Feed and Feed Ingredient Situation and Outlook: the Seen and the Unseen

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The opportunity to present a feed and feed ingredient Situation and Outlook for poultry at the 2015 Arkansas Nutrition Conference is both an honor and a rather daunting task. As we all know, feed comprises in excess of sixty percent of total live production costs borne by integrators; production labor and management, capital, utilities other overhead is borne by the grower. This S&O report is a bit non-traditional in that it does not deal only with factors that affect feed quantity and price, although that is its primary focus, the "Seen". But the "Unseen" to me is more fascinating. I have always enjoyed a peek behind the curtain to try and catch a glimpse of the real "Wizard of Oz". I do not intend to give a definitive price and quantity forecast for poultry for the next couple of years, nor do I purport to gaze effectively into the future to uncover technological breakthroughs that will impact feed and feed ingredients. With that said, let us begin.

U.S. Poultry Forecasts

An examination of the potential quantities of poultry for the 2015 and 2016 will give an indication of the amount of feedstuffs needed to for that same time period. The World Agricultural Outlook Board of USDA produces a series of World Agricultural Supply and Demand Estimates for all major U.S. agricultural commodities that are updated monthly. Select estimates form August 18 for U.S. poultry are shown in Table 1. For the current year, WASDE estimates are for just over 42 B pounds, or approximately 8.6 B birds (assuming a 72 dressing percentage). This represents about a 3 percent increase in total broiler numbers over 2014. A similar increase is predicted to occur in 2016. However, it is unclear what effect, if any, will occur as a result of avian influenza. USDA-APHIS is predicting the potential of a widespread AI outbreak in the Winter 2015 and Spring 2016, based upon the presence of significant presence of AI in all flyways for waterfowl.

WASDE numbers for turkeys and dozens of commercial table eggs indicate a decrease of 5.7 percent and 5.1 percent, respectively, for 2015 by euthanizing flocks as impacted by AI. Estimates for 2016 reflect an expected 6.7 percent in turkeys over 2015 and 2.3 percent for table eggs.

Increases in production and decreases in exports are expected to weigh on broiler prices, resulting in an approximately nine percent decrease in price levels as reflected by the USDA twelve-city average. However, quantity pressures for turkeys and table eggs are expected to result in seven and forty percent price increases, respectively, over 2014. In 2016, turkey prices are expected to maintain their 2015 levels while eggs prices are expected to decrease roughly 35 percent from their 2015 levels.

Table 1. U.S. poultry forecasts, 8/18/15

	2013	2014	2015								2016
	Annual	I	II	III	IV	Annual	I	II	III	IV	Annual	Annual
Production, million lb.												
Broilers	**37,830**	9,283	9,618	9,835	9,814	**38,550**	9,717	10,003	*10,300*	*10,225*	*40,245*	*41,375*
Turkeys	**5,806**	1,332	1,428	1,478	1,517	**5,756**	1,429	1,388	*1,390*	*1,425*	*5,632*	*6,010*
Table eggs, million dozen	**7,079**	1,771	1,799	1,827	1,868	**7,265**	1,789	1,689	*1,650*	*1,725*	*6,853*	*7,015*
Per capita disappearance, retail lb. 1/												
Broilers	**81.9**	20.2	20.8	21.2	21.2	**83.4**	21.4	22.1	*22.6*	*22.3*	*88.4*	*90.0*
Turkeys	**16.0**	3.4	3.5	3.9	5.0	**15.8**	3.5	3.6	*4.0*	*4.8*	*15.9*	*16.2*
Eggs, number	**258.7**	64.8	65.4	66.4	66.8	**263.4**	64.4	61.6	*60.6*	*63.4*	*249.9*	*252.3*
Market prices												
Broilers, 12 City, cents/lb.	**99.70**	98.40	113.70	104.60	102.80	**104.90**	97.00	104.20	*89-91*	*89-95*	*95-97*	*94-102*
Turkeys, Eastern, cents/lb.	**99.80**	100.70	105.60	110.20	113.90	**107.60**	99.60	108.50	*122-126*	*128-136*	*115-117*	*110-119*
Eggs, New York, cents/doz.	**124.70**	142.70	134.60	129.30	162.70	**142.30**	146.90	170.30	*238-246*	*238-252*	*199-203*	*164-178*
U.S. trade, million lb.												
Broiler exports	**7,346**	1,827	1,834	1,857	1,782	**7,301**	1,629	1,714	*1,750*	*1,750*	*6,843*	*7,215*
Turkey exports	**760**	163	188	223	231	**805**	154	123	*130*	*135*	*542*	*740*

Note: Forecasts are in italics.

