Next Generation Analytics for Animal Feed Formulation

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GENESIS
FEED TECHNOLOGIES

Todays Agenda

- Introduction of the Nutrient Value Calculator
- Methodology in Purchasing
- DDGS – Four examples used in the economic analysis
- Effect on a formula – Shadow Price

- Effect on a formula – *FEED COST REDUCTION*
- Effect on an Enterprise – *PROFIT IMPACT OF CHOICE*

Nutrient Value Calculator

- Developed by Genesis Feed Technologies since Oct 2017 for SBM economic comparison
- Uses Feed Formulation technology to apply to purchasing decisions
  - Ingredient nutritional values
  - Formula specifications for multiple species
  - Price intel
  - Least cost calculation
  - Interface showing comparative values and financial impacts
- Enables rapid nutritional scenario comparisons
- Enables buyers and sellers to see the Nutritional Value of different variants of a commodity based on their full nutrient profile
- Transitions Protein based evaluation to Total Nutrient evaluation

Nutrients Used in Purchasing v. Nutrition

Purchasing (Quality Contracts)

- Moisture
- Protein
- Pro-fat
- Fiber
- Ash

- Flow Agent
- Texture
- Color

- *Sustainability*

Nutrition (Nutrient Supply)

- Amino Acids
- Digestibility
- SID Amino Acids
- Reactive Lysine
- *ENERGY*

- *Minerals*
- Digestible P

- ***Feed Optimisation***

What drives selection for a formula?

Nutrients for GMY / DGTC204B — 204 Cobb Grower B No CP

Code	Name	Solution Amount	100.00	*	Minimum	Maximum	Rest Cost
1	Weight (Kgs)	1.0000			1.0000	1.0000	484.1705
5	Crude Protein (%)	19.1455	21.8997		18.0000	24.0000	
6	Crude Fat (%)	5.3173	6.0823			11.0000	
7	Crude Fibre (%)	2.7337	3.1269			5.0000	
11	Neutral Det Fibre (%)	9.4311	10.7879			20.0000	
12	Acid Det Fibre (%)	3.6098	4.1291			20.0000	
41	Calcium (%)	0.7770	0.8888		0.7770	0.8270	-13.3992
44	Av Phos (Poultry) (%)	0.3700	0.4232		0.3700	100.0000	-37.7103
48	Sodium (%)	0.1800	0.2059		0.1800	0.2000	-35.3668
49	Chloride (%)	0.2400	0.2745			0.2400	12.9961
61	AMEn Poultry (Kcals/Kg)	3,043.2520	3,481.0410			4,000.0000	
62	AMEn Broiler (Kcals/Kg)	3,005.0000	3,437.2860		3,005.0000	3,950.0000	-0.1875
161	Digestible Lys Poult (%)	1.0800	1.2354		1.0800	100.0000	-27.8216
162	Digestible Met Poult (%)	0.5893	0.6741		0.4331	100.0000	
164	Digestible M&C Poult (%)	0.8186	0.9364		0.8186	100.0000	-33.5119
165	Digestible Thr Poult (%)	0.7031	0.8042		0.7031	100.0000	-21.2671
166	Digestible Trp Poult (%)	0.2155	0.2464		0.1728	100.0000	
167	Digestible Ile Poult (%)	0.6934	0.7931		0.6934	100.0000	-161.7872
168	Digestible Val Poult (%)	0.8308	0.9503		0.8186	100.0000	
169	Digestible Arg Poult (%)	1.1954	1.3673		1.1372	100.0000	

- Crude protein is not limiting
- Energy is a high cost item
- Minerals are limiting
- Some essential AA's are limiting
- The Restriction Costs of the different nutrients will vary
- Only the contribution to the restricted nutrients will add up to value

