U.S. Experiences with Lohmann Selected Leghorn (LSL-Lite) Layers

**** Part 4: Economic Evaluation of Flock Performance****

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Introduction

"Flock indexing (or profiling) is a system for evaluating multiple traits of performance in table egg laying flocks. Oftentimes, flocks will experience good results in several traits with poor results in others. Flock indexing allows multiple traits to be evaluated simultaneously in relation to their economic importance. Egg production, egg size, feed consumption and mortality effects are considered along with typical feed and egg prices to come up with an index of profitability. The use of standardized egg prices and feed costs allow flock or production system comparisons over different time periods. An index is really a measure of biological performance stated in economic terms" (Bell, 1991).

This article has two objectives: (1) To describe the more important factors which have an effect on the economics of production in commercial layer flocks in general and (2) to discuss in more detail recent U.S. experiences with the LSL-Lite layer and the subject of flock evaluations.

Background

Individual flock performance monitoring became common in the 1960s when flock separation by age became prevalent. Prior to then, individual houses often contained different ages, sources and strains. The one-age house allowed improved records and more effective management.

In the early 1990s, a multi-trait record system was developed by Extension personnel of the University of California to economically evaluate flocks, programs and products. The system was field-tested on a dozen commercial farms with several hundred large flocks totaling approximately 28 million White Leghorn laying hens. Cooperating farms provided us with detailed lifetime records representing weekly performance. These records were then analyzed and reports were provided back to each cooperator.

Flock Results for 1991 and 2003 hatch dates

Results improved dramatically between flocks included in the first two studies which were 12 years apart. Egg production increased by an additional egg per hen-housed each year. The number of weeks over 90% production doubled (see Table 1).

Table 1: Changes in Performances and Economic Results between flocks hatched in 1991 vs. 2003

Measurement	1991 hatch	2003 hatch
No. Eggs/HH to 60 wks.	225	237
Weeks of 90+% HD EP	8.8	17.5
Mortality (%/wk.)	.163	.133
Egg weight (g)	60.1	59.9
Feed (lbs./dozen)	3.23	3.03
Feed (g/egg)	122	114
Total egg mass (kg/HH)	13.35	13.98
Flock Index ($/HH)	5.26	5.75

(Bell, 2012a)

Flock Index variation between flocks representing major strains of White Leghorn chickens

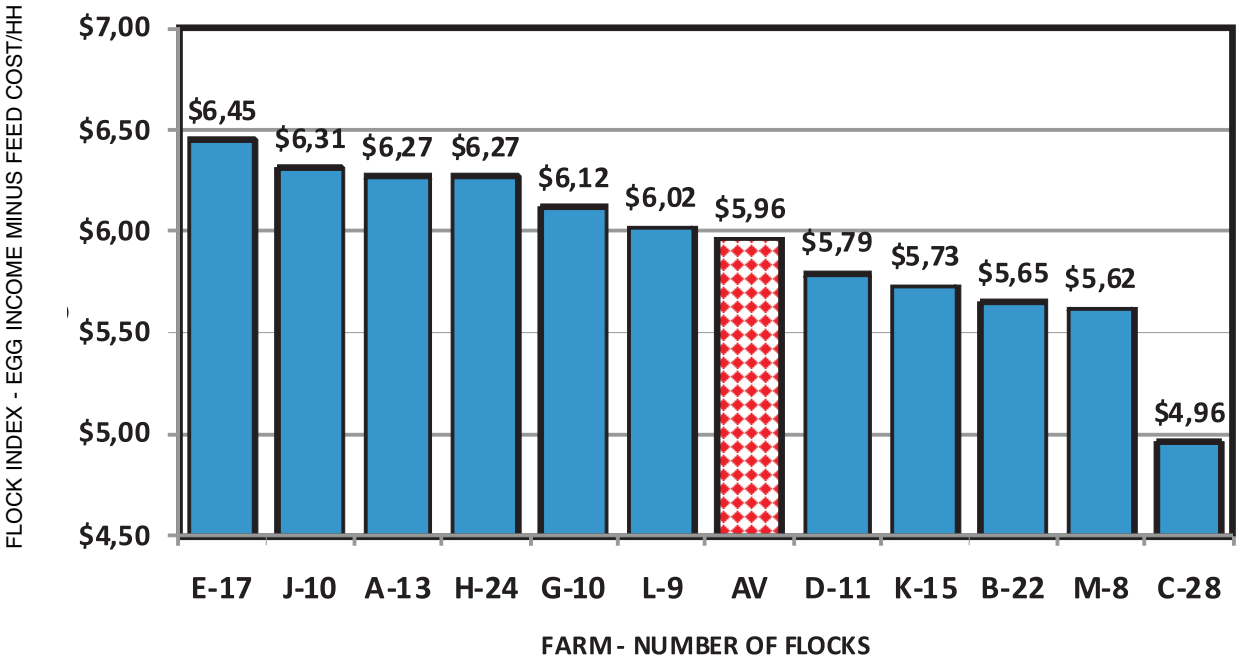
Table 2 lists the flock to flock variation in index results for an earlier study. Since nine White Leghorn strains were used, differences in performance could be attributed to many factors **including** strain selection. Arbitrary grouping into five income classes identified major index differences. A total flock index difference of approximately $1.50/HH was observed among the 165 flocks in the study.

