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**FINAL REPORT OF THE THIRTY SECOND
NORTH CAROLINA LAYER PERFORMANCE
AND MANAGEMENT TEST**

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The North Carolina Layer Performance and Management Test is conducted under the auspices of the Cooperative Extension Service at North Carolina State University and the North Carolina Department of Agriculture. The flock is maintained at the Piedmont Research Station, Salisbury, North Carolina. Mr. Raymond Coltrain is Piedmont Research Station Superintendent; Mr. David Joyce is Resident Manager of the flock; and Dr. Kenneth E. Anderson is Project Leader. The purpose of this program is to assist poultrymen in evaluation of commercial layer stocks and management systems.

The data presented herein represents the analysis of the first production cycle, feed restriction molt, restricted feeding molt, and subsequent second cycle production parameters of the 32nd North Carolina Layer Performance and Management Test. Performance summary tables are available examining open and closed housing types, and density individually as well as the combined results.

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32nd NORTH CAROLINA LAYER PERFORMANCE AND MANAGEMENT TEST

Protocol Procedures Used

Entries:

Fourteen entries were accepted in accordance with the rules and regulations of the test. Nine white egg and five brown egg strains participated.

Dates of Importance:

The eggs were set on November 14, 1995 at the Piedmont Research Station (NCDA) Poultry Unit. The flock was hatched on December 6, 1995 and moved to laying facilities on April 9 and 10, 1996 at 17 weeks of age. The age of the flock at transfer was lowered to approximately 17 weeks due to current trends in the industry and requests of the breeders to move the flock prior to excessive egg production in the rearing houses.

First cycle production records commenced on April 11, 1996 (18 weeks of age) until molt was induced on March 13, 1997. The molt records commenced on March 13, 1997 (66 weeks of age) and ended on April 10, 1997 (70 weeks of age). The second cycle commenced on April 11, 1997 (70 weeks of age) and ended on January 15, 1998 (110 weeks of age) This report includes production data summarized from 18 to 66 weeks, 66 to 70 weeks, and 70 to 110 weeks.

Pullet Housing:

House 6 - is an environmentally controlled brood-grow facility with 4 banks of triple-deck cages. Each side of each bank was assigned a row number, and each 3-cage section within each row and level/row was assigned a replicate number. For statistical analysis pairs of rows were designated as blocks. Thus, each block consisted of two rows containing 8 replicates on each level for a total of 48 replicates per block. The white and brown-egg strains were randomly assigned to the replicates in the house. Entrant strains were assigned to the replicates in a restricted randomized manner with the restrictions being that all strains were approximately equally represented in all rows and levels. Chicks were brooded in the cages on paper within each of the replicate series within each row. Each replicate was filled with 30 white-egg (10 per 61 x 51 cm cage) and 30 brown-egg (10 per 61 x 51 cm cage) pullets on the day of hatch. This allowed for a final rearing density of 310 cm² (48 in²) for the white-egg and brown-egg pullets.

House 8 - is an open-sided brood-grow facility with six rows of 122 cm wide by 102 cm deep single deck cages with each cage assigned a replicate number. The white and brown-egg strains were randomly assigned to the replicates in each house. Entrant strains were assigned to the replicates in a restricted randomized manner with the restrictions being that all strains were approximately equally represented in all rows. Forty white-egg or brown-egg females were started and grown in each replicate with a final rearing space allowance of 310 cm² (48 in²). Refer to the 32nd North Carolina Layer Performance and Management Test Growing Report (Vol. 32, No. 2) for details of pullet management, nutrition, and performance.

Pullets from all strain and pullet housing combinations were moved to both laying houses randomly over a three-day period. Final photoperiod duration in both laying facilities was 16.5 hours light, 7.5 hours dark, with artificial illumination provided by compact fluorescent lamps.

Test Design:

The test was a factorial arrangement of treatments. Strain, layer housing, and density. Following are general descriptions of the main effects:

Strain

Samples of fertile eggs were provided from the breeders. All eggs were set and hatched concurrently. A total of nine white egg strains and five brown egg strains participated in the test. See the 32nd Hatch Report (Vol. 32, No. 1) for details.

Layer Housing

Two lay houses (4 and 5) were utilized. House 4 is a high rise, environmentally controlled facility with three banks of four-deck high cages. Each side of each bank was designated as a row, and each row was divided into nine eight-foot replicate blocks/level. The replicate blocks contain cages that are either 61 or 81 cm wide. All cages are 35.5 cm deep. House 5 is a standard height open-sided laying house with a flush manure handling system. It has two banks of triple deck cages and two banks with four levels of cages. Again, each side of a bank was designated as a row and each row was divided into nine eight-foot replicate blocks/level. The replicate blocks contain cages that are either 61 or 81 cm wide. All cages are 35.5 cm deep. Both houses contain feeder systems which allow feed consumption to be determined per replicate block. The white-egg and brown-egg strains were assigned to the replicates in a restricted randomized manner, with the restrictions being that all strains were approximately equally represented in all rows, levels and cage sizes.

Density

One hen population was utilized for both brown and white egg layers, of 7 hens per cage. The hen population of 7 hens per cage resulted in replicates containing 28 or 21 hens per replicate depending on cage lengths of 61 cm or 81 cm. Cage densities within the 7 hen per cage group were 310 cm² (48 in²) and 413 cm² (64 in²). Initial population size was constant throughout the test, and therefore, is not a factor in these test results.

Layer Management and Nutrition:

Layer diets are identified as Diets D, E, F, G, H, I, M, N, O, P, and Q which consist of a pre-lay diet and a series of layer diets formulated to assure a daily protein, mineral and amino acid intake as shown below. The diets are provided to the birds in a crumblized form to reduce feed wastage. Dietary formulations are presented in the succeeding section. Feed was offered ad libitum in accordance with the following guidelines such that all birds received acceptable nutrient intake. The diet being fed at any given time provides the nutrient intake and is determined based upon bird age, production stage, and average daily feed intake.

MINIMUM DAILY INTAKE OF NUTRIENTS PER BIRD AT VARIOUS STAGES OF PRODUCTION

Production Stage	> 87% and Pre-Peak	87-80%	80-70%	<70%
<u>White-Egg Layers</u>				
Protein (g/day)	19	18	17	16
Calcium (g/day)	3.8	3.8	4.0	4.0
Lysine (mg/day)	820	780	730	690
TSAA (mg/day)	700	670	630	590
<u>Brown Egg Layers</u>				
Protein (g/day)	20	19	18	17
Calcium (g/day)	3.8	3.8	3.8	4.0
Lysine (mg/day)	830	820	780	730
TSAA (mg/day)	710	700	670	630

Layer Management and Nutrition (Molting Programs):

Two molting programs, Forced Molting and Feed Restriction Molting, were utilized to allow for a rest period between the First and Second Cycles. The traditional forced molt program used in previous NCLP&M tests consisted of removal of feed from the pullets until a 30% body weight loss was achieved in each strain. Strains were returned to feed based on the bird weights from replicates with the same densities (sister replicates). When the sampling replicates attained a 30% body weight loss all sister replicates were returned to full feed. The feed restriction molt program utilized a short fast period to stop egg production followed by restricted feed allocation to maintain the weight loss and zero egg production. Weight loss target was 25% of initial body weight of the hens. Hens on this program were returned to full feed at 48 days past molt initiation.

LAYING HOUSE FEEDING PROGRAM

Rate of Production	Consumption Per 100 Birds/Day (kg)	Diet Fed	
		White Egg Strains	Brown Egg Strains
Weeks 17-26	< 9.52	D	D
Pre-Peak and > 87%	< 9.52	F	E
	9.57-10.39	G	F
	10.43-11.29	I	H
	11.34-12.20	N	M
	12.25-13.11	P	O
	>13.15	Q	Q
80-87%	< 9.52	G	F
	9.57-10.39	H	G
	10.43-11.29	M	I
	11.34-12.20	O	N
	12.25-13.11	Q	P
	>13.15	Q	Q
70-80%	< 9.52	H	G
	9.57-10.39	I	H
	10.43-11.29	N	M
	11.34-12.20	P	O
	12.25-13.11	Q	Q
	>13.15	Q	Q
< 70%	< 9.52	I	H
	9.57-10.39	M	I
	10.43-11.29	O	N
	11.34-12.20	Q	O
	12.25-13.11	Q	Q
	>13.15	Q	Q
Post-Molt < 70%	< 9.52	G	F
	9.57-10.39	H	G
	10.43-11.29	M	I
	11.34-12.20	O	N
	12.25-13.11	Q	P
	>13.15	Q	Q

LAYING PERIOD DIETS

Diet Identification¹

-----Layer Diets-----					
Ingredient	D	E	F	G	H
-----Pounds Per Ton-----					
Corn	772.07	819.01	934.81	1000.11	1068.72
Corn Gluten Meal	100.0	75.00	85.00	90.00	90.00
Soybean Meal	603.43	581.58	530.80	466.26	412.42
Wheat Midds	145.62	150.00	100.14	109.38	110.93
Calcium Carb	200.49	194.30	188.83	184.03	178.56
DiCalcium Phos	21.20	23.15	24.36	24.02	24.91
Sodium Bi-Carb	16.74	16.66	17.72	17.54	17.52
Salt	5.00	5.00	5.00	5.00	5.00
Methionine	3.54	4.50	4.82	5.45	5.06
Lysine		1.31		1.90	2.66
Choline Chloride	5.49	5.35	5.27	5.20	5.10
Vitamin premix	2.00	2.00	2.00	2.00	2.00
Min. premix	1.00	1.00	1.00	1.00	1.00
Fat	120.42	118.14	97.25	85.11	73.12
Mold Inhibitor	2.00	2.00	2.00	2.00	2.00
Tracer	1.00	1.00	1.00	1.00	1.00
Total	2000	2000	2000	2000	2000
Protein %	22	21	20	19	18
ME kcal/kg	2925	2925	2925	2925	2925
Calcium %	4.10	4.00	3.90	3.80	3.70
T. Phos %	.59	.60	.59	.58	.58
Lysine %	1.14	1.15	1.02	1.00	.95
TSAA %	.90	.90	.90	.90	.85

LAYING PERIOD DIETS

Diet Identification¹

-----Layer Diet-----						
Ingredient	I	M	N	O	P	Q
-----Pounds Per Ton-----						
Corn	1136.49	1211.94	1233.32	1215.69	1318.20	1390.16
Corn Gluten Meal	100.00	85.00	50.00	50.00	25.00	25.00
Soybean Meal	346.86	314.14	300.80	223.71	216.04	162.24
Wheat Midds	109.19	103.88	147.81	256.18	200.00	200.00
Calcium Carb	178.31	168.03	158.33	155.44	150.20	145.85
DiCalcium Phos	26.00	25.88	24.14	19.60	20.30	18.78
Sodium Bi-Carb	17.56	17.69	16.77	14.52	15.70	15.71
Salt	5.00	5.00	5.00	5.00	5.00	5.00
Methionine	4.56	4.32	3.36	2.20	1.97	1.58
Lysine	3.80	3.91	1.97	1.80	2.61	3.37
Choline Chloride	5.04	4.91	4.71	4.60	4.46	4.37
Vet premix	2.00	2.00	2.00	2.00	2.00	2.00
Min. premix	1.00	1.00	1.00	1.00	1.00	1.00
Fat	61.19	49.30	47.79	45.26	34.79	21.94
Mold Inhibitor	2.00	2.00	2.00	2.00	2.00	2.00
Tracer	1.00	1.00	1.00	1.00	1.00	1.00
Total	2000	2000	2000	2000	2000	2000
Protein %	17	16	15	14	13	12
Me kcal/kg	2925	2925	2925	2925	2925	2925
Calcium %	3.7	3.5	3.3	3.2	3.1	3.0
T. Phos %	.58	.57	.56	.54	.52	.50
Lysine %	.90	.85	.75	.65	.65	.60
TSAA %	.80	.75	.65	.55	.50	.45

Data Collection Schedule and Procedures:

Egg Production--All eggs that had the potential of being marketed were credited toward the test unit's (replicate) egg production, regardless of the shell condition at the time of collection. All eggs were collected and recorded daily. Egg production was summarized at twenty-eight day intervals, and was calculated and reported on a hen-day basis.

Egg Weight--At twenty-eight day intervals, all eggs produced in the previous 24-hour period were weighed and sorted by size (See egg size distribution). Percentages of eggs within each size category, average egg weight (g), and egg mass (g) were calculated and reported.

Egg Quality--At twenty-eight day intervals, all eggs produced within the previous 24 hours were collected and transported to the processing room. The eggs were then examined by candling light and graded according to current USDA standards for egg quality in the pilot processing facilities. Egg income was calculated using three-year regional average prices for farm value of eggs based on egg production and quality evaluation.