DDGS Examples – Proximate Analyse and ME

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NAME	DDGS NRC	DDGS PS	DDGS MC	DDGS CW
Crude Protein	27.40	26.37	26.81	27.58
Dry Matter	90.00	89.53	89.39	89.72
AMEn Poultry	2,480.00	2,341.77	2,516.04	2,391.63
ME Swine	2,420.69	2,409.03	2,508.29	2,441.08
Crude Fat	9.00	6.21	8.98	7.95
Crude Fibre	9.10	7.52	6.84	8.13
Ash	4.20	4.76	5.10	4.54

DDGS Examples – Digestible Amino Acids Swine

Genesis Feed Technologies

NAME	DDGS NRC	DDGS PS	DDGS MC	DDGS CW
Digestible Lys P	0.61	0.61	0.56	0.60
Digestible Met P	0.52	0.53	0.48	0.51
Digestible M&C P	1.05	1.06	0.96	1.03
Digestible Thr P	0.76	0.76	0.70	0.74
Digestible Trp P	0.17	0.17	0.15	0.16
Digestible Ile P	0.93	0.93	0.85	0.91
Digestible Val P	1.15	1.16	1.06	1.13
Digestible Arg P	0.98	0.99	0.90	0.96

DDGS Examples – Digestible Amino Acids Swine

NAME	DDGS NRC	DDGS PS	DDGS MC	DDGS CW
Digestible Lys Swine	0.59	0.60	0.54	0.58
Digestible Met Swine	0.51	0.51	0.46	0.49
Digestible M&C Swine	0.99	0.99	0.90	0.96
Digestible Thr Swine	0.76	0.76	0.70	0.74
Digestible Trp Swine	0.16	0.16	0.14	0.15
Digestible Ile Swine	0.90	0.91	0.83	0.88
Digestible Val Swine	0.84	0.85	0.77	0.82
Digestible Arg Swine	0.96	0.96	0.88	0.94

The Formula and Shadow Prices

Ingredients for GMY / DGTC204B | 204 Cobb Grower B No CP

Code	Name	Solution Amount %	Price	*	Low Cost
CORN-USA	Corn USA	62.0850	178.0000		
SBM	Base SBM	31.6621	337.0000		96.1789
OIL-SOY	Oil, Soybean	2.5825	1,200.0000		486.2349
LIME	Limestone	1.1400	25.0000		
MDCP	MDCP	0.7390	490.0000		
PREMIX	Premix Ingredients	0.6000	880.0000		
BCARB	Bicarb	0.3168	400.0000		
DLMET	DL-Methionine	0.3048	2,800.0000		
SALT	Salt	0.2243	80.0000		
LLYS	L-Lysine HCl	0.1661	1,400.0000		
LTHR	L-Threonine	0.0796	1,600.0000		
NSPASE1	NSP Enzyme Generic 500g	0.0500	3,500.0000		3,500.0000
PHYT050	Phytase 500 g 1000 FTU (STD)	0.0500	5,250.0000		5,250.0000
LVAL	L-Valine		3,600.0000		
WP	Wheat Pollard		145.0000		17.3267
DDGSCWAV	DDGS CW Avg		195.0000	-O	215.0617
DDGSMCAV	DDGS MC Avg		195.0000	-O	219.9343
DDGSNRC	DDGS NRC 1994		195.0000	-O	199.1041
DDGSPSAV	DDGS PS Avg		195.0000	-O	183.9020
FFS	FFS 92% DM Extruded		387.0000	-O	517.3466

- Highest value is MC Variant
- Lowest is PS variant (lowest energy and protein)
- PS variant will be rejected as shadow price is < cost
- Others will be used as shadow price > cost

DDGS CW Avg	215.0617
DDGS MC Avg	219.9343
DDGS NRC 1994	199.1041
DDGS PS Avg	183.9020

Shadow prices and what to do with them

- Shadow prices give a good indicator of relative value
- Do not necessarily indicate which type is preferred
- Will only apply to one formula
- Will be different in other formula types and species

