



Effect of new SID-AA values of feed ingredients on price, ingredient and nutrient composition of compound feed for pigs

Néstor Gutiérrez
Willy Nielen
Neil Jaworski

 **trouw nutrition**
a Nutreco company

1

Objectives

To determine the effect of formulating nursery, finishing and lactating sow diets with SID AA-2022 coefficients on:

- Nutrient composition (e.g. SID AA, SID AA/ Lys, SID Lys/NE₂₀₁₅)
- Ingredient composition
- Price

 **trouw nutrition**
a Nutreco company

2

Methodology:

Generalities

Desk study with least-cost diet formulations for the following phases:

- 5-12 kg pigs
- 80-120 kg pigs
- Lactating sows

SID AA values were tested in different formulation scenarios for nursery and finishing pigs

- e.g. varying NE_{2015} density of diets
 - Measuring effect on Total SID AA, ingredient and nutrient composition, and price

Diets are Wheat/Barley based to represent the North-Western European environment

Internal nutrient recommendations (constraints) were used for diet formulation, e.g.:

- Current SID AA values in database are from 2007
- SID AA/Lys ratios; SID Lys/ NE_{2015}
- Kinetics of protein and fiber
- Stomach's pH

A few formulation constraints were applied to ingredients (e.g. max. corn @ 5%)



3



4

Methodology:

Ingredient comp. of diets for 5–12 kg pigs

Ingredient, %	NE ₂₀₁₅ MJ/kg				
	10.1	...	10.5	...	11.0
Wheat	45.0	...	43.5	...	39.6
Barley	20.9	...	18.1	...	17.7
Soybean meal 47	14.5	...	16.7	...	19.0
Maize	5.0	...	5.0	...	5.0
Whey powder	4.3	...	4.3	...	4.3
Rapeseed meal	3.5	...	3.5	...	3.5
Soybean oil	1.8	...	3.7	...	5.7
L-Lysine HCl 98%	0.7	...	0.7	...	0.7
L-Threonine min 98%	0.3	...	0.3	...	0.3
DL-Methionine 99%	0.2	...	0.2	...	0.2
L-Valine 96.5%	0.1	...	0.1	...	0.1
Others	3.7	...	3.8	...	3.8

Diets:

- NE₂₀₁₅ increased from 10.1 to 11.0
 - 11 diets formulated
- SID Lys / NE₂₀₁₅ = 1,17 g/MJ
- Wheat/Barley based

5

Methodology:

Nutrient comp. of diets for 5–12 kg pigs

Description		NE ₂₀₁₅ MJ/kg				
		10.1	...	10.5	...	11.0
Crude Protein	g/kg	173	...	179	...	185
Crude Fat (ah)	g/kg	37	...	55	...	74
NE ₂₀₁₅	MJ/kg	10.1	...	10.5	...	11.0
SID LYS/NE ₂₀₁₅	g/MJ	1.17	...	1.17	...	1.17
SID LYS	g/kg	11.8	...	12.3	...	12.8
SID M+C/LYS		0.58	...	0.58	...	0.58
SID THR/LYS		0.63	...	0.63	...	0.63
SID TRP/LYS		0.18	...	0.18	...	0.18
SID VAL/LYS		0.65	...	0.65	...	0.65
SID ILE/LYS		0.48	...	0.48	...	0.482
SID LEU/LYS		0.87	...	0.87	...	0.87
Ca/ STTD P		1.99	...	1.99	...	1.99

As NE₂₀₁₅ increase:

- Crude protein and fat increase
- SID Lys/NE₂₀₁₅ is constant
- SID Lys increase with NE₂₀₁₅
- SID AA/Lys ratios are constant
- Ca/STTD P ratios are constant