Feed Consumption--All feed offered for consumption was recorded for each unit. At twenty-eight day intervals, feed not consumed was weighed and feed consumption was calculated. Daily feed intake (kg/100 hens/day) was calculated and reported for each strain. Feed costs were based on the regional prices for each feed delivery which were calculated and summarized for the complete production cycle.

Mortality--All mortalities were recorded daily, categorized as best possible as to the cause, and obvious accidents were not included in reported mortalities.

Statistical Analyses and Separation of Means:

Analyses of variance were performed on all data. Separate analyses were conducted for white and brown egg strains. Significant differences ($P < .01$) within white and brown egg strains are noted by differing letters among columns of means. All data were subjected to ANOVA utilizing the GLM procedure of SAS, with main effects of strain, layer house, and density. First and second order interactions were tested for significance. Mean differences were separated via the PDIF option of the GLM procedure.

DESCRIPTION OF DATA TABLE STATISTICS

First cycle performance of white and brown egg strains are shown on Tables 1-12. The force molt period performance of the white and brown egg strains are shown on Tables 13 to 16. The feed restriction molt period performance of the white and brown egg strains are shown on Tables 17 to 20. Second cycle performance of white and brown egg strains, force molted are shown on Tables 21-32. Second cycle performance of white and brown egg strains, feed restriction molted are shown on Tables 33-44. Overall performance of white and brown egg strains, force molted data are shown on Tables 45-56. Overall performance of white and brown egg strains, feed restriction molted data are shown on Tables 57-68. Production curves and feed intake for the strains and molting techniques are shown on Figures 1-14.

Breeder (Strain):

Short identification codes of the breeder and strain of the stock were developed. See more complete information following data tables.

Layer House:

"Open" denotes performance in the curtain-sided flush facility. "Closed" denotes performance in the controlled environment high rise facility.

Population and Density Allocations:

White and Brown Hens per Cage	Cage Size		Floor Space per Bird	Feeder Space per Bird	Water Nipples per Cage
	Width	Depth			
7	61 cm	35.5 cm	310 cm ² (48 in ²)	8.7 cm 3.4 in	3
7	82 cm	35.5 cm	413 cm ² (64 in ²)	11.7 cm 4.6 in	3

Hen Housed Eggs per Bird:

The total number of eggs produced divided by the number of birds housed at 126 days.

Hen Day Egg Production:

The average daily number of eggs produced per 100 hens per day.

Egg Mass:

The average daily production of egg mass in grams per hen day.

Mortality:

The percentage of birds which died between 126 and 434 days of age. Mortality which occurred during the molt period were reported separately.

Feed Consumption:

The kilograms of feed consumed daily per 100 hens.

Feed Conversion:

The grams of egg produced per gram of feed consumed.

Egg Weight:

The average egg weight of period samples in grams per egg.

Egg Income:

The calculated income per hen housed at 126 days, from egg production using three-year regional average egg prices as follows:

<u>Grade</u>	<u>Size</u>	<u>Cents/Dozen</u>
A	Extra Large	81.2
A	Large	81.2
A	Medium	71.3
A	Small	56.1
A	Pee Wee	28.1
B	All	28.1
Cracks	All	43.0

Feed Cost:

The calculated feed cost per hen housed at 133 days, using average price per ton.

<u>Diets</u>	<u>Price Per Ton</u>
D	242.50
E	241.20
F	251.80
G	252.50
H	215.00
I	198.20
M	198.80
N	197.10

Grade Information:

The average grade of eggs according to USDA grading standards.

Egg Size Distribution:

These are the USDA size classifications of the eggs. There has been blending of egg size in this test with the weight cutoff between medium and large being 23.5. This action will maximize the number of USDA large eggs as blending would occur in commercial plants. The proportion of the eggs falling into the following size categories are reported in the tables.

<u>Size Category</u>	<u>Ounces/Dozen</u>
Pee Wee	< 18
Small	18 - 21
Medium	21 - 23.5
Large	23.5 - 27
Extra Large	> 27

Metric Conversions:

1 lb = 453.6 g	1 g = .03527 oz
1 lb = .4536 kg	1 kg = 2.204 lb
1 oz = 28.35 g	1 g = 1000 mg
	1 kg = 1000 g

TABLE 1. EFFECT OF LAYING HOUSE ON PERFORMANCE OF WHITE EGG STRAINS,
32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Laying House	Feed Cons (kg/100 hens/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)	Age at 50% Production (Days)
Hy-Line (W-36)	Closed	9.7	.46	252.7	76.0	45.6	6.6	152
	Open	9.8	.47	259.6	77.3	46.5	5.2	152
	Average	9.8 ^F	.46 ^{AB}	256.1 ^A	76.7 ^C	46.0 ^D	5.9 ^E	152 ^A
Hy-Line (W-77)	Closed	10.8	.44	256.8	76.9	47.3	6.3	144
	Open	10.9	.44	258.9	77.4	47.6	7.1	143
	Average	10.8 ^{ABC}	.44 ^D	257.8 ^A	77.2 ^{BC}	47.4 ^{BCD}	6.7 ^E	143 ^D
Bovans (White)	Closed	10.4	.44	257.5	77.9	46.3	7.9	146
	Open	10.3	.46	262.6	79.8	47.6	9.4	143
	Average	10.3 ^{DE}	.45 ^{BCD}	260.1 ^A	78.8 ^{ABC}	46.9 ^{CD}	8.6 ^{DE}	144 ^{CD}
H & N ("Nick Chick")	Closed	11.2	.44	266.6	81.9	50.2	14.8	149
	Open	11.2	.44	261.6	80.9	49.7	15.1	147
	Average	11.2 ^A	.44 ^{CD}	264.1 ^A	81.4 ^A	49.9 ^A	15.0 ^B	148 ^B
Shaver (White)	Closed	9.9	.44	247.9	74.0	44.4	7.8	153
	Open	10.2	.46	263.6	79.5	47.6	10.4	151
	Average	10.1 ^{EF}	.45 ^{BCD}	255.8 ^A	76.7 ^C	46.0 ^D	9.1 ^{CDE}	152 ^A
Shaver (2000)	Closed	11.0	.43	246.5	77.3	48.3	17.7	151
	Open	11.0	.44	241.9	78.3	49.2	21.4	150
	Average	11.0 ^{AB}	.44 ^{CD}	244.2 ^B	77.8 ^{BC}	48.8 ^{ABC}	19.6 ^A	150 ^A
ISA/Babcock (B300)	Closed	10.4	.46	257.1	79.0	47.9	13.8	144
	Open	10.5	.45	254.4	79.2	47.9	16.0	144
	Average	10.5 ^{CDE}	.46 ^{BC}	255.8 ^A	79.1 ^{ABC}	47.9 ^{BCD}	14.9 ^B	144 ^D
ISA (Experiment)	Closed	10.3	.47	257.9	78.4	49.0	12.4	146
	Open	10.2	.48	257.3	79.6	49.7	14.0	146
	Average	10.2 ^E	.48 ^A	257.6 ^A	79.0 ^{ABC}	49.4 ^{AB}	13.2 ^{BC}	146 ^{BC}
Bovans (Experiment)	Closed	10.7	.43	258.0	79.0	46.9	10.9	147
	Open	10.7	.45	265.0	81.2	48.6	11.9	146
	Average	10.7 ^{BCD}	.44 ^{CD}	261.5 ^A	80.1 ^{AB}	47.7 ^{BCD}	11.4 ^{BCD}	147 ^B
All Strains	Closed	10.5	.45	255.7	77.8	47.3	10.9	148
	Open	10.5	.45	258.3	79.2	48.3	12.3	147
	Average	10.5	.45	257.0	78.6	47.8	11.7	147

A,B,C,D,E,F - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 2. EFFECT OF LAYING HOUSE ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF WHITE EGG STRAINS, 32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Laying House	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
Hy-Line (W-36)	Closed	59.0	2.1	8.1	16.7	30.4	42.3
	Open	59.2	1.9	9.2	14.8	32.4	41.5
	Average	59.1 ^D	2.0 ^A	8.7 ^A	15.8 ^A	31.4 ^{CD}	41.9 ^{EF}
Hy-Line (W-77)	Closed	61.0	0.7	7.4	13.0	28.1	50.5
	Open	61.1	1.0	6.6	13.2	27.9	51.2
	Average	61.1 ^B	0.9 ^{BCD}	7.0 ^B	13.1 ^{BC}	28.0 ^E	50.8 ^{BC}
Bovans (White)	Closed	58.7	1.8	7.1	15.7	37.4	37.4
	Open	59.1	1.0	7.1	15.7	37.3	38.5
	Average	58.9 ^D	1.4 ^{ABCD}	7.1 ^B	15.7 ^A	37.3 ^A	38.0 ^{FG}
H & N ("Nick Chick")	Closed	60.3	0.3	7.4	11.1	30.6	50.0
	Open	60.6	0.8	7.6	13.0	31.7	46.7
	Average	60.5 ^{BC}	0.6 ^D	7.5 ^{AB}	12.0 ^{CD}	31.2 ^D	48.3 ^{CD}
Shaver (White)	Closed	58.8	1.6	8.2	15.3	36.8	37.8
	Open	59.2	1.8	6.0	13.7	38.0	40.0
	Average	59.0 ^D	1.7 ^{AB}	7.1 ^B	14.5 ^{AB}	37.4 ^A	38.9 ^{FG}
Shaver (2000)	Closed	61.5	0.6	6.5	10.5	26.5	55.5
	Open	62.0	0.5	5.9	10.6	27.1	55.4
	Average	61.8 ^A	0.6 ^D	6.2 ^{BC}	10.6 ^D	26.8 ^E	55.4 ^A
ISA/Babcock (B300)	Closed	60.1	0.7	7.4	12.2	31.8	47.4
	Open	60.0	0.8	6.4	12.4	36.5	43.4
	Average	60.0 ^C	0.8 ^{CD}	6.9 ^B	12.3 ^{CD}	34.2 ^{BC}	45.4 ^{DE}
ISA (Experiment)	Closed	61.7	0.6	5.4	10.5	27.4	55.4
	Open	61.8	0.6	5.7	11.3	28.2	53.9
	Average	61.8 ^A	0.6 ^D	5.6 ^C	10.9 ^D	27.8 ^E	54.6 ^{AB}
Bovans (Experiment)	Closed	58.6	1.0	9.1	16.5	36.4	36.7
	Open	59.1	1.9	8.0	15.6	35.8	38.4
	Average	58.8 ^D	1.5 ^{ABC}	8.5 ^A	16.1 ^A	36.1 ^{AB}	37.6 ^G
All Strains	Closed	60.0	1.0	7.4	13.5	31.7	45.9
	Open	60.2	1.1	6.9	13.4	32.8	45.4
	Average	60.1	1.1	7.2	13.4	32.3	45.6

A,B,C,D,E,F,G - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 3. EFFECT OF LAYING HOUSE ON EGG QUALITY, INCOME AND FEED COSTS OF WHITE EGG STRAINS, 32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
Hy-Line (W-36)	Closed	96.7	0.9 ^Z	2.0	0.4	15.71	8.46
	Open	96.0	2.1 ^{UVWXY}	1.8	0.1	16.12	8.60
	Average	96.4	1.5	1.9	0.3	15.91 ^{BC}	8.53 ^D
Hy-Line (W-77)	Closed	96.6	1.0 ^{YZ}	2.3	0.1	16.29	9.38
	Open	95.3	2.2 ^{UVWX}	2.3	0.2	16.29	9.49
	Average	95.9	1.6	2.3	0.2	16.29 ^{AB}	9.43 ^A
Bovans (White)	Closed	96.5	1.2 ^{XYZ}	2.1	0.2	16.10	8.96
	Open	95.7	2.0 ^{UVWXY}	1.8	0.4	16.44	8.82
	Average	96.1	1.6	2.0	0.3	16.27 ^{AB}	8.89 ^{BCD}
H & N ("Nick Chick")	Closed	96.5	1.4 ^{XYZ}	1.9	0.2	16.93	9.52
	Open	95.6	2.6 ^{UVW}	1.6	0.2	16.42	9.47
	Average	96.1	2.0	1.7	0.2	16.67 ^A	9.50 ^A
Shaver (White)	Closed	96.2	1.6 ^{WXYZ}	2.0	0.3	15.50	8.68
	Open	95.0	2.6 ^{UVW}	2.1	0.3	16.45	8.84
	Average	95.6	2.1	2.0	0.3	15.97 ^{ABC}	8.76 ^{CD}
Shaver (2000)	Closed	95.2	1.6 ^{WXYZ}	3.0	0.2	15.57	9.20
	Open	94.9	2.9 ^{UV}	2.1	0.1	15.29	8.88
	Average	95.0	2.2	2.6	0.2	15.43 ^C	9.04 ^{BC}
ISA/Babcock (B300)	Closed	96.3	1.6 ^{WXYZ}	1.9	0.1	16.23	8.88
	Open	95.2	3.0 ^U	1.7	0.2	15.98	8.84
	Average	95.7	2.3	1.8	0.1	16.11 ^{ABC}	8.86 ^{BCD}
ISA (Experiment)	Closed	95.6	2.1 ^{UVWXY}	2.2	0.1	16.34	8.87
	Open	96.1	1.6 ^{WXYZ}	2.1	0.3	16.38	8.62
	Average	95.8	1.8	2.1	0.2	16.36 ^{AB}	8.75 ^{CD}
Bovans (Experiment)	Closed	95.7	1.9 ^{VWXYZ}	2.1	0.3	16.05	9.11
	Open	95.9	1.7 ^{WXYZ}	2.2	0.2	16.51	9.17
	Average	95.8	1.8	2.1	0.3	16.28 ^{AB}	9.14 ^{AB}
All Strains	Closed	96.1	1.5	2.2	0.2	16.08	9.01
	Open	95.5	2.3	2.0	0.2	16.21	8.97
	Average	95.8	1.9	2.1	0.2	16.14	8.98

A,B,C,D - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

U,V,W,X,Y,Z - Different letters denote significant strain x housing interactions (P<.01).

