

# Enzyme Analysis Matrix Development

BroilerOpt™ Feed Program and Matrix Values from the Enzyme Study-

Effect of phytase and protease combination on performance,  
metabolizable energy, and amino acid digestibility of broilers fed  
nutrient-restricted diets

Bernardes et al, R. Bras. Zootec., 51:e202120211, 2022

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After reviewing the Quality of this Study,  
we felt it was ideal for showing the Enzyme Values  
that resulted.

- We appreciate and thank the authors of “Effect of phytase and protease combination on performance, metabolizable energy, and amino acid digestibility of broilers fed nutrient-restricted diets”.

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- This following work is by Feed2Gain, LLC only.

# Feeding Trial with Seven Treatments:

- Treatment 1 is a Positive Control (PC). Energy is the same in all starter diets and grower diets but protein and amino acids are highest in this dietset.
- Treatment 2 is NC1; PC minus 0.16% calcium, 0.15% aP, and 0.5% crude protein [CP] in each diet.
- Treatment 3 is NC1 plus an enzyme blend CBE at 250 g per tonne.
- Treatment 4 is NC1 plus an enzyme blend SE at 250 g per tonne.
- Treatment 5 is NC2; PC minus 0.16% calcium, 0.15% aP, and 1% CP.
- Treatment 6 is NC2 plus an CBE at 250 g per tonne
- Treatment 7 is NC2 plus an enzyme blend SE at 250 g per tonne.

# Our Analysis works with the NC1 and NC2 treatments.

- First, we calibrate BroilerOpt.exe to each of the feeding programs of NC1 and NC2. The chicks are all Cobb males.
- Then, we use the calibrated treatment to analyze the Contribution of the Enzyme treatments with the feeding results reported.
- We are using a matrix set of corn and soybean meal that are not the values that were used in the study as we do not have those.
- Knowing the basic diet allows us to determine what must have changed to get the enhanced growth with the enzyme mixture.
- With the changed diet, we can estimate the benefit of the enzyme treatment.

The Enzymes increased the growth and feed conversion of the test animals.

Published Results at 42 days of age			
Diets	Enzyme	Flock Weight Gain, kg	Feed/Gain
PC	none	3.245	1.516
NC1	none	3.146	1.571
	CBE	3.167	1.547
	SE	3.267	1.513
NC2	none	3.044	1.567
	CBE	3.206	1.54
	SE	3.241	1.528

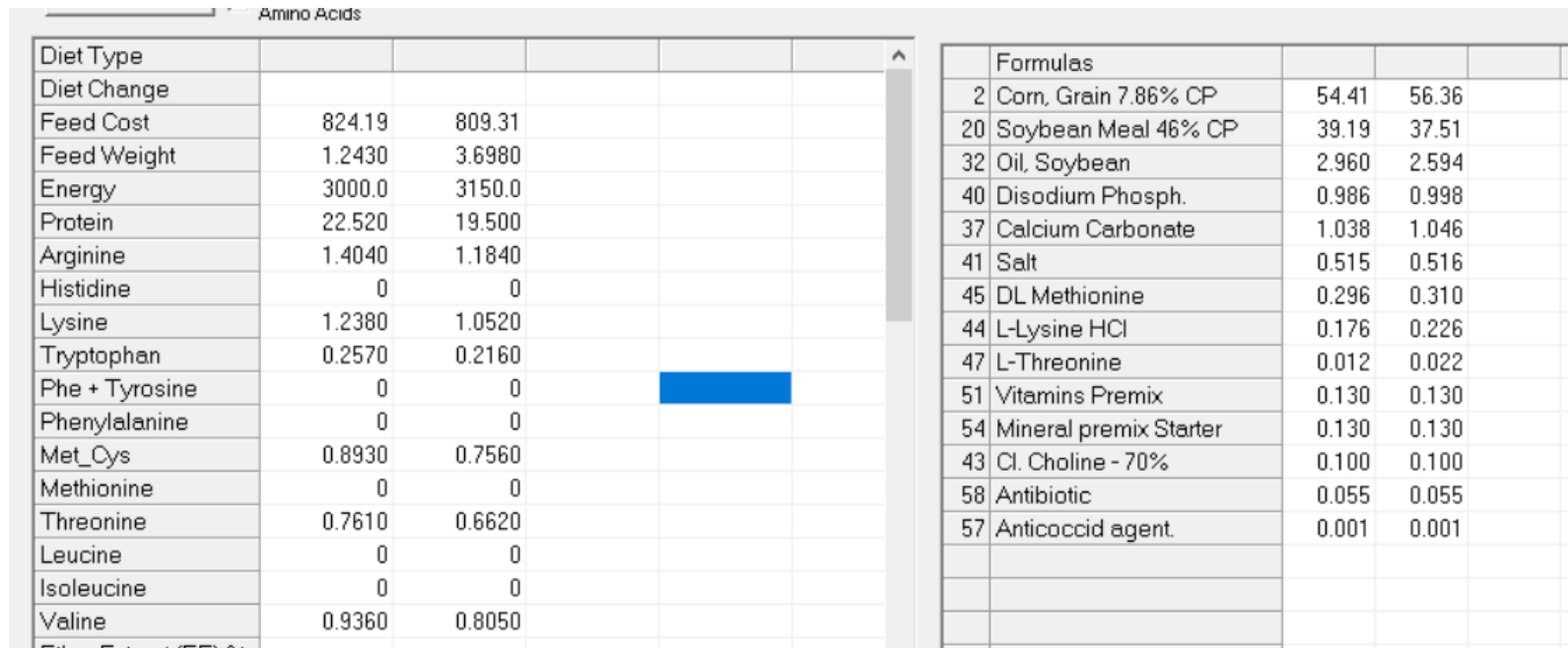
# NC1 was Calibrated and then Used in Current Flock