“Current” recommendations for nutrient constraints

6

Methodology: Steps and estimation of new formulation constraints

1 Current recommendations			2			3		
	Value	Min	Value	Min	Value	Min	Value	Min
SID Lys / NE ₂₀₁₅ , g/MJ	1.17	1.17	SID Lys / NE ₂₀₁₅ , g/MJ	1.17	-	SID Lys / NE ₂₀₁₅ , g/MJ	1.15	-
SID M+C/LYS	0.58	0.58	SID M+C/LYS	0.58	-	SID M+C/LYS	0.58	-
SID THR/LYS	0.63	0.63	SID THR/LYS	0.63	-	SID THR/LYS	0.63	-
SID TRP/LYS	0.18	0.18	SID TRP/LYS	0.18	-	SID TRP/LYS	0.18	-
SID VAL/LYS	0.65	0.65	SID VAL/LYS	0.65	-	SID VAL/LYS	0.65	-
SID ILE/LYS	0.48	0.48	SID ILE/LYS	0.48	-	SID ILE/LYS	0.47	-
SID LEU/LYS	0.87	0.87	SID LEU/LYS	0.87	-	SID LEU/LYS	0.86	-
SID HIS/LYS	0.3	0.3	SID HIS/LYS	0.3	-	SID HIS/LYS	0.3	-
SID LYS_2022/NE ₂₀₁₅ , g/MJ	1.19	-	SID LYS_2022/NE ₂₀₁₅ , g/MJ	1.19	1.19	SID LYS_2022/NE ₂₀₁₅ , g/MJ	1.17	1.17
SID M+C/LYS_2022	0.58	-	SID M+C/LYS_2022	0.58	0.58	SID M+C/LYS_2022	0.58	0.58
SID Thr/LYS_2022	0.63	-	SID Thr/LYS_2022	0.63	0.63	SID Thr/LYS_2022	0.63	0.63
SID Trp/LYS_2022	0.18	-	SID Trp/LYS_2022	0.18	0.18	SID Trp/LYS_2022	0.18	0.18
SID Val/LYS_2022	0.65	-	SID Val/LYS_2022	0.65	0.65	SID Val/LYS_2022	0.65	0.65
SID ILE/LYS_2022	0.49	-	SID ILE/LYS_2022	0.49	0.49	SID ILE/LYS_2022	0.48	0.48
SID LEU/LYS_2022	0.89	-	SID LEU/LYS_2022	0.89	0.89	SID LEU/LYS_2022	0.87	0.87
SID ARG/LYS_2022	0.30	-	SID ARG/LYS_2022	0.30	0.30	SID ARG/LYS_2022	0.30	0.30

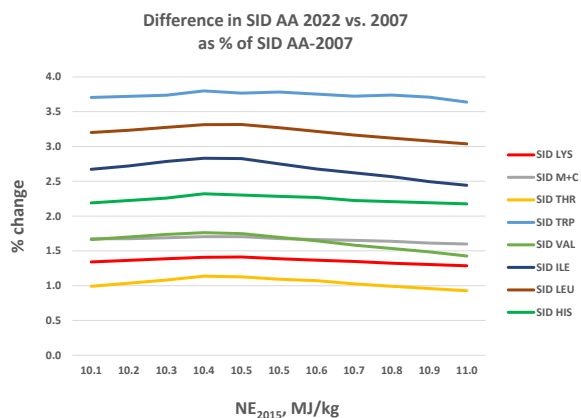
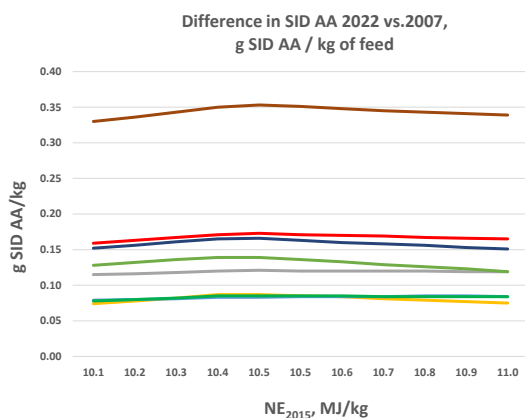
Shadow SID AA values (pointing to 1.19, 0.58, 0.63, 0.18, 0.65, 0.49, 0.89, 0.30 in column 1)