TABLE 4. EFFECT OF DENSITY ON PERFORMANCE OF WHITE EGG STRAINS, 32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Density ¹ (cm ²)	Feed Cons (kg/100 hens/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)	Age at 50% Production (Days)
Hy-Line (W-36)	310	9.6	.47	254.4	76.7	45.7	5.7	152
	413	10.0	.46	257.8	76.7	46.3	6.1	152
Hy-Line (W-77)	310	10.3	.44	248.1	74.7	45.6	8.1	144
	413	11.4	.43	267.5	79.7	49.3	5.3	143
Bovans (White)	310	10.0	.45	252.5	76.9	45.6	9.8	145
	413	10.7	.45	267.7	80.8	48.3	7.5	144
H & N ("Nick Chick")	310	11.1	.44	261.0	81.7	49.9	19.2	147
	413	11.2	.44	267.2	81.1	50.0	10.8	148
Shaver (White)	310	9.9	.45	244.9	74.8	45.1	14.3	153
	413	10.2	.45	266.6	78.7	46.9	3.9	151
Shaver (2000)	310	10.7	.44	233.0	74.8	47.0	19.6	151
	413	11.3	.44	255.4	80.7	50.5	19.6	149
ISA/Babcock (B300)	310	10.3	.46	250.1	78.7	47.6	17.6	144
	413	10.6	.45	261.4	79.4	48.1	12.2	144
ISA (Experiment)	310	10.0	.47	244.9	76.1	47.6	16.2	147
	413	10.5	.48	270.3	81.9	51.1	10.2	145
Bovans (Experiment)	310	10.4	.44	250.9	77.7	46.1	13.1	147
	413	11.0	.44	272.2	82.6	49.4	9.6	147
All Strains	310	10.2 ^B	.45	248.9 ^B	76.9 ^B	46.7 ^B	13.7 ^A	148
	413	10.8 ^A	.45	265.1 ^A	80.2 ^A	48.9 ^A	9.5 ^B	147

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 5. EFFECT OF DENSITY ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF WHITE EGG STRAINS, 32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Density ¹ (cm ²)	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
Hy-Line (W-36)	310	58.7	2.0	9.0	16.7	33.5	38.4
	413	59.6	1.9	8.4	14.8	29.3	45.3
Hy-Line (W-77)	310	60.7	1.1	6.8	12.8	29.9	49.2
	413	61.4	0.7	7.1	13.3	26.1	52.5
Bovans (White)	310	58.5	1.0	7.8	16.5	38.2	35.9
	413	59.3	1.9	6.4	14.9	36.5	40.1
H & N ("Nick Chick")	310	60.2	0.7	8.1	12.8	31.2	46.8
	413	60.8	0.5	6.9	11.2	31.1	49.9
Shaver (White)	310	59.3	1.8	7.3	13.9	37.3	39.3
	413	58.7	1.6	6.9	15.0	37.6	38.6
Shaver (2000)	310	62.0	0.2	7.1	9.9	27.0	55.5
	413	61.6	0.9	5.4	11.3	26.7	55.4
ISA/Babcock (B300)	310	60.0	0.8	7.1	12.2	34.1	45.2
	413	60.1	0.8	6.8	12.3	34.2	45.6
ISA (Experiment)	310	61.8	0.6	5.5	11.3	26.2	55.9
	413	61.7	0.5	5.6	10.5	29.5	53.4
Bovans (Experiment)	310	58.7	1.3	8.8	16.2	36.5	37.2
	413	59.0	1.7	8.3	16.0	35.7	38.0
All Strains	310	60.0	1.0	7.5	13.6	32.6	44.8
	413	60.2	1.2	6.9	13.3	31.9	46.5

*There are no significant differences among these means.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 6. EFFECT OF DENSITY ON EGG QUALITY, INCOME AND FEED COSTS OF WHITE EGG STRAINS, 32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Density ¹ (cm ²)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
Hy-Line (W-36)	310	96.3	1.4	1.8	0.4	15.73	8.26
	413	96.4	1.6	2.0	0.1	16.09	8.80
Hy-Line (W-77)	310	95.6	1.7	2.5	0.2	15.63	8.90
	413	96.3	1.5	2.1	0.1	16.94	9.97
Bovans (White)	310	96.0	1.8	2.0	0.2	15.75	8.55
	413	96.2	1.4	2.0	0.4	16.78	9.23
H & N ("Nick Chick")	310	95.9	2.2	1.8	0.2	16.40	9.29
	413	96.3	1.8	1.7	0.3	16.95	9.70
Shaver (White)	310	95.0	2.1	2.4	0.4	15.20	8.46
	413	96.2	2.0	1.6	0.1	16.74	9.06
Shaver (2000)	310	95.1	2.1	2.6	0.2	14.74	8.67
	413	95.0	2.3	2.5	0.1	16.12	9.41
ISA/Babcock (B300)	310	95.5	2.5	2.0	0.1	15.70	8.57
	413	96.0	2.1	1.6	0.2	16.52	9.15
ISA (Experiment)	310	95.7	1.9	2.2	0.2	15.53	8.39
	413	96.0	1.7	2.1	0.2	17.19	9.10
Bovans (Experiment)	310	95.1	1.9	2.7	0.3	15.58	8.77
	413	96.4	1.7	1.6	0.2	16.97	9.51
All Strains	310	95.6 ^B	2.0	2.2	0.2	15.59 ^B	8.65 ^B
	413	96.1 ^A	1.8	1.9	0.2	16.70 ^A	9.33 ^A

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 7. EFFECT OF LAYING HOUSE ON PERFORMANCE OF BROWN EGG STRAINS, 32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Laying House	Feed Cons (kg/100 hens/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)	Age at 50% Production (Days)
ISA (Brown)	Closed	11.0	.46	262.6	80.7	50.7	15.3	143
	Open	10.9	.46	253.3	80.2	50.5	20.2	143
	Average	10.9 ^B	.46 ^A	257.9 ^B	80.4 ^A	50.6 ^A	17.8 ^A	143 ^B
Shaver (Brown 579)	Closed	11.0	.45	252.4	79.0	49.4	14.0	143
	Open	10.8	.46	247.4	80.0	49.5	23.5	142
	Average	10.9 ^B	.45 ^{AB}	249.9 ^B	79.5 ^{AB}	49.5 ^{AB}	18.8 ^A	143 ^B
H & N ("Brown Nick")	Closed	10.7	.46	259.7	79.9	50.1	10.1	148
	Open	11.1	.46	262.0	80.9	50.9	12.8	146
	Average	10.9 ^B	.46 ^A	260.8 ^{AB}	80.4 ^A	50.5 ^A	11.5 ^B	147 ^A
Bovans (Brown)	Closed	11.5	.44	270.0	81.6	51.0	9.7	148
	Open	11.4	.44	272.4	82.0	51.1	8.5	145
	Average	11.5 ^A	.44 ^{AB}	271.2 ^A	81.8 ^A	51.1 ^A	9.1 ^B	147 ^A
Hy-Line (Brown)	Closed	11.0	.43	254.1	77.0	48.4	7.8	148
	Open	10.9	.44	253.7	77.4	48.3	7.8	148
	Average	11.0 ^B	.44 ^B	253.9 ^B	77.2 ^B	48.3 ^B	7.8 ^B	148 ^A
All Strains	Closed	11.0	.45	259.8	79.6	49.9	11.5	146
	Open	11.0	.45	257.8	80.1	50.1	14.6	145
	Average	11.0	.45	258.9	79.9	50.0	13.2	145

A,B - Different letters denote significant differences ($P < .01$), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 8. EFFECT OF LAYING HOUSE ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF BROWN EGG STRAINS, 32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Laying House	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
ISA (Brown)	Closed	62.5	0.1	4.1	10.4	29.5	55.7
	Open	62.4	0.3	4.2	11.6	28.4	55.1
	Average	62.4	0.2	4.1	11.0	28.9	55.4
Shaver (Brown 579)	Closed	62.2	0.2	5.0	11.2	28.9	54.5
	Open	61.5	0.6	5.1	12.4	31.4	50.3
	Average	61.8	0.4	5.0	11.8	30.2	52.4
H & N ("Brown Nick")	Closed	62.0	0.2	4.3	10.0	29.6	55.6
	Open	62.3	0.3	4.2	10.4	29.9	54.8
	Average	62.2	0.3	4.2	10.2	29.7	55.2
Bovans (Brown)	Closed	61.9	0.0	5.4	10.6	29.2	54.4
	Open	61.7	0.5	5.3	11.0	31.2	51.6
	Average	61.8	0.3	5.4	10.8	30.2	53.0
Hy-Line (Brown)	Closed	62.1	0.9	4.6	9.8	29.3	55.8
	Open	61.7	0.4	5.3	11.4	30.7	52.0
	Average	61.9	0.3	5.0	10.6	30.0	53.9
All Strains	Closed	62.1	0.1	4.7	10.4	29.3	55.2
	Open	61.9	0.4	4.8	11.4	30.3	52.8
	Average	62.0	0.3	4.7	10.9	29.8	53.9

TABLE 9. EFFECT OF LAYING HOUSE ON EGG QUALITY, INCOME AND FEED COSTS OF BROWN EGG STRAINS, 32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
ISA (Brown)	Closed	97.1	1.6	1.1	0.1	16.97	8.88
	Open	95.4	2.8	1.8	0.0	16.14	8.56
	Average	96.3	2.2	1.4	0.1	16.55 ^B	8.72 ^{BC}
Shaver (Brown 579)	Closed	96.6	1.5	1.8	0.1	16.22	8.70
	Open	95.8	2.3	1.9	0.1	15.76	8.30
	Average	96.2	1.9	1.8	0.1	15.99 ^B	8.50 ^C
H & N ("Brown Nick")	Closed	96.3	1.8	1.6	0.3	16.68	8.65
	Open	95.6	2.2	2.1	0.2	16.73	8.91
	Average	95.9	2.0	1.8	0.3	16.71 ^{AB}	8.78 ^{BC}
Bovans (Brown)	Closed	96.5	1.8	1.5	0.2	17.30	9.40
	Open	96.0	2.0	1.8	0.1	17.37	9.40
	Average	96.3	1.9	1.7	0.1	17.34 ^A	9.40 ^A
Hy-Line (Brown)	Closed	97.0	1.2	1.7	0.1	16.41	9.04
	Open	95.2	2.9	1.7	0.3	16.09	8.88
	Average	96.1	2.1	1.7	0.2	16.25 ^B	8.96 ^B
All Strains	Closed	96.7	1.6	1.5	0.2	16.72	8.93
	Open	95.6	2.4	1.9	0.1	16.42	8.81
	Average	96.1	2.0	1.7	0.1	16.58	8.88

A,B,C - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 10. EFFECT OF DENSITY ON PERFORMANCE OF BROWN EGG STRAINS,
32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Density ¹ (cm ²)	Feed Cons (kg/100 hens/d)	Feed Conver- sion (g egg/ g feed)	Eggs Per Bird Housed	Egg Produc- tion (HD%)	Egg Mass (g/HD)	Mortal- ity (%)	Age at 50% Pro- duction (Days)
ISA (Brown)	310	10.6	.46	247.5	78.2	48.6	20.0	143
	413	11.3	.46	268.4	82.6	52.5	15.6	143
Shaver (Brown 579)	310	10.4	.46	243.5	77.5	48.0	19.6	143
	413	11.4	.44	256.4	81.5	51.0	18.0	143
H & N ("Brown Nick")	310	10.5	.46	249.9	78.3	49.1	13.1	148
	413	11.2	.46	271.7	82.5	51.9	9.8	146
Bovans (Brown)	310	11.2	.44	262.1	80.0	49.5	11.4	146
	413	11.7	.45	280.3	83.7	52.6	6.8	148
Hy-Line (Brown)	310	10.6	.44	245.6	75.6	47.2	9.2	148
	413	11.3	.44	262.2	78.8	49.5	6.4	147
All Strains	310	10.7 ^B	.45	249.7 ^B	77.9 ^B	48.5 ^B	14.6	145
	413	11.4 ^A	.45	267.8 ^A	81.8 ^A	51.5 ^A	11.3	145