- The diets and intakes are as given in the paper.
- Growth is as given in the paper and feed conversion close (1.571 given). Note the age is too high, suggesting a difficult calibration.
- Now, we can use our matrix to select ingredients to evaluate.

Calibration of Location		Current Flock	
Click on Desired Location Test#NC1	Current Calculation	Open Diets	<input checked="" type="checkbox"/> When Protein Changes, Ratio Amino Acids
<input type="radio"/> Show Instruction	Save Diets		<input type="checkbox"/> Or When Lysine Changes, ratio Amino Acids
Flock Sex: Males	Save All Current	Diet Type	
Flock Size: 15	Use Calibration Diets	Diet Change	
No of Diets: 2	GIVEN COST	Feed Cost	824.19 809.31
Flock Final Weight: 3.146 kg	Run LP	Feed Weight	1.243 3.712
Flock Feed Conversion: 1.575	View Report	Energy	3000.0 3150.0
Final Age: 43.1 days	Enzyme Top Off	Protein	22.520 19.500
Cost/Bird: 24.03		Arginine	1.4040 1.1840
Cost/Tonne: 7638.3		Histidine	0 0
Profit/Bird: -		Lysine	1.2380 1.0520
		Tryptophan	0.2570 0.2160
		Phe + Tyrosine	0 0
		Phenylalanine	0 0
		Met_Cys	0.8930 0.7560
		Methionine	0 0
		Threonine	0.7610 0.6620
		Leucine	0 0
		Isoleucine	0 0
		Valine	0.9360 0.8050
		Ether Extract (EE) %	
		Dry matter %	

# Setting Up NC1 for Ingredient Testing

- Now we have our matrix ingredients closely matching the Published Nutrients in the Diets.
- We can go to the Ingredient Testing Tab



The screenshot displays two data tables from a software application. The left table, titled "Amino Acids", compares nutrient values for two different diet types. The right table, titled "Formulas", lists various ingredients and their associated values.

Amino Acids			
Diet Type			
Diet Change			
Feed Cost	824.19	809.31	
Feed Weight	1.2430	3.6980	
Energy	3000.0	3150.0	
Protein	22.520	19.500	
Arginine	1.4040	1.1840	
Histidine	0	0	
Lysine	1.2380	1.0520	
Tryptophan	0.2570	0.2160	
Phe + Tyrosine	0	0	
Phenylalanine	0	0	
Met_Cys	0.8930	0.7560	
Methionine	0	0	
Threonine	0.7610	0.6620	
Leucine	0	0	
Isoleucine	0	0	
Valine	0.9360	0.8050	
Other Amino Acids (%)			

