



Progress In Poultry

"THROUGH RESEARCH"

THE EFFECTS OF CAGE DENSITY, HOUSING AND STRAIN OF CHICKENS ON VARIOUS PERFORMANCE PARAMETERS (REPORT #1)

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Introduction: The effects of floor space allowances and colony size for caged layers has been the subject of hundreds of scientific papers over the last forty or more years. Differences between treatments have ranged from little or none to very large effects on performance. Obviously, the conditions between experiments varied as researchers used different strains, breeds, cage sizes and designs, housing systems, environments, feeding programs and other related management systems.

The North Carolina Random Sample Test began to study these inter-relationships in the early 1980's when new facilities were constructed at the Piedmont Research Station. Three houses were equipped with conventional 12" wide by 18" deep cages and the shallow cage which used the exact reverse dimensions--18" wide by 12" deep.

The researchers were interested in determining the effects of various forms of management and housing on performance in white and brown egg strains of chickens. This research is, without a doubt, the most comprehensive ever attempted to seek answers to this very complex question.

This report is a summarization of results over the last five tests and allows the reader to assess the repeatability of results associated with the factors of strain/breed, housing, and cage density. A second report will emphasize the cage shape aspects of the tests.

Description of the test: The following table describes the five tests included in this review.

NUMBER	I.D.	HATCH DATE	ENDING DATE	WEEKS	
23rd	81/82	4/1/81	8/10/82	21-71	
24th	82/83	3/31/82	8/9/83	21-71	46.8
25th	83/84	3/30/83	8/7/84	21-71	AVERAGE
26th	84/85	4/14/84	6/23/85	20-62	WEEKS
27th	85/86	12/17/85	2/24/87	20-62	OF LAY

All groups were reared in cages. Each test group was replicated four times and randomly located within each housing type. Throughout this discussion, LAC refers to light and air controlled housing and curtain refers to an open-sided flush house. Density results reflect the average of both cage shapes.

Tables 1-3 summarize results by chicken type (white vs. brown egg strains). Tables 4-12 summarize results by strain for six major strains of White Leghorns. Table 13 is a summary of the other tables.

Interpretation of these data should emphasize the repeatability of results between strains, breeds and housing types. The reader should pay particular attention to the possibility of

interactions between factors. e.g. Do results appear to change direction with various factors? Does cage shape affect performance in one type of housing differently than in others?

Statistical analyses were not performed on the consistency of results between tests because of the many differences which existed between the tests. We would suggest, though, that the reader should place greatest emphasis on those factors that repeat themselves in at least four of the five tests.

The Babcock results in tables 4-12 have been adjusted to compensate for not being in all five tests in the ratio of the three-test results to the five-test averages.

A brief summary of general conclusions is on page 15.

TABLE 1 EFFECTS OF CAGE DENSITY & HOUSING ON PERFORMANCE

EGGS/HEN-HOUSED	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST (WHITE)	236.8	221.5	15.3	255.0	240.2	14.8
82/83 TEST "	265.1	260.9	4.2	265.7	252.1	13.6
83/84 TEST "	262.3	265.7	-3.4	267.2	251.3	15.9
84/85 TEST "	225.2	212.4	12.8	221.6	214.2	7.4
85/87 TEST "	235.6	217.4	18.2	222.3	211.8	10.5
AVERAGE "	245.0	235.6	9.4	246.4	233.9	12.4
81/82 TEST (BROWN)	238.1	219.8	18.3	230.7	218.7	12.0
82/83 TEST "	240.0	235.0	5.0	251.3	234.6	16.7
83/84 TEST "	254.3	244.6	9.7	250.4	238.8	11.6
84/85 TEST "	209.6	190.0	19.6	205.5	193.6	11.9
85/87 TEST "	229.8	212.6	17.2	214.9	200.8	14.1
AVERAGE "	234.4	220.4	14.0	230.6	217.3	13.3
=====						
FEED PER 100 HENS/DAY (LBS.)						
81/82 TEST (WHITE)	22.1	21.3	0.8	23.7	23.3	0.4
82/83 TEST "	22.6	21.9	0.7	23.6	22.5	1.1
83/84 TEST "	23.5	23.0	0.5	24.6	23.1	1.5
84/85 TEST "	22.9	22.0	0.9	23.5	22.8	0.7
85/87 TEST "	25.2	23.7	1.5	24.3	23.0	1.3
AVERAGE "	23.3	22.4	0.9	23.9	22.9	1.0
81/82 TEST (BROWN)	23.0	23.4	-0.4	25.6	24.6	1.0
82/83 TEST "	25.2	24.2	1.0	25.6	24.6	1.0
83/84 TEST "	25.7	24.6	1.1	26.7	25.5	1.2
84/85 TEST "	25.4	24.6	0.8	25.2	24.1	1.1
85/87 TEST "	28.7	25.9	2.8	27.0	25.6	1.4
AVERAGE "	25.6	24.5	1.1	26.0	24.9	1.1
=====						
FEED (LBS./DOZ.)						
81/82 TEST (WHITE)	3.62	3.58	0.04	3.72	3.77	-0.05
82/83 TEST "	3.47	3.41	0.06	3.64	3.60	0.04
83/84 TEST "	3.62	3.47	0.15	3.76	3.66	0.10
84/85 TEST "	3.50	3.49	0.01	3.63	3.62	0.01
85/87 TEST "	3.68	3.66	0.02	3.71	3.65	0.06
AVERAGE "	3.58	3.52	0.06	3.69	3.66	0.03
81/82 TEST (BROWN)	3.93	4.18	-0.25	4.46	4.61	-0.15
82/83 TEST "	4.26	4.15	0.11	4.12	4.21	-0.09
83/84 TEST "	4.06	4.04	0.02	4.38	4.33	0.05
84/85 TEST "	4.13	4.27	-0.14	4.22	4.21	0.01
85/87 TEST "	4.37	4.14	0.23	4.30	4.31	-0.01
AVERAGE "	4.15	4.16	-0.01	4.30	4.33	-0.04
=====						