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 11. EFFECT OF DENSITY ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF BROWN EGG STRAINS, 32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Density ¹ (cm ²)	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
ISA (Brown)	310	61.8	0.2	3.9	12.8	31.2	51.3
	413	63.1	0.2	4.4	9.2	26.6	59.5
Shaver (Brown 579)	310	61.5	0.6	5.0	13.3	30.7	50.1
	413	62.2	0.2	5.1	10.3	29.7	54.7
H & N ("Brown Nick")	310	62.1	0.4	3.9	10.2	31.3	53.7
	413	62.3	0.1	4.6	10.2	28.2	56.7
Bovans (Brown)	310	61.3	0.3	5.3	11.8	32.6	49.7
	413	62.3	0.2	5.4	9.7	27.8	56.4
Hy-Line (Brown)	310	61.7	0.2	5.3	11.0	29.8	53.4
	413	62.1	0.3	4.7	10.2	30.2	54.4
All Strains	310	61.7 ^B	0.4	4.7	11.8 ^A	31.1 ^A	51.7 ^B
	413	62.4 ^A	0.2	4.8	9.9 ^B	28.5 ^B	56.3 ^A

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 12. EFFECT OF DENSITY ON EGG QUALITY, INCOME AND FEED COSTS OF BROWN EGG STRAINS, 32ND NCLP&MT (126-469 DAYS)

Breeder (Strain)	Density (cm ²)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
ISA (Brown)	310	96.1	2.5	1.4	0.0	15.80	8.30
	413	96.4	2.0	1.5	0.1	17.31	9.15
Shaver (Brown 579)	310	96.0	1.9	1.9	0.2	15.48	8.05
	413	96.4	1.9	1.7	0.0	16.49	8.95
H & N ("Brown Nick")	310	95.3	2.3	1.9	0.4	15.92	8.35
	413	96.5	1.7	1.7	0.1	17.50	9.21
Bovans (Brown)	310	95.6	2.5	1.7	0.2	16.66	9.05
	413	96.9	1.4	1.6	0.1	18.01	9.74
Hy-Line (Brown)	310	96.0	2.5	1.4	0.1	15.68	8.58
	413	96.2	1.7	1.9	0.2	16.83	9.34
All Strains	310	95.8 ^B	2.3 ^A	1.7	0.2	15.91 ^B	8.47 ^B
	413	96.5 ^A	1.7 ^B	1.7	0.1	17.23 ^A	9.28 ^A

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 13. EFFECT OF LAYING HOUSE ON SYNCHRONIZED MOLT OF WHITE EGG STRAINS, 32ND NCLP&MT (469-497 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Beginning Body Weight (kg)	Ending Body Weight (kg)	Weight Loss/Day (g)	Weight Loss (%)	Mortality (%)
Hy-Line (W-36)	Closed	1.97	1.44	38	27.2	1.1
	Open	1.90	1.39	37	27.1	0.3
	Average	1.94 ^{BC}	1.41 ^B	38	27.2	0.7
Hy-Line (W-77)	Closed	2.13	1.51	44	29.1	2.0
	Open	2.14	1.67	33	21.6	3.4
	Average	2.13 ^A	1.59 ^A	39	25.3	2.7
Bovans (White)	Closed	1.94	1.35	42	30.6	2.1
	Open	1.89	1.38	37	27.3	2.4
	Average	1.92 ^{BC}	1.36 ^B	40	29.0	2.2
H & N ("Nick Chick")	Closed	2.04	1.41	45	30.8	3.1
	Open	2.01	1.39	45	31.1	4.3
	Average	2.02 ^{AB}	1.40 ^B	45	31.0	3.7
Shaver (White)	Closed	2.01	1.38	45	31.3	1.6
	Open	1.95	1.37	42	29.9	3.3
	Average	1.98 ^{BC}	1.38 ^B	43	30.6	2.5
Shaver (2000)	Closed	2.07	1.42	47	31.7	4.1
	Open	1.96	1.38	52	29.7	3.4
	Average	2.02 ^{ABC}	1.40 ^B	49	30.7	3.7
ISA/Babcock (B300)	Closed	1.81	1.27	39	30.0	3.8
	Open	2.00	1.42	41	28.9	4.3
	Average	1.90 ^{BCD}	1.34 ^{BC}	40	29.4	4.1
ISA (Experiment)	Closed	1.73	1.15	42	33.4	3.9
	Open	1.85	1.28	50	30.5	1.4
	Average	1.79 ^D	1.21 ^C	46	31.9	2.7
Bovans (Experiment)	Closed	1.91	1.31	42	31.1	3.9
	Open	1.89	1.31	41	30.6	1.5
	Average	1.90 ^{CD}	1.31 ^{BC}	42	30.9	2.7
All Strains	Closed	1.96	1.36	43	30.6	2.8
	Open	1.95	1.40	42	28.5	2.7
	Average	1.96	1.38	42	29.6	2.8

A,B,C,D - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 14. EFFECT OF DENSITY ON SYNCHRONIZED MOLT OF WHITE EGG STRAINS,
32ND NCLP&MT (469-497 DAYS), FORCE MOLTED

Breeder (Strain)	Density (cm ²)	Beginning Body Wt. (kg)	Ending Body Wt. (kg)	Weight Loss/day (g)	Weight Loss (%)	Mortality (%)
Hy-Line (W-36)	310	1.88	1.38	36	26.9	0.6
	413	1.99	1.45	39	27.4	0.8
Hy-Line (W-77)	310	2.09	1.51	42	28.0	4.1
	413	2.18	1.68	36	22.7	1.4
Bovans (White)	310	1.85	1.29	40	30.4	3.1
	413	1.98	1.44	39	27.5	1.4
H & N ("Nick Chick")	310	2.04	1.39	46	31.9	4.4
	413	2.01	1.41	43	30.0	2.9
Shaver (White)	310	1.98	1.39	42	29.8	3.5
	413	1.99	1.36	44	31.4	1.4
Shaver (2000)	310	2.00	1.36	45	31.9	3.1
	413	2.04	1.44	53	29.6	4.4
ISA/Babcock (B300)	310	1.87	1.30	40	30.1	5.1
	413	1.94	1.38	40	28.7	3.0
ISA (Experiment)	310	1.86	1.21	56	35.0	3.4
	413	1.72	1.22	36	28.9	1.9
Bovans (Experiment)	310	1.88	1.31	41	30.5	3.3
	413	1.91	1.32	43	31.2	2.1
All Strains	310	1.94	1.35	43	30.5	3.4 ^A
	413	1.97	1.41	41	28.6	2.1 ^B

A,B - Different letters denote significant differences between densities (P<.01).

TABLE 15. EFFECT OF LAYING HOUSE ON SYNCHRONIZED MOLT OF BROWN EGG STRAINS, 32ND NCLP&MT (469-497 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Beginning Body Weight (kg)	Ending Body Weight (kg)	Weight Loss/Day (g)	Weight Loss (%)	Mortality (%)
ISA (Brown)	Closed	2.18	1.55	45	29.2	4.8
	Open	2.17	1.61	40	25.9	9.8
	Average	2.18	1.58	43	27.5	7.3 ^A
Shaver (Brown 579)	Closed	2.24	1.58	47	29.3	4.1
	Open	2.15	1.63	38	24.3	5.9
	Average	2.20	1.60	42	26.8	5.0 ^{AB}
H & N ("Brown Nick")	Closed	2.32	1.74	42	25.1	4.7
	Open	2.40	1.71	57	28.9	4.1
	Average	2.36	1.72	49	27.0	4.4 ^B
Bovans (Brown)	Closed	2.36	1.73	45	26.9	2.6
	Open	2.29	1.62	48	29.2	3.9
	Average	2.32	1.67	47	28.0	3.3 ^B
Hy-Line (Brown)	Closed	2.31	1.62	49	30.0	2.5
	Open	2.46	1.78	63	27.3	2.8
	Average	2.38	1.70	56	28.6	2.7 ^B
All Strains	Closed	2.28	1.64	46	28.1	3.7
	Open	2.29	1.67	49	27.1	5.3
	Average	2.29	1.66	47	27.6	4.5

A,B - Different letters denote significant differences ($P < .01$), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 16. EFFECT OF DENSITY ON SYNCHRONIZED MOLT OF BROWN EGG STRAINS,
32ND NCLP&MT (469-497 DAYS), FORCE MOLTED

Breeder (Strain)	Density (cm ²)	Beginning Body Wt. (kg)	Ending Body Wt. (kg)	Weight Loss/day (g)	Weight Loss (%)	Mortality (%)
ISA (Brown)	310	2.11	1.55	40	26.6	6.7
	413	2.24	1.60	46	28.5	7.8
Shaver (Brown 579)	310	2.23	1.58	47	29.3	5.3
	413	2.16	1.63	38	24.3	4.6
H & N ("Brown Nick")	310	2.34	1.71	45	26.9	5.7
	413	2.38	1.74	54	27.1	3.2
Bovans (Brown)	310	2.28	1.61	48	29.4	4.3
	413	2.36	1.73	45	26.7	2.2
Hy-Line (Brown)	310	2.37	1.57	72	33.4	4.6
	413	2.40	1.83	41	23.8	0.7
All Strains	310	2.27	1.60 ^B	50	29.1	5.3
	413	2.31	1.71 ^A	45	26.1	3.7

A,B - Different letters denote significant differences (P<.01).

TABLE 17. EFFECT OF LAYING HOUSE ON SYNCHRONIZED MOLT OF WHITE EGG STRAINS, 32ND NCLP&MT (469-497 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Beginning Body Weight (kg)	Ending Body Weight (kg)	Weight Loss/Day (g)	Weight Loss (%)	Mortality (%)
Hy-Line (W-36)	Closed	1.88	1.46	59	22.2	0.0
	Open	1.91	1.53	53	19.5	0.9
	Average	1.89 ^{BC}	1.50 ^{BC}	56	20.9	0.4 ^B
Hy-Line (W-77)	Closed	2.16	1.68	68	22.0	4.8
	Open	2.19	1.69	72	23.1	2.1
	Average	2.17 ^A	1.69 ^A	70	22.5	3.4 ^{AB}
Bovans (White)	Closed	1.95	1.51	63	22.7	0.0
	Open	1.90	1.51	57	20.8	0.0
	Average	1.93 ^{BC}	1.51 ^{BC}	60	21.7	0.0 ^B
H & N ("Nick Chick")	Closed	2.02	1.51	73	25.3	1.2
	Open	2.01	1.53	69	23.8	2.4
	Average	2.02 ^{ABC}	1.52 ^{BC}	71	24.6	1.8 ^B
Shaver (White)	Closed	2.02	1.56	65	22.7	3.3
	Open	1.93	1.48	65	23.3	1.8
	Average	1.97 ^{ABC}	1.52 ^{BC}	65	23.0	2.5 ^B
Shaver (2000)	Closed	2.07	1.56	72	24.3	2.1
	Open	2.07	1.52	77	26.2	3.6
	Average	2.07 ^{AB}	1.54 ^B	74	25.2	2.8 ^{AB}
ISA/Babcock (B300)	Closed	1.98	1.54	64	22.5	4.2
	Open	1.89	1.45	62	22.9	9.5
	Average	1.93 ^{BC}	1.50 ^{BC}	63	22.7	6.8 ^A
ISA (Experiment)	Closed	1.73	1.31	59	23.9	2.1
	Open	2.04	1.36	97	31.6	4.5
	Average	1.88 ^{BC}	1.34 ^D	78	27.8	3.3 ^{AB}
Bovans (Experiment)	Closed	1.89	1.41	68	25.5	3.9
	Open	1.77	1.37	57	22.2	2.4
	Average	1.83 ^C	1.39 ^{CD}	63	23.9	3.1 ^{AB}
All Strains	Closed	1.97	1.50	66	23.5	2.4
	Open	1.97	1.49	68	23.7	3.0
	Average	1.97	1.50	67	23.6	2.7

A,B,C,D - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 18. EFFECT OF DENSITY ON SYNCHRONIZED MOLT OF WHITE EGG STRAINS,
32ND NCLP&MT (469-497 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density (cm ²)	Beginning Body Wt. (kg)	Ending Body Wt. (kg)	Weight Loss/day (g)	Weight Loss (%)	Mortality (%)
Hy-Line (W-36)	310	1.85	1.42	62	23.3	0.9
	413	1.93	1.58	51	18.4	0.0
Hy-Line (W-77)	310	2.13	1.63	72	23.7	4.5
	413	2.21	1.74	68	21.4	2.4
Bovans (White)	310	1.95	1.51	62	22.4	0.0
	413	1.91	1.50	58	21.1	0.0
H & N ("Nick Chick")	310	2.01	1.49	75	26.0	0.0
	413	2.02	1.55	67	23.1	3.6
Shaver (White)	310	1.90	1.46	63	23.0	2.7
	413	2.05	1.58	67	23.0	2.4
Shaver (2000)	310	2.01	1.51	72	24.9	0.9
	413	2.12	1.58	77	25.5	4.8
ISA/Babcock (B300)	310	1.98	1.53	65	23.0	8.9
	413	1.89	1.47	60	22.4	4.8
ISA (Experiment)	310	2.00	1.33	96	31.5	1.8
	413	1.77	1.34	61	24.0	4.8
Bovans (Experiment)	310	1.83	1.35	68	26.1	2.7
	413	1.83	1.43	57	21.6	3.6
All Strains	310	1.96	1.47	70	24.9	2.5
	413	1.97	1.53	63	22.3	2.9

*There are no significant differences among these means.