Formulas			
2	Corn, Grain 7.86% CP	54.41	56.36
20	Soybean Meal 46% CP	39.19	37.51
32	Oil, Soybean	2.960	2.594
40	Disodium Phosph.	0.986	0.998
37	Calcium Carbonate	1.038	1.046
41	Salt	0.515	0.516
45	DL Methionine	0.296	0.310
44	L-Lysine HCl	0.176	0.226
47	L-Threonine	0.012	0.022
51	Vitamins Premix	0.130	0.130
54	Mineral premix Starter	0.130	0.130
43	Cl. Choline - 70%	0.100	0.100
58	Antibiotic	0.055	0.055
57	Anticoccid agent.	0.001	0.001

# With Ingredient Testing, We choose the Ingredients that are most affected and Enter the Performance Values for the Treatment.

- There are only two bulk ingredients, corn and soybean meal.
- We enter the growth data.
- We will let the computer find what nutrients in corn and soy can be increased in sync to get the observed Performance.

Evaluate the impact of an Enzyme / Process on up to 4 Ingredients

Select Current Ingredients to be analyzed - Up to 4 -  
Click Here to Transfer From Control Diet

	Ing. Name		Diet No. 1	Diet No. 2	
2	Corn, Grain 7.86% CP	<input checked="" type="checkbox"/>	52.82	60.54	
3	Soybean Meal 46% C	<input checked="" type="checkbox"/>	39.41	31.41	
6	Oil, Soybean	<input type="checkbox"/>	3.502	4.361	
7	Dicalcium Phosph.	<input type="checkbox"/>	1.786	1.489	
8	Limestone	<input type="checkbox"/>	1.049	0.779	
9	Salt	<input type="checkbox"/>	0.516	0.473	

Put Your Results from Test Ingredient Addition Below

Flock Final Weight	Flock Feed Conversion	Final Age	Results
3.167	1.547	43	
Ing. Name	Energy Increase	Protein/Lysine Increa:	



# Clicking Run Analysis Shows the Changes Needed in Corn and Soy to get the performance

To get the Increase in live weight and improvement in Feed Conversion, Corn was increased 1.8 % in energy and 4.89 % in protein. Soybean Meal contributed no additional energy and 2 % more Protein.

Evaluate the impact of an Enzyme / Process on up to 4 Ingredients

Select Current Ingredients to be analyzed - Up to 4 -  
Click Here to Transfer From Control Diet

Ing. Name		Diet No. 1	Diet No. 2
2 Corn, Grain 7.86% CP	<input checked="" type="checkbox"/>	54.41	62.07
20 Soybean Meal 46% C	<input checked="" type="checkbox"/>	39.19	31.25
32 Oil, Soybean	<input type="checkbox"/>	2.960	3.789
40 Disodium Phosph.	<input type="checkbox"/>	0.986	0.685
37 Calcium Carbonate	<input type="checkbox"/>	1.038	0.825
41 Salt	<input type="checkbox"/>	0.515	0.472

Run Analysis

Save Outcome

Put Your Results from Test Ingredient Addition Below

Flock Final Weight: 3.167  
Flock Feed Conversion: 1.547  
Final Age: 43

Results

Ing. Name	Energy Increase	Protein/Lysine Increase
20 Corn, Grain 7.86% CP	1.800	4.890
Soybean Meal 46% CP	0	2.012

