

How to use the full potential in feed enzymes to improve the overall feeding cost

Carbohydrase
Phytase
Protease
Amylase
???

Arne Korsbak



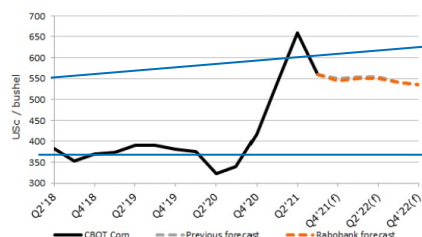
Agenda

- Market situation
- DIF / Matrix values from for different enzymes -
- Additivity Model -
- Feed formulation -
 - the ultimate tool to show the benefit of the enzymes

World price have increased on almost all feed raw materials

CBOT Corn's bullish price outlook largely maintained

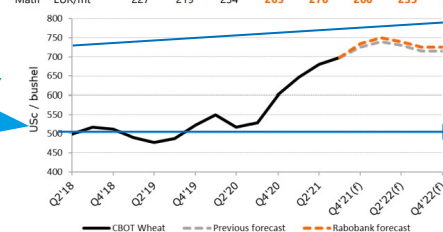
Unit	Q1'21	Q2'21	Q3'21	Q4'21f	Q1'22f	Q2'22f	Q3'22f	Q4'22f
Corn US\$/bu	536	659	560	545	550	550	540	535



Source: Bloomberg Finance L.P., Rabobank 2021

Price forecast raised but still neutral-bearish to market

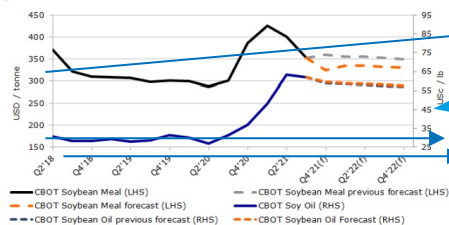
unit	Q1'21	Q2'21	Q3'21	Q4'21f	Q1'22f	Q2'22f	Q3'22f	Q4'22f
CBOT Wheat US\$/bu	646	680	698	735	750	740	725	725
Matif EUR/mt	227	219	234	265	270	260	235	235



Source: Bloomberg Finance L.P., Rabobank 2021

CBOT Soymeal reduced on delayed demand, Soy Oil strong

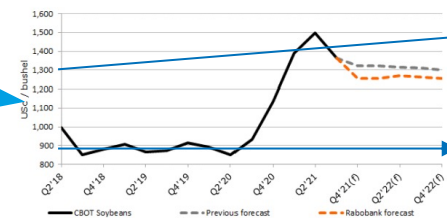
Unit	Q1'21	Q2'21	Q3'21	Q4'21f	Q1'22f	Q2'22f	Q3'22f	Q4'22f
Soymeal USD/ton	434	404	352	325	335	335	332	330
Soy Oil US\$/lb	45.9	63.2	61.8	59.5	59	58.5	58	57.5



Source: Bloomberg Finance L.P., Rabobank 2021

CBOT Soybeans supply risks wane, leaving it range-bound

Unit	Q1'21	Q2'21	Q3'21	Q4'21f	Q1'22f	Q2'22f	Q3'22f	Q4'22f
Soy US\$/bu	1388	1497	1361	1255	1255	1270	1260	1255



Source: Bloomberg Finance L.P., Rabobank 2021

Feed cost price difference 21-22

SPECIES/YEAR	2021	2022	Difference	%
Layers	305.2 €/t	384.3 €/t	+79.13 €/t	+26
Broilers	353.6 €/t	461.4 €/t	+107.81 €/t	+30
Turkeys	356.6 €/t	465.1 €/t	+108.44 €/t	+30
Piglets	355.3 €/t	481.4 €/t	+126.14 €/t	+32
Pigs	296.8 €/t	390.5 €/t	+93.72 €/t	+45
Sows	252.7 €/t	339.6 €/t	+86.9 €/t	+34
Beef cattle	287.3 €/t	371.7 €/t	+84.41 €/t	+29
Dairy cattle	276.1 €/t	345.7 €/t	+69.68 €/t	+25

Source - DSM Iberia, May

DIF/Matrix values values for

RONOZYME®

MultiGrain

WX

VP

HiStarch

DSM Enzyme portfolio

Complexity of substrates requires wide portfolio

RONOZYME® WX

Excellent Mono-component xylanase

RONOZYME® MultiGrain

Multi-component for all cereals

RONOZYME® VP

Multi-component for vegetable protein

RONOZYME® HiPhos

Consistent high phosphorus release

RONOZYME® ProAct

Unique pure protease



DIF
Digestibility Improvement
Factor

Digestibility Improvement Factors (DIF)