TABLE 19. EFFECT OF LAYING HOUSE ON SYNCHRONIZED MOLT OF BROWN EGG STRAINS, 32ND NCLP&MT (469-497 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Beginning Body Weight (kg)	Ending Body Weight (kg)	Weight Loss/Day (g)	Weight Loss (%)	Mortality (%)
ISA (Brown)	Closed	2.21	1.73	68	21.5	10.7
	Open	2.24	1.76	70	21.7	3.9
	Average	2.23	1.75	69	21.6	7.3
Shaver (Brown 579)	Closed	2.27	1.78	70	21.5	3.3
	Open	2.34	1.71	89	25.8	6.0
	Average	2.30	1.75	80	23.7	4.6
H & N ("Brown Nick")	Closed	2.39	1.91	69	20.1	1.8
	Open	2.35	1.83	74	22.1	6.3
	Average	2.37	1.87	71	21.1	4.0
Bovans (Brown)	Closed	2.32	1.80	75	22.5	0.0
	Open	2.29	1.72	82	24.9	1.8
	Average	2.31	1.76	78	23.7	0.9
Hy-Line (Brown)	Closed	2.44	1.96	69	19.8	0.0
	Open	2.30	1.81	70	21.3	1.8
	Average	2.37	1.88	69	20.5	0.9
All Strains	Closed	2.33	1.84	70	21.1	3.2
	Open	2.30	1.77	77	23.2	4.0
	Average	2.32	1.80	73	22.1	3.5

*There are no significant differences among these means.

TABLE 20. EFFECT OF DENSITY ON SYNCHRONIZED MOLT OF BROWN EGG STRAINS,
32ND NCLP&MT (469-497 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density (cm ²)	Beginning Body Wt. (kg)	Ending Body Wt. (kg)	Weight Loss/day (g)	Weight Loss (%)	Mortality (%)
ISA (Brown)	310	2.23	1.72	74	23.1	6.2
	413	2.22	1.77	64	20.1	8.3
Shaver (Brown 579)	310	2.38	1.73	93	26.6	4.5
	413	2.23	1.77	66	20.8	4.8
H & N ("Brown Nick")	310	2.36	1.85	74	21.8	4.5
	413	2.37	1.89	69	20.4	3.6
Bovans (Brown)	310	2.28	1.71	81	24.8	1.8
	413	2.33	1.81	75	22.5	0.0
Hy-Line (Brown)	310	2.30	1.77	75	22.9	1.8
	413	2.43	1.99	63	18.1	0.0
All Strains	310	2.31	1.76 ^B	79	23.9	3.7
	413	2.32	1.84 ^A	68	20.4	3.3

A,B - Different letters denote significant differences (P<.01).

TABLE 21. EFFECT OF LAYING HOUSE ON PERFORMANCE OF WHITE EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Feed Cons (kg/100 hens/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)
Hy-Line (W-36)	Closed	10.3	.48	165.3	73.8	49.2	7.7
	Open	10.7	.43	173.4	75.3	44.9	6.0
	Average	10.5 ^D	.45 ^A	169.3	74.6 ^{AB}	47.0 ^{ABCD}	6.8 ^C
Hy-Line (W-77)	Closed	11.4	.42	152.6	70.2	47.8	10.3
	Open	12.1	.37	152.3	71.6	43.4	9.7
	Average	11.7 ^{AB}	.40 ^C	152.4	70.9 ^B	45.6 ^{BCDE}	10.0 ^{ABC}
Bovans (White)	Closed	11.1	.43	152.4	72.1	48.1	14.3
	Open	11.0	.41	151.9	73.1	43.6	8.0
	Average	11.0 ^{BCD}	.42 ^{BC}	152.2	72.6 ^{AB}	45.8 ^{BCDE}	11.2 ^{ABC}
H & N ("Nick Chick")	Closed	11.6	.46	146.4	78.3	53.4	13.7
	Open	11.8	.39	143.3	74.8	45.6	9.5
	Average	11.7 ^{AB}	.43 ^{AB}	144.9	76.6 ^A	49.5 ^A	11.6 ^{ABC}
Shaver (White)	Closed	10.5	.43	153.6	68.9	45.5	7.3
	Open	11.1	.40	151.6	73.6	43.3	7.9
	Average	10.8 ^{CD}	.42 ^{BC}	152.6	71.2 ^B	44.4 ^{DE}	7.6 ^{BC}
Shaver (2000)	Closed	12.2	.42	134.7	72.4	50.2	7.5
	Open	12.0	.38	127.7	73.1	45.0	10.9
	Average	12.1 ^A	.40 ^{BC}	131.2	72.8 ^{AB}	47.6 ^{AB}	9.2 ^{ABC}
ISA/Babcock (B300)	Closed	10.7	.45	137.3	71.5	47.7	10.9
	Open	11.0	.39	128.6	71.0	41.7	14.5
	Average	10.8 ^{CD}	.42 ^{BC}	133.0	71.2 ^B	44.7 ^{CDE}	12.7 ^A
ISA (Experiment)	Closed	10.7	.47	147.8	74.2	50.4	13.9
	Open	10.7	.42	140.5	73.2	43.9	12.7
	Average	10.7 ^{CD}	.45 ^A	144.2	73.7 ^{AB}	47.1 ^{ABC}	13.3 ^A
Bovans (Experiment)	Closed	11.5	.41	139.6	71.2	46.8	13.3
	Open	11.1	.38	146.1	70.4	40.8	11.0
	Average	11.3 ^{BC}	.39 ^C	142.9	70.8 ^B	43.8 ^E	12.2 ^{AB}
All Strains	Closed	11.1	.44	147.8	72.5	48.8	11.0
	Open	11.3	.40	146.2	72.9	43.6	10.0
	Average	11.2	.42	147.0	72.7	46.2	10.5

A,B,C,D,E - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 22. EFFECT OF LAYING HOUSE ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF WHITE EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
Hy-Line (W-36)	Closed	66.7	0.0	0.0	0.7	17.9	81.1
	Open	60.4	0.0	0.0	1.1	14.1	84.5
	Average	63.6 ^{CDE}	0.0	0.0	0.9 ^{AB}	16.0 ^{ABC}	82.8 ^{CDE}
Hy-Line (W-77)	Closed	68.1	0.0	0.0	0.1	10.4	89.4
	Open	61.8	0.1	0.0	0.2	8.7	90.9
	Average	64.9 ^B	0.0	0.0	0.2 ^B	9.5 ^{DE}	90.2 ^A
Bovans (White)	Closed	66.7	0.0	0.1	1.1	15.0	83.1
	Open	60.7	0.0	0.0	0.9	14.4	84.4
	Average	63.7 ^{CD}	0.0	0.0	1.0 ^{AB}	14.7 ^{BCD}	83.7 ^{BCD}
H & N ("Nick Chick")	Closed	68.2	0.0	0.0	1.3	10.9	87.5
	Open	61.8	0.0	0.2	0.2	9.3	90.0
	Average	65.0 ^B	0.0	0.1	0.7 ^{AB}	10.1 ^{DE}	88.7 ^{AB}
Shaver (White)	Closed	66.1	0.1	0.1	1.7	21.0	76.9
	Open	60.1	0.0	0.0	0.5	15.6	83.4
	Average	63.1 ^{DE}	0.0	0.0	1.1 ^A	18.3 ^{ABC}	80.1 ^{CDE}
Shaver (2000)	Closed	69.3	0.0	0.0	0.1	9.9	89.6
	Open	62.8	0.0	0.0	0.2	8.5	91.1
	Average	66.0 ^A	0.0	0.0	0.2 ^B	9.2 ^E	90.4 ^A
ISA/Babcock (B300)	Closed	66.3	0.0	0.1	1.5	19.1	78.9
	Open	59.8	0.0	0.0	0.9	20.0	78.5
	Average	63.0 ^{DE}	0.0	0.0	1.2 ^A	19.6 ^{AB}	78.7 ^{DE}
ISA (Experiment)	Closed	68.0	0.0	0.0	0.3	13.0	86.5
	Open	61.0	0.0	0.1	0.9	14.2	84.6
	Average	64.5 ^{BC}	0.0	0.1	0.6 ^{AB}	13.6 ^{CDE}	85.5 ^{ABC}
Bovans (Experiment)	Closed	65.8	0.1	0.0	0.8	20.3	77.8
	Open	59.6	0.0	0.0	1.6	19.9	77.9
	Average	62.7 ^B	0.0	0.0	1.2 ^A	20.1 ^A	77.8 ^E
All Strains	Closed	67.2	0.0	0.0	0.8	15.3	83.4
	Open	60.9	0.0	0.0	0.7	13.9	85.0
	Average	64.1	0.0	0.0	0.8	14.6	84.2

A,B,C,D,E - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 23. EFFECT OF LAYING HOUSE ON EGG QUALITY, INCOME AND FEED COSTS OF WHITE EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
Hy-Line (W-36)	Closed	96.9	0.7	2.0	0.4	10.94	5.10
	Open	97.0	0.5	2.0	0.5	11.49	5.48
	Average	97.0 ^A	0.6	2.0	0.4	11.21	5.29 ^{AB}
Hy-Line (W-77)	Closed	96.3	0.9	1.9	0.9	10.06	5.51
	Open	96.2	0.5	2.9	0.4	10.07	5.70
	Average	96.3 ^{AB}	0.7	2.4	0.7	10.07	5.60 ^A
Bovans (White)	Closed	97.2	0.6	2.1	0.1	10.08	5.24
	Open	96.1	0.4	3.4	0.0	10.04	5.04
	Average	96.7 ^A	0.5	2.8	0.1	10.06	5.14 ^{BC}
H & N ("Nick Chick")	Closed	97.2	1.0	1.6	0.2	9.70	4.76
	Open	96.3	0.8	2.7	0.2	9.47	5.00
	Average	96.8 ^A	0.9	2.2	0.2	9.58	4.88 ^{BCD}
Shaver (White)	Closed	96.5	0.9	2.4	0.3	10.13	5.13
	Open	95.4	1.1	3.3	0.3	9.95	5.06
	Average	96.0 ^{AB}	1.0	2.8	0.3	10.04	5.10 ^{BC}
Shaver (2000)	Closed	95.7	1.5	2.5	0.4	8.84	5.01
	Open	95.3	0.7	3.9	0.2	8.41	4.61
	Average	95.5 ^{AB}	1.1	3.2	0.3	8.63	4.81 ^{CD}
ISA/Babcock (B300)	Closed	96.0	1.1	2.6	0.4	9.03	4.54
	Open	95.2	1.3	3.0	0.5	8.41	4.35
	Average	95.6 ^{AB}	1.2	2.8	0.4	8.72	4.44 ^D
ISA (Experiment)	Closed	95.9	1.0	2.8	0.3	9.75	4.68
	Open	96.1	0.6	3.2	0.2	9.28	4.50
	Average	96.0 ^{AB}	0.8	3.0	0.3	9.52	4.59 ^D
Bovans (Experiment)	Closed	95.0	1.8	2.7	0.5	9.07	4.99
	Open	94.6	1.0	4.0	0.5	9.52	5.10
	Average	94.8 ^B	1.4	3.4	0.5	9.29	5.05 ^{BC}
All Strains	Closed	96.3	1.1	2.3	0.4	9.73	5.00
	Open	95.8	0.8	3.2	0.3	9.63	4.98
	Average	96.1	0.9	2.7	0.4	9.68	4.99

A,B,C,D - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 24. EFFECT OF DENSITY ON PERFORMANCE OF WHITE EGG STRAINS,
32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Feed Cons (kg/100 hens/d)	Feed Conver- sion (g egg/ g feed)	Eggs Per Bird Housed	Egg Produc- tion (HD%)	Egg Mass (g/HD)	Mortal- ity (%)
Hy-Line (W-36)	310	10.2	.46	170.0 ^U	74.7	46.5	7.4
	413	10.8	.44	168.7 ^U	74.4	47.6	6.2
Hy-Line (W-77)	310	11.3	.40	145.3 ^{VWXYZ}	69.9	44.8	11.1
	413	12.2	.39	159.6 ^{UVW}	71.9	46.3	9.0
Bovans (White)	310	10.9	.42	142.7 ^{WXYZ}	72.4	45.7	14.2
	413	11.2	.42	161.6 ^{UV}	72.7	46.0	8.1
H & N ("Nick Chick")	310	11.8	.42	136.2 ^{YZ}	76.4	49.2	11.1
	413	11.6	.43	153.5 ^{UVWXY}	76.7	49.7	12.1
Shaver (White)	310	10.8	.40	133.9 ^Z	68.8	43.1	9.0
	413	10.8	.43	171.2 ^U	73.7	45.7	6.2
Shaver (2000)	310	11.6	.41	130.8 ^Z	70.6	46.4	8.7
	413	12.6	.39	131.6 ^Z	75.0	48.8	9.7
ISA/Babcock (B300)	310	10.6	.43	127.8 ^Z	71.2	44.8	11.8
	413	11.0	.41	138.1 ^{XYZ}	71.3	44.7	13.6
ISA (Experiment)	310	10.5	.44	131.8 ^Z	71.5	45.7	14.0
	413	10.8	.45	156.6 ^{UVW}	76.0	48.6	12.5
Bovans (Experiment)	310	10.9	.40	131.3 ^Z	68.8	42.4	14.6
	413	11.7	.39	154.5 ^{UVWX}	72.8	45.2	9.7
All Strains	310	11.0 ^B	.42	138.9	71.6 ^B	45.4 ^B	11.3
	413	11.4 ^A	.42	155.0	73.8 ^A	47.0 ^A	9.7

A,B - Different letters denote significant differences (P<.01).