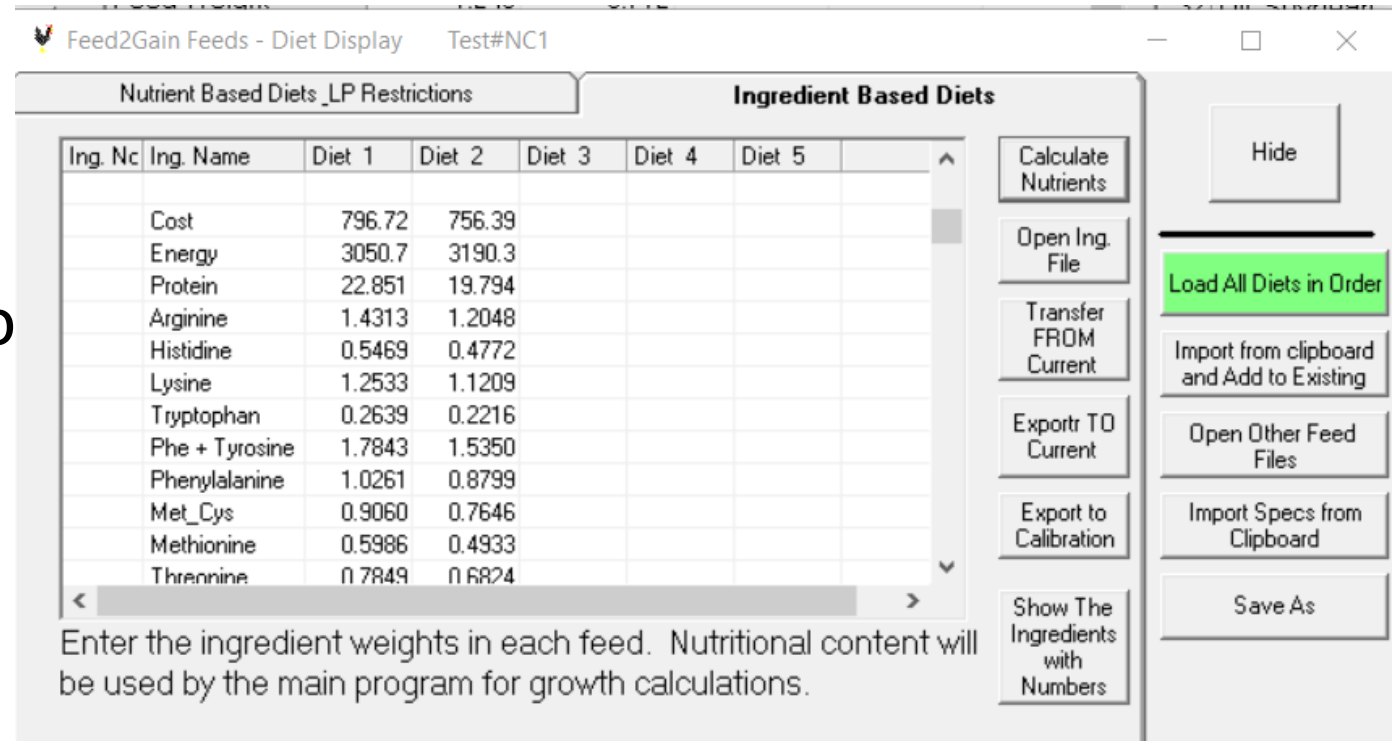
Best Fit: 3.167 kg, 1.546 f2g, 43.05 days, 29.66

Adjusted Diets

Energy	3033	3188
Protein	23.10	20.03
Arginine	1.440	1.216
Histidine	0	0
Lysine	1.270	1.081

# We can Use “Diet Display” Window to get the Feed Ingredients.

- We enter the ingredient number from our matrix to select an ingredient.
- Then we put in the weight of the ingredient in each diet.
- There are two diets in the publication.
- We Export to the Current Calc. Tab.



The screenshot shows the 'Feed2Gain Feeds - Diet Display' window for 'Test#NC1'. It features two tabs: 'Nutrient Based Diets\_LP Restrictions' and 'Ingredient Based Diets'. The 'Ingredient Based Diets' tab is active, displaying a table with columns for 'Ing. No', 'Ing. Name', and five diet columns (Diet 1 to Diet 5). The table contains the following data:

Ing. No	Ing. Name	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5
	Cost	796.72	756.39			
	Energy	3050.7	3190.3			
	Protein	22.851	19.794			
	Arginine	1.4313	1.2048			
	Histidine	0.5469	0.4772			
	Lysine	1.2533	1.1209			
	Tryptophan	0.2639	0.2216			
	Phe + Tyrosine	1.7843	1.5350			
	Phenylalanine	1.0261	0.8799			
	Met_Cys	0.9060	0.7646			
	Methionine	0.5986	0.4933			
	Threonine	0.7849	0.6824			

Below the table, a note states: 'Enter the ingredient weights in each feed. Nutritional content will be used by the main program for growth calculations.' To the right of the table is a vertical toolbar with buttons: 'Calculate Nutrients', 'Open Ing. File', 'Transfer FROM Current', 'Export TO Current', 'Export to Calibration', and 'Show The Ingredients with Numbers'. On the far right, there is a 'Hide' button and a 'Load All Diets in Order' button (highlighted in green), along with other options like 'Import from clipboard and Add to Existing', 'Open Other Feed Files', 'Import Specs from Clipboard', and 'Save As'.