1/ Per capita meat and egg disappearance calculated using Resident Population Plus Armed Forces Overseas series, Census Bureau of the Department of Commerce.

Source: World Agricultural Supply and Demand Estimates and Supporting Materials.

U.S. Corn Forecasts

Table 2 reflects the past three marketing years for corn in the U.S. WASDE reports production in these years was 10.7 B bushels in 2012/13, 13.8 B in 2013/14 and estimates it to be 14.2 B in 2014/15 and 13.5 B in 2015/16. However, these numbers exceed USDA and Pro Farmer estimates by close to one billion bushels. It is not clear what the source of this difference is; however, most "experts" expect the final production numbers to be in the neighborhood of 13.3-13.5 B bushels. This could be the source of the price differences between current cash prices of $3.80-$3.90 and the WASDE expectations of $3.60-$3.80 reflected in Table 3.

Weather in the late maturing acreages and during corn harvest will impact the final numbers and grain quality. Regardless, it is safe to say that there is no indication that corn will return to the $6.50 - $8.00 per bushel range that resulted from the widespread Midwest drought of the 2012/13 marketing year. It is important to remember that about ninety percent of all corn produced in the U.S. is from the extensive geography of the Corn Belt states. Therefore, variable weather conditions that prompt late plantings or re-planting or typically occurring abnormally spotty dry or extreme heat conditions are generally offset by favorable growing conditions in other parts of the Corn Belt. For instance, non-optimal conditions in the Eastern Corn Belt are being offset this year by near-ideal growing conditions in Iowa and Minnesota.

Turning to the dynamics of changing corn yield and its relevance to the poultry industry, consider this example for broilers. Assuming a 6.5 pound average live weight, a 72 percent dressing, and a feed ration that is 70 percent corn, approximately 1.3 B bushels of corn are required to service broiler feed demand, which is 25 percent of the U.S. total corn production estimated to be used for feed in 2015. This is the relative percentage of corn the industry has utilized in recent years. Given the WASDE estimates of broiler production in 2016 and the anticipated plantings and harvest, this percentage should remain stable, suggesting that all else constant, corn prices should remain in the $3.50-$3.80 per bushel range.

The major wild card in this assessment for corn supply and price is the state of the world economy, particularly given the recent slowdown in China's economy. Feed grain and oilseed imports by China have kept world supplies somewhat tight; there could well be slack in supplies if the economic contractions continue and become more pronounced. Increasing world incomes have driven the demand for exported animal proteins and animal proteins produced in other countries, which result in importation of feedstuffs from the U.S.

Table 2--Corn: U.S. quarterly supply and disappearance (million bushels), 7/14/2015

Commodity, market year, and quarter 1/			Beginning stocks	Production	Imports	Total supply	Food, seed, and industrial use	Feed and residual use	Exports	Total disappear-ance	Ending stocks	Farm price 2/ (dollars per bushel)
Corn	2012/13	Sep-Nov	989	10,755	35	11,779	1,466	2,060	221	3,746	8,033	6.87
		Dec-Feb	8,033		45	8,078	1,430	1,087	161	2,678	5,400	6.95
		Mar-May	5,400		40	5,440	1,567	921	186	2,674	2,766	7.04
		Jun-Aug	2,766		40	2,806	1,575	247	162	1,985	821	6.67
		Mkt yr	989	10,755	160	11,904	6,038	4,315	730	11,083	821	6.89
	2013/14	Sep-Nov	821	13,829	15	14,665	1,550	2,312	350	4,212	10,453	4.66
		Dec-Feb	10,453		7	10,459	1,607	1,451	393	3,451	7,008	4.40
		Mar-May	7,008		9	7,017	1,668	859	637	3,165	3,852	4.63
		Jun-Aug	3,852		6	3,858	1,678	411	537	2,626	1,232	4.06
		Mkt yr	821	13,829	36	14,686	6,503	5,034	1,917	13,454	1,232	4.46
	2014/15	Sep-Nov	1,232	14,216	5	15,452	1,610	2,223	408	4,241	11,211	3.55
		Dec-Feb	11,211		6	11,217	1,624	1,440	404	3,467	7,750	
		Mar-May	7,750		10	7,760	1,661	1,116	536	3,313	4,447	
		Mkt yr	1,232	14,216	27	15,474	6,546	5,300	1,850	13,696	1,779	3.60-3.80
	2015/16	Mkt yr	1,779	13,530	25	15,334	6,585	5,275	1,875	13,735	1,599	3.45-4.05

Latest market year is projected; previous market year is estimated. Totals may not add due to rounding.