TABLE 2 EFFECTS OF CAGE DENSITY & HOUSING ON PERFORMANCE

EGG WT. (OZS./DOZ.)	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST (WHITE)	24.4	24.2	0.2	25.3	25.2	0.1
82/83 TEST "	24.3	24.3	0.0	25.3	25.1	0.2
83/84 TEST "	24.1	24.1	0.0	25.4	25.2	0.2
84/85 TEST "	23.7	23.6	0.1	24.7	24.5	0.2
85/87 TEST "	22.2	22.2	0.0	22.8	22.8	0.0
AVERAGE "	23.7	23.7	0.1	24.7	24.6	0.1
81/82 TEST (BROWN)	26.1	26.2	-0.1	27.0	27.1	-0.1
82/83 TEST "	26.7	26.4	0.3	27.2	27.1	0.1
83/84 TEST "	26.1	25.9	0.2	27.6	27.7	-0.1
84/85 TEST "	25.7	25.2	0.5	27.0	26.9	0.1
85/87 TEST "	24.5	24.2	0.3	24.9	24.8	0.1
AVERAGE "	25.8	25.6	0.2	26.7	26.7	0.0
=====						
% LARGE EGGS						
81/82 TEST (WHITE)	65.5	64.6	0.9	76.7	75.3	1.4
82/83 TEST "	67.3	65.5	1.8	79.3	77.3	2.0
83/84 TEST "	62.5	62.7	-0.2	82.7	81.8	0.9
84/85 TEST "	60.3	58.5	1.8	72.1	70.0	2.1
85/87 TEST "	62.8	62.6	0.2	69.9	69.7	0.2
AVERAGE "	63.7	62.8	0.9	76.1	74.8	1.3
81/82 TEST (BROWN)	82.1	81.8	0.3	86.7	87.0	-0.3
82/83 TEST "	89.7	88.4	1.3	91.1	90.2	0.9
83/84 TEST "	83.4	82.4	1.0	93.8	94.6	-0.8
84/85 TEST "	81.2	76.1	5.1	85.8	86.9	-1.1
85/87 TEST "	82.6	80.0	2.6	85.4	83.4	2.0
AVERAGE "	83.8	81.7	2.1	88.6	88.4	0.1
=====						
TOTAL EGG WEIGHT/HEN HOUSED (LBS.)						
81/82 TEST (WHITE)	30.1	27.9	2.2	33.6	31.4	2.2
82/83 TEST "	33.5	33.0	0.5	35.0	32.9	2.1
83/84 TEST "	32.8	33.2	-0.4	35.2	32.9	2.3
84/85 TEST "	27.8	26.1	1.7	28.5	27.3	1.2
85/87 TEST "	29.5	27.3	2.2	28.7	27.3	1.4
AVERAGE "	30.7	29.5	1.2	32.2	30.4	1.8
81/82 TEST (BROWN)	32.4	29.9	2.5	32.4	30.9	1.5
82/83 TEST "	33.3	32.3	1.0	35.6	33.1	2.5
83/84 TEST "	34.5	32.9	1.6	35.9	34.3	1.6
84/85 TEST "	28.1	24.9	3.2	28.9	27.1	1.8
85/87 TEST "	31.9	29.1	2.8	30.4	28.2	2.2
AVERAGE "	32.0	29.8	2.2	32.6	30.7	1.9

TABLE 3 EFFECTS OF CAGE DENSITY & HOUSING ON PERFORMANCE

% CRACKED EGGS	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST (WHITE)	2.1	3.5	-1.4	3.5	3.6	-0.1
82/83 TEST "	2.6	2.6	0.0	2.5	3.0	-0.5
83/84 TEST "	2.5	3.5	-1.0	2.8	3.4	-0.6
84/85 TEST "	2.1	2.9	-0.8	3.0	3.5	-0.5
85/87 TEST "	2.4	3.6	-1.2	3.0	3.4	-0.4
AVERAGE "	2.3	3.2	-0.9	3.0	3.4	-0.4
81/82 TEST (BROWN)	2.5	2.9	-0.4	2.5	3.5	-1.0
82/83 TEST "	3.0	3.1	-0.1	3.1	4.6	-1.5
83/84 TEST "	2.1	3.2	-1.1	3.8	3.3	0.5
84/85 TEST "	2.4	3.4	-1.0	4.9	4.9	0.0
85/87 TEST "	2.2	3.2	-1.0	2.1	3.7	-1.6
AVERAGE "	2.4	3.2	-0.7	3.3	4.0	-0.7
=====						
% DIED						
81/82 TEST (WHITE)	12.4	17.3	-4.9	10.7	15.4	-4.7
82/83 TEST "	6.2	8.8	-2.6	6.0	8.7	-2.7
83/84 TEST "	10.7	10.5	0.2	7.6	10.5	-2.9
84/85 TEST "	5.6	8.9	-3.3	7.0	7.4	-0.4
85/87 TEST "	5.5	9.4	-3.9	7.2	9.5	-2.3
AVERAGE "	8.1	11.0	-2.9	7.7	10.3	-2.6
81/82 TEST (BROWN)	6.3	12.5	-6.2	8.3	10.9	-2.6
82/83 TEST "	9.6	11.1	-1.5	7.8	11.4	-3.6
83/84 TEST "	10.5	10.6	-0.1	6.3	9.2	-2.9
84/85 TEST "	9.4	17.1	-7.7	6.7	10.4	-3.7
85/87 TEST "	3.9	7.7	-3.8	6.9	6.8	0.1
AVERAGE "	7.9	11.8	-3.9	7.2	9.7	-2.5
=====						
FEED/EGG RATIO						
81/82 TEST (WHITE)	2.37	2.37	0.00	2.35	2.41	-0.06
82/83 TEST "	2.29	2.25	0.04	2.30	2.29	0.01
83/84 TEST "	2.41	2.30	0.11	2.37	2.32	0.05
84/85 TEST "	2.36	2.36	0.00	2.34	2.35	-0.01
85/87 TEST "	2.45	2.42	0.03	2.44	2.35	0.09
AVERAGE "	2.38	2.34	0.04	2.36	2.34	0.02
81/82 TEST (BROWN)	2.41	2.56	-0.15	2.64	2.67	-0.03
82/83 TEST "	2.56	2.52	0.04	2.43	2.49	-0.06
83/84 TEST "	2.49	2.49	0.00	2.54	2.51	0.03
84/85 TEST "	2.57	2.69	-0.12	2.47	2.47	0.00
85/87 TEST "	2.61	2.54	0.07	2.52	2.55	-0.03
AVERAGE "	2.53	2.56	-0.03	2.52	2.54	-0.02