# Save Outcome Gives Matrix Values for NC1 + CBE and Can Save them to your Matrix.

- The Program finds the apparent matrix of the enzyme for all given amino acids, protein and energy.
- The program can create a new ingredient for Corn and Soybean plus enzyme.
- One can choose which to use when testing value of the enzyme impact.

Ingredient Analysis - Save Results

Add a New Test Ingredient    Add Existing but Upgraded Ingredients    Cancel

You can save this analysis TWO ways. Create a Matrix Value for your Test Ingredient by setting an input weight and cost. OR You can Add New Ingredients to the Matrix for the Ingredients that were analyzed with an addition to the name and new cost. You will see the values before saving. You can update Names in the Grid

	NC1 + CBE		New Corn, Grain 7.86% CP	New Soybean Meal 46% CP	
Price		Dose 0.025 %			
Energy	145671		3425	2396	
Protein	2169		8.244	47.44	
Arginine	132.6		0.357	3.244	
Histidine	0		0.231	1.112	
Lysine	117.6		0.199	2.652	
Tryptophan	24.22		0.063	0.602	
Phe + Tyrosine	0		0.629	3.795	
Phenylalanine	0		0.346	2.203	
Met_Cys	84.60		0.304	1.183	
Methionine	0		0.157	0.581	
Threonine	73.55		0.304	1.602	
Leucine	0		0.954	3.264	
Isoleucine	0		0.252	1.969	
Valine	89.71		0.325	2.030	

NC1 + CBE    0.025    Enter the Dose then Click Here

# We repeat for NC1 with SE enzyme product.

- We use the published weight gain and feed conversion for the fourth treatment, NC1 plus SE.
- We Solve for the Impact of the enzyme on Corn and Soybean Meal.
- The impact on energy is the same as NC1 + CBE but more protein is released to achieve the observed growth and feed conversion.

Formulas		Diet No. 1	Diet No. 2
2	Corn, Grain 7.86% CP <input checked="" type="checkbox"/>	54.41	56.36
20	Soybean Meal 46% C <input checked="" type="checkbox"/>	39.19	37.51
32	Oil, Soybean <input type="checkbox"/>	2.960	2.594
40	Disodium Phosph. <input type="checkbox"/>	0.986	0.998
37	Calcium Carbonate <input type="checkbox"/>	1.038	1.046
41	Salt <input type="checkbox"/>	0.515	0.516

Put Your Results from Test Ingredient Addition Below

Flock Final Weight	Flock Feed Conversion	Final Age	Results
3.267	1.513	43	

Ing. Name	Energy Increase	Protein/Lysine Increa:
20 Corn, Grain 7.86% CP	2.000	15.64
Soybean Meal 46% CP	0	8.355
Best Fit	3.267 kg	1.510 f2g 43.19 days
Adjusted Diets		
Energy	3037	3188
Protein	24.71	21.65
Arginine	1.541	1.315
Histidine	0	0
Lysine	1.358	1.168

# We can then Generate Matrix Values from this outcome with N1 + SEC .

- We can see the matrix values that could be used for the Enzyme Product and for Corn and Soy plus the enzyme.
- The program would save these values with just a click.
- We will look at the average results later.

Add a New Test Ingredient    Add Existing but Upgraded Ingredients    Cancel

You can save this analysis TWO ways. Create a Matrix Value for your Test Ingredient by setting an input weight and cost. OR You can Add New Ingredients to the Matrix for the Ingredients that were analyzed with an addition to the name and new cost. You will see the values before saving. You can update Names in the Grid

	NC1 + SE		New Corn, Grain 7.86% CP	New Soybean Meal 46% CP
Price		Dose 0.025 %		
Energy	150356		3431	2396
Protein	8643		9.089	50.39
Arginine	528.4		0.393	3.446
Histidine	0		0.254	1.181
Lysine	468.5		0.220	2.817
Tryptophan	96.47		0.069	0.639
Phe + Tyrosine	0		0.694	4.031
Phenylalanine	0		0.382	2.340
Met_Cys	337.0		0.335	1.257
Methionine	0		0.173	0.618
Threonine	293.1		0.335	1.701
Leucine	0		1.052	3.467
Isoleucine	0		0.278	2.091
Valine	357.4		0.358	2.156

NC1 + SE    0.025    Enter the Dose then Click Here

# We Calibrate and Process NC2 the same way

- We Calibrate and then run on Current Calc.
- We add the ingredients via the Open Diets window.
- Here we are set to run the Evaluation of an ingredient.