Table 2: Frequency of Flock Indexes – 2010 U.S. study*

Classification	Egg Income minus Feed Cost Range	Number of Flocks	Percentage of Flocks
Exceptional	$6.50+	4	2.4
Excellent	$6.00 to $6.49	48	29.1
Good	$5.50 to 5.99	68	41.2
Fair	$5.00 to $5.49	33	20.0
Poor	< $5.00	12	7.3

*165 flocks (all white-egg strains) – January, 2010
Egg prices standardized at 55 cents per dozen for large eggs
Feed prices standardized at $7.50/100 pounds (16.5 cents/kg)

Figure 1: Flock Indexes U.S. study of 74 LSL-Lite flocks – Eleven Farms -



Flock variation within a single strain

Figure 1 illustrates the individual company flock indexes for the 74 LSL-Lite flocks in the most recent study. Even within this fairly short period, the total value of the differences observed was almost $1.50 per hen housed. A comparison of the results in the flock index report (see Table 4A and 4B) within or between farms reveal the traits leading to significant index differences. This example excluded “strain” as a contributor to the observed differences, because all flocks were of the same strain.

Variation between companies and flocks for each performance trait has been discussed in previous reports (Bell, 2011, 2012a, 2012b). Table 3 illustrates the range in results for the eleven farms studied in the current report.

Table 3: Range in performance and economic results between farms 2012 U.S. study – 74 LSL-Lite flocks – 20 to 60 wks of age

Measurement	Low Farm*	High Farm*	Average (11)
No. Eggs/HH	220	247	239
Mortality (%/wk.)	.075	.198	.121
Egg wt. (g/egg)	57.0	59.9	58.8
Feed (lbs./dozen)	3.00	3.19	3.07
Feed (g/egg)	113	120	116
Total egg mass (kg/HH)	12.06	14.18	14.06
Flock index ($/HH)	4.98	6.45	5.00

*Each row within a column may represent different flocks

Input Data for the Major Performance Traits

Calculation of the index requires the user to enter flock profiles in terms of records for egg production, mortality, feed consumption and egg weight. These profiles can be for a one-use-only application or may be used to represent “typical” results. We recommend to start with representative curves for each trait based upon at least five actual farm records. As flock performance changes over time, these curves should be modified.

We are now using a series of egg price data sets which are associated with different ages and case weights (360 eggs). These are developed to be used for a multi-year period. Prices can be changed over time or between flocks IF justified by major changes in the economy. The egg price/value tables can relate to actual on-going weights or to standard age relationships. Five years ago, we used a 55 cent price for one-dozen large eggs in the U.S.

Tables 4A and 4B list weekly performance traits based upon a U.S. sample of 74 LSL-Lite flocks. The spreadsheet calculates the flock index value based upon the unique data in the input and the standardized values for eggs and feed. The columns with these input values are shaded to reflect sample input.

Why are standard values used?

The only estimated values used in these projections are for egg prices and feed prices. Since these values change almost weekly, they must be standardized in order to be able to measure the real effect of performance changes – and not those caused by different prices. This allows us to make meaningful comparisons over time, between regions and countries, and between flocks hatched in different seasons.

Egg value standards

Egg values vary by the size and proportions of eggs of different weights as well as with changes in value associated with the season and market place.

Eggs may be valued based upon their average weight, by the piece or by their category (large, medium, small). Software is available to estimate the “all egg” average price based upon standard weight/category definitions and different price levels. Since these are estimates for the future, we suggest that you continue using the same standards unless there are major changes in costs or prices.