1/ Corn and sorghum, September 1-August 31 marketing year; Barley and oats, June 1-May 31 marketing year.

2/ Average price received by farmers based on monthly price weighted by monthly marketings. For the latest market year, quarterly prices are calculated by using the current monthly prices weighted by the monthly marketings for those months for the previous 5 years divided by the sum of marketings for those months.

Source: USDA, World Agricultural Outlook Board, World Agricultural Supply and Demand Estimates and supporting materials.

Table 3--Cash corn prices, 7/14/2015

Market year and month 1/	Corn, No. 2 yellow, Central IL (dollars per bushel)			Corn, No. 2 yellow, Gulf ports, LA (dollars per bushel)		
	2012/13	2013/14	2014/15	2012/13	2013/14	2014/15
Sep	7.70	4.78	3.16	8.15	5.27	4.14
Oct	7.48	4.20	3.09	8.16	5.13	4.15
Nov	7.39	4.10	3.45	8.18	5.06	4.54
Dec	7.23	4.13	3.75	7.85	5.06	4.55
Jan	7.17	4.13	3.67	7.70	5.03	4.44
Feb	7.15	4.33	3.65	7.70	5.32	4.41
Mar	7.33	4.64	3.66	7.85	5.65	4.43
Apr	6.57	4.98	3.59	7.11	5.65	4.38
May	6.83	4.72	3.49	7.50	5.51	4.23
Jun	6.94	4.37	3.52	7.58	5.14	4.24
Jul	6.61	3.74		7.10	4.64	
Aug	5.98	3.59		6.07	4.48	
Market year	7.03	4.31		7.58	5.16	

1/ Corn, September 1-August 31 marketing year. Simple average of monthly prices for the marketing year.
Source: USDA, Agricultural Marketing Service, http://marketnews.usda.gov/portal/lg.

U.S. Soybean and Soybean Meal Forecasts

Soybean and soybean meal (SBM) production, stocks and disappearance for the past two marketing years and WASDE estimates for 2015/16 are shown in Table 4. Note the sizable increase in production from 2013/14 to 2014/15, an increase of 18.2 percent. This is a largely a result of farmers seeking alternatives to corn as a result of price pressures and cost of production for corn. Shuffling productive land among crops is nothing new in agriculture, but the combination of increasing leases based upon consecutive years of high profits from corn combined with the higher input costs for corn versus soybeans has pushed this. In addition, relatively low soybean stocks sent the signal to producers to plant more beans. The 2015/16 marketing year is expected to have production roughly equivalent to that of 2014/15.

Of course, the primary concern for poultry is the supply of SBM. WASDE estimates for the 2014/15 marketing year are for an 8.6 percent increase in crush to 44.2 M tons with domestic use totaling 31.85 M tons, a 7.7 percent increase year-to-year. Of the SBM utilized domestically, poultry accounts for just over 30 percent, about 10.3 M tons. So, with only a 300,000 carryover anticipated, relatively close to the last two

Table 4--Soybean and Soybean meal: U.S. supply and disappearance

SOYBEAN

	Supply				Disappearance			
Year beginning September 1	Beginning stocks	Production	Imports	Total	Crush	Exports	Total	Ending stocks
	million bushels							
2013/14[1]	141	3,358	72	3,570	1,734	1,638	3,478	92
2014/15[2]	92	3,969	30	4,091	1,845	1,825	3,851	240
2015/16[2]	240	3,916	30	4,186	1,860	1,725	3,716	270

SOYBEAN MEAL

	Supply				Disappearance			
Year beginning October 1	Beginning stocks	Production	Imports	Total	Domestic	Exports	Total	Ending stocks
	1,000 short tons							
2013/14[1]	275	40,685	383	41,343	29,547	11,546	41,093	250
2014/15[2]	250	44,200	350	44,800	31,850	12,650	44,500	300
2015/16[2]	300	44,225	325	44,850	32,900	11,650	44,550	300

[1] Estimated. [2] Forecast. Note: 1 metric ton equals 1.10231 short tons.

Source: USDA, World Agricultural Outlook Board, *World Agricultural Supply and Demand Estimates.*

Last update: 8/20/15

years' carryover, supplies are expected to remain relatively constant through next year. Therefore, SBM prices are expected to return to the 2010/11marketing year range of $340-$350 per ton (Table 5). Compared to corn, however, South American production has a larger impact on SBM prices; South American beans often fill exports to Europe, Asia and the Pacific Rim. As discussed in the previous section on corn forecasts, the world economic situation is likely to have a sizable impact on the supply situation, and thus world and domestic prices, for both soybeans and SBM.