The screenshot displays a software interface for diet formulation, divided into three main sections: Calibration of Location, Current Flock, and Optimization.

**Calibration of Location:** Includes a dropdown for 'Click on Desired Location' (TestNC2), a 'Show Instruction' checkbox, and various input fields for flock parameters: Flock Sex (Males), Flock Size (1000), No of Diets (2), Flock Final Weight (3.044 kg), Flock Feed Conversion (1.550), Final Age (42.2 days), Cost/Bird (0), Cost/Tonne (0), and Profit/Bird (-). Buttons for 'Current Calculation', 'Open Diets', 'Save Diets', 'Save All Current', 'Use Calibration Diets', 'Run LP', 'View Report', and 'Enzyme Top Off' are present.

**Current Flock:** Features checkboxes for 'When Protein Changes, Ratio Amino Acids' (checked) and 'Or When Lysine Changes, ratio Amino Acids' (unchecked), and checkboxes for 'Show Pink Changes' and 'Show Temperatures'. A 'Lean Breed' label is also visible.

**Optimization:** Contains a table of ingredients and formulas. The 'Formulas' table is highlighted below.

Formulas		
2 Corn, Grain 7.86% CP	56.36	63.70
20 Soybean Meal 46% CP	37.51	29.83
32 Oil, Soybean	2.594	3.489
40 Disodium Phosph.	0.998	0.693
37 Calcium Carbonate	1.046	0.831
41 Salt	0.516	0.472
45 DL Methionine	0.310	0.236
44 L-Lysine HCl	0.226	0.317
47 L-Threonine	0.022	0.022
51 Vitamins Premix	0.130	0.130
54 Mineral premix Starter	0.130	0.130
43 Cl. Choline - 70%	0.100	0.100
58 Antibiotic	0.055	0.055
57 Anticoccid agent.	0.001	0.001

# We have set up the Ingredient Testing for NC2 with CBE added.

- This treatment shows 2 % energy from Corn and none from Soybean Meal. Then an increase in Corn Protein by 14.5% and Soybean Meal by 2.1 %.
- We can average the two outcomes for CBE (in NC1 and NC2) later.

This Section finds the change in energy and protein contribution of ingredients affected by an Enzyme. It searches for the changes that best explain the Growth Differences observed between the Control and Test Outcomes.

Evaluate the impact of an Enzyme / Process on up to 4 Ingredients

Select Current Ingredients to be analyzed - Up to 4 -  
Click Here to Transfer From Control Diet

Formulas		Diet No. 1	Diet No. 2
2 Corn, Grain 7.86% CP	<input checked="" type="checkbox"/>	56.36	63.70
20 Soybean Meal 46% C	<input checked="" type="checkbox"/>	37.51	29.83
32 Oil, Soybean	<input type="checkbox"/>	2.594	3.489
40 Disodium Phosph.	<input type="checkbox"/>	0.998	0.693
37 Calcium Carbonate	<input type="checkbox"/>	1.046	0.831
41 Salt	<input type="checkbox"/>	0.516	0.472

Put Your Results from Test Ingredient Addition Below

Flock Final Weight	Flock Feed Conversion	Final Age
<input type="text" value="3.206"/>	<input type="text" value="1.54"/>	<input type="text" value="42"/>

Results

Ing. Name	Energy Increase	Protein/Lysine Increa:			
20 Corn, Grain 7.86% CP	2.000	14.50			
Soybean Meal 46% CP	0	2.085			
Best Fit	3.206 kg	1.519 f2g	43.08 days		16233
Adjusted Diets					
Energy	3038	3193			
Protein	23.07	20.02			
Arginine	1.468	1.206			
Histidine	0	0			
Lysine	1.294	1.108			

For Help  
Dbl Click He

# We next generate the Matrix values for the Enzyme and for Corn and Soy Plus CBE

- The values look similar to the NC1 plus CBE.