The original prices used twenty years ago were 55 cents per dozen for large eggs and $7.50 per 100 pounds of feed (16.5 cents per kg). In recent years both of these figures have become outdated. Today we use 85 cents for large eggs and $15.00 for feed. These are the values used in Figure 1 and Tables 4A and 4B. Interestingly these two combinations of egg and feed prices result in almost equal flock indexes - $5.00 to $6.00 per hen-housed to 60 weeks of age.

Sample data input and output forms

Tables 4A and 4B represent the completed input and output spreadsheets used in calculating the flock indexes for the average results from the 74 LSL-Lite flocks. The shaded areas are used for inputting new data. All the other columns are automatically calculated and represent the output. The reader can substitute his/her own figures for starting hen counts, weekly mortality, hen-day egg production, case weight for eggs (360 eggs), daily feed consumption, and egg and feed price estimates. Formulas are written in U.S. units, but can be altered to systems used in other countries.

The spread sheet calculates performance for the 20 to 60 week period of a flock's life. This period was chosen to allow for the comparisons of similar periods of time – it can be extended to 80 weeks, but care must be taken to not include variable molting ages. This would make comparisons between flocks less meaningful.

The flock indexes listed in columns 24 and 25 are the egg income minus feed costs for each hen housed at 20 weeks of age. Since laying periods and prices and costs have been standardized, the index represents the economic value of performance per se. This allows for meaningful comparisons of two or more flocks with their associated management systems. In other words: two strains may be compared or two feeding programs or any other factor of interest to the egg producer and researcher which yields different performance profiles. Positive and negative factors can be evaluated in terms of additive trait results and net worth.

Multiple Uses for Flock Indexing Software

The flock indexing software is a multi-use system for recording current flock performance and a modeling system for projecting events into the future.
Modeling allows a manager to simulate situations in a "what if" format.

Seven principle uses of this software are listed below:

1. Current actual flock results compared with various standards
2. Placing each item of performance and costs in proper perspective
3. Forecasting company results with different cost/income assumptions
4. Determining optimum replacement policies
5. Long-range planning for new investments
6. Developing marketing strategies based on accurate production forecasting
7. Testing a concept on paper before investing in the product or project

Much of the success of an egg enterprise is associated with how well it is planned from the beginning. Input comes from many individuals from within a company as well as from outside sources. In the planning stages, it is important to "try out" various ideas before they become an integral part of a company's plans for the future. Modeling is the most efficient and least expensive way to evaluate new ideas.

Profiling (flock indexing) software is presented to give the reader ideas and to stimulate their thinking about new technologies. Broad categories are listed above. The general concepts presented in this article are illustrated with actual field results for a single strain of layers. The existing software can be used by researchers or individual companies to evaluate various alternatives, and they can be modified to include many other items and relationships. With a little study, practically any output can be produced in tabular or graphic formats.