- Is a practical tool for feed formulation
- DIF takes into account the effect of the enzyme on individual raw materials
- Results in accurately balanced diets
- Lowers overall feed costs



DIF Values Recommendations

Poultry / Layer

	Barley	Wheat	Corn	Sorghum	Rye	Triticale
DIF	8%	5%	3%	3%	5%	6%
Kcal/kg*	190	170	100	70	120	140
MJ/kg*	0.8	0.7	0.4	0.3	0.5	0.6
Protein / AA	4%	3%	2%	2%	4%	3%

* These values may differ as they are the percentage of the ME of the respective raw material. In the example above, barley has a ME value of 2375 kcal/kg or 10 MJ/kg.



Dose should be adjusted to the level and quality of relevant substrate in the diet

	Minimum EU dose	Recommended dose
Broilers	50 ppm	100 ppm
Layers	80 ppm	80 ppm
Turkeys	100 ppm	100 ppm
Ducks	50 ppm	100 ppm

If Multigrain is used in combination with ProAct and or RONOZYME VP it's recommended to use only 50% of the Protein and AA value!

DIF Values Recommendations

Growing pigs >35kg and Sows

	Barley	Wheat	Corn	Sorghum	Rye	Triticale
DIF	4%	3%	1,5%	1,5%	3%	3%
Kcal/kg*	95	102	50	35	72	84
MJ/kg*	0.4	0.43	0.21	0.15	0.3	0.35
Protein / AA	2%	1,5%	1%	1%	2%	1,5%

* These values may differ as they are the percentage of the ME of the respective raw material. In the example above, barley has a ME value of 2375 kcal/kg or 10 MJ/kg.



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DIF Value Recommendations

Poultry, Layer

	Barley	Wheat	Corn	Sorghum	Rye	Triticale	Oats	Wheat bran
DIF	7%	6%	3%	3%	5%	6%	7%	7%
Kcal/kg	165	170	100	70	120	140		
MJ/Kg	0.7	0.72	0.4	0.3	0.5	0.6		
Protein / AA	3,5%	2,5%	1,5%	1,5%	2,5%	2,5%	3,5%	3,5%

Dose Recommendations

	Minimum EU dose	Recommended dose
Broilers	100 FXU/KG	150 - 200 FXU/KG
Layers	100 FXU/KG	100 - 150 FXU/KG
Piglets	200 FXU/KG	200 FXU/KG



Dose should be adjusted to the level and quality of relevant substrate in the diet

If RONOZYME WX is used in combination with ProAct and or RONOZYME VP it's recommended to use only 50% of the Protein and AA value!

DIF Values Recommendations

Growing pigs >35kg and Sows

	Barley	Wheat	Corn	Sorghum	Rye	Triticale
DIF	4%	3%	1,5%	1,5%	3%	3%
Kcal/kg*	95	102	50	35	72	84
MJ/kg*	0.4	0.43	0.21	0.15	0.3	0.35
Protein / AA	2%	1,5%	1%	1%	2%	1,5%

* These values may differ as they are the percentage of the ME of the respective raw material. In the example above, barley has a ME value of 2375 kcal/kg or 10 MJ/kg.



Dose should be adjusted to the level and quality of relevant substrate in the diet

	Minimum EU dose	Recommended dose
Broilers	50 ppm	100 ppm
Layers	80 ppm	80 ppm
Turkeys	100 ppm	100 ppm
Ducks	50 ppm	100 ppm

If Multigrain is used in combination with ProAct and or RONOZYME VP it's recommended to use only 50% of the Protein and AA value!

DIF value recommendation

RONOZYME® VP is the only multi-component carbohydrase product on the market for both intestinal viscosity reduction and nutrient release from vegetable protein feed crops for swine and poultry species

Crop	DIF	MJ/kg	Kcal/kg	Protein / AA
SBM	6%	0.60	145	3%
Toasted FFSBM	3%	0.56	135	1,5%
Extruded FFSBM	2%	0.40	95	1%
Sunflower meal	7%	0.56	135	3%
Rapeseed meal (LF)	10%	0.96	230	5%
FF Rapeseed meal (HF)	6%	0.60	145	3%
Peas	3%	0,54	129	3%
Lupins	3%	0,50	120	2,5%
Palm kernel meal	5%	0,31	74	2,5%
Soya Hulls	3%	0,48	115	2,5%

	Minimum EU dose	Recommended dose
Broilers	200 ppm	200 ppm
Piglets	200 ppm	200 ppm