Shadow SID AA values used as new formulation constraints (pointing to 1.19, 0.58, 0.63, 0.18, 0.65, 0.49, 0.89, 0.30 in column 2)



7

Effect on SID AA (g) /kg with SID AA-2022



- The new coefficients of SID AA 2022 increase the amount of SID AA of all AA in the final diet
 - The increase is greater for SID Trp (approx. 3.7%)
 - SID Lys increased by approximately 1.4%



8

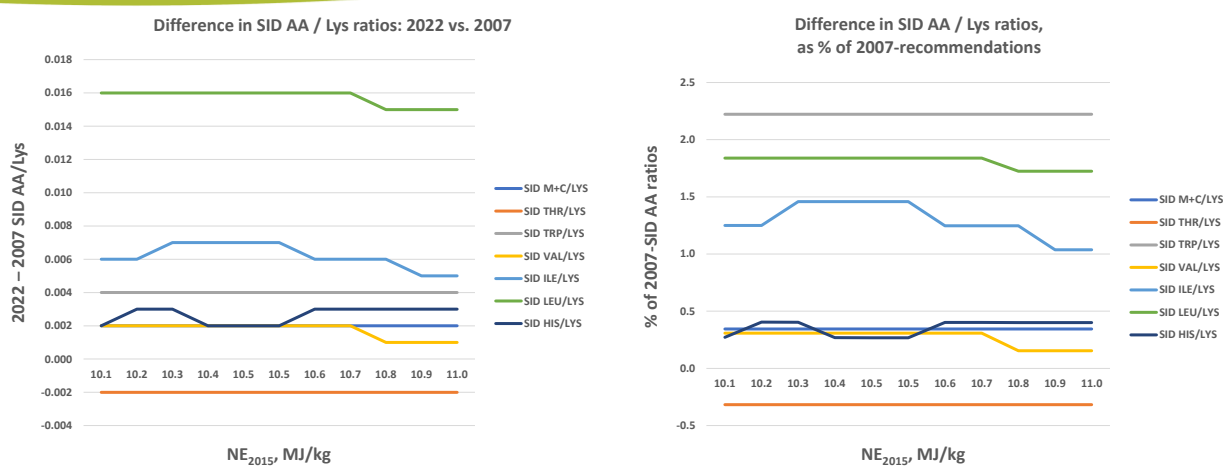
Effect on SID AA (g) /kg with SID AA-2022

g/kg	2007			2022		
	10.1	10.5	11.0	10.1	10.5	11.0
SID LYS	11.8	12.3	12.8	12.0	12.5	13.0
SID M+C	6.9	7.2	7.4	7.0	7.3	7.6
SID THR	7.5	7.8	8.1	7.5	7.9	8.2
SID TRP	2.1	2.2	2.3	2.2	2.3	2.4
SID VAL	7.7	8.0	8.3	7.8	8.2	8.5
SID ILE	5.7	5.9	6.2	5.8	6.1	6.3
SID LEU	10.3	10.7	11.2	10.6	11.1	11.5
SID HIS	3.6	3.7	3.9	3.6	3.8	3.9
SID Lys / NE _{2015'} g/MJ	1.17	1.17	1.17	1.19	1.19	1.19



9

Effect on SID AA/Lys ratios with SID AA-2022



- The SID AA / Lys ratios in wheat/barley-based diets increased with the 2022 version for most AA
 - Except for Thr
- The increase in ratios is low across different formulation scenarios

10

Re-formulating diets for 5–12 kg pigs using shadow values

Diets were re-calculated using shadow values (2022) for:

- 1) SID Lys / NE
- 2) SID AA/Lys were calculated

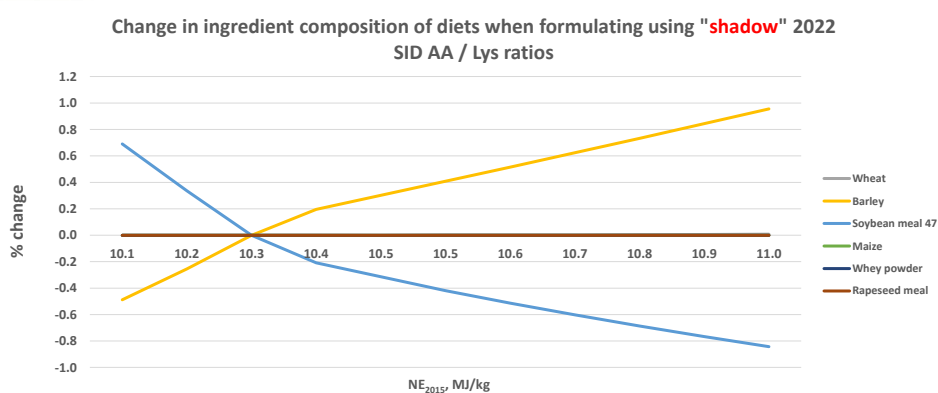
	Original	Shadow	
	2007	2022	Average change, %
SID Lys / NE _{2015*} g/MJ	1.17	1.19	1.4
SID M+C/LYS	0.58	0.58	0.3
SID THR/LYS	0.63	0.63	-0.3
SID TRP/LYS	0.18	0.18	2.2
SID VAL/LYS	0.65	0.65	0.3
SID ILE/LYS	0.48	0.49	1.3
SID LEU/LYS	0.87	0.89	1.8
SID HIS/LYS	0.3	0.30	0.4



11

Effect on ingredient composition of diets with SID AA–2022

Using "shadow" SID AA ratios for 5–12 kg pigs



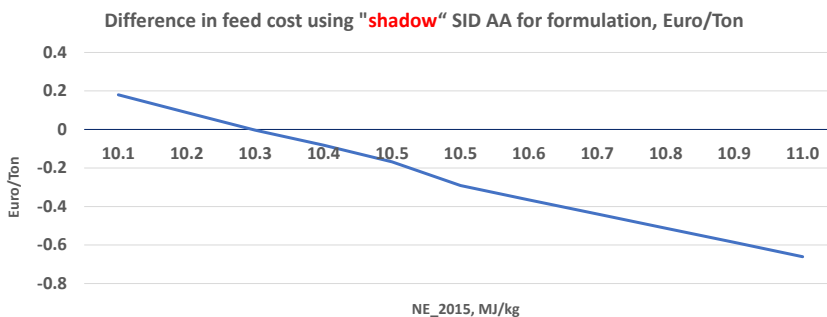
The effect of SID AA₂₀₂₂ on ingredient composition of diets is negligible



12

Effect on feed cost with SID AA-2022:

Using "shadow" SID AA ratios for 5-12 kg pigs



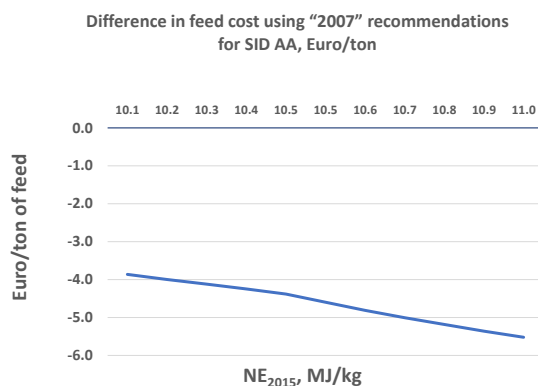
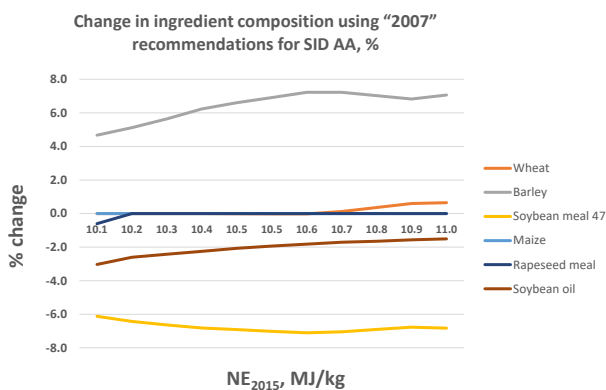
Effect of SID AA-2022 on diet cost is minor, with potential savings at greater NE and nutrient densities