**TABLE 4 EFFECTS OF CAGE DENSITY AND HOUSING BY STRAIN
EGGS PER HEN HOUSED**

DEKALB XL	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST	244.5	216.9	27.6	261.4	239.0	22.4
82/83 TEST	277.4	268.6	8.8	265.5	256.3	9.2
83/84 TEST	275.3	275.1	0.2	267.5	266.5	1.0
84/85 TEST	230.4	211.4	19.0	220.2	220.8	-0.6
85/87 TEST	249.1	215.3	33.8	232.9	223.6	9.3
AVERAGE	255.3	237.5	17.9	249.5	241.2	8.3

BABCOCK B300						
81/82 TEST	250.4	238.5	11.9	261.1	243.6	17.5
82/83 TEST			N/A			
83/84 TEST			N/A			
84/85 TEST	208.4	200.4	8.0	214.9	209.3	5.6
85/87 TEST	241.0	229.1	11.9	230.0	227.6	2.4
ADJ. AVERAGE	244.5	240.6	3.9	248.1	236.5	11.6

HISEX WHITE						
81/82 TEST	241.2	240.1	1.1	249.1	260.8	-11.7
82/83 TEST	279.0	272.8	6.2	275.9	251.7	24.2
83/84 TEST	256.1	266.2	-10.1	268.1	244.1	24.0
84/85 TEST	239.7	227.8	11.9	229.8	217.5	12.3
85/87 TEST	232.2	219.0	13.2	214.5	211.5	3.0
AVERAGE	249.6	245.2	4.5	247.5	237.1	10.4

H&N						
81/82 TEST	241.3	239.9	1.4	268.6	245.2	23.4
82/83 TEST	267.2	259.6	7.6	267.1	251.7	15.4
83/84 TEST	263.6	262.2	1.4	274.1	250.3	23.8
84/85 TEST	228.5	191.6	36.9	230.6	217.4	13.2
85/87 TEST	234.3	226.7	7.6	225.0	218.0	7.0
AVERAGE	247.0	236.0	11.0	253.1	236.5	16.6

HYLINE W36						
81/82 TEST	252.1	218.8	33.3	267.4	250.7	16.7
82/83 TEST	261.1	249.0	12.1	258.0	251.7	6.3
83/84 TEST	258.1	256.6	1.5	265.2	251.1	14.1
84/85 TEST	231.4	218.0	13.4	209.1	219.3	-10.2
85/87 TEST	237.5	222.9	14.6	222.8	217.9	4.9
AVERAGE	248.0	233.1	15.0	244.5	238.1	6.4

SHAVER 288A						
81/82 TEST	218.0	208.6	9.4	257.6	244.4	13.2
82/83 TEST	254.8	254.6	0.2	262.1	249.0	13.1
83/84 TEST	258.6	268.4	-9.8	261.0	244.3	16.7
84/85 TEST	226.0	214.2	11.8	221.1	214.8	6.3
85/87 TEST	251.4	218.7	32.7	213.1	208.0	5.1
AVERAGE	241.8	232.9	8.9	243.0	232.1	10.9
=====						
SIX STRAIN AVERAGE	247.7	237.5	10.2	247.6	236.9	10.7
=====						

TABLE 5 EFFECTS OF CAGE DENSITY AND HOUSING BY STRAIN
FEED PER 100 HENS/DAY (LBS.)

DEKALB XL	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST	23.0	21.0	2.0	23.6	22.9	0.7
82/83 TEST	22.8	21.8	1.0	23.3	22.8	0.5
83/84 TEST	23.5	23.8	-0.3	25.1	23.5	1.6
84/85 TEST	24.1	23.3	0.8	23.4	23.5	-0.1
85/87 TEST	24.1	25.0	-0.9	25.0	23.9	1.1
AVERAGE	23.5	23.0	0.5	24.1	23.3	0.8

BABCOCK B300						
81/82 TEST	23.0	20.6	2.4	24.3	23.5	0.8
82/83 TEST			N/A			
83/84 TEST			N/A			
84/85 TEST	23.5	22.5	1.0	23.8	22.7	1.1
85/87 TEST	25.8	23.4	2.4	24.8	23.3	1.5
ADJ. AVERAGE	23.8	22.1	1.7	24.4	22.9	1.5