Dose should be adjusted to the level and quality of relevant substrate in the diet

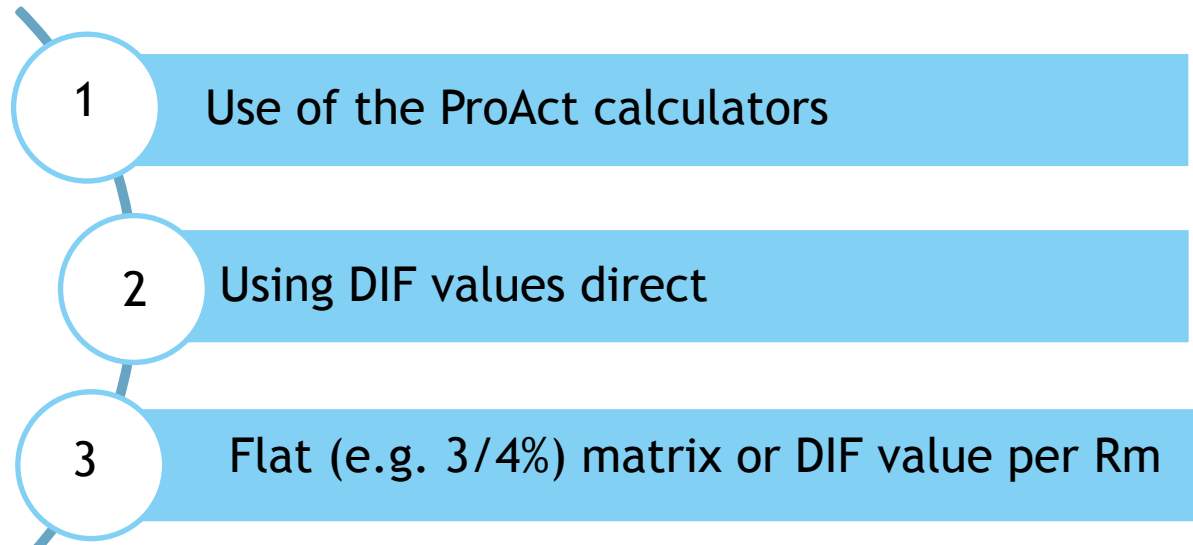
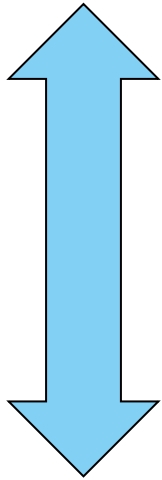
If RONOZYME VP is used in combination with ProAct and or RONOZYME WX and or Multigrain it's recommended to use only 50% of the Protein and AA value!

RONOZYME® ProAct

Matrix / DIF value

Practical implementation into diet formulations

More precise/ initial implementation
more time consuming



Less precise/implementation
quick

- Balance of precision and simplicity
- Balance of performance and cost saving
- User specific

DSM ProAct Matrix calculator

Link: <https://dsm-ronozympreact.com>

The screenshot displays the DSM ProAct Matrix calculator interface. The top section shows the DSM logo and the RONOZYME ProAct logo. The main content area is divided into two steps: Step 1 (Calculations) and Step 2 (Results). Step 2 is currently active, showing a table of results for Phase 1 Feed. The table lists various nutrients and their corresponding RONOZYME ProAct Contribution (%) and RONOZYME ProAct Matrix Value (%).

Step 2 Select the number of feeding phases you are using the + or - . Enter the inclusion level of protein containing ingredients, the kg feed/bird and the safety margin for each feeding phase. To increase the safety margin a negative SD should be added.

Phase 1 **Results >**

Calculations

Step 1 Create

Please select a Feed Mill

Feed Mill

- Corn
- Wheat
- Soy Bean Meal
- Full Fat Soy
- Canola Meal / Rapeseed Meal
- Sunflower Meal
- Wheat Middlings
- Sum

Phase 1 Feed - Results

Nutrient	RONOZYME ProAct Contribution (%)	RONOZYME ProAct Matrix Value (%)
CP	47.9	2,394.9
d. Met	0.6	30.7
d. Cys	1.1	54.9
d. M+C	1.7	86.6
d. Lys	2.2	108.8
d. Thr	2.3	115.2
d. Trp	0.6	29.8
d. Arg	2.3	113.3
d. Val	2.0	97.7
d. Ile	1.7	85.0
d. Leu	2.5	123.7
d. His	1.1	55.0
d. G+S	4.4	221.7

How do we capture the value of a protease for formulation purposes?