Table 5--U.S. soybean meal prices

Marketing year	Soybean meal [2]
	$/Short ton
2005/06	174.17
2006/07	205.44
2007/08	335.94
2008/09	331.17
2009/10	311.27
2010/11	345.52
2011/12	393.53
2012/13	468.11
2013/14	489.94
2014/15[1]	370.00
2015/16[1]	310-350

Marketing month		Marketing month	
2013/14	*$/Short ton*	2014/15	*$/Short ton*
October	443.63	October	381.50
November	451.13	November	441.39
December	498.10	December	431.73
January	479.54	January	380.03
February	509.25	February	370.38
March	495.71	March	357.83
April	514.01	April	336.61
May	519.38	May	320.23
June	501.72	June	335.03
July	450.79	July	375.71
August	490.32		
September	525.72		

[1] Preliminary. [2] High-protein Decatur, IL
Source: USDA, Ag Mktg Service, *Monthly Feedstuff Prices.* Last updated 8/20/15

Poultry Feed Forecast

To put into perspective the preceding discussions of corn and SBM forecasts, a brief look at the most recent seven years of feed costs and the percentage of live production costs comprised by feed is insightful. No one is likely to soon forget the drastic impact high corn and SBM prices had on production costs during the period 2011-2013. Information in Table 6 indicates this percentage went from about 62 percent historically to 67-68 percent for the two year period, an *almost ten percent relative increase* in the share of production costs attributable to feed. Given the expected corn and SBM prices expected for the 2014/15 at levels not seen since 2007 and 2008, it is rational to expect that the percentage of total live production costs attributable to feed will decrease to less than 62 percent, perhaps to 61 percent, a share not seen since before 2008.

Table 6. Historic Prices, Corn, Soybean Meal and Broiler Feed. 2003-1014

YEAR	CORN/BU	CORN/TON	SBM/TON	FEEED/TON	% live costs	Avg Bird Wt
2003	$2.34	$92.12	$191.19	$150.98	N/A	N/A
2004	$2.55	$100.39	$233.60	$177.52	N/A	N/A
2005	$2.13	$83.85	$185.41	$148.31	N/A	N/A
2006	$2.55	$100.39	$176.65	$152.72	N/A	N/A
2007	$3.71	$146.06	$233.26	$202.36	N/A	N/A
2008	$5.30	$208.65	$326.26	$282.74	61.9	5.85
2009	$4.19	$164.95	$353.87	$249.25	64.2	5.87
2010	$4.39	$172.83	$321.00	$242.20	61.8	6.05
2011	$7.10	$279.51	$364.92	$328.57	67.2	6.13
2012	$7.32	$288.17	$428.59	$358.14	68.2	6.22
2013	$6.70	$263.77	$468.45	$360.55	67.9	6.32
2014	$4.62	$181.88	$477.29	$302.45	63.9	6.42

Source: AgriStats Annual Summaries

Determining the Value of Components Utilized as Poultry Feed Ingredients

The remainder of this paper addresses a portion of the "unseen" referred to in its title. Presented are partial results of a survey of poultry nutritionists and ingredient buyers conducted during the period February 15 to May 1. More complete results of the survey are expected to appear in leading feed and poultry trade publications later in 2015.

Price volatility and supply variability for feed grains, oilseeds and animal protein products have been extreme in recent years. The interaction of feed grain and oilseed supplies has dramatically affected subsequent supplies and prices of animal proteins and protein products. Relatively little attention has been paid to supplies

and prices of animal proteins and protein products. The questions dealt with various topics. The aim was to learn more about the principal economic issues associated with feed, performance and economics in the poultry industry. A better understanding of this industry will enable agricultural economists, stakeholders, and policy makers to be better prepared to address issues of performance, feed quality, price and other economic matters associated with this very important sector of the agricultural economy.

Design of Survey Instrument

Survey questions dealt with modern practices of poultry nutrition and Willingness To Pay (WTP) of nutritionists and buyers for various characteristics, including:

- A reduction in feed mill down time
- Importance of the presence of microbial control
- Importance of the presence of feed preservatives
- Uniformity and consistency (nutrient density) of various components
- Reduction in variation of feed mix
- Importance of amino acid availability
- Delivery on time
- How feed mix affects the environmental conditions of the bird
- Dependability/integrity of supplier(s)

Many of these characteristics are intangible characteristics of feed ingredients, while others focus on tangible aspects of feed ingredients.

