.
2015:	The standard for digestible lysine for lactating sows was raised to 7.7 g per feed unit and the amino acid profile in per cent of lysine was maintained, ie. all amino acids standards were raised by 16-17%. The minimum standard for digestible crude protein for lactating sows was raised from 110 to 125 g per feed unit.
2016:	The lysine standard was raised to 8.8 and 8.5 g per feed unit for growers in the weight intervals 30-45 kg and 30-55 kg. The remaining amino acids for growers were revised according to the current amino acid profile with the exception of isoleucine, leucine and histidine. These three amino acids were lowered to the same percentage of lysine as in the weaner standards for all weight intervals for growers and finishers, ie. 53, 100 and 32% of lysine. The standards for amino acids and protein for finishers in all weight intervals were raised by 2.5% for each time FCR improves by 0.1 with on a point of departure of 2.8 feed units per kg gain.
2017:	The tryptophan standard for weaners is increased to 21% of lysine.

### Minerals:

1991:	The selenium standard was revised.
1995:	Standards for digestible phosphorus for growers and finishers were incorporated in the standards.
1997:	The standards for calcium and digestible phosphorus for sows and weaners were revised.
1998:	Phase feeding standards for phosphorus were incorporated in the standards.
2000:	Calcium standards for sows and weaners were revised.
2002:	<ul style="list-style-type: none"> <li>The recommendations for total-P content in the feed including phytase were revised.</li> <li>A calcium standard was incorporated for the use of phytase.</li> </ul>
2005:	The standard for digestible phosphorus was made a minimum standard.
2006:	<ul style="list-style-type: none"> <li>The standard for digestible phosphorus for weaners was revised.</li> </ul>

	<ul style="list-style-type: none"> <li>The guiding minimum content of total-P was revised.</li> <li>Recommendations for double dosage of phytase were introduced.</li> </ul>
2008:	The standards for digestible phosphorus were revised for all animal groups.
2010:	<ul style="list-style-type: none"> <li>The standards for digestible phosphorus for growing pigs and finishers were revised, and the guiding levels of total phosphorus were revised.</li> <li>A recommendation for increased phosphorus content was introduced when a high zinc inclusion is applied (2,500 ppm).</li> </ul>
2012:	Efficiency of a new phytase product (Ronozyme NP) was determined.
2014:	Mineral standards for gilts and recommendation for calcium content in feed for weaners suffering from diarrhoea were incorporated.
2015:	The standard for digestible phosphorus for lactating sows was raised from 2.7 to 3.0 g per feed unit.
2016:	Optiphos phytase – efficiency estimated at 250 OTU for 100% inclusion (standard inclusion).
2016:	Axtra Phy and Quantum Blue efficiency estimated at 400 FTU for 100% inclusion (standard inclusion). Recommendations added on the addition of zinc to feed for finishers with normal and high inclusion of phytase.
2017:	Calcium standard is graduated in relation to phytase dosis, and the calcium standard for weaners 9-15 kg is lowered to 0.5 g.

#### Vitamins:

1990:	The vitamin standards were revised.
2004:	The vitamin E standard for lactating sows was revised.
2005:	The vitamin E standard for weaners was revised.
2012:	The vitamin E standard is presented in IU and supplemented with conversion to mg when using different vitamin E products.
2014:	Vitamin standards for gilts were incorporated.



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Ophavsretten tilhører SEGES. Informationerne fra denne hjemmeside må anvendes i anden sammenhæng med kildeangivelse.

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