13

Effect on composition and feed cost with SID AA-2022

Using "2007" SID AA ratios for 5-12kg pigs



When formulating with SID AA_2022 and "2007" nutrient constraints for SID AA/Lys and SID Lys/NE₂₀₁₅:

- Increase in variation of inclusion levels of macro-ingredients
- Reduction in feed cost (≈1%)
 - A consequence of a higher SID AA supply from feed ingredients to meet "old" formulation nutrient constraints

Note: For a safe comparison and implementation, "shadow" SID AA/Lys and SID Lys/NE ratios should be used as "new" formulation targets

14

Finishing pigs

80–120 kg



trouw nutrition
a Nutreco company

15

Ingredient comp. of diets for 80–120 kg pigs

Ingredient, %	NE ₂₀₁₅ MJ/kg				
	9.4	...	10.0	...	10.5
Wheat	35.8	...	45.0	...	45.0
Barley	45.0	...	31.6	...	27.4
Rapeseed meal	7.1	...	10.0	...	10.0
Maize	1.3	...	5.0	...	5.0
Soybean meal 48	-	...	1.8	...	3.8
Sunflower meal	5.6	...	-	...	-
Wheat bran	3.0	...	3.0	...	3.0
Sunflower oil	-	...	1.5	...	3.7
L-Lysine Hcl 98%	0.5	...	0.5	...	0.5
L-Threonine 98%	0.1	...	0.2	...	0.2
DL-Methionine 99%	0.0	...	0.1	...	0.1
Others	1.5	...	1.3	...	1.3

Diets:

- NE₂₀₁₅ increased from 9.4 to 10,5
 - 8 diets formulated
- SID Lys / NE₂₀₁₅ = 0.81 g/MJ
- Wheat/Barley based

trouw nutrition
a Nutreco company

16

Nutrient comp. of diets for 80–120 kg pigs

Description		NE ₂₀₁₅ MJ/kg		
		9.4	10.0	10.5
Crude Protein	g/kg	141	...	146
Crude Fat (ah)	g/kg	22	...	36
NE ₂₀₁₅	MJ/kg	9.4	...	10.0
SID LYS/NE ₂₀₁₅	g/MJ	0.81	...	0.81
SID LYS	g/kg	7.6	...	8.1
SID M+C/LYS		0.62	...	0.62
SID THR/LYS		0.68	...	0.68
SID TRP/LYS		0.20	...	0.20
SID VAL/LYS		0.68	...	0.68
SID ILE/LYS		0.53	...	0.53
SID LEU/LYS		1.00	...	1.00
Ca/STTD P		2.75	...	2.75

As NE₂₀₁₅ increase:

- Crude protein and fat increase
- SID Lys/NE₂₀₁₅ is constant
- SID Lys increase with NE₂₀₁₅
- SID AA/Lys ratios are constant
- Ca/STTD P ratios are constant