- Generate a database of 'lift' value for protease to allow:
 - direct upgrade of raw materials in LCF programs using DIF values
 - Calculation of matrix values for specific diets based on ingredient inclusion and/or nutrient specification
 - Best estimation of a matrix value



Heat map of broiler Ileal amino acid digestibility improvement factors with RONOZYME® ProAct

	Samples tested	CP	Met	Cys	M+C	Lys	Thr	Arg	Val	Ile	Leu
Corn	11	3.42%	2.85%	6.75%	4.73%	3.58%	7.21%	3.31%	4.14%	3.62%	1.40%
Wheat	12	3.47%	2.46%	2.52%	2.49%	6.44%	4.77%	4.48%	3.81%	3.73%	3.31%
Barley	6	1.33%	1.68%	0.50%	1.02%	1.75%	2.55%	1.44%	1.59%	1.11%	1.17%
Soy Bean Meal	20	2.21%	2.38%	4.52%	3.68%	1.98%	4.24%	1.66%	1.97%	1.63%	1.13%
Full Fat Soy	5	6.43%	4.67%	17.37%	11.02%	2.52%	8.49%	5.30%	4.47%	3.17%	0.40%
Rapeseed Meal	18	1.62%	1.80%	1.56%	1.66%	2.05%	1.86%	1.19%	2.05%	1.93%	1.68%
DDGS Corn	7	3.14%	3.13%	5.05%	4.09%	5.45%	5.92%	3.36%	2.49%	2.23%	0.37%
Sunflower Meal	11	2.04%	0.41%	1.17%	0.66%	3.35%	2.32%	0.85%	0.85%	0.72%	0.94%
Meat Bone Meal	3	5.41%	5.47%	20.48%	12.97%	4.66%	6.43%	5.58%	3.86%	1.76%	1.54%
Poultry by-prod.	1	3.89%	6.12%	6.83%	6.47%	0.76%	2.31%	1.67%	3.24%	14.43%	1.09%
Feather Meal	2	1.96%	14.59%	1.06%	7.82%	1.11%	0.91%	0.67%	0.65%	2.71%	1.16%
Fishmeal	1	3.89%	3.74%	15.24%	9.39%	4.91%	1.76%	2.76%	4.89%	3.70%	3.69%
Sorghum	1	0.95%	0.13%	0.50%	0.32%	2.06%	0.36%	1.27%	1.55%	1.69%	0.77%
Wheat Midds.	1	2.16%	0.12%	0.00%	0.06%	0.00%	4.55%	1.09%	1.74%	2.77%	1.68%
Pura	1	1.76%	1.00%	2.46%	1.73%	1.40%	3.23%	0.76%	1.67%	1.59%	1.45%

- Database still being expanded
- Longer term we need a tool to accurately predict amino acid digestibility of individual batches of ingredients and ProAct lift



Implimenting RONOZYME PROACT

Flat approach



- Approach 1: Simple approach
 - Increase digestible amino acid levels and CP of raw materials* from 3% to max 8%**
 - Wheat based - normal*** CP Diets - 4%
 - Corn based - normal ***CP diets - 4%
 - Wheat based - low**** CP diets - 3%
 - Corn based - low**** CP diets - 3%

* Cereal and protein sources only

** Dependent on diet composition

*** CP 20 - 22%;

**** CP 18 - 20%



Matrix values for layers and breeders

GT Dose FYT // g/t feed		300	0-15	15	600	15-30	30	900	30-45	45	1200	45-60	60	1500***	60-75	75	1800***	75-90	90
	Contribution		Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose
Nutrients for Laying and Breeding Poultry	Units	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value
Available Phosphorus*	G/KG	1.15	76 667	76 667	1.50	23 000	49 833	1.70	13 800	37 822	1.80	6 517	29 996	1.85	3 450	24 687	1.87	1 533	20 828
Total Ca	G/KG	1.38	92 000	92 000	1.72	22 816	57 408	1.92	13 174	42 663	2.01	5 911	33 475	2.01	0	26 780	2.01	0	22 317
Sodium	G/KG	0.1																	
Crude protein**	%	0.1																	
Digest. Lysine**	G/KG	0.2																	
Digest. Methionine**	G/KG	0.0																	
Digest. Met + Cys**	G/KG	0.2																	
Digest. Threonine**	G/KG	0.3																	
Digest. Tryptophan**	G/KG	0.0																	
Digest. Iso-leucine**	G/KG	0.2																	
Digest. Arginine**	G/KG	0.1																	
Digest. Valine**	G/KG	0.2																	
Iron	MG/KG	22																	
Copper	MG/KG	4.0																	
Zinc	MG/KG	35																	
Manganese	MG/KG	7.5																	
MJ, ME**	MJ ME/KG	0.2																	
Kcal, ME**	Kcal ME/KG	70																	