U,V,W,X,Y,Z - Different letters denote significant differences (P<.01) among the strain by density averages.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 25. EFFECT OF DENSITY ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF WHITE EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
Hy-Line (W-36)	310	62.8	0.0	0.0	1.3	19.5	78.9
	413	64.3	0.0	0.0	0.5	12.5	86.8
Hy-Line (W-77)	310	64.8	0.0	0.0	0.2	10.9	88.8
	413	65.1	0.1	0.0	0.1	8.1	91.5
Bovans (White)	310	65.3	0.0	0.1	1.2	15.9	82.4
	413	64.0	0.0	0.0	0.8	13.5	85.1
H & N ("Nick Chick")	310	64.8	0.0	0.2	0.4	10.4	88.8
	413	65.2	0.0	0.0	1.1	9.7	88.7
Shaver (White)	310	63.5	0.0	0.0	0.7	17.8	81.0
	413	62.7	0.1	0.1	1.5	18.8	79.3
Shaver (2000)	310	66.4	0.0	0.0	0.2	8.8	90.6
	413	65.6	0.0	0.0	0.1	9.6	90.1
ISA/Babcock (B300)	310	63.1	0.0	0.0	1.4	19.6	78.3
	413	63.0	0.0	0.1	1.0	19.5	79.1
ISA (Experiment)	310	64.5	0.0	0.1	0.6	12.8	86.3
	413	64.4	0.0	0.0	0.6	14.4	84.8
Bovans (Experiment)	310	62.4	0.0	0.0	0.8	21.6	76.5
	413	62.9	0.1	0.0	1.6	18.5	79.1
All Strains	310	64.0	0.0	0.0	0.8	15.3	83.5
	413	64.1	0.0	0.0	0.8	13.9	84.9

*There are no significant differences among these means.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 26. EFFECT OF DENSITY ON EGG QUALITY, INCOME AND FEED COSTS OF WHITE EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
Hy-Line (W-36)	310	96.0	0.8	2.6	0.5	11.18 ^{UV}	5.17
	413	97.9	0.3	1.4	0.4	11.25 ^U	5.42
Hy-Line (W-77)	310	96.0	0.7	2.8	0.5	9.60 ^{WXY}	5.21
	413	96.6	0.7	2.0	0.8	10.53 ^{UVW}	6.00
Bovans (White)	310	97.3	0.4	2.3	0.0	9.47 ^{WXYZ}	4.77
	413	96.1	0.6	3.2	0.1	10.65 ^{UVW}	5.51
H & N ("Nick Chick")	310	96.7	0.9	2.3	0.1	9.03 ^{XYZ}	4.63
	413	96.8	0.9	2.0	0.2	10.13 ^{UVWX}	5.13
Shaver (White)	310	95.7	1.0	3.1	0.2	8.79 ^{YZ}	4.65
	413	96.2	0.9	2.5	0.3	11.28 ^U	5.54
Shaver (2000)	310	94.6	1.2	4.0	0.3	8.55 ^{YZ}	4.74
	413	96.4	1.0	2.5	0.2	8.70 ^{YZ}	4.88
ISA/Babcock (B300)	310	95.4	1.1	3.1	0.4	8.36 ^Z	4.19
	413	95.7	1.4	2.5	0.4	9.08 ^{XYZ}	4.69
ISA (Experiment)	310	95.6	0.8	3.3	0.3	8.68 ^{YZ}	4.26
	413	96.3	0.9	2.6	0.2	10.36 ^{UVW}	4.92
Bovans (Experiment)	310	94.7	1.2	3.7	0.4	8.53 ^{YZ}	4.60
	413	94.9	1.6	3.0	0.5	10.06 ^{VWX}	5.49
All Strains	310	95.8	0.9	3.0	0.3	9.13	4.69 ^B
	413	96.3	0.9	2.4	0.4	10.23	5.29 ^A

A,B - Different letters denote significant differences (P<.01).

U,V,W,X,Y,Z - Different letters denote significant differences (P<.01) among the strain by density averages.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 27. EFFECT OF LAYING HOUSE ON PERFORMANCE OF BROWN EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Feed Cons (kg/100 hens/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)
ISA (Brown)	Closed	11.9	.39	123.0	66.2	45.5	13.9
	Open	11.9	.34	102.1	64.8	39.7	20.6
	Average	11.9	.36	112.5 ^B	65.5	42.6	17.2
Shaver (Brown 579)	Closed	12.2	.36	118.2	63.0	43.8	13.3
	Open	11.9	.35	110.4	67.0	40.2	10.3
	Average	12.0	.36	114.3 ^B	65.0	42.0	11.8
H & N ("Brown Nick")	Closed	11.9	.41	137.8	68.3	47.9	9.6
	Open	12.6	.34	130.8	68.7	42.2	18.1
	Average	12.3	.38	134.3 ^A	68.5	45.1	13.9
Bovans (Brown)	Closed	12.7	.38	142.6	68.6	47.5	9.6
	Open	12.3	.35	144.9	67.7	41.3	10.8
	Average	12.5	.36	143.7 ^A	68.1	44.4	10.2
Hy-Line (Brown)	Closed	12.0	.37	134.4	62.6	43.6	10.3
	Open	11.8	.34	138.3	65.0	39.5	10.7
	Average	11.9	.35	136.4 ^A	63.8	41.5	10.5
All Strains	Closed	12.1	.38	131.2	65.7	45.7	11.3
	Open	12.1	.34	125.3	66.6	40.6	14.1
	Average	12.1	.36	128.2	66.2	43.1	12.7

A,B - Different letters denote significant differences ($P < .01$), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 28. EFFECT OF LAYING HOUSE ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF BROWN EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
ISA (Brown)	Closed	68.8	0.0	0.0	1.0	11.8	86.9
	Open	63.1	0.0	0.0	0.4	9.9	89.4
	Average	65.9	0.0	0.0	0.7	10.9	88.2
Shaver (Brown 579)	Closed	69.5	0.1	0.1	0.6	12.7	86.0
	Open	61.5	0.1	0.1	1.2	15.6	83.0
	Average	65.5	0.1	0.1	0.9	14.1	84.5
H & N ("Brown Nick")	Closed	70.2	0.0	0.0	0.3	8.1	91.1
	Open	63.1	0.0	0.0	0.3	8.9	90.5
	Average	66.7	0.0	0.0	0.3	8.5	90.8
Bovans (Brown)	Closed	69.2	0.0	0.0	0.7	11.1	87.8
	Open	62.6	0.0	0.0	0.6	11.9	87.1
	Average	65.9	0.0	0.0	0.7	11.5	87.5
Hy-Line (Brown)	Closed	69.7	0.0	0.0	0.9	10.1	88.8
	Open	62.2	0.0	0.1	0.8	11.2	87.5
	Average	66.0	0.0	0.0	0.8	10.6	88.1
All Strains	Closed	69.5	0.0	0.0	0.7	10.8	88.1
	Open	62.5	0.0	0.0	0.7	11.5	87.5
	Average	66.0	0.0	0.0	0.7	11.1	87.8

*There are no significant differences among these means.

TABLE 29. EFFECT OF LAYING HOUSE ON EGG QUALITY, INCOME AND FEED COSTS OF BROWN EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
ISA (Brown)	Closed	96.0	1.5	1.6	0.0	8.06	4.82
	Open	95.4	1.1	3.5	0.0	6.72	3.99
	Average	95.7	1.3	2.6	0.0	7.39 ^B	4.40 ^B
Shaver (Brown 579)	Closed	96.2	2.4	1.4	0.0	7.77	5.02
	Open	95.3	1.4	3.0	0.2	7.26	4.19
	Average	95.8	1.9	2.2	0.1	7.51 ^B	4.60 ^B
H & N ("Brown Nick")	Closed	96.5	1.7	1.9	0.0	9.10	5.23
	Open	95.3	1.5	2.9	0.3	8.58	5.21
	Average	95.9	1.6	2.4	0.1	8.84 ^A	5.22 ^A
Bovans (Brown)	Closed	97.1	1.3	1.5	0.2	9.45	5.76
	Open	95.7	1.2	3.2	0.0	9.55	5.73
	Average	96.4	1.3	2.3	0.1	9.50 ^A	5.75 ^A
Hy-Line (Brown)	Closed	96.2	1.7	2.0	0.1	8.86	5.65
	Open	95.5	1.2	3.3	0.1	9.09	5.50
	Average	95.8	1.4	2.7	0.1	8.98 ^A	5.57 ^A
All Strains	Closed	96.4	1.7	1.7	0.1	8.65	5.30
	Open	95.4	1.3	3.2	0.1	8.24	4.92
	Average	95.9	1.5	2.4	0.1	8.44	5.11

A,B - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 30. EFFECT OF DENSITY ON PERFORMANCE OF BROWN EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Feed Cons (kg/100 hens/d)	Feed Conver- sion (g egg/ g feed)	Eggs Per Bird Housed	Egg Produc- tion (HD%)	Egg Mass (g/HD)	Mortal- ity (%)
ISA (Brown)	310	11.6 ^{CD}	.37	111.9	65.4	42.2	14.8
	413	12.2 ^{ABCD}	.36	113.1	65.6	43.0	19.7
Shaver (Brown 579)	310	11.1 ^D	.38	112.6	65.1	41.7	9.5
	413	13.0 ^A	.33	116.0	64.9	42.3	14.0
H & N ("Brown Nick")	310	11.7 ^{BCD}	.39	130.0	68.0	44.7	11.1
	413	12.8 ^{AB}	.36	138.6	69.0	45.5	16.7
Bovans (Brown)	310	12.7 ^{ABC}	.35	133.0	67.9	43.7	10.8
	413	12.3 ^{ABCD}	.37	154.5	68.3	45.1	9.7
Hy-Line (Brown)	310	11.8 ^{ABCD}	.36	132.7	63.1	41.4	7.9
	413	12.0 ^{ABCD}	.35	140.1	64.5	41.7	13.2
All Strains	310	11.8	.37	124.0	65.9	42.7	10.8 ^B
	413	12.5	.36	132.4	66.5	43.5	14.6 ^A

A,B,C,D - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 31. EFFECT OF DENSITY ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF BROWN EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
ISA (Brown)	310	65.5	0.0	0.0	1.0	12.2	86.6
	413	66.4	0.0	0.0	0.4	9.5	89.7
Shaver (Brown 579)	310	64.9	0.0	0.1	0.9	17.2	81.8
	413	66.1	0.2	0.1	1.0	11.0	87.2
H & N ("Brown Nick")	310	66.6	0.0	0.0	0.4	7.6	91.4
	413	66.7	0.0	0.0	0.1	9.4	90.2
Bovans (Brown)	310	65.1	0.0	0.0	0.5	12.3	86.8
	413	66.8	0.0	0.0	0.9	10.7	88.2
Hy-Line (Brown)	310	66.2	0.0	0.0	0.5	9.9	89.3
	413	65.8	0.0	0.1	1.2	11.4	87.0
All Strains	310	65.6	0.0	0.0	0.7	11.8	87.2
	413	66.4	0.0	0.0	0.7	10.4	88.5