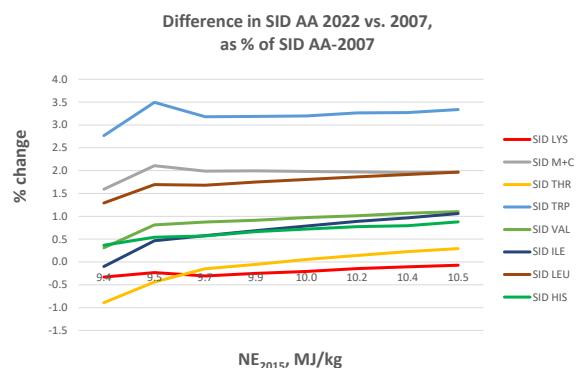
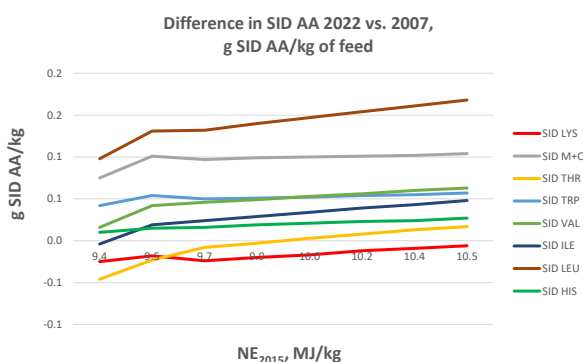
“Current” recommendations for nutrient constraints



17

Effect on SID AA (g) /kg with SID AA 2022:

80–120 kg pigs



- The new coefficients of SID AA 2022 increase the amount of SID AA for most AA in the final diet
 - There is no increase for SID Lys (approx. -0.2%)
 - The increase is the greatest for SID Trp (approx. 3.3%)



18

Effect on SID AA (g) /kg with SID AA-2022:

80-120 kg pigs

g/kg	2007			2022		
	9.4	10.0	10.5	9.4	10.0	10.5
SID LYS	7.6	8.1	8.5	7.6	8.1	8.5
SID M+C	4.7	5.0	5.3	4.8	5.1	5.4
SID THR	5.2	5.5	5.8	5.1	5.5	5.8
SID TRP	1.5	1.6	1.7	1.6	1.7	1.8
SID VAL	5.2	5.5	5.7	5.2	5.5	5.8
SID ILE	4.0	4.3	4.5	4.0	4.3	4.6
SID LEU	7.6	8.1	8.5	7.7	8.3	8.7
SID HIS	2.7	2.9	3.1	2.7	2.9	3.1
SID Lys / NE ₂₀₁₅ g/MJ	0.81	0.81	0.81	0.81	0.81	0.81

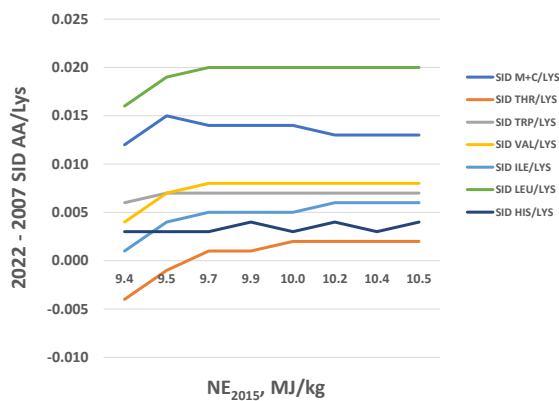


19

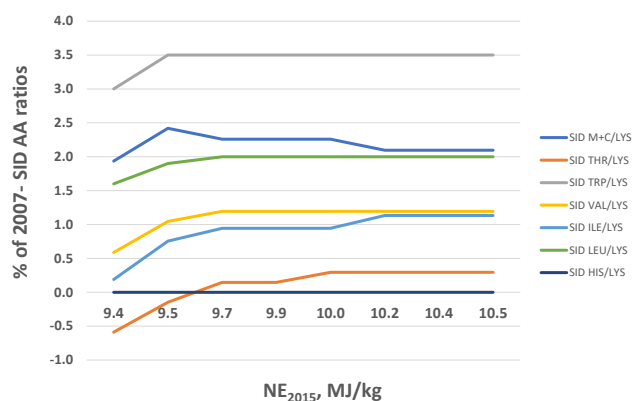
Effect on SID AA/Lys ratios with SID AA-2022