Shadow pricing in Swine Grower

Ingredients for GMY / GMY302 | 302 Swine Grower

Code	Name	Solution Amount %	Price	*	Low Cost
CORN-USA	Corn USA	69.9961	178.0000		71.2389
SBM	Base SBM	25.5791	337.0000		268.0016
OIL-SOY	Oil, Soybean	1.0000	1,200.0000		151.2269
LIME	Limestone	0.8285	25.0000		
MDCP	MDCP	0.7897	490.0000		83.4646
PREMIX	Premix Ingredients	0.5000	880.0000		880.0000
BCARB	Bicarb	0.4830	400.0000		150.2110
LLYS	L-Lysine HCl	0.3396	1,400.0000		265.7457
SALT	Salt	0.1703	80.0000		
DLMET	DL-Methionine	0.1130	2,800.0000		307.3150
LTHR	L-Threonine	0.1008	1,600.0000		332.9214
NSPASE1	NSP Enzyme Generic	0.0500	3,500.0000		3,500.0000
PHYT050	Phytase 500 g 1000	0.0500	5,250.0000		5,250.0000
DDGS	DDGS Ev EE<11		500.0000		262.8745
LTRP	L-Tryptophan		10,250.0000		320.3368
LVAL	L-Valine		3,600.0000		297.1178
DDGSCWAV	DDGS CW Avg		195.0000	-O	266.9050
DDGSMCAV	DDGS MC Avg		195.0000	-O	259.2263
DDGSNRC	DDGS NRC 1994		195.0000	-O	263.7871
DDGSPSAV	DDGS PS Avg		195.0000	-O	262.3711

- Shadow prices are higher for Swine in this example
- Not as much variation between types
- ALL the types can be used as Shadow Price > cost
- Higher differential between shadow price and buying price = more profit potential

DDGS CW Avg	266.9050
DDGS MC Avg	259.2263
DDGS NRC 1994	263.7871
DDGS PS Avg	262.3711

Formula Effect – Broiler Starter

Name	Price	NRC Solution Amount %	PS Solution Amount %	MC Solution Amount %	CW Solution Amount %
Corn USA	178.0000	57.2396	57.1748	57.1748	57.6842
Base SBM	337.0000	28.7665	28.6724	28.6724	28.4377
DDGS Used	195.0000	7.5000	7.5000	7.5000	7.5000
Oil, Soybean	1,200.0000	2.9341	3.0950	3.0950	2.9252
Limestone	25.0000	1.2224	1.2351	1.2351	1.2344
Premix Ingredients	880.0000	0.6000	0.6000	0.6000	0.6000
MDCP	490.0000	0.5745	0.5599	0.5599	0.5801
DL-Methionine	2,800.0000	0.2840	0.2926	0.2926	0.2716
Bicarb	400.0000	0.2797	0.2740	0.2740	0.2198
L-Lysine HCl	1,400.0000	0.2197	0.2161	0.2161	0.1985
Salt	80.0000	0.1989	0.2004	0.2004	0.1689
L-Threonine	1,600.0000	0.0806	0.0798	0.0798	0.0797
NSP Enzyme	3,500.0000	0.0500	0.0500	0.0500	0.0500
Phytase 500 g 1000	5,250.0000	0.0500	0.0500	0.0500	0.0500
		$ 275.03	$ 276.17	$ 273.47	$ 273.47

- Differences in feed cost when using different DDGS types

Shadow prices and what to do with them

- Shadow prices give a good indicator of relative value
- Do not necessarily indicate which type is preferred
- Will only apply to one formula
- Will be different in other formula types and species

- Better to look at the cost of formula as a decision making measure
- NVC is a formulation system designed to evaluate alternative supplies
- NVC uses the same internal calculations as industry standard formulation systems
- Multiple DDGS samples can be run for cost reduction comparison
- Multiple feeds can be run simultaneously
- Enterprise level assessment in NVC
- Output shows value v cost and calculates profitability impact.