Matrix values for pigs

GT Dose FYT // g/t feed		500	0-25	25	1000	25-50	50	1500	50-75	75	2000	75-100	100	2500**	100-125	125	3000**	125-150	150
	Contribution		Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose
Nutrients for Pigs	Units	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value
Digest. Phosphorus***	G/KG	1.00	40 000	40 000	1.20	8 000	24 000	1.33	5 200	17 733	1.44	4 400	14 400	1.45	400	11 600	1.46	400	9 733
Total Ca	G/KG	1.25	50 000	50 000	1.44	7 600	28 800	1.53	3 580	20 393	1.57	1 480	15 060	1.57	0	12 528	1.57	0	10 440
Sodium	G/KG	0																	
Crude protein*	%	0																	
Digest. Lysine*	G/KG	0																	
Digest. Methionine*	G/KG	0.1																	
Digest. Met + Cys*	G/KG	0.1																	
Digest. Threonine*	G/KG	0																	
Digest. Tryptophan*	G/KG	0.1																	
Digest. Iso-leucine*	G/KG	0.1																	
Digest. Leucine*	G/KG	0																	
Digest. Arginine*	G/KG	0.1																	
Digest. Valine*	G/KG	0																	
Iron	MG/KG	12																	
Copper	MG/KG	2																	
Zinc	MG/KG	19																	
Manganese	MG/KG	3																	
MJ, ME**	MJ ME/KG	0																	
Kcal, ME**	Kcal ME/KG	3																	



For Meat Poultry (Broilers, Turkeys and Ducks)

GT Dose FYT // g/t feed		500	0-25	25	1000	25-50	50	1500	50-75	75	2000	75-100	100	2500***	100-125	125	3000***	125-150	150
	Contribution		Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose	Contribution	Flex dose	Fixed dose
Nutrients for Meat Poultry	Units	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value	g/kg	Matrix value	Matrix value
Available Phosphorus*	G/KG	1.15	46 000	46 000	1.50	13 800	29 900	1.70	8 280	22 693	1.80	3 910	17 998	1.85	2 070	14 812	1.87	920	12 497
Total Ca	G/KG	1.38	55 200	55 200	1.72	13 690	34 445	1.92	7 905	25 598	2.01	3 547	20 085	2.01	0	16 068	2.01	0	13 390
Sodium	G/KG	0.15	5 980	5 980	0.18	1 346	3 663	0.20	538	2 621	0.20	127	1 998	0.20	0	1 598	0.20	0	1 332
Crude protein**	%	0.59	23 600	23 600	0.72	5 310	14 455	0.78	2 124	10 345	0.79	501	7 884	0.79	0	6 307	0.79	0	5 256
Digest. Lysine**	G/KG	0.232	9 280	9 280	0.284	2 088	5 684	0.305	835	4 068	0.310	197	3 100	0.310	0	2 480	0.310	0	2 067
Digest. Methionine**	G/KG	0.014	560	560	0.017	126	343	0.018	50	245	0.019	12	187	0.019	0	150	0.019	0	125
Digest. Met + Cys**	G/KG	0.228	9 120	9 120	0.279	2 052	5 586	0.300	821	3 998	0.305	194	3 047	0.305	0	2 437	0.305	0	2 031
Digest. Threonine**	G/KG	0.309	12 360	12 360	0.379	2 781	7 571	0.406	1 112	5 418	0.413	263	4 129	0.413	0	3 303	0.413	0	2 753
Digest. Tryptophan**	G/KG	0.034	1 360	1 360	0.042	306	833	0.045	122	596	0.045	29	454	0.045	0	363	0.045	0	303
Digest. Iso-leucine**	G/KG	0.235	9 400	9 400	0.288	2 115	5 758	0.309	846	4 120	0.314	200	3 140	0.314	0	2 512	0.314	0	2 093
Digest. Leucine**	G/KG	0.304	12 160	12 160	0.372	2 736	7 445	0.400	1 094	5 330	0.406	258	4 062	0.406	0	3 250	0.406	0	2 708
Digest. Arginine**	G/KG	0.106	6 640	6 640	0.203	747	4 067	0.218	299	2 911	0.222	71	2 218	0.222	0	1 775	0.222	0	1 479
Digest. Valine**	G/KG	0.263	10 520	10 520	0.322	2 367	6 444	0.346	947	4 611	0.351	224	3 514	0.351	0	2 811	0.351	0	2 343
Iron	MG/KG	22.57	902 971	902 971	27.65	203 168	553 070	29.69	81 267	395 802	30.16	19 188	301 649	30.16	0	241 319	30.16	0	201 099
Copper	MG/KG	4.00	160 080	160 080	4.90	36 018	98 049	5.26	14 407	70 188	5.35	3 402	53 477	5.35	0	42 781	5.35	0	35 651
Zinc	MG/KG	35.88	1 435 200	1 435 200	43.96	322 620	879 060	47.18	129 168	620 096	47.94	30 498	479 447	47.94	0	383 357	47.94	0	319 631
Manganese	MG/KG	7.59	303 600	303 600	9.30	68 310	185 955	9.98	27 324	133 078	10.14	6 452	101 421	10.14	0	81 137	10.14	0	67 614
MJ, ME**	MJ ME/KG	0.29	11 715	11 715	0.36	2 636	7 175	0.38	994	5 115	0.39	220	3 891	0.39	0	3 113	0.39	0	2 594
Kcal, ME**	Kcal ME/KG	70.0	2 800 000	2 800 000	85.8	630 000	1 715 000	91.7	237 462	1 222 487	93.0	52 658	930 030	93.0	0	744 024	93.0	0	620 020