The survey also included additional questions related to costs per pound of meat yielded; costs per ton of feed; reasonable cost ranges of feed mixes (on a dollars per ton basis); value of synthetics; size of feeding operations; extent of emphasis on prophylactic antibiotic use; and extent of focus on vegetarian diets, antibiotic-free diets, and organic diets. Additionally, questions dealt with the type of poultry publications read and the length of time spent in the job.

Survey Population and Respondents

Input was solicited concerning the email addresses and telephone numbers of targeted nutritionists and buyers or purchasing agents. The original number of targeted nutritionists and buyers or purchasing agents was 133. However, owing to the fact that a notable number of potential respondents were outside the area of poultry nutrition, coupled with the fact that more than a few of the email addresses/telephone numbers were incorrect, the relevant pool of potential respondents was cut to 82. The survey was initiated from the end of February 2015 to early May 2015, a period of roughly 10 weeks. The number of completed survey responses was 21, a response rate of approximately 25 percent. This response rate

is typical in survey research, especially in a survey with a 25-30 questions. Non-responses were attributed to: (1) company policies that prohibited employees from participating in surveys of any type; (2) respondents not qualified to complete the survey, for example, nutrient suppliers or research and/or laboratory personnel; and (3) policies by respondents of non-participation in any survey.

Survey Results

We describe responses received on the following basis: 1) Were responses representative of the poultry industry?; 2) What characteristics were important to respondents; and 3) What value did respondents place on the characteristics that were stated to be important?

Representativeness of Respondents:

Fifteen of the 21 respondents were nutritionists; responses also were received from veterinarians, live production managers, purchasing managers, consultants, and buyers. Thirteen of the 21 respondents had been formulating feed for more than ten years, with only two formulating for one year or less. Most of the respondents had a notable percentage of the decision-making for feed formulation and purchasing under their control, with an average percentage of decision authority of 78%; 12 stated they had 90-100% of decision authority.

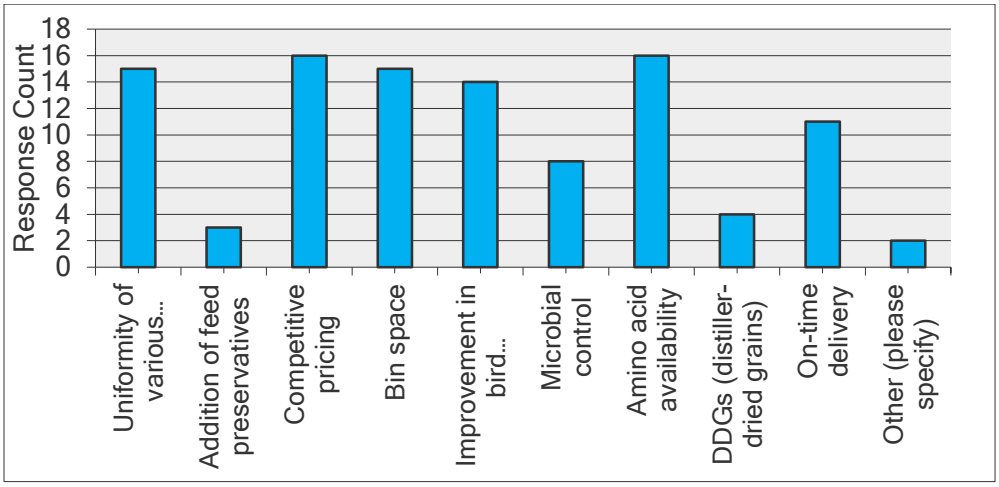
Respondents formulated feed for broilers (20), breeders (13), pullets (5) turkeys (4) and commercial Layers (2). Those formulating for broilers were represented by: 28% greater than 7.5 lbs., 18% 6.0 to 6.8 lbs. and 16% less than 4.4 lbs. In terms of annual feed production, seven respondents formulated for companies producing 0.5 to 1.5 M tons, with six greater than 5.0 M tons and five 1.5 to 5.0 M tons. Broiler finisher, grow-out and starter feeds comprised just over 85 percent of total tonnage.

Traditional diets and antibiotic-free diets rank high in importance to respondents. Interest in vegetarian diets was somewhat important to respondents. The majority of respondents ranked non-GMO and organic/all natural diets as either unimportant or somewhat important. Of the feeds formulated by respondents, 74% were traditional and 16% were anti-biotic free; only 6 % were vegetarian.