Effect on Feed Cost – Broiler and Swine

Genesis Feed Technologies

FORMULA	DDGS DDGS BASE	DDGSCWAV DDGS CW AVG	DDGSMCAV DDGS MC AVG	DDGSNRC DDGS NRC 1994	DDGSPSAV DDGS PS AVG
GMY203F (203 Cobb Starter B No CP) Forecast: 1 tons	$ 283.1453	$ 281.6407	$ 281.2752	$ 282.8734	$ 283.1453
GMY204B (204 Cobb Grower B No CP) Forecast: 1 tons	$ 275.3422	$ 273.8376	$ 273.4722	$ 275.0344	$ 275.3422
GMY302 (302 Swine Grower) Forecast: 1 tons	$ 246.6979	$ 243.9634	$ 244.3710	$ 244.3076	$ 244.3195
GMY303 (303 Swine Finisher) Forecast: 1 tons	$ 228.6682	$ 221.2394	$ 221.9192	$ 222.0452	$ 222.1993
Total Cost	**$ 1,033.8537**	**$ 1,020.6812**	**$ 1,021.0376**	**$ 1,024.2607**	**$ 1,025.0064**

- Broiler feeds pick up a different DDGS. Saving approximately $1.90 per tonne feed
- Swine feeds using DDGS save approximately $7.00 per ton feed

Enterprise effect Broiler

FORMULA	DDGS DDGS BASE	DDGSCWAV DDGS CW AVG	DDGSMCAV DDGS MC AVG	DDGSNRC DDGS NRC 1994	DDGSPSAV DDGS PS AVG
GMY203F (203 Cobb Starter B No CP) Forecast: 3000 tons	$ 849,435.9713	$ 844,922.0862	$ 843,825.7481	$ 848,620.3122	$ 849,435.9713
GMY204B (204 Cobb Grower B No CP) Forecast: 6000 tons	$ 1,652,053.4907	$ 1,643,025.7205	$ 1,640,833.0443	$ 1,650,206.6339	$ 1,652,053.4907
GMY205B (205 Cobb Fin 1 B No CP) Forecast: 1000 tons	$ 273,985.7950	$ 272,481.1666	$ 272,115.7206	$ 273,677.9855	$ 273,985.7950
Total Cost	**$ 2,775,475.2570**	**$ 2,760,428.9733**	**$ 2,756,774.5130**	**$ 2,772,504.9316**	**$ 2,775,475.2570**

- MC version is the most cost effective
- PS version is rejected
- Some small savings when NRC version is used v no usage

Enterprise effect Broiler - Premiums

INGREDIENT	COGS DIFF	TOTAL USAGE	NUTRITIONAL PARITY	REPLACEMENT VALUE	PREMIUM
DDGS BASE (DDGS) Set as Basis	-2,970.3254	0.0000	-∞	500.0000	-∞
DDGS CW Avg (DDGSCWAV) Set as Basis	12,075.9583	750.0000	211.1013	195.0000	**16.1013**
DDGS MC Avg (DDGSMCAV) Set as Basis	15,730.4186	750.0000	215.9739	195.0000	**20.9739**
DDGS NRC 1994 (DDGSNRC) Basis	0.0000	723.7412	195.0000	195.0000	**0.0000**
DDGS PS Avg (DDGSPSAV) Set as Basis	-2,970.3254	0.0000	-∞	195.0000	

- Premium $ 16.10 to 20.97 reported for two current DDGS types
- One type is not cost effective
- Recommended to know the analysis and make an enterprise formulation choice

Evaluation of discounted prices

INGREDIENT	COGS DIFF	TOTAL USAGE	NUTRITIONAL PARITY	REPLACEMENT VALUE	PREMIUM
DDGS BASE (DDGS) Set as Basis	-2,970.3254	0.0000	-∞	500.0000	-∞
DDGS CW Avg (DDGSCWAV) Set as Basis	12,075.9583	750.0000	211.1013	195.0000	**16.1013**
DDGS MC Avg (DDGSMCAV) Set as Basis	15,730.4186	750.0000	215.9739	195.0000	**20.9739**
DDGS NRC 1994 (DDGSNRC) Basis	0.0000	723.7412	195.0000	195.0000	**0.0000**
DDGS PS Avg (DDGSPSAV) Set as Basis	7,456.1163	750.0000	179.9415	170.0000	**9.94**