Table 4A: Flock Performance Index – Input data – 74 LSL-Lite flocks

FLOCK PERFORMANCE INDEXING				(enter)						
20 WEEK HEN COUNT:				10.000						
PERFORMANCE FACTORS										
1	2	3	4	5	6	7	8	9	10	11
		(enter)	(enter)	WKLY	(enter)		WT OF	(enter)	FEED	
AGE	AVG	%	H.D.	EGGS	EW	EW	EGGS	FD	USED	EGGS/HH
WKS	HENS	DIED	%	DOZEN	LB/CS	G/EGG	(CWT)	LBS/100	(CWT)	TO DATE
20	9.993	0,132	24,5	1.428	35,4	44,6	16,84	16,70	116,8	1,7
21	9.978	0,155	50,1	2.916	37,8	47,6	36,71	17,71	123,7	5,2
22	9.963	0,148	71,8	4.173	39,6	49,9	55,11	18,85	131,5	10,2
23	9.950	0,135	83,9	4.870	41,2	51,9	66,87	20,10	140,0	16,1
24	9.938	0,115	90,3	5.235	42,6	53,7	74,40	21,00	146,1	22,3
25	9.928	0,107	92,1	5.334	43,7	55,0	77,66	21,43	148,9	28,7
26	9.917	0,105	93,2	5.392	44,4	56,0	79,87	21,65	150,3	35,2
27	9.904	0,130	93,2	5.385	45,0	56,7	80,72	21,98	152,4	41,7
28	9.893	0,112	93,6	5.402	45,6	57,4	82,04	22,31	154,5	48,2
29	9.883	0,104	93,8	5.408	45,9	57,9	82,82	22,32	154,4	54,6
30	9.872	0,106	93,7	5.396	46,4	58,4	83,41	22,38	154,6	61,1
31	9.862	0,107	93,8	5.396	46,6	58,7	83,87	22,40	154,6	67,6
32	9.850	0,119	93,8	5.390	46,9	59,1	84,24	22,56	155,5	74,1
33	9.839	0,115	93,8	5.383	47,1	59,3	84,47	22,71	156,4	80,5
34	9.828	0,112	93,7	5.372	47,2	59,5	84,55	22,59	155,4	87,0
35	9.816	0,122	93,5	5.354	47,5	59,8	84,75	22,87	157,2	93,4
36	9.803	0,128	93,2	5.330	47,8	60,2	84,83	22,62	155,2	99,8
37	9.791	0,127	93,1	5.317	47,9	60,3	84,85	22,54	154,5	106,2
38	9.778	0,126	92,8	5.293	47,9	60,4	84,56	23,00	157,5	112,5
39	9.766	0,131	92,8	5.286	47,9	60,4	84,47	22,52	153,9	118,9
40	9.753	0,133	92,4	5.257	48,1	60,6	84,31	22,64	154,6	125,2
41	9.738	0,146	92,2	5.238	48,2	60,8	84,22	22,86	155,8	131,5
42	9.724	0,145	92,2	5.230	48,3	60,8	84,19	22,92	156,0	137,7
43	9.710	0,145	92,0	5.211	48,4	61,0	84,10	22,89	155,6	144,0
44	9.696	0,146	91,6	5.181	48,4	60,9	83,52	22,85	155,1	150,2
45	9.682	0,142	91,3	5.157	48,5	61,1	83,37	22,90	155,2	156,4
46	9.668	0,150	91,1	5.138	48,6	61,2	83,17	22,91	155,0	162,6
47	9.652	0,162	90,9	5.118	48,7	61,3	83,02	22,89	154,6	168,7
48	9.637	0,159	90,6	5.093	48,6	61,3	82,56	22,95	154,8	174,8
49	9.621	0,158	90,2	5.062	48,6	61,3	82,08	23,17	156,1	180,9
50	9.605	0,169	90,2	5.054	48,8	61,5	82,20	22,99	154,6	187,0
51	9.589	0,172	89,6	5.012	48,7	61,4	81,43	23,24	156,0	193,0
52	9.572	0,173	89,2	4.981	48,8	61,5	81,08	23,09	154,7	198,9
53	9.556	0,168	89,0	4.961	48,9	61,7	80,93	23,22	155,3	204,9
54	9.539	0,177	88,6	4.930	49,0	61,7	80,46	23,17	154,7	210,8
55	9.522	0,180	87,9	4.882	49,1	61,9	79,98	23,07	153,7	216,7
56	9.504	0,190	87,6	4.856	49,3	62,1	79,74	23,20	154,4	222,5
57	9.485	0,195	87,3	4.830	49,3	62,1	79,38	23,17	153,8	228,3
58	9.466	0,208	86,9	4.798	49,4	62,2	79,01	23,15	153,4	234,1
59	9.445	0,214	86,2	4.749	49,5	62,4	78,39	23,20	153,4	239,8
60	9.425	0,212	86,1	4.734	49,6	62,5	78,31	23,10	152,4	245,4
						Total lbs.	321.248			

Summary of Performance (20 to 60 weeks of age)			74 flocks		
Hen day %	87,8		Av egg wt/case (lbs)		47,12
Eggs/hen housed	245,4		Av egg wt/egg (g)		59,37
Feed/day (lbs)	0,223		Av Mortality/week (%)		0,144
Feed/dozen (lbs)	3,04		Total egg mass (kg/hh		14,57
Feed:Egg ratio	1,94		Av daily egg mass (g)		52,2