80-120 kg pigs

Difference in SID AA / Lys ratios: 2022 vs. 2007



Difference in SID AA/ Lys ratios, as % of 2007 recommendations

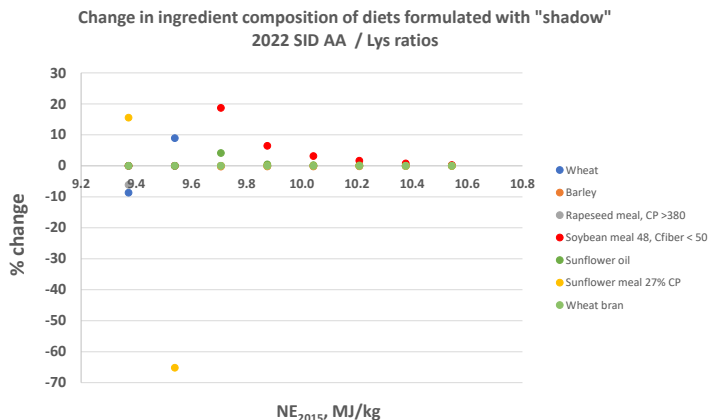


- The SID AA / Lys ratios in wheat/barley-based diets increased slightly with the 2022 version for all AA
- The increase in ratios is low across different formulation scenarios

20

Effect on ingredient composition of diets with SID AA-2022

Using "shadow" SID AA ratios for 80-120 kg pigs



High variation in inclusion rates of ingredients was observed at lower energy densities
Ingredients with low CP and/or low inclusion rates were the most variable

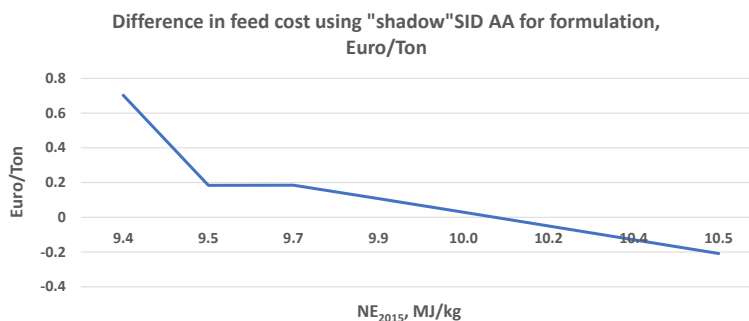
The effect of SID AA_2022 on ingredient composition was low at high NE densities, where SBM contributes the most to CP



21

Effect on feed cost with SID AA-2022:

Using "shadow" SID AA ratios for 80-120 kg pigs



The use of SID AA-2022 may slightly increase diet cost at lower nutrient densities, where CP-rich ingredients are not used

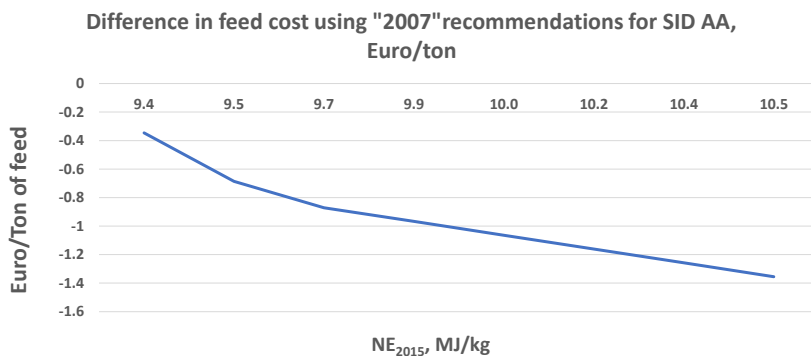
The effect of SID AA-2022 on feed cost decrease as CP-rich ingredients enter formulation



22

Effect on feed cost with SID AA-2022:

Using "2007" SID AA ratios for 80-120 kg pigs



The use of 2007 recommendations when formulating with SID AA-2022 may reduce the cost of feed

The cost-reduction effect increases with nutrient density (higher inclusion of CP-rich ingredients)