General Feed Attributes Important to Respondents

Key factors associated with choosing a feed ingredient additive were in order of frequency of responses were: cost (95.2%); uniformity/consistency (90.5%); quality (85.7%); delivery (57.1%); microbial control (42.9%) and presence of feed

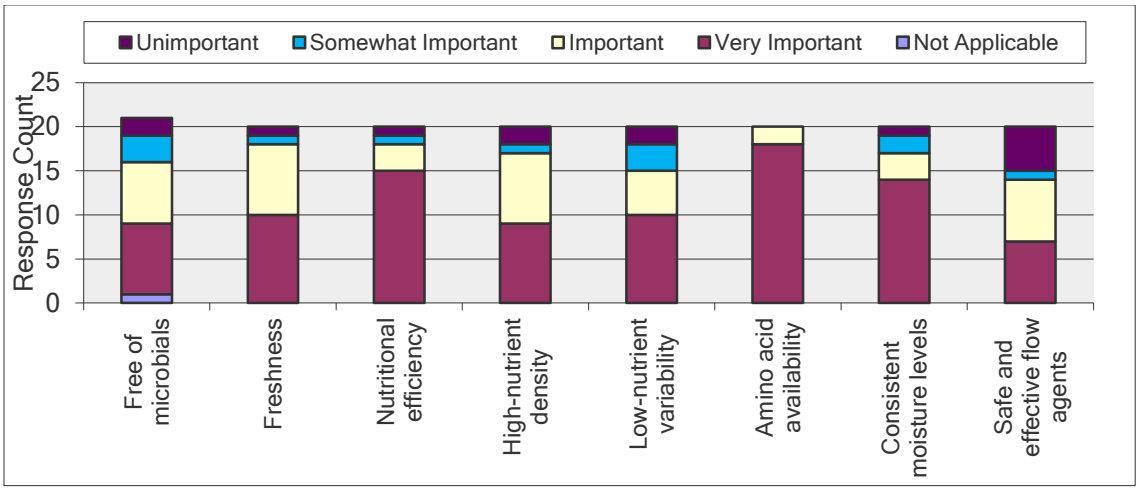
preservatives (23.8%). Major challenges indicated by respondents concerning feed ingredient additives were: amino acid availability (76.2); competitive pricing (76.2%); uniformity of various formulas (71.4%); bin space (71.4%); improvement in bird performance (66.7%); on-time delivery (52.4%); microbial control (38.1%); distiller-dried grains (19.0%); and addition of feed preservation (14.3%).



The majority of respondents (15 of 20) ranked the value of prophylactic antibiotic use important to very important. In addition, most respondents indicated their best guess concerning the costs per ton of feed for replacement pullets, breeder hens, growers, and finishers was less than $280 to $300 per ton and $300 to $320 per ton.

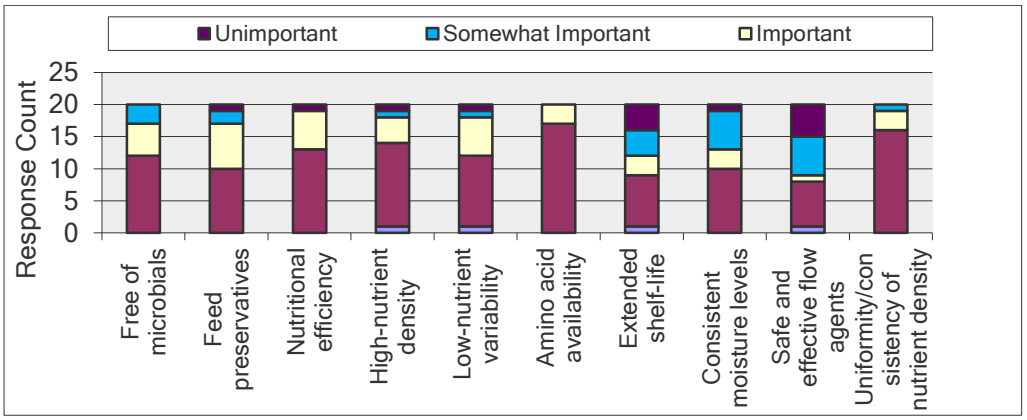
Tangible Feed Attributes: Importance and Value to Respondents

A series of questions asked respondents to identify the importance level of various tangible product attributes for several feed components and their willingness to pay for these various attributes. For feed grains and DDGs, amino acid availability, nutritional efficiency, consistent moisture levels and high-nutrient variability were ranked important to very important. Despite the importance of the aforementioned characteristics for feed grains and DDGs, the maximum willingness to pay was $5 to $10 per ton. The majority of the respondents were either not willing to pay any additional amounts for these characteristics or at most $1 to $5 per ton.