Table 4B: Flock Performance Index – Output data – 74 LSL-Lite flocks

										0					
	ECONOMIC FACTORS				price adj + 30 = 85 cts for large eggs										
(1)	12	13		14	15	16	17	18	19	20	21	22	23	24	25
				AV EGG		EGG		EGG INCOME MINUS				EGG INCOME MINUS FEED COST/HH			
	FEED	FEED	CASE	VALUE		INCOME		FEED COST ($)							
AGE	COST	COST	WT	CTS/DOZ		$	($)	CURRENT		TO DATE		Current		TO DATE	
WKS	($)	$/DOZ	LBS	(no prem.)	(premium)	No prem.	Premium	No prem.	Premium	No prem.	Premium	No prem.	(prem.)	No prem.	(prem.)
20	1752	1,227	35,4	38,0	38,0	543	543	-1.210	-1.210	-1.210	-1.210	-0,121	-0,121	-0,121	-0,121
21	1856	0,636	37,8	36,7	36,7	1.070	1.070	-786	-786	-1.995	-1.995	-0,079	-0,079	-0,200	-0,200
22	1972	0,473	39,6	55,0	55,1	2.295	2.299	323	327	-1.673	-1.668	0,323	0,327	-0,167	-0,167
23	2100	0,431	41,2	62,5	63,0	3.043	3.068	943	968	-729	-701	0,943	0,968	-0,073	-0,070
24	2191	0,419	42,6	68,0	68,2	3.560	3.570	1.369	1.379	640	679	1,369	1,379	0,064	0,068
25	2233	0,419	43,7	72,0	72,5	3.840	3.867	1.607	1.633	2.246	2.312	1,607	1,633	0,225	0,231
26	2255	0,418	44,4	74,5	75,0	4.017	4.044	1.762	1.789	4.009	4.101	1,762	1,789	0,401	0,410
27	2286	0,424	45,0	76,0	76,4	4.092	4.114	1.807	1.828	5.815	5.929	1,807	1,828	0,582	0,593
28	2317	0,429	45,6	77,0	77,6	4.159	4.192	1.842	1.874	7.657	7.804	1,842	1,874	0,766	0,780
29	2316	0,428	45,9	77,5	78,1	4.191	4.223	1.875	1.908	9.532	9.711	1,875	1,908	0,953	0,971
30	2320	0,430	46,4	78,0	78,8	4.209	4.252	1.889	1.932	11.421	11.644	1,889	1,932	1,142	1,164
31	2320	0,430	46,6	78,4	79,1	4.231	4.268	1.911	1.949	13.332	13.592	1,911	1,949	1,333	1,359
32	2333	0,433	46,9	78,7	79,5	4.242	4.285	1.909	1.952	15.241	15.544	1,909	1,952	1,524	1,554
33	2346	0,436	47,1	78,8	79,6	4.242	4.285	1.896	1.939	17.137	17.483	1,896	1,939	1,714	1,748
34	2331	0,434	47,2	78,8	79,6	4.233	4.276	1.902	1.945	19.039	19.428	1,902	1,945	1,904	1,943
35	2357	0,440	47,5	79,0	80,0	4.229	4.283	1.872	1.926	20.911	21.354	1,872	1,926	2,091	2,135
36	2328	0,437	47,8	79,0	80,1	4.210	4.269	1.882	1.941	22.793	23.295	1,882	1,941	2,279	2,329
37	2318	0,436	47,9	79,0	80,0	4.201	4.254	1.883	1.936	24.676	25.231	1,883	1,936	2,468	2,523
38	2362	0,446	47,9	79,0	80,0	4.182	4.235	1.820	1.873	26.496	27.104	1,820	1,873	2,650	2,710
39	2309	0,437	47,9	79,0	80,0	4.176	4.229	1.867	1.920	28.364	29.024	1,867	1,920	2,836	2,902
40	2319	0,441	48,1	79,0	80,2	4.153	4.216	1.834	1.897	30.198	30.921	1,834	1,897	3,020	3,092
41	2337	0,446	48,2	79,0	80,3	4.138	4.206	1.801	1.869	31.998	32.790	1,801	1,869	3,200	3,279
42	2340	0,447	48,3	79,1	80,4	4.137	4.205	1.797	1.865	33.795	34.654	1,797	1,865	3,379	3,465
43	2334	0,448	48,4	79,1	80,4	4.122	4.190	1.788	1.856	35.583	36.510	1,788	1,856	3,558	3,651
44	2326	0,449	48,4	79,1	80,4	4.098	4.165	1.772	1.839	37.354	38.349	1,772	1,839	3,735	3,835
45	2328	0,451	48,5	79,1	80,5	4.079	4.151	1.751	1.823	39.105	40.172	1,751	1,823	3,911	4,017
46	2325	0,453	48,6	79,1	80,5	4.064	4.136	1.738	1.810	40.844	41.982	1,738	1,810	4,084	4,198
47	2320	0,453	48,7	79,2	80,7	4.053	4.130	1.734	1.811	42.577	43.793	1,734	1,811	4,258	4,379
48	2322	0,456	48,6	79,1	80,6	4.029	4.105	1.706	1.783	44.284	45.575	1,706	1,783	4,428	4,558
49	2341	0,462	48,6	79,1	80,6	4.004	4.080	1.664	1.739	45.947	47.315	1,664	1,739	4,595	4,731
50	2318	0,459	48,8	79,3	80,9	4.008	4.089	1.689	1.770	47.637	49.085	1,689	1,770	4,764	4,909
51	2340	0,467	48,7	79,2	80,9	3.969	4.054	1.629	1.714	49.266	50.800	1,629	1,714	4,927	5,080
52	2320	0,466	48,8	79,3	80,9	3.950	4.029	1.629	1.709	50.895	52.509	1,629	1,709	5,090	5,251
53	2329	0,470	48,9	79,5	81,0	3.944	4.019	1.615	1.689	52.510	54.198	1,615	1,689	5,251	5,420
54	2320	0,471	49,0	79,5	81,5	3.919	4.018	1.599	1.698	54.109	55.896	1,599	1,698	5,411	5,590
55	2306	0,472	49,1	79,5	81,5	3.881	3.979	1.575	1.673	55.685	57.569	1,575	1,673	5,568	5,757
56	2315	0,477	49,3	79,6	81,5	3.866	3.958	1.550	1.643	57.235	59.211	1,550	1,643	5,723	5,921
57	2307	0,478	49,3	79,6	81,5	3.845	3.937	1.538	1.629	58.772	60.841	1,538	1,629	5,877	6,084
58	2301	0,479	49,4	79,7	81,5	3.824	3.911	1.524	1.610	60.296	62.451	1,524	1,610	6,030	6,245
59	2301	0,485	49,5	79,7	81,6	3.785	3.876	1.484	1.574	61.780	64.025	1,484	1,574	6,178	6,402
60	2286	0,483	49,6	79,7	81,7	3.773	3.868	1.487	1.581	63.267	65.606	1,487	1,581	6,327	6,561
					Total $	156.607									
								No premiu	Premium			Price assumptions:			Premium
		Average egg value (cts/dozen)						0,766	0,777			Jumbo eggs @ $.85/dozen			$0,91
		Average feed cost/dozen (cts)						0,456	0,456			Extra large eggs @ $.85			$0,88
		Egg income/hen housed ($)						15,66	15,89			Large eggs @ $.85			
		Feed cost/hen housed ($)						9,33	9,33			Medium eggs @ $.65			
		Egg income minus feed cost/hh ($)						6,33	6,56			Small eggs @ $.35			
												Feed @ $15.00/cwt			
		Average egg value ($/lb)				0,487									
		Average egg value ($/kg)				1,075									