* Digestible P can be estimated by multiplying available phosphorus figures by the relative biological value of the inorganic P source being utilized in feed. Typically, this varies between 80 and 95%.
 ** Matrix values are typically not fully additive and therefore need to be adjusted when multiple enzymes are used in the same feed to avoid overestimation of the contribution from the combination.
 *** Always ensure there is adequate phytate for the chosen dose of phytase to act, particularly when using higher dose rates.

HEALTH • NUTRITION • MATERIALS

HEALTH • NUTRITION • MATERIALS

HEALTH • NUTRITION • MATERIALS

MATRIX VALUES
To be shared

RONOZYME® HiPhos
(20 000 GT)

HiPhos Online Matrix calculator

Link: [RONOZYME® HiPhos Matrix Calculator \(dsm-ronozymehiphos.com\)](https://dsm-ronozymehiphos.com)

Step 1: Calculate Phytate Accessibility Factor

The default Phytate Accessibility Factor is **80 %**

Your Accessible phytate P estimate (raw material leverage only) is **0.208 %**

Do you wish to complete an assessment to calculate the corrected Phytate P value based on the non-raw material selection?

☐ Use default

☒ Using custom factor

Step 2: Phytate Accessibility Factor Calculator

Non-raw material selection

Drinking water pH	<input type="range"/>	7
Drinking water temperature (C)	<input type="range"/>	10
Dietary CI (%)	<input type="range"/>	0.27
Protease	☐	No
Carbohydrase	☐	No
Acidifier in water or feed	☐	No
Pharmaceutical Zn or Cu	☐	No
Diet Ca (%)	<input type="range"/>	0.8

Corrected Accessibility Factor 80%

Reactive/Soluble Phytate P Estimate 0.208%

Matrix

Nutrient Matrix based on our suggested dose

[How is this calculated?](#)

Properties

Feed Name: Broiler grower_2

Animal Category: Meat Poultry

Dietary Phytate-P: 0.261 %

Accessible Phytate-P (80%): 0.208 %

Corrected Accessibility Factor: 83 %

Corrected Phytate-P: 0.215 %

Product Form: HiPhos 20,000 GT

Suggested Dose: 3000 FYT, 150 ppm

Matrix

NUTRIENT	G/KG %	CONTRIBUTION	MATRIX
Available Phosphorus	%	0.1874	1,249.4
Digestible Phosphorus	%	0	0
Myo-inositol	%	0.1808	1,205.4
Total Ca	%	0.2009	1,339.4
Sodium	%	0.02	133.4
Protein	%	0.788	5,254
Digest. Lysine	%	0.031	206.6
Digest. Methionine	%	0.0019	12.6
Digest. Met + Cys	%	0.0305	203.4
Digest. Threonine	%	0.0413	275.4
Digest. Tryptophan	%	0.0045	30
Digest. Arginine	%	0.0222	148
Digest. Valine	%	0.0351	234
Digest. Leucine	%	0.0406	270.6
Digest. Iso-leucine	%	0.0314	209.4
Digest. Gly + Ser	%	0.0822	548
MJ, ME	Mj/Kg	0.389	2,594
Kcal, ME	Kcal/kg	93.003	620,020
Iron	mg/Kg	30.165	201,100
Copper	mg/Kg	5.348	35,654
Zinc	mg/Kg	47.945	319,634

DSM's Business Drivers for Sustainability

HiPhos Online Matrix calculator

Link: [RONOZYME® HiPhos Matrix Calculator \(dsm-ronozymehiphos.com\)](https://dsm-ronozymehiphos.com)

What's your ROI?