HISEX WHITE						
81/82 TEST	21.9	22.6	-0.7	23.1	23.9	-0.8
82/83 TEST	21.9	21.9	0.0	23.9	22.6	1.3
83/84 TEST	23.6	23.0	0.6	25.1	22.6	2.5
84/85 TEST	23.1	22.0	1.1	25.0	23.5	1.5
85/87 TEST	25.7	24.1	1.6	24.4	23.1	1.3
AVERAGE	23.2	22.7	0.5	24.3	23.1	1.2

H&N						
81/82 TEST	23.0	22.7	0.3	24.7	24.0	0.7
82/83 TEST	23.1	23.6	-0.5	24.5	23.2	1.3
83/84 TEST	23.8	23.0	0.8	24.9	23.8	1.1
84/85 TEST	23.3	22.1	1.2	24.4	24.3	0.1
85/87 TEST	27.5	24.8	2.7	24.8	24.8	0.0
AVERAGE	24.1	23.2	0.9	24.7	24.0	0.6

HYLINE W36						
81/82 TEST	21.4	19.2	2.2	22.7	23.0	-0.3
82/83 TEST	22.4	20.4	2.0	22.6	21.5	1.1
83/84 TEST	23.1	23.0	0.1	23.4	22.7	0.7
84/85 TEST	21.8	21.7	0.1	23.0	22.5	0.5
85/87 TEST	25.4	23.4	2.0	23.2	21.8	1.4
AVERAGE	22.8	21.5	1.3	23.0	22.3	0.7

SHAVER 288A						
81/82 TEST	22.7	22.6	0.1	24.5	23.4	1.1
82/83 TEST	22.8	21.9	0.9	23.5	22.6	0.9
83/84 TEST	23.4	22.3	1.1	24.6	23.0	1.6
84/85 TEST	22.6	21.9	0.7	22.8	22.9	-0.1
85/87 TEST	24.7	24.4	0.3	24.0	22.9	1.1
AVERAGE	23.2	22.6	0.6	23.9	23.0	0.9
=====						
SIX STRAIN AVERAGE	23.5	22.5	0.9	24.1	23.1	0.9
=====						

TABLE 6 EFFECTS OF CAGE DENSITY AND HOUSING BY STRAIN
FEED (LBS./DOZ.)

DEKALB XL	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST	3.67	3.32	0.35	3.66	3.78	-0.12
82/83 TEST	3.42	3.34	0.08	3.59	3.56	0.03
83/84 TEST	3.51	3.43	0.08	3.86	3.59	0.27
84/85 TEST	3.57	3.55	0.02	3.63	3.62	0.01
85/87 TEST	3.37	3.75	-0.38	3.68	3.61	0.07
AVERAGE	3.51	3.48	0.03	3.68	3.63	0.05

BABCOCK B300						
81/82 TEST	3.87	3.46	0.41	3.78	3.85	-0.07
82/83 TEST			N/A			
83/84 TEST			N/A			
84/85 TEST	3.77	3.77	0.00	3.90	3.74	0.16
85/87 TEST	3.77	3.58	0.19	3.73	3.60	0.13
ADJ. AVERAGE	3.80	3.72	0.08	3.82	3.71	0.11

HISEX WHITE						
81/82 TEST	3.35	3.48	-0.13	3.55	3.71	-0.16
82/83 TEST	3.26	3.26	0.00	3.59	3.59	0.00
83/84 TEST	3.66	3.44	0.22	3.83	3.68	0.15
84/85 TEST	3.37	3.36	0.01	3.71	3.81	-0.10
85/87 TEST	3.79	3.70	0.09	3.88	3.74	0.14
AVERAGE	3.49	3.45	0.04	3.71	3.71	0.01

H&N						
81/82 TEST	3.64	3.67	-0.03	3.79	3.83	-0.04
82/83 TEST	3.61	3.69	-0.08	3.76	3.71	0.05
83/84 TEST	3.69	3.58	0.11	3.72	3.73	-0.01
84/85 TEST	3.53	3.61	-0.08	3.66	3.66	0.00
85/87 TEST	3.93	3.56	0.37	3.81	3.90	-0.09
AVERAGE	3.68	3.62	0.06	3.75	3.77	-0.02

HYLINE W36						
81/82 TEST	3.53	3.37	0.16	3.55	3.67	-0.12
82/83 TEST	3.51	3.30	0.21	3.55	3.46	0.09
83/84 TEST	3.58	3.55	0.03	3.65	3.67	-0.02
84/85 TEST	3.30	3.40	-0.10	3.61	3.56	0.05
85/87 TEST	3.71	3.64	0.07	3.62	3.42	0.20
AVERAGE	3.53	3.45	0.07	3.60	3.56	0.04

SHAVER 288A						
81/82 TEST	3.64	3.76	-0.12	3.79	3.62	0.17
82/83 TEST	3.57	3.44	0.13	3.70	3.67	0.03
83/84 TEST	3.68	3.37	0.31	3.72	3.66	0.06
84/85 TEST	3.49	3.49	0.00	3.47	3.68	-0.21
85/87 TEST	3.47	3.72	-0.25	3.62	3.58	0.04
AVERAGE	3.57	3.56	0.01	3.66	3.64	0.02
=====						
SIX STRAIN AVERAGE	3.60	3.55	0.05	3.70	3.67	0.03
=====						

TABLE 7 EFFECTS OF CAGE DENSITY AND HOUSING BY STRAIN
EGG WEIGHT (OZS./DOZ.)