23



24

Ingredient and nutrient comp. of a lactating sow diet

Ingredient	%	Nutrient	Amount
Wheat	42.2	Crude Protein	g/kg 158
Barley	30.0	Crude Fat (ah)	g/kg 57
Soybean meal 48	12.4	NE _{sow,lac}	MJ/kg 10.3
Rapeseed meal	3.5	SID LYS	g/kg 8.4
Maize	5.0	SID M+C/LYS	0.60
Soybean oil	3.6	SID THR/LYS	0.66
L-Lysine HCl 98%	0.3	SID TRP/LYS	0.19
L-Threonine min 98%	0.1	SID VAL/LYS	0.73
DL-Methionine 99%	0.0	SID ILE/LYS	0.62
Others	2.8	SID LEU/LYS	1.15



25

Effect on SID AA (g) /kg with SID AA 2022:

Lactating sows

SID AA, g/kg	Version		Difference	
	2007	Shadow	g/kg	%
SID LYS	8.4	8.5	0.076	0.9
SID M+C	5.0	5.1	0.084	1.7
SID THR	5.5	5.6	0.022	0.4
SID TRP	1.6	1.7	0.055	3.5
SID VAL	6.1	6.2	0.062	1.0
SID ILE	5.2	5.3	0.079	1.5
SID LEU	9.7	9.9	0.204	2.1
SID HIS	3.4	3.4	0.041	1.2

- The new coefficients of SID AA-2022 increase the amount of SID AA of all AA in the final diet
 - The increase is greater for SID Trp (approx. 3.5%)
 - SID Lys increased by approximately 1%



26

Effect on SID AA/Lys ratios with SID AA-2022

Lactating sows

SID AA/Lys ratios	Version		Difference	
	2007	Shadow	2022-2007	%
SID M+C/LYS	0.60	0.60	0.005	0.8
SID THR/LYS	0.66	0.66	-0.003	-0.5
SID TRP/LYS	0.19	0.20	0.005	2.5
SID VAL/LYS	0.73	0.73	0.001	0.1
SID ILE/LYS	0.62	0.63	0.004	0.6
SID LEU/LYS	1.15	1.16	0.014	1.2

- The SID AA / Lys increased with the 2022 version for most AA
 - SID TRP / Lys increased by 2.5%
- The increase in ratios is "low"



27

Effect on ingredient composition of diets with SID AA-2022

Lactating sows

	Shadow	%Change with shadow	2007	%Change with 2007
	g/kg	%	g/kg	%
Wheat	0.04	0.1	-2.4	-5.8
Barley	0.00	0.0	0.0	0.0
Soybean meal 48	0.06	0.5	-2.9	-23.2
Rapeseed meal	-0.09	-2.5	5.0	139.7
Maize	0.00	0.0	0.0	0.0
Soybean oil	-0.01	-0.2	0.4	12.6

- The effect of SID AA_2022 on ingredient composition is negligible when formulated with shadow values
- When formulating with 2007 recommendations the variation in ingredient composition increase, but is low



28

Effect on feed cost with SID AA-2022:

Using "shadow" SID AA ratios for lactating sows

SID AA, g/kg	Version	
	2007	Shadow
Price, Euro/Ton	-1.89	-0.01

There is no effect of SID AA-2022 on diet cost

Assuming the risk of formulating with 2007 recommendations may bring savings on feed cost



29

Conclusions

The introduction of SID AA-2022 increase the amount of SID AA across phases

- The magnitude of the increase is phase dependent (Nursery > Finishing)
- An uplift in SID AA may also occur in lactating sows

The ingredient composition, nor hierarchy of use of ingredients, does not seem to be significantly affected by the new set of coefficients

There is potential for feed cost savings, but...

- The effect on price is associated with risk or implementation approach
 - Shadow vs. Current recommendations
- The effect is phase related (Nursery > Finishing)

The magnitude of the effects in this presentation are affected by ingredient availability, feed price, and formulation constraints



30