*based upon replacement of inorganic phosphate

1	HiPhos 20,000 GT Price ?	USD/kg	10
2	Phosphate Type	MCP (Monocalcium Phosphate) ▼	
	Phosphate Price	USD/kg	0.51
3	Total Phosphorus	%	22.5
	Availability ?	%	92

ROI
3.1 / 1

Sustainability

Creating a more sustainable future...



Annual Feed Production

150,000

TN

HiPhos inclusion in the above mentioned annual quantity of feed, will reduce Phosphorus emissions by

124 MT per annum (expressed as PO₄ equivalent)

...and Greenhouse Gas Emissions (CO₂, CH₄, N₂O) by

3,465 MT per annum (expressed as CO₂ equivalent)

This Greenhouse Gas Emission reduction, is equivalent to:

Taking
1,445 cars
off the streets

Planting
89,744 trees

Turning off
122,661 lamps

For more information refer to the [Sustainability impact sheet](#)

Additivity using enzymes

- Can we just add different types of enzymes into the diet and still use full DIF / Matrix value

RONOZYME[®]HiPhos + **RONOZYME[®]WX** + **RONOZYME[®]VP** + **RONOZYME[®]ProAct**

$$1 + 1 + 1 + 1 = 4,0 ?$$

$$1 + 1 + 1 + 1 = 3,5 ?$$

$$1 + 1 + 1 + 1 = 2,5 ?$$



Enzyme additivity assumptions

	Protein			Energy			Phosphorous		
	For calculation of <u>protein</u> and AS, add the contribution of			For the calculation of <u>energy</u> , add the contribution of			For the calculation of <u>phosphorous</u> , add the contribution of		
If in use	NSP	Phytase	Protease	NSP	Phytase	Protease	NSP	Phytase	Protease
- Phytase - Protease - NSP-enzyme	0%	100%	100%	100%	50%	0%	0%	100%	0%
- Phytase - NSP-enzyme	100%	100%	---	100%	50%	---	0%	100%	---
- Phytase - Protease	---	100%	100%	---	100%	0%	---	100%	0%
- NSP-enzyme - Protease	50%	---	100%	100%	---	0%	0%	---	0%

Feed formulation Broiler grower feed

		Broiler Ross 308 Grower 11-24	Broiler Ross 308 Grower 11-24	Broiler Ross 308 Grower 11-24	Broiler Ross 308 Grower 11-24	Broiler Ross 308 Grower 11-24	Broiler Ross 308 Grower 11-24	Broiler Ross 308 Grower 11-24	Broiler Ross 308 Grower 11-24
RECALCULATED	€/ton	502.46	481.48	468.23	464.51	431.05	427.07	426.91	427.03
Cost saving	€/ton		-20.98	-34.23	-37.95	-71.41	-75.39	-75.55	-75.43
Additional cost saving	€/ton		-20.98	-13.25	-3.72	-33.46	-3.98	-0.16	0.12
Corn 8.0%	300.00	347.41	363.13	373.57	386.21	427.81	432.77	432.99	433.07
Wheat 2013	305.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
Canola Meal	290.00	30.00	30.00						
Canola Meal with VP	290.00			30.00	30.00	30.00	30.00	30.00	30.00
Soya Bean Meal 46%	590.00	317.21	314.96						
Soya Bean Meal 46% - with VP	590.00			313.46	302.49	282.56	280.58	280.54	280.53
Sunflower Meal 38 %	300.00	20.00	20.00						
Sunflower Meal 38 % with VP	300.00			20.00	20.00	20.00	20.00	20.00	20.00
Limestone	110.00	10.48	10.48	10.52	10.53	9.56	9.54	9.67	9.73
Monocalcium Phos	1500.00	16.42	16.41	16.41	16.52	8.89	7.31	7.04	6.92
Salt	20.00	2.75	2.73	2.72	2.70	2.63	2.62	2.62	2.62
Sodium Bicarbonate	320.00	1.55	1.57	1.57	1.59	0.99	0.95	0.95	0.95
Soy Oil	1840.00	45.09	31.57	22.40	20.66	8.36	6.98	6.91	6.88
DL Methionine	3200.00	3.12	3.09	3.08	2.94	2.78	2.76	2.76	2.76
L Threonine	2400.00	0.98	0.98	0.97	0.81	0.65	0.64	0.64	0.64
Lysine HCL 78%	2500.00	2.50	2.52	2.54	2.59	2.77	2.79	2.79	2.79
Broiler Grower PX	3000.00	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Ronozyme WX 2000 CT	7500.00		0.08	0.08	0.08	0.08	0.08	0.08	0.08
Ronozyme VP CT	7000.00			0.20	0.20	0.20	0.20	0.20	0.20
Ronozyme ProAct Calculator online	13500.00				0.20	0.20	0.20	0.20	0.20
1,1-HiPhos 0-25g/t ne-Poul.	13000.00					0.03	0.03	0.03	0.03
2,1-HiPhos 25-50g/t ne--poul.	13000.00					0.03	0.03	0.03	0.03
3,1-HiPhos 50-75g/t ne--poul	13000.00						0.03	0.03	0.03
4,1-HiPhos 75-100g/t ne-poul	13000.00						0.03	0.03	0.03
5,0-HiPhos 100-125g/t ne-poul	13000.00							0.03	0.03
6-HiPhos 125-150g/t ne-poul	13000.00								0.03
TOTAL		1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00