- Price of $ 179.94 is feasible for PS
- At $ 170.00, there is a profit per tonne on the trade of $ 9.94 per tonne purchased
- Purchase price can be varied to find the best deal of price v value and profitability

Broiler Enterprise Summary

NAME	DDGS NRC	DDGS PS	DDGS MC	DDGS CW
Crude Protein	27.40	26.37	26.81	27.58
Dry Matter	90.00	89.53	89.39	89.72
AMEn Poultry	2,480.00	2,341.77	2,516.04	2,391.63
ME Swine	2,420.69	2,409.03	2,508.29	2,441.08
Crude Fat	9.00	6.21	8.98	7.95
Crude Fibre	9.10	7.52	6.84	8.13
Ash	4.20	4.76	5.10	4.54
Relative value	$ 195.00	**$ 179.94**	**$ 215.97**	$ 211.10

Enterprise effect Swine

INGREDIENT	COGS DIFF	TOTAL USAGE	NUTRITIONAL PARITY	REPLACEMENT VALUE	PREMIUM
DDGS BASE (DDGS) Basis	0.0000	0.0000	NaN	500.0000	NaN
DDGS CW Avg (DDGSCWAV) Set as Basis	48,081.7435	855.0082	251.2354	195.0000	56.2354
DDGS MC Avg (DDGSMCAV) Set as Basis	43,052.4901	873.9800	244.2603	195.0000	49.2603
DDGS NRC 1994 (DDGSNRC) Set as Basis	42,676.3304	785.8820	249.3037	195.0000	54.3037
DDGS PS Avg (DDGSPSAV) Set as Basis	41,858.0653	770.3653	249.3353	195.0000	54.33

- All DDGS versions are profitable in growing swine
- Range of values from $ 244.30 per ton up to $ 251.24 per ton.

Enterprise effect Swine

INGREDIENT	COGS DIFF	TOTAL USAGE	NUTRITIONAL PARITY	REPLACEMENT VALUE	PREMIUM
DDGS BASE (DDGS) Set as Basis	-42,676.3304	0.0000	-∞	500.0000	-∞
DDGS CW Avg (DDGSCWAV) Set as Basis	5,405.4131	855.0082	201.3221	195.0000	6.3221
DDGS MC Avg (DDGSMCAV) Set as Basis	376.1596	873.9800	195.4304	195.0000	0.4304
DDGS NRC 1994 (DDGSNRC) Basis	0.0000	785.8820	195.0000	195.0000	0.0000
DDGS PS Avg (DDGSPSAV) Set as Basis	(818.2651)	770.3653	193.9378	195.0000	(1.06

- Less variation in the premiums in swine feeds compared to broiler
- PS version is noticeably more valuable in the Swine series compared to Broiler

Swine Enterprise Summary

NAME	DDGS NRC	DDGS PS	DDGS MC	DDGS CW
Crude Protein	27.40	26.37	26.81	27.58
Dry Matter	90.00	89.53	89.39	89.72
AMEn Poultry	2,480.00	2,341.77	2,516.04	2,391.63
ME Swine	2,420.69	2,409.03	2,508.29	2,441.08
Crude Fat	9.00	6.21	8.98	7.95
Crude Fibre	9.10	7.52	6.84	8.13
Ash	4.20	4.76	5.10	4.54
Relative value broiler	$ 195.00	**$ 179.94**	**$ 215.97**	$ 211.10
Relative value Swine	$ 195.00	**$ 193.93**	$ 195.43	$ 201.32

Conclusions

- Ranging can be used in individual formulas to make decisions on the common feeds
- Ranging does not calculate profitability forecast

- Tonnage weighting of feeds is preferred

- Variation in value is greater in Broilers compared to growing swine in this data set
- All the DDGS types show profit in Swine feeds
- Ranking of value can change when DDGS is evaluated in differing species