DEKALB XL	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST	25.2	24.5	0.7	25.6	25.3	0.3
82/83 TEST	24.4	24.3	0.1	25.3	25.0	0.3
83/84 TEST	23.9	24.2	-0.3	25.4	25.1	0.3
84/85 TEST	23.6	23.7	-0.1	24.6	24.6	0.0
85/87 TEST	21.8	22.3	-0.5	22.8	22.7	0.1
AVERAGE	23.8	23.8	0.0	24.7	24.5	0.2

BABCOCK B300						
81/82 TEST	24.5	23.9	0.6	25.7	25.3	0.4
82/83 TEST			N/A			
83/84 TEST			N/A			
84/85 TEST	24.0	24.1	-0.1	25.1	24.5	0.6
85/87 TEST	22.5	22.3	0.2	23.0	22.7	0.3
ADJ. AVERAGE	24.0	23.7	0.3	25.0	24.6	0.4

HISEX WHITE						
81/82 TEST	24.1	23.9	0.2	24.7	25.0	-0.3
82/83 TEST	24.3	24.2	0.1	25.4	25.1	0.3
83/84 TEST	24.5	24.0	0.5	25.9	25.6	0.3
84/85 TEST	23.9	23.8	0.1	24.9	24.6	0.3
85/87 TEST	22.3	22.3	0.0	23.3	23.6	-0.3
AVERAGE	23.8	23.6	0.2	24.8	24.8	0.1

H&N						
81/82 TEST	24.3	24.7	-0.4	25.5	25.5	0.0
82/83 TEST	24.6	24.9	-0.3	25.7	25.5	0.2
83/84 TEST	24.1	24.3	-0.2	25.4	25.1	0.3
84/85 TEST	23.9	23.4	0.5	24.8	24.5	0.3
85/87 TEST	22.8	22.6	0.2	23.3	23.1	0.2
AVERAGE	23.9	24.0	0.0	24.9	24.7	0.2

HYLINE W36						
81/82 TEST	24.1	23.8	0.3	25.2	25.2	0.0
82/83 TEST	24.2	23.9	0.3	25.1	24.9	0.2
83/84 TEST	23.8	24.2	-0.4	25.4	25.4	0.0
84/85 TEST	23.5	23.5	0.0	24.5	24.4	0.1
85/87 TEST	21.8	21.9	-0.1	22.9	22.3	0.6
AVERAGE	23.5	23.5	0.0	24.6	24.4	0.2

SHAVER 288A						
81/82 TEST	24.4	24.4	0.0	25.3	25.3	0.0
82/83 TEST	24.1	24.2	-0.1	25.1	25.1	0.0
83/84 TEST	24.1	24.0	0.1	25.0	25.0	0.0
84/85 TEST	23.4	23.5	-0.1	24.2	24.5	-0.3
85/87 TEST	22.7	22.4	0.3	22.9	22.9	0.0
AVERAGE	23.7	23.7	0.0	24.5	24.6	-0.1
=====						
SIX STRAIN AVERAGE	23.8	23.7	0.1	24.8	24.6	0.2
=====						

TABLE 8 EFFECTS OF CAGE DENSITY AND HOUSING BY STRAIN
% LARGE EGGS

DEKALB XL	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST	74.2	67.9	6.3	79.6	77.6	2.0
82/83 TEST	68.8	66.0	2.8	80.2	74.8	5.4
83/84 TEST	59.6	64.1	-4.5	82.4	80.0	2.4
84/85 TEST	56.3	60.1	-3.8	74.7	68.0	6.7
85/87 TEST	60.2	64.3	-4.1	72.2	71.1	1.1
AVERAGE	63.8	64.5	-0.7	77.8	74.3	3.5

BABCOCK B300						
81/82 TEST	69.4	64.2	5.2	82.1	77.4	4.7
82/83 TEST			N/A			
83/84 TEST			N/A			
84/85 TEST	67.1	67.1	0.0	74.5	72.4	2.1
85/87 TEST	66.5	64.4	2.1	72.0	70.0	2.0
ADJ. AVERAGE	66.4	65.7	0.7	77.7	75.9	1.8

HISEX WHITE						
81/82 TEST	63.5	63.9	-0.4	70.7	73.6	-2.9
82/83 TEST	68.5	66.8	1.7	81.4	77.6	3.8
83/84 TEST	69.9	63.4	6.5	87.3	82.6	4.7
84/85 TEST	63.6	62.7	0.9	74.1	73.0	1.1
85/87 TEST	62.9	62.3	0.6	73.1	76.1	-3.0
AVERAGE	65.7	63.8	1.9	77.3	76.6	0.7

H&N						
81/82 TEST	66.1	71.3	-5.2	79.7	76.6	3.1
82/83 TEST	70.7	72.9	-2.2	82.4	81.5	0.9
83/84 TEST	61.9	62.6	-0.7	82.1	79.2	2.9
84/85 TEST	63.5	55.7	7.8	73.7	73.6	0.1
85/87 TEST	72.0	67.3	4.7	76.1	74.6	1.5
AVERAGE	66.8	66.0	0.9	78.8	77.1	1.7

HYLINE W36						
81/82 TEST	60.9	57.6	3.3	75.7	74.5	1.2
82/83 TEST	65.5	59.1	6.4	75.2	73.3	1.9
83/84 TEST	58.2	63.1	-4.9	81.0	88.9	-7.9
84/85 TEST	57.5	63.1	-5.6	69.4	68.6	0.8
85/87 TEST	57.6	59.1	-1.5	69.9	65.9	4.0
AVERAGE	59.9	60.4	-0.5	74.2	74.2	0.0

SHAVER 288A						
81/82 TEST	65.6	69.1	-3.5	75.7	78.3	-2.6
82/83 TEST	62.9	62.5	0.4	77.3	79.1	-1.8
83/84 TEST	62.9	60.5	2.4	80.6	78.5	2.1
84/85 TEST	54.6	54.9	-0.3	67.2	72.7	-5.5
85/87 TEST	69.7	63.4	6.3	73.4	72.9	0.5
AVERAGE	63.1	62.1	1.1	74.8	76.3	-1.5
=====						
SIX STRAIN AVERAGE	64.3	63.7	0.6	76.8	75.7	1.1
=====						

TABLE 9 EFFECTS OF CAGE DENSITY AND HOUSING BY STRAIN
TOTAL EGG WEIGHT/HEN HOUSED (LBS.)