*There are no significant differences among these means.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 32. EFFECT OF DENSITY ON EGG QUALITY, INCOME AND FEED COSTS OF BROWN EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density (cm ²)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
ISA (Brown)	310	95.7	1.0	2.4	0.0	7.33	4.28
	413	95.7	1.5	2.8	0.0	7.45	4.53
Shaver (Brown 579)	310	96.2	1.5	2.2	0.1	7.44	4.20
	413	95.4	2.2	2.3	0.1	7.59	5.01
H & N ("Brown Nick")	310	95.4	1.4	3.0	0.2	8.52	4.88
	413	96.3	1.8	1.8	0.1	9.16	5.56
Bovans (Brown)	310	95.9	1.2	2.7	0.2	8.75	5.46
	413	96.8	1.3	1.9	0.0	10.24	6.03
Hy-Line (Brown)	310	95.8	1.1	3.1	0.0	8.76	5.46
	413	95.8	1.7	2.2	0.2	9.19	5.69
All Strains	310	95.8	1.2	2.7	0.1	8.16	4.85 ^B
	413	96.0	1.7	2.2	0.1	8.73	5.36 ^A

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 33. EFFECT OF LAYING HOUSE ON PERFORMANCE OF WHITE EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Feed Cons (kg/100 hens/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)
Hy-Line (W-36)	Closed	10.9	.47	163.5	75.8	51.6	10.7
	Open	11.0	.44	172.7	77.7	46.5	6.3
	Average	10.9 ^{BC}	.45	168.1	76.7	49.1	8.5
Hy-Line (W-77)	Closed	11.6	.43	156.1	73.7	50.0	6.0
	Open	12.5	.34	147.4	67.7	41.4	11.3
	Average	12.1 ^{AB}	.38	151.7	70.7	45.7	8.6
Bovans (White)	Closed	10.8	.41	143.8	66.0	44.1	7.7
	Open	10.9	.41	163.9	73.7	43.5	13.4
	Average	10.9 ^C	.41	153.9	69.8	43.8	10.6
H & N ("Nick Chick")	Closed	12.7	.43	150.6	78.2	54.3	10.7
	Open	11.8	.40	143.2	75.7	45.6	13.1
	Average	12.2 ^A	.41	146.9	76.9	50.0	11.9
Shaver (White)	Closed	11.3	.46	162.0	76.7	50.9	6.8
	Open	11.6	.40	164.9	76.6	45.5	8.3
	Average	11.4 ^{ABC}	.43	163.4	76.7	48.2	7.6
Shaver (2000)	Closed	12.4	.43	146.6	77.6	53.5	7.4
	Open	12.2	.38	133.1	73.6	45.3	8.9
	Average	12.3 ^A	.40	139.8	75.6	49.4	8.2
ISA/Babcock (B300)	Closed	12.4	.42	153.0	76.4	51.9	10.7
	Open	12.3	.35	117.0	70.6	42.2	13.7
	Average	12.3 ^A	.38	135.0	73.5	47.0	12.2
ISA (Experiment)	Closed	10.7	.48	144.8	74.7	50.9	6.2
	Open	10.7	.44	150.1	76.1	46.8	10.7
	Average	10.7 ^C	.46	147.4	75.4	48.8	8.5
Bovans (Experiment)	Closed	11.3	.43	163.2	74.5	49.0	6.0
	Open	11.4	.41	146.5	77.4	45.4	13.1
	Average	11.3 ^{ABC}	.42	154.8	75.9	47.2	9.5
All Strains	Closed	11.6	.44	153.7	74.8	50.7	8.0
	Open	11.6	.40	148.8	74.3	44.7	11.0
	Average	11.6	.42	151.2	74.6	47.7	9.5

A,B,C, - Different letters denote significant differences ($P < .01$), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 34. EFFECT OF LAYING HOUSE ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF WHITE EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
Hy-Line (W-36)	Closed	68.1	0.0	0.2	0.3 ^{YZ}	9.2	89.9
	Open	60.8	0.0	0.0	0.2 ^{YZ}	12.5	87.2
	Average	64.5 ^{ABC}	0.0	0.1	0.3	10.8 ^{BC}	88.6 ^{ABC}
Hy-Line (W-77)	Closed	67.8	0.0	0.0	1.4 ^X	12.2	86.2
	Open	62.2	0.0	0.2	0.0 ^Z	10.3	89.3
	Average	65.0 ^{AB}	0.0	0.1	0.7	11.3 ^{BC}	87.8 ^{ABC}
Bovans (White)	Closed	66.8	0.0	0.5	0.4 ^{YZ}	14.4	84.1
	Open	60.2	0.0	0.0	0.4 ^{YZ}	14.6	84.7
	Average	63.5 ^{CD}	0.0	0.2	0.4	14.5 ^{ABC}	84.4 ^{BCD}
H & N ("Nick Chick")	Closed	69.5	0.0	0.0	0.0 ^Z	6.9	92.1
	Open	61.6	0.0	0.0	0.0 ^Z	8.2	91.5
	Average	65.5 ^{AB}	0.0	0.0	0.0	7.6 ^C	91.8 ^A
Shaver (White)	Closed	66.3	0.0	0.0	0.4 ^{YZ}	19.7	79.5
	Open	60.3	0.0	0.0	1.1 ^{XY}	14.3	84.5
	Average	63.3 ^{CD}	0.0	0.0	0.8	17.0 ^{AB}	82.0 ^{CD}
Shaver (2000)	Closed	69.0	0.0	0.0	0.7 ^{XYZ}	9.7	89.1
	Open	62.5	0.0	0.0	0.2 ^{YZ}	6.4	92.6
	Average	65.8 ^A	0.0	0.0	0.4	8.0 ^C	90.9 ^{AB}
ISA/Babcock (B300)	Closed	67.9	0.0	0.0	0.5 ^{XYZ}	11.0	88.1
	Open	60.7	0.0	0.0	0.0 ^Z	12.1	87.1
	Average	64.3 ^{BC}	0.0	0.0	0.2	11.6 ^{BC}	87.6 ^{ABC}
ISA (Experiment)	Closed	68.2	0.0	0.0	0.7 ^{XYZ}	8.8	89.7
	Open	62.3	0.0	0.0	0.3 ^{YZ}	11.5	88.0
	Average	65.3 ^{AB}	0.0	0.0	0.5	10.1 ^{BC}	88.8 ^{ABC}
Bovans (Experiment)	Closed	65.9	0.0	0.0	0.3 ^{YZ}	21.1	78.0
	Open	59.5	0.0	0.0	0.9 ^{XYZ}	16.7	82.4
	Average	62.7 ^D	0.0	0.0	0.6	18.9 ^A	80.2 ^D
All Strains	Closed	67.7	0.0	0.1	0.5	12.6	86.3
	Open	61.1	0.0	0.0	0.3	11.8	87.5
	Average	64.4	0.0	0.0	0.4	12.2	86.9

A,B,C,D,E - Different letters denote significant differences (P<.01), comparisons made among strain average values.

X,Y,Z - Different letters denote significant differences among individual laying house and strain averages.

TABLE 35. EFFECT OF LAYING HOUSE ON EGG QUALITY, INCOME AND FEED COSTS OF WHITE EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
Hy-Line (W-36)	Closed	97.5	0.0	1.6	0.9	10.81	5.23
	Open	95.5	0.6	3.3	0.7	11.37	5.42
	Average	96.5	0.3	2.4	0.8 ^A	11.09	5.33
Hy-Line (W-77)	Closed	96.6	1.1	1.9	0.5	10.31	5.52
	Open	96.6	0.4	1.9	1.2	9.73	6.01
	Average	96.6	0.7	1.9	0.8 ^A	10.02	5.76
Bovans (White)	Closed	95.3	1.2	3.3	0.3	9.43	5.16
	Open	97.1	0.4	2.6	0.0	10.90	5.34
	Average	96.2	0.8	2.9	0.1 ^B	10.16	5.25
H & N ("Nick Chick")	Closed	96.7	1.4	1.9	0.0	9.90	5.38
	Open	96.1	2.0	1.9	0.0	9.45	4.90
	Average	96.4	1.7	1.9	0.0 ^B	9.67	5.14
Shaver (White)	Closed	96.1	1.0	2.7	0.2	10.68	5.32
	Open	96.1	0.8	2.9	0.3	10.91	5.51
	Average	96.1	0.9	2.8	0.2 ^{AB}	10.80	5.42
Shaver (2000)	Closed	95.6	0.5	3.9	0.0	9.64	5.23
	Open	94.7	1.6	3.7	0.0	8.69	4.87
	Average	95.1	1.1	3.8	0.0 ^B	9.16	5.05
ISA/Babcock (B300)	Closed	96.8	0.7	2.3	0.2	10.13	5.48
	Open	96.1	1.2	2.5	0.3	7.69	4.47
	Average	96.5	1.0	2.4	0.2 ^{AB}	8.91	4.97
ISA (Experiment)	Closed	97.4	0.5	1.9	0.2	9.57	4.58
	Open	97.3	0.8	1.7	0.3	9.97	4.67
	Average	97.4	0.6	1.8	0.2 ^{AB}	9.77	4.62
Bovans (Experiment)	Closed	95.9	1.3	2.7	0.2	10.72	5.49
	Open	95.0	0.9	3.7	0.5	9.63	4.74
	Average	95.4	1.1	3.2	0.3 ^{AB}	10.18	5.12
All Strains	Closed	96.4	0.9	2.5	0.3	10.13	5.27
	Open	96.1	1.0	2.7	0.4	9.82	5.10
	Average	96.2	0.9	2.6	0.3	9.97	5.18

A,B, - Different letters denote significant differences ($P < .01$), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 36. EFFECT OF DENSITY ON PERFORMANCE OF WHITE EGG STRAINS,
32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Feed Cons (kg/100 hens/d)	Feed Conver- sion (g egg/ g feed)	Eggs Per Bird Housed	Egg Produc- tion (HD%)	Egg Mass (g/HD)	Mortal- ity (%)
Hy-Line (W-36)	310	10.6	.46	163.2	76.0	48.4	9.8
	413	11.2	.45	173.0	77.4	49.7	7.1
Hy-Line (W-77)	310	11.7	.40	145.1	70.8	46.0	8.9
	413	12.5	.37	158.4	70.6	45.4	8.3
Bovans (White)	310	10.8	.42	159.0	71.8	44.6	11.6
	413	10.9	.40	148.7	67.9	43.1	9.5
H & N ("Nick Chick")	310	12.4	.40	132.8	74.7	48.7	14.3
	413	12.1	.43	161.0	79.2	51.3	9.5
Shaver (White)	310	11.2	.43	151.2	76.3	47.1	4.5
	413	11.7	.43	175.6	77.0	49.3	10.7
Shaver (2000)	310	12.3	.39	128.3	72.7	47.4	11.6
	413	12.4	.42	151.3	78.5	51.4	4.8
ISA/Babcock (B300)	310	12.5	.38	124.1	74.1	46.9	12.5
	413	12.2	.39	145.9	72.9	47.2	11.9
ISA (Experiment)	310	11.0	.45	139.4	74.9	48.8	9.8
	413	10.4	.48	155.5	75.9	48.9	7.1
Bovans (Experiment)	310	11.4	.39	138.0	71.3	44.2	10.7
	413	11.3	.45	171.7	80.6	50.3	8.3
All Strains	310	11.5	.41	142.3 ^B	73.6	46.9	10.4
	413	11.6	.42	160.1 ^A	75.5	48.5	8.6

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 37. EFFECT OF DENSITY ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF WHITE EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
Hy-Line (W-36)	310	64.2	0.0	0.2	0.3	11.1	87.9
	413	64.7	0.0	0.0	0.2	10.6	89.3
Hy-Line (W-77)	310	65.1	0.0	0.2	0.4	10.2	89.1
	413	64.9	0.0	0.0	1.0	12.4	86.4
Bovans (White)	310	63.0	0.0	0.0	0.6	16.8	81.8
	413	64.0	0.0	0.5	0.2	12.2	87.0
H & N ("Nick Chick")	310	65.8	0.0	0.0	0.0	8.3	91.7
	413	65.3	0.0	0.0	0.0	6.9	91.9
Shaver (White)	310	62.1	0.0	0.0	1.0	19.7	79.4
	413	64.5	0.0	0.0	0.6	14.4	84.7
Shaver (2000)	310	65.9	0.0	0.0	0.7	8.6	89.8
	413	65.7	0.0	0.0	0.2	7.5	91.9
ISA/Babcock (B300)	310	63.6	0.0	0.0	0.2	15.0	83.9
	413	64.9	0.0	0.0	0.2	8.1	91.3
ISA (Experiment)	310	65.5	0.0	0.0	0.4	9.4	90.0
	413	65.0	0.0	0.0	0.6	10.9	87.6
Bovans (Experiment)	310	63.0	0.0	0.0	0.3	16.6	83.1
	413	62.5	0.0	0.0	0.9	21.3	77.4
All Strains	310	64.2	0.0	0.0	0.4	12.8	86.3
	413	64.6	0.0	0.1	0.4	11.6	87.5