Ingredient Analysis - Save Results

Add a New Test Ingredient   Add Existing but Upgraded Ingredients   Cancel

You can save this analysis TWO ways. Create a Matrix Value for your Test Ingredient by setting an input weight and cost. OR You can Add New Ingredients to the Matrix for the Ingredients that were analyzed with an addition to the name and new cost. You will see the values before saving. You can update Names in the Grid

	NC2 + CBE		New Corn, Grain 7.86% CP	New Soybean Meal 46% CP
Price		Dose 0.025 %		
Energy	166472		3431	2396
Protein	4052		9.000	47.47
Arginine	247.6		0.389	3.246
Histidine	0		0.252	1.113
Lysine	225.1		0.218	2.654
Tryptophan	44.81		0.069	0.602
Phe + Tyrosine	0		0.687	3.798
Phenylalanine	0		0.378	2.205
Met_Cys	161.9		0.332	1.184
Methionine	0		0.172	0.582
Threonine	138.1		0.332	1.603
Leucine	0		1.042	3.267
Isoleucine	0		0.275	1.970
Valine	167.7		0.355	2.031
Ether Extract (EE) %			3.810	2.850

NC2 + CBE   0.025   Enter the Dose then Click Here



# We have set up the Ingredient Testing for NC2 with SE added.

- Energy seems to come from Corn and not Soy while this enzyme mix shows a response to soy protein and a large response to Corn protein.

Evaluate the impact of an Enzyme / Process on up to 4 Ingredients

Select Current Ingredients to be analyzed - Up to 4 -  
Click Here to Transfer From Control Diet

Formulas		Diet No. 1	Diet No. 2
2 Corn, Grain 7.86% CP	<input checked="" type="checkbox"/>	56.36	63.70
20 Soybean Meal 46% C	<input checked="" type="checkbox"/>	37.51	29.83
32 Oil, Soybean	<input type="checkbox"/>	2.594	3.489
40 Disodium Phosph.	<input type="checkbox"/>	0.998	0.693
37 Calcium Carbonate	<input type="checkbox"/>	1.046	0.831
41 Salt	<input type="checkbox"/>	0.516	0.472

Put Your Results from Test Ingredient Addition Below

Initial Final Weight: 1.241      Flock Feed Conversion: 1.528      Final Age: 42

**Results**

Ing. Name	Energy Increase	Protein/Lysine Increase		
20 Corn, Grain 7.86% CP	1.800	21.38		
Soybean Meal 46% CP	0	2.570		
Best Fit	3.241 kg	1.508 f2g	43.07 days	1
Adjusted Diets				
Energy	3034	3189		
Protein	23.46	20.43		
Arginine	1.493	1.231		
Histidine	0	0		
Lysine	1.316	1.131		

Have the Run Arr... For Help Dbl Click He

# Matrix Values for NC2 plus SE

- We now have two estimates for the matrix that one could use for CBE and SE enzyme addition to very similar diets.
- This would be an excellent way to judge the enzyme values in your own matrix.
- Run a trial or use the enzyme for a period and then compare results.

Ingredient Analysis - Save Results

Add a New Test Ingredient   Add Existing but Upgraded Ingredients   Cancel

You can save this analysis TWO ways. Create a Matrix Value for your Test Ingredient by setting an input weight and cost. OR You can Add New Ingredients to the Matrix for the Ingredients that were analyzed with an addition to the name and new cost. You will see the values before saving. You can update Names in the Grid

	NC2 + SE		New Corn, Grain 7.86% CP	New Soybean Meal 46% CP
Price		Dose 0.025 %		
Energy	149825		3425	2396
Protein	5675		9.540	47.70
Arginine	346.8		0.413	3.262
Histidine	0		0.267	1.118
Lysine	315.3		0.231	2.667
Tryptophan	62.77		0.073	0.605
Phe + Tyrosine	0		0.728	3.816
Phenylalanine	0		0.401	2.216
Met_Cys	226.8		0.352	1.190
Methionine	0		0.182	0.585
Threonine	193.4		0.352	1.610
Leucine	0		1.105	3.282
Isoleucine	0		0.291	1.980
Valine	235.0		0.376	2.041
Ether Extract (EE) %			3.810	2.850
Dry matter %			88.00	89.10

NC2 + SE   0.025   Enter the Dose then Click Here

# Combined NC1 and NC2 Results for Matrix Values

- The differences between the two matrix sets is obvious. More Energy and Protein is released by SE. Of course, that was obvious from the better growth performance seen with SE.
- BroilerOpt™ Feed Program can put numerical values on a Test Ingredient and show which ingredients appear to be most affected.
- Formulation with the Corn Plus Enzyme may work better as there are diets that will have more corn and less soybean meal as we go higher in age fed.