DEKALB XL	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST	32.1	27.7	4.4	34.9	31.5	3.4
82/83 TEST	35.3	34.0	1.3	35.0	33.4	1.6
83/84 TEST	34.3	34.7	-0.4	35.4	34.8	0.6
84/85 TEST	28.3	26.1	2.2	28.2	28.3	-0.1
85/87 TEST	30.8	27.1	3.7	30.2	28.8	1.4
AVERAGE	32.2	29.9	2.2	32.7	31.4	1.4

BABCOCK B300						
81/82 TEST	32.0	29.7	2.3	34.9	32.1	2.8
82/83 TEST			N/A			
83/84 TEST			N/A			
84/85 TEST	26.1	25.2	0.9	28.1	26.7	1.4
85/87 TEST	30.6	28.6	2.0	29.9	29.2	0.7
ADJ. AVERAGE	31.1	30.0	1.1	32.9	30.7	2.2

HISEX WHITE						
81/82 TEST	30.3	29.9	0.4	32.0	34.0	-2.0
82/83 TEST	35.3	34.4	0.9	36.5	32.9	3.6
83/84 TEST	32.7	33.3	-0.6	36.2	32.5	3.7
84/85 TEST	29.8	28.2	1.6	29.8	27.9	1.9
85/87 TEST	29.2	27.5	1.7	28.5	28.4	0.1
AVERAGE	31.5	30.7	0.8	32.6	31.1	1.5

H&N						
81/82 TEST	30.5	30.9	-0.4	35.7	32.6	3.1
82/83 TEST	34.2	33.7	0.5	35.8	33.4	2.4
83/84 TEST	33.1	33.2	-0.1	36.3	32.7	3.6
84/85 TEST	28.4	23.4	5.0	29.8	27.7	2.1
85/87 TEST	30.0	29.1	0.9	29.7	28.4	1.3
AVERAGE	31.2	30.1	1.2	33.5	31.0	2.5

HYLINE W36						
81/82 TEST	31.6	27.1	4.5	35.1	32.9	2.2
82/83 TEST	32.9	31.0	1.9	33.7	32.6	1.1
83/84 TEST	32.0	32.3	-0.3	35.1	33.2	1.9
84/85 TEST	28.3	26.7	1.6	26.7	27.9	-1.2
85/87 TEST	29.3	27.7	1.6	28.9	27.7	1.2
AVERAGE	30.8	29.0	1.9	31.9	30.9	1.0

SHAVER 288A						
81/82 TEST	27.7	26.5	1.2	33.9	32.2	1.7
82/83 TEST	32.0	32.1	-0.1	34.3	32.6	1.7
83/84 TEST	32.5	33.6	-1.1	34.0	31.8	2.2
84/85 TEST	27.5	26.2	1.3	27.9	27.4	0.5
85/87 TEST	32.2	27.7	4.5	27.7	27.1	0.6
AVERAGE	30.4	29.2	1.2	31.6	30.2	1.3
=====						
SIX STRAIN AVERAGE	31.2	29.8	1.4	32.5	30.9	1.7
=====						

TABLE 10 EFFECTS OF CAGE DENSITY AND HOUSING BY STRAIN
% CRACKED EGGS

DEKALB XL	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST	2.5	2.7	-0.2	5.7	3.1	2.6
82/83 TEST	2.9	3.4	-0.5	2.6	3.0	-0.4
83/84 TEST	3.1	4.5	-1.4	3.5	3.4	0.1
84/85 TEST	1.7	3.7	-2.0	3.2	3.4	-0.2
85/87 TEST	2.2	3.2	-1.0	5.2	2.7	2.5
AVERAGE	2.5	3.5	-1.0	4.0	3.1	0.9

BABCOCK B300						
81/82 TEST	1.3	2.2	-0.9	2.5	3.4	-0.9
82/83 TEST			N/A			
83/84 TEST			N/A			
84/85 TEST	1.3	3.2	-1.9	0.9	2.5	-1.6
85/87 TEST	2.7	1.9	0.8	1.9	3.4	-1.5
ADJ. AVERAGE	1.9	2.4	-0.5	2.1	3.0	-0.9

HISEX WHITE						
81/82 TEST	3.0	4.2	-1.2	3.6	4.9	-1.3
82/83 TEST	2.7	3.6	-0.9	3.8	3.4	0.4
83/84 TEST	3.6	4.2	-0.6	2.9	3.8	-0.9
84/85 TEST	5.8	4.1	1.7	4.9	6.7	-1.8
85/87 TEST	2.5	3	-0.5	1.8	5.6	-3.8
AVERAGE	3.5	3.8	-0.3	3.4	4.9	-1.5

H&N						
81/82 TEST	1.7	4.1	-2.4	2.4	3.5	-1.1
82/83 TEST	3.0	2.4	0.6	2.3	2.7	-0.4
83/84 TEST	2.1	3.3	-1.2	2.3	3.6	-1.3
84/85 TEST	1.9	1.8	0.1	1.4	2.3	-0.9
85/87 TEST	3.3	3.4	-0.1	2.9	2.0	0.9
AVERAGE	2.4	3.0	-0.6	2.3	2.8	-0.6