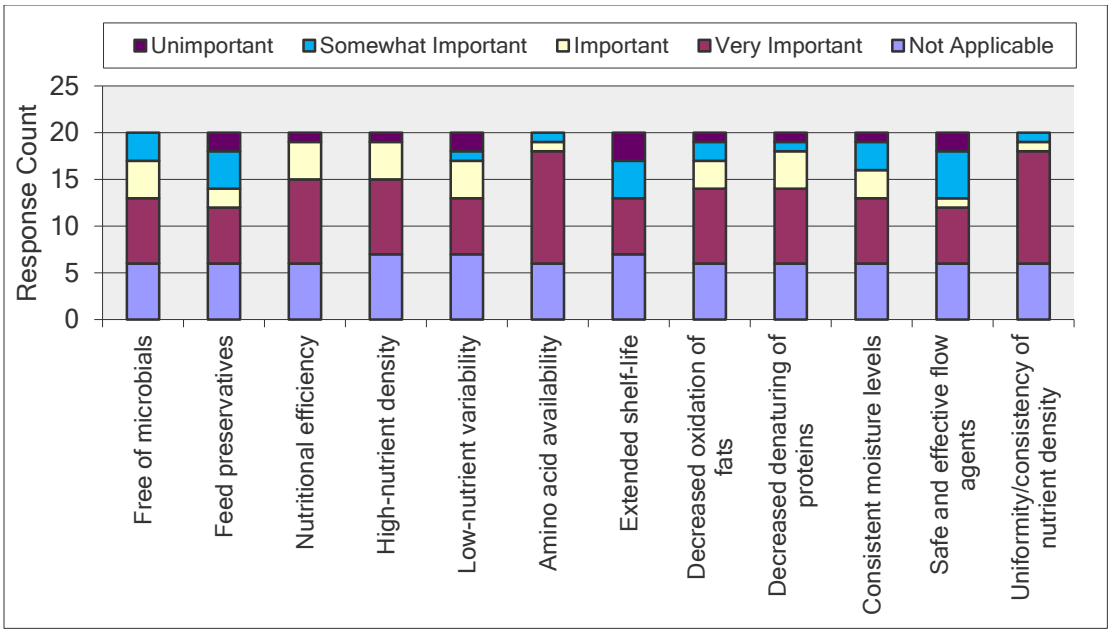


For soybean meal, amino acid availability, nutritional efficiency, high-nutrient density and low-nutrient variability were the top four attributes. Despite the importance of the aforementioned characteristics, the maximum willingness-to-pay for free of microbials and amino acid availability was $10 to $20/ton. For freshness, nutritional efficiency, high-nutrient density, low-nutrient variability, and consistent moisture levels, the maximum willingness-to-pay was $5 to $10/ton. A notable number of respondents were not willing to pay for these characteristics.

For meat and bone meal (MBM), poultry meat, and fishmeal characteristics such as: amino acid availability, nutritional efficiency, uniformity/ consistency of nutrient density and free of microbials were the four top-ranked attributes cited.



Despite their importance, the maximum willingness-to-pay was between $1 to $5/ton to $5 to $10/ton for these characteristics for MBM, poultry meal and fishmeal. Seven respondents were unwilling to pay for these characteristics.



For protein pre-mixes, characteristics such as amino acid availability, uniformity/ consistency of nutrient density, free of microbials and high-nutrient density were the top four attributes and were ranked important to very important. No attributes were important to six respondents, an indication they did not use protein pre-mixes.

Despite the importance of these characteristics associated with protein pre-mixes, the maximum willingness-to-pay was in excess of $20/ton. Most respondents were either unwilling to pay any additional amount or $1 to $5/ton. However, if the midpoints of the amounts respondents said they were willing to pay for tangible product attributes are used to calculate an actual value for all respondents, an 'unconditional value' was derived. This 'unconditional value' assumes all factors were additive, that is, comprised a complete package of the attributes. This weighted sum of attributes was found to be $46.81 per ton. If only respondents who said they were willing to pay for these attributes are included, the same weighted sum approach yields what is referred to as a conditional value of $94.22 per ton.

The following attributes in an animal protein product were either preferred or highly preferred: (1) total digestible amino acid availability, (2) no antibiotics included; (3) no ionophores included; (4) impact of feed in gut health; (5) total amino acid levels; (6) ease of feed handling/flowability; and (7) pepsin digestibility. The following attributes in an animal protein product were somewhat preferred: (1) total fatty acid profiles; (2) consistent moisture levels; and (3) impact of feed in bird environment. The following attributes in an animal protein product were not preferred: (1) antibiotics included; (2) ionophores included; (3) probiotics included; and (4) addition of enzymes. The preference for the inclusion of synthetic amino acids was mixed among respondents (See below).