Feed formulation Broiler grower feed

		Pig Finisher	Pig Finisher	Pig Finisher	Pig Finisher	Pig Finisher	Pig Finisher	Pig Finisher
SAVED COST	Cost/ton	337.12	335.60	325.65	323.81	322.90	322.21	322.44
RECALCULATED	€/t	337.12	335.60	325.65	323.81	322.90	322.21	322.44
Cost saving	€/t		-1.52	-11.47	-13.31	-14.22	-14.91	-14.68
Additional cost saving	€/t		-1.52	-9.95	-1.84	-0.91	-0.69	0.23
Barley 2013	295.00	304.62	532.24	601.40	633.02	639.58	643.94	644.02
Sukker beat pellets w. molas.8.8	200.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Wheat 2013	305.00	387.42	157.51	102.59	73.08	67.67	63.98	63.90
Bran 15%	168.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00
Canola Meal	350.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00
Soya Bean Meal 46%	520.00	49.21	51.81	44.91	44.10	43.64	43.43	43.43
Sunflower Meal 38 %	345.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Limestone	110.00	11.77	11.79	11.51	11.62	11.78	12.03	12.06
Monocalcium Phos	1500.00	11.96	11.80	5.31	3.99	3.15	2.43	2.36
Salt	20.00	6.64	6.59	6.21	6.14	6.12	6.11	6.11
Soy Oil	1820.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50
DL Methionine	3200.00	0.45	0.44	0.45	0.45	0.45	0.45	0.45
L Threonine	2400.00	0.60	0.55	0.43	0.41	0.40	0.40	0.40
L Tryptophan	8770.00	0.36	0.39	0.38	0.38	0.38	0.38	0.38
Lysine HCL 78%	2500.00	3.48	3.34	3.26	3.23	3.22	3.22	3.22
Premix Pig Finisher	3000.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Ronozyyme WX 5000 CT	14000.00		0.04	0.04	0.04	0.04	0.04	0.04
1,1-HiPhos 0-25g/t ne-Swine	13000.00			0.03	0.03	0.03	0.03	0.03
2,1-HiPhos 25-50g/t ne-Swine	13000.00				0.03	0.03	0.03	0.03
3,1 HiPhos 50-75g/t ne-Swine	13000.00					0.03	0.03	0.03
4,1 HiPhos 75-100g/t ne-Swine	13000.00						0.03	0.03
5-HiPhos 100-125g/t e-Swine	13000.00							0.03
TOTAL		1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00

Feed formulation

Summary



- Using the right values, not too much not too little !
 - It's difficult to be 100% right - that's why DSM using some safe matrix/DIF values
- The HiPhos matrix values is conservative – do not go below the recommendation – use the HiPhos calculator and even increase the matrix value with taking adjustment into consideration for greater cost saving.
- The DIF values in NSP's are 20 years with small moderations over time
- ProAct Matrix value have been created from more the 50 digestibility trials and are confirmed form the use within our customers

Feed formulation

Take home message



- Using the additivity model, this ensure you not overestimate the enzyme effect in an easy way.
- The most important thing is to: Ensure a more well-balanced diet taking the enzyme effect in consideration - this normally gives a lower feed cost
- Using the right mix of enzymes this gives a better performance due to lower ANF effect from different negative substrates as: Phytate, fibers, proteins... this ensure a better gut microflora and a better overall performance
- Most important : **Price per kg meat produced** better than *high weight gain and Low FCR* as the main parameter

Precis formulation and enzyme dosing

- Helps you to hit the target



Questions ?