HYLINE W36						
81/82 TEST	2.7	2.2	0.5	2.7	2.1	0.6
82/83 TEST	2.9	1.4	1.5	2.2	3.1	-0.9
83/84 TEST	2.0	2.2	-0.2	3.4	3.5	-0.1
84/85 TEST	0.8	3.1	-2.3	4.6	4.0	0.6
85/87 TEST	1.0	4.0	-3.0	3.5	4.0	-0.5
AVERAGE	1.9	2.6	-0.7	3.3	3.3	-0.1

SHAVER 288A						
81/82 TEST	0.9	2.7	-1.8	3.7	2.2	1.5
82/83 TEST	1.7	2.2	-0.5	1.6	2.6	-1.0
83/84 TEST	1.8	3.2	-1.4	1.7	2.8	-1.1
84/85 TEST	1.5	3.3	-1.8	1.8	3.8	-2.0
85/87 TEST	2.7	3.5	-0.8	1.2	3.1	-1.9
AVERAGE	1.7	3.0	-1.3	2.0	2.9	-0.9
=====						
SIX STRAIN AVERAGE	2.3	3.0	-0.7	2.8	3.3	-0.5
=====						

TABLE 11 EFFECTS OF CAGE DENSITY AND HOUSING BY STRAIN
% DIED

DEKALB XL	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST	11.7	24.7	-13.0	11.7	12.5	-0.8
82/83 TEST	1.1	6.7	-5.6	5.6	10.0	-4.4
83/84 TEST	6.7	4.5	2.2	5.6	5.7	-0.1
84/85 TEST	6.7	14.6	-7.9	6.7	6.2	0.5
85/87 TEST	5.0	16.3	-11.3	8.3	8.8	-0.5
AVERAGE	6.2	13.4	-7.1	7.6	8.6	-1.1

BABCOCK B300						
81/82 TEST	1.9	7.3	-5.4	10.0	11.4	-1.4
82/83 TEST			N/A			
83/84 TEST			N/A			
84/85 TEST	13.3	10.0	3.3	3.3	6.2	-2.9
85/87 TEST	1.7	2.5	-0.8	3.3	2.5	0.8
ADJ. AVERAGE	5.4	5.9	-0.5	5.2	6.7	-1.5

HISEX WHITE						
81/82 TEST	19.6	15.7	3.9	18.3	12.9	5.4
82/83 TEST	4.4	7.5	-3.1	3.3	9.2	-5.9
83/84 TEST	14.4	14.2	0.2	4.4	11.7	-7.3
84/85 TEST	1.7	8.7	-7.0	5.0	8.7	-3.7
85/87 TEST	5.0	10.9	-5.9	5.0	5.0	0.0
AVERAGE	9.0	11.4	-2.4	7.2	9.5	-2.3

H&N						
81/82 TEST	15.0	14.1	0.9	5.0	12.5	-7.5
82/83 TEST	3.3	10.8	-7.5	7.8	8.3	-0.5
83/84 TEST	12.2	8.3	3.9	8.9	15.8	-6.9
84/85 TEST	6.0	16.0	-10.0	5.6	15.9	-10.3
85/87 TEST	11.1	12.5	-1.4	3.7	6.9	-3.2
AVERAGE	9.5	12.3	-2.8	6.2	11.9	-5.7

HYLINE W36						
81/82 TEST	1.7	11.2	-9.5	3.3	8.8	-5.5
82/83 TEST	10.1	11.7	-1.6	8.9	7.5	1.4
83/84 TEST	12.2	10.8	1.4	5.6	8.3	-2.7
84/85 TEST	1.7	5.0	-3.3	16.7	5.0	11.7
85/87 TEST	6.7	6.3	0.4	3.3	6.3	-3.0
AVERAGE	6.5	9.0	-2.5	7.6	7.2	0.4

SHAVER 288A						
81/82 TEST	20.0	20.8	-0.8	10.0	17.8	-7.8
82/83 TEST	12.2	7.5	4.7	4.4	8.3	-3.9
83/84 TEST	7.8	9.2	-1.4	13.3	10.8	2.5
84/85 TEST	3.3	6.2	-2.9	10.0	5.0	5.0
85/87 TEST	0.0	10.0	-10.0	11.7	11.3	0.4
AVERAGE	8.7	10.7	-2.1	9.9	10.6	-0.8
=====						
SIX STRAIN AVERAGE	7.6	10.5	-2.9	7.3	9.1	-1.8
=====						

TABLE 12 EFFECTS OF CAGE DENSITY AND HOUSING BY STRAIN
FEED/EGG RATIO

DEKALB XL	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
81/82 TEST	2.33	2.17	0.16	2.29	2.38	-0.09
82/83 TEST	2.25	2.20	0.05	2.27	2.27	0.00
83/84 TEST	2.35	2.27	0.08	2.43	2.28	0.15
84/85 TEST	2.41	2.39	0.02	2.35	2.34	0.01
85/87 TEST	2.27	2.48	-0.21	2.36	2.32	0.04
AVERAGE	2.32	2.30	0.02	2.34	2.32	0.02

BABCOCK B300						
81/82 TEST	2.53	2.32	0.21	2.36	2.43	-0.07
82/83 TEST			N/A			
83/84 TEST			N/A			
84/85 TEST	2.51	2.50	0.01	2.47	2.41	0.06
85/87 TEST	2.47	2.40	0.07	2.39	2.34	0.05
ADJ. AVERAGE	2.49	2.37	0.12	2.43	2.37	0.06