	CBE	SE
Energy	145671	166472
Protein	2169	4042
Arginine	132.6	274/6
Histidine	0	0
Lysine	117.6	225.1
Tryptophan	24.22	44.81
Phe + Tyrosine	0	0
Phenylalanine	0	0
Met_Cys	84.6	161.9
Methionine	0	
Threonine	73.55	138.1
Leucine	0	0
Isoleucine	0	0
Valine	89.71	167.7

# BroilerOpt™ Feed Program is A Great Resource

- It can formulate feed and accurately predict Flock Growth, carcass content and Feed Efficiency for Males and Females.
- It does feed formulation and can show graphs of cost, feed conversion, and age with Protein or Lysine and Energy content of each feed.
- It can Find the Optimum Feeding Program for your Feeding Locations based on Ingredient Cost as well as final age, live weight and carcass composition.
- Now, It can help with identifying Matrix Values for low addition weight Feed Ingredients that have Significant Effects on Growth and Feed Efficiency.

# Using the Created Matrix Values to Measure Value

- The program can save the Bulk Ingredients that were created to match the growth observed and/or the matrix for the Test Ingredient.
- We chose the N1 diets and the addition of SE enzyme mix from slide 13.
- We priced the ingredients so they would not be used and looked at the Shadow Prices found by the Least Cost Calculations.
- These are the highest prices that would be needed to just get the ingredients into the diets and are not evaluated if the ingredient is blocked from use in the Diets (restricted to no addition).

# Shadow Prices tell the value Ingredients when Used in the Diets

- The Prices of Corn and soybean meal are important. The Corn used by the program was priced at 454 per tonne (units were not important). The Soybean meal was 1150 per tonne.
- The program valued the New Corn at about 496.1 or 9.2% more.
- Soy was 1195 or 3.4% more value.
- The Enzyme Product was valued at 187274 per tonne.

Shadow Prices				
Ingred.Name	Current Price	Diet 1	Diet 2	
8 Limestone	175.0	175.0	175.0	
9 Salt	125.0	125.0	125.0	
10 DL Methionine	6500	6500	6500	
11 BioLis, 54.5%	6500	6500	6500	
12 L-Threonine	4450	4450	4450	
13 Vitamins Premix	400.0	400.0	400.0	
14 Mineral premix Starter	400.0	400.0	400.0	
15 Cl. Choline - 60%	249.0	249.0	249.0	
16 Salinomycin3 (12%)	6000	6000	6000	
17 Antioxidant (BHT)	6000	6000	6000	
18 New Corn, Grain 7.86%	500.0	496.1	500.0	
19 New Soybean Meal 46	1300	1195	1197	
20 NC1 SE	200000	187274	200000	

# Just for Interest

- We know that every study has variation. So, we looked at NC1 and NC2 with the Calibration for PC, the positive Control, using the given diets for each. Then with NC1 Calibration and then NC2 Calibration.

- The differences between Observed and Calibrated is the 42 day restriction on the program.
- NC1 seemed to perform worse than expected on Feed Conversion (f2g) expected 1.524 – 1.571 observed.
- NC2 was poorer on growth expected 3.127, observed 3.044.

		Expected Performance <u>at 42 days</u>		
Observed	Calibration	PC	NC1	NC2
3.245	PC	3.245	3.174	3.127
1.516		1.516	1.524	1.539
3.146	NC1	3.1	3.059	3.027
1.571		1.535	1.55	1.562
3.044	NC2	3.158	3.112	3.035
1.528		1.496	1.512	1.542

# Conclusion: A Matrix Set of Values was Possible with BroilerOpt™.exe

- In this Experiment, Both Enzyme Products provided value when added to the lower protein diets.
- The Product coded SE provided more value than the CBE product.
- Because, in this case, the Matrix Values were not present, not all amino acids could be evaluated.
- A Research Trial would be expected to have more variation in its results because there are fewer animals involved, a Commercial Trial will have only two outcomes, with and without the enzyme.
- Either way, the comparison of nutrients required to generate the growth response will provide the needed information for BroilerOpt.exe to evaluate the Added Ingredient.