Summary and conclusion

Traditional approaches for analyzing flock performance, one trait at a time, must make way for more complex techniques which bring the economics of the issue into proper focus. Researchers as well as egg producers must evaluate multiple traits and this can be done only with representative economic values. Over-emphasis on one performance trait over others can and does lead to erroneous conclusions regarding strain selection, programs used and products purchased. Egg producers in today's low margin industry cannot live with errors of interpretation of this nature.

Important relationships relative to products and management practices should be re-examined from time to time under new price and cost conditions to assure that good technology is not lost to the industry because "at one time, it was not considered a sound economic practice". Likewise, the economic circumstances widely accepted in certain regions or countries may not justify the use of

certain technology which may be commonly used by others. Sound economic analyses using attainable performance results from local flocks and representative cost/income standards will give the final answers to these important decisions. The industry and scientific communities must review the many factors involved in the decision-making process continuously.

Zusammenfassung

Wirtschaftliche Bewertung der Leistung von Legehennen und Praxisergebnisse von LSL Lite in den USA

In der Vergangenheit wurden Herden häufig nur anhand einzelner Merkmale verglichen. Stattdessen sollten vorhandene Programme genutzt werden, um die gesamtwirtschaftlichen Auswirkungen von Maßnahmen zur Steigerung der Leistung zu bewerten. Falsche Entscheidungen kann sich die Geflügelwirtschaft angesichts der geringen Margen nicht leisten.

Teilergebnisse umfangreicher Auswertungen von Praxisdaten aus 74 LSL Lite Herden in den USA wurden bereits in drei vorangegangenen Beiträgen berichtet. In diesem vierten Beitrag werden die Ergebnisse genutzt, um die Indexberechnung zu illustrieren.

Hauptanliegen der Beratung bleibt es, durch Herden- und Betriebsvergleiche deutlich zu machen, welches genetische Potenzial heute in den besten Betrieben realisiert wird und durch Problemanalysen auf konkrete Verbesserungsmöglichkeiten aufmerksam zu machen.

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