Answer Options	Not Preferred	Somewhat Preferred	Preferred	Highly Preferred	Not Applicable
Antibiotics included	**17**	1	1	0	1
No antibiotics included	4	2	2	**11**	1
Ionophores included	**14**	3	0	1	2
No ionophores included	5	3	1	**9**	2
Probiotics included	**14**	3	1	1	1
Synthetic amino acids included	6	4	5	3	2
Total amino acid levels	2	2	**10**	6	0
Total digestible amino acid availability	1	0	7	**12**	0
Impact of feed on gut health	2	3	6	**9**	0
Impact of feed on bird environment (i.e. NH3 levels)	5	6	5	4	0
Consistent moisture levels	1	**9**	**7**	3	0
Ease of feed handling, flowability	2	4	**11**	3	0
Total fatty acid profiles	1	**10**	6	3	0
Pepsin digestibility	0	**8**	7	5	0
Addition of enzymes	**13**	2	1	3	1

Intangible Feed Attributes: Importance and Value to Respondents

Intangible attributes associated with the feed ingredient supplier were assessed as to their importance and value. Respondents' level of preference for the following attributes associated with supplier(s) of animal protein products appear below:

Answer Options	Not Preferred	Somewhat Preferred	Preferred	Highly Preferred	Not Applicable
Decrease in feed mill downtime	2	3	**6**	**7**	2
Accurate product information	1	2	3	**14**	0
Technical information available	2	4	3	**11**	0
Technical assistance available	2	3	**7**	**8**	0
Product availability	1	0	**7**	**12**	0
Short lead-time for delivery	2	4	**8**	**6**	0
Prompt customer service	2	0	**10**	**8**	0
Accurate and timely invoicing	2	1	**11**	**6**	0
Just-in-time delivery	4	4	**5**	**7**	0
Delivery during crisis	1	3	2	**13**	1

Despite the preference for the aforementioned attributes, the maximum willingness-to-pay was between $1 to $10/ton. The maximum willingness-to-pay for delivery during crisis was $10 to $20/ton. Again, most respondents were unwilling to pay any additional amounts for the respective attributes. Once again, however, if the midpoints of the amounts respondents said they were willing to pay for intangible product attributes are used to calculate an actual value for all respondents, and assuming the factors are additive, in other words comprised a complete package of the attributes, the value of a weighted sum of the intangible product attributes, referred to as 'unconditional value', was $13.11 per ton. If only respondents who said they were willing to pay for these attributes are included, using the same weighted sum approach yields what is referred to as a 'conditional value' of $51.67 per ton.

Answer Options	$0 / ton	$1-10 / ton	$10-20 / ton	$20-30 / ton	>$30 / ton	N/A
Decrease in feed mill downtime	**14**	6	0	0	0	0
Accurate product information	**15**	5	0	0	0	0
Technical information available	**16**	4	0	0	0	0
Technical assistance available	**14**	6	0	0	0	0
Product availability	**14**	6	0	0	0	0
Short lead-time for delivery	**15**	5	0	0	0	0
Prompt customer service	**15**	5	0	0	0	0
Accurate and timely invoicing	**17**	3	0	0	0	0
Just-in-time delivery	**16**	4	0	0	0	0
Delivery during crisis	**13**	5	1	0	0	1

Additional Unseen Factors Affecting Feed and Feedstuffs

Two additional factors to briefly draw attention to are the potential for advances in feed ingredient technology and changes in the mindset of feed ingredient purchasers. Regarding technology, the production of ethanol in the past decade has brought on-line into the market a significant amount of Distillers' Dried Grains. Advances in nutrition science that could better utilize this feedstuff are underway in studies sponsored by the U.S. Grains Council, among others. At this time, the effects of using DDG oils in broiler rations on feed conversion/feed efficiency and skin color are being assessed, with results expected by mid-Autumn. This could bring about additional decreases in feed costs as the DDG oils replace relatively more expensive fats as an energy source in poultry diets.

As poultry nutritionists hold greater sway in determining the final composition of feed ingredients in the diet, it is likely that rations may move more quickly away from a least cost per pound of feed decision framework to a least costs per pound of meat framework. This could impact ingredient selections, particularly as advance in nutrition and feed science pave the way for greater ingredient efficacy through design and implementation of "boutique diets". We shall see.