HISEX WHITE						
81/82 TEST	2.21	2.32	-0.11	2.29	2.37	-0.08
82/83 TEST	2.15	2.15	0.00	2.26	2.28	-0.02
83/84 TEST	2.39	2.29	0.10	2.37	2.30	0.07
84/85 TEST	2.26	2.26	0.00	2.36	2.32	0.04
85/87 TEST	2.51	2.45	0.06	2.45	2.33	0.12
AVERAGE	2.30	2.29	0.01	2.35	2.32	0.03

H&N						
81/82 TEST	2.40	2.38	0.02	2.37	2.41	-0.04
82/83 TEST	2.35	2.38	-0.03	2.34	2.33	0.01
83/84 TEST	2.45	2.36	0.09	2.34	2.38	-0.04
84/85 TEST	2.37	2.47	-0.10	2.34	2.38	-0.04
85/87 TEST	2.54	2.32	0.22	2.41	2.47	-0.06
AVERAGE	2.42	2.38	0.04	2.36	2.39	-0.03

HYLINE W36						
81/82 TEST	2.35	2.26	0.09	2.26	2.33	-0.07
82/83 TEST	2.32	2.21	0.11	2.26	2.22	0.04
83/84 TEST	2.41	2.35	0.06	2.30	2.31	-0.01
84/85 TEST	2.25	2.32	-0.07	2.35	2.33	0.02
85/87 TEST	2.49	2.43	0.06	2.33	2.24	0.09
AVERAGE	2.36	2.31	0.05	2.30	2.29	0.01

SHAVER 288A						
81/82 TEST	2.39	2.47	-0.08	2.40	2.29	0.11
82/83 TEST	2.37	2.29	0.08	2.36	2.34	0.02
83/84 TEST	2.45	2.25	0.20	2.39	2.34	0.05
84/85 TEST	2.40	2.38	0.02	2.30	2.39	-0.09
85/87 TEST	2.25	2.43	-0.18	2.30	2.28	0.02
AVERAGE	2.37	2.36	0.01	2.35	2.33	0.02
=====						
SIX STRAIN AVERAGE	2.38	2.34	0.04	2.35	2.34	0.02
=====						

TABLE 13

SUMMARY OF EFFECTS OF CAGE DENSITY & HOUSING*

WHITE EGG LAYERS	LAC HOUSING			CURTAIN HOUSING		
	3	4	3-4	3	4	3-4
EGGS/HEN-HOUSED	245.0	235.6	9.4	246.4	233.9	12.5
FEED/100 HENS (LBS)	23.3	22.4	0.9	23.9	22.9	1.0
FEED (LBS./DOZ.)	3.58	3.52	0.06	3.69	3.66	0.03
EGG WT. (OZ/DOZ)	23.7	23.7	0	24.7	24.6	0.1
LARGE EGGS	63.7	62.8	0.9	76.1	74.8	1.3
EGG MASS/H.H. (LBS)	30.7	29.5	1.2	32.2	30.4	1.8
CRACKED EGGS (%)	2.3	3.2	-0.9	3.0	3.4	-0.4
MORTALITY (%)	8.1	11.0	-2.9	7.7	10.3	-2.6
FEED: EGG RATIO	2.38	2.34	0.04	2.36	2.34	0.02
<hr/>						
BROWN EGG LAYERS						
EGGS/HEN-HOUSED	234.4	220.4	14.0	230.6	217.3	13.3
FEED/100 HENS (LBS)	25.6	24.5	1.1	26.0	24.9	1.1
FEED (LBS./DOZ.)	4.15	4.16	-0.01	4.30	4.33	-0.03
EGG WT. (OZ/DOZ)	25.8	25.6	0.2	26.7	26.7	0
LARGE EGGS (%)	83.8	81.7	2.1	88.6	88.4	0.2
EGG MASS/H.H. (LBS)	32.0	29.8	2.2	32.6	30.7	1.9
CRACKED EGGS (%)	2.4	3.2	-0.8	3.3	4.0	-0.7
MORTALITY (%)	7.9	11.8	-3.9	7.2	9.7	2.5
FEED: EGG RATIO	2.53	2.56	-0.03	2.52	2.54	-0.02

* Other strains are included besides those listed in Tables 4-12.

General Conclusions: Hen housed egg production consistently favors the lower density. Housing type and strain/breed appear to have very little influence on the differences observed between the two densities. In general the 3 bird cages outperformed the 4 bird cages by about 12 eggs. Feed consumption was 4 to 5 percent more in the three bird cages and about 2 percent higher in the curtain sided housing. All strains/breeds showed similar relationships.

The feed required to produce one dozen eggs is about 4 percent higher in the curtain sided house but is essentially the same in the two densities. All strains perform similarly relative to these factors.

Density appears to have partially no effect on egg size. Egg size, though, is about 4 percent larger in the curtain sided house.

Total egg mass is primarily affected by the hen-housed egg production differences. The 3 bird cages produced about 6 percent more total weight of eggs. This was consistent with all strains. The curtain sided houses produced about 3 percent more egg mass.

The 3 bird cages produced less cracked eggs, 2.75% vs 3.45%. The LAC house also produced less cracked eggs, 2.78% vs 3.43%.

Considerably less mortality was observed in the 3 bird cages. Total mortality for the average test combining housing types was 7.7 percent for the three bird cage compared to 10.7 percent for the four bird cages. Mortality was slightly higher in the LAC house.

The feed requirement to produce a pound of eggs was practically the same between densities and housing types. The

combined results for the two chicken types were practically the same in both types of houses and in both densities.

In conclusion, there is very little evidence that strains perform differ-

ently with respect to cage density or housing. Density advantages or disadvantages seem to be shared equally among the strains tested. Effects of housing are also common to different strains.

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