*There are no significant differences among these means.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 38. EFFECT OF DENSITY ON EGG QUALITY, INCOME AND FEED COSTS OF WHITE EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
Hy-Line (W-36)	310	97.2	0.0	2.0	0.8	10.78	5.07
	413	95.8	0.6	2.9	0.8	11.41	5.59
Hy-Line (W-77)	310	96.6	0.5	1.7	1.2	9.56	5.33
	413	96.6	1.0	2.1	0.4	10.47	6.19
Bovans (White)	310	96.2	1.2	2.6	0.0	10.47	5.27
	413	96.2	0.4	3.2	0.3	9.85	5.24
H & N ("Nick Chick")	310	96.9	1.3	1.8	0.0	8.83	4.85
	413	96.0	2.1	1.9	0.0	10.51	5.44
Shaver (White)	310	95.9	0.7	3.4	0.0	10.02	4.91
	413	96.3	1.1	2.1	0.5	11.58	5.93
Shaver (2000)	310	93.3	1.4	5.3	0.0	8.30	4.80
	413	97.0	0.8	2.3	0.0	10.03	5.29
ISA/Babcock (B300)	310	96.3	1.3	2.3	0.3	8.14	4.56
	413	96.7	0.7	2.5	0.2	9.68	5.39
ISA (Experiment)	310	97.7	0.7	1.2	0.4	9.29	4.52
	413	97.0	0.6	2.4	0.0	10.26	4.73
Bovans (Experiment)	310	95.5	0.8	3.5	0.2	9.11	4.96
	413	95.4	1.3	2.9	0.4	11.25	5.28
All Strains	310	96.2	0.9	2.6	0.3	9.39 ^B	4.91 ^B
	413	96.3	0.9	2.5	0.3	10.56 ^A	5.45 ^A

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 39. EFFECT OF LAYING HOUSE ON PERFORMANCE OF BROWN EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Feed Cons (kg/100 hens/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)
ISA (Brown)	Closed	12.3	.39	106.7	67.7	47.0	20.2
	Open	12.1	.36	114.2	70.4	42.8	16.4
	Average	12.2	.38	110.4 ^C	69.0	44.9	18.3
Shaver (Brown 579)	Closed	12.2	.38	129.1	66.8	46.2	16.4
	Open	11.8	.37	114.0	67.9	42.4	13.4
	Average	12.0	.37	121.5 ^{BC}	67.4	44.3	14.9
H & N ("Brown Nick")	Closed	12.0	.42	142.1	72.0	49.5	11.9
	Open	12.9	.38	125.1	77.8	47.9	14.9
	Average	12.4	.40	133.6 ^{ABC}	74.9	48.7	13.4
Bovans (Brown)	Closed	13.5	.36	146.8	69.2	47.7	10.1
	Open	12.0	.39	143.3	72.8	45.9	8.3
	Average	12.8	.38	145.0 ^{AB}	71.0	46.8	9.2
Hy-Line (Brown)	Closed	12.4	.40	155.9	70.5	49.4	8.9
	Open	12.4	.34	148.2	68.3	41.1	5.4
	Average	12.4	.37	152.0 ^A	69.4	45.3	7.1
All Strains	Closed	12.5	.39	136.1	69.2	48.0	13.5
	Open	12.2	.37	129.0	71.4	44.0	11.7
	Average	12.4	.38	132.5	70.3	46.0	12.6

A,B,C - Different letters denote significant differences ($P < .01$), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 40. EFFECT OF LAYING HOUSE ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF BROWN EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
ISA (Brown)	Closed	69.3	0.0	0.0	0.3	11.8	85.7
	Open	61.8	0.0	0.0	0.7	11.9	87.4
	Average	65.6	0.0	0.0	0.5	11.8	86.6
Shaver (Brown 579)	Closed	69.2	0.0	0.0	0.4	15.0	84.2
	Open	63.3	0.0	0.0	0.3	7.5	91.4
	Average	66.2	0.0	0.0	0.3	11.2	87.8
H & N ("Brown Nick")	Closed	68.8	0.0	0.0	0.0	10.7	88.7
	Open	62.6	0.0	0.3	0.8	8.9	89.7
	Average	65.7	0.0	0.2	0.4	9.8	89.2
Bovans (Brown)	Closed	69.2	0.0	0.0	1.4	12.1	86.1
	Open	64.3	0.0	0.0	0.5	6.9	92.4
	Average	66.8	0.0	0.0	0.9	9.5	89.3
Hy-Line (Brown)	Closed	70.2	0.0	0.0	0.0	10.5	89.2
	Open	61.6	0.0	0.2	1.1	14.0	84.8
	Average	65.9	0.0	0.1	0.6	12.2	87.0
All Strains	Closed	69.3	0.0	0.0	0.4	12.0	86.8
	Open	62.7	0.0	0.1	0.7	9.8	89.1
	Average	66.0	0.0	0.1	0.5	10.9	88.0

*There are no significant differences among these means.

TABLE 41. EFFECT OF LAYING HOUSE ON EGG QUALITY, INCOME AND FEED COSTS OF BROWN EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
ISA (Brown)	Closed	97.4	1.2	1.5	2.3	6.96	4.20
	Open	95.5	1.2	2.8	0.5	7.52	4.26
	Average	96.5	1.2	2.1	1.4	7.24 ^C	4.23 ^C
Shaver (Brown 579)	Closed	97.5	1.4	0.8	0.3	8.53	5.04
	Open	96.2	1.6	2.3	0.0	7.49	4.29
	Average	96.8	1.5	1.6	0.2	8.01 ^{BC}	4.66 ^{BC}
H & N ("Brown Nick")	Closed	94.8	3.2	2.1	0.0	9.28	5.21
	Open	95.9	0.9	3.2	0.0	8.25	4.60
	Average	95.4	2.0	2.6	0.0	8.76 ^{ABC}	4.91 ^{ABC}
Bovans (Brown)	Closed	98.4	0.8	0.8	0.0	9.79	6.17
	Open	97.1	0.9	2.1	0.0	9.51	5.18
	Average	97.8	0.8	1.4	0.0	9.65 ^{AB}	5.67 ^{AB}
Hy-Line (Brown)	Closed	97.6	0.7	1.7	0.0	10.37	6.00
	Open	95.3	2.0	2.7	0.0	9.76	5.90
	Average	96.5	1.4	2.2	0.0	10.07 ^A	5.95 ^A
All Strains	Closed	97.1	1.5	1.4	0.5	8.99	5.32
	Open	96.0	1.3	2.6	0.1	8.51	4.85
	Average	96.6	1.4	2.0	0.3	8.75	5.08

A,B,C - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 42. EFFECT OF DENSITY ON PERFORMANCE OF BROWN EGG STRAINS,
32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Feed Cons (kg/100 hens/d)	Feed Conver- sion (g egg/ g feed)	Eggs Per Bird Housed	Egg Produc- tion (HD%)	Egg Mass (g/HD)	Mortal- ity (%)
ISA (Brown)	310	12.2	.39	110.5	70.7	46.2	15.2
	413	12.1	.37	110.3	67.4	43.6	21.4
Shaver (Brown 579)	310	11.8	.39	129.2	69.2	46.0	14.3
	413	12.2	.36	113.9	65.5	42.7	15.5
H & N ("Brown Nick")	310	12.3	.40	121.9	74.8	48.3	19.6
	413	12.6	.39	145.2	75.0	49.1	7.1
Bovans (Brown)	310	12.1	.40	146.6	72.1	47.2	8.9
	413	13.4	.36	143.5	69.9	46.5	9.5
Hy-Line (Brown)	310	11.8	.39	149.1	71.3	45.6	3.6
	413	12.9	.35	154.9	67.5	45.0	10.7
All Strains	310	12.0	.39	131.5	71.6	46.7	12.3
	413	12.6	.36	133.6	69.1	45.3	12.9

There are no significant differences among these means.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 43. EFFECT OF DENSITY ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF BROWN EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
ISA (Brown)	310	65.7	0.0	0.0	0.7	11.0	88.3
	413	65.5	0.0	0.0	0.3	12.7	84.8
Shaver (Brown 579)	310	66.2	0.0	0.0	0.2	9.0	90.4
	413	66.3	0.0	0.0	0.5	13.5	85.2
H & N ("Brown Nick")	310	65.3	0.0	0.3	0.8	11.5	87.2
	413	66.0	0.0	0.0	0.0	8.1	91.2
Bovans (Brown)	310	66.2	0.0	0.0	1.7	11.3	86.6
	413	67.3	0.0	0.0	0.2	7.6	91.9
Hy-Line (Brown)	310	64.6	0.0	0.2	1.1	17.5	80.8
	413	67.2	0.0	0.0	0.0	6.9	93.1
All Strains	310	65.6	0.0	0.1	0.9	12.1	86.7
	413	66.5	0.0	0.0	0.2	9.7	89.3

*There are no significant differences among these means.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 44. EFFECT OF DENSITY ON EGG QUALITY, INCOME AND FEED COSTS OF BROWN EGG STRAINS, 32ND NCLP&MT (497-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density (cm ²)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
ISA (Brown)	310	96.5	0.9	2.2	0.5	7.32	4.19
	413	96.5	1.5	2.1	2.3	7.16	4.27
Shaver (Brown 579)	310	95.8	2.3	2.0	0.0	8.49	4.77
	413	97.9	0.7	1.1	0.3	7.54	4.55
H & N ("Brown Nick")	310	96.0	1.1	3.0	0.0	8.06	4.40
	413	94.7	3.0	2.3	0.0	9.46	5.41
Bovans (Brown)	310	97.5	1.1	1.4	0.0	9.72	5.37
	413	98.0	0.6	1.5	0.0	9.57	5.97
Hy-Line (Brown)	310	96.4	0.9	2.7	0.0	9.85	5.44
	413	96.5	1.8	1.7	0.0	10.28	6.46
All Strains	310	96.4	1.2	2.2	0.1	8.69	4.83
	413	96.7	1.5	1.7	0.5	8.80	5.33

*There are no significant differences among these means.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 45. EFFECT OF LAYING HOUSE ON PERFORMANCE OF WHITE EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Feed Cons (kg/100 hens/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)
Hy-Line (W-36)	Closed	10.0	.47	429.4	73.4	46.3	15.4
	Open	10.2	.45	417.9	75.0	45.0	11.5
	Average	10.1 ^D	.46 ^A	423.6	74.2 ^B	45.7 ^{BC}	13.5 ^D
Hy-Line (W-77)	Closed	11.1	.43	426.5	73.1	47.2	18.6
	Open	11.5	.40	415.1	74.0	45.5	20.4
	Average	11.3 ^A	.41 ^D	420.8	73.6 ^B	46.3 ^{BC}	19.5 ^{CD}
Bovans (White)	Closed	10.8	.45	427.9	74.6	46.9	22.9
	Open	10.6	.43	414.7	75.0	44.9	20.7
	Average	10.7 ^{BC}	.44 ^{ABC}	421.3	74.8 ^B	45.9 ^{BC}	21.8 ^{BC}
H & N ("Nick Chick")	Closed	11.4	.46	428.8	79.9	51.6	31.5
	Open	11.6	.41	418.1	77.4	47.6	28.7
	Average	11.5 ^A	.43 ^{BCD}	423.5	78.6 ^A	49.6 ^A	30.1 ^A
Shaver (White)	Closed	10.2	.44	409.2	69.7	43.8	15.8
	Open	10.6	.43	417.6	75.8	45.2	23.0
	Average	10.4 ^{CD}	.43 ^{BCD}	413.4	72.7 ^B	44.5 ^C	19.4 ^{CD}
Shaver (2000)	Closed	11.6	.41	389.7	73.5	48.3	29.3
	Open	11.5	.40	381.7	74.9	46.7	35.9
	Average	11.6 ^A	.41 ^D	385.7	74.2 ^B	47.5 ^{AB}	32.6 ^A
ISA/Babcock (B300)	Closed	10.5	.45	405.3	74.5	47.2	29.0
	Open	10.7	.42	395.9	74.8	44.8	34.9
	Average	10.6 ^{BC}	.44 ^{ABC}	400.6 ^{BC}	74.6 ^B	46.0 ^{BC}	31.9 ^A
ISA (Experiment)	Closed	10.5	.46	420.0	75.2	48.8	28.2
	Open	10.5	.44	408.4	75.5	46.4	29.2
	Average	10.5 ^{CD}	.45 ^{AB}	414.2	75.3 ^B	47.6 ^{AB}	28.7 ^A
Bovans (Experiment)	Closed	11.2	.43	410.8	74.7	46.5	29.4
	Open	11.0	.42	415.9	75.8	45.0	23.5
	Average	11.1 ^{AB}	.42 ^{CD}	413.4	75.3 ^B	45.8 ^{BC}	26.4 ^{AB}
All Strains	Closed	10.8	.44	416.4	74.3	47.4	24.5
	Open	10.9	.42	409.5	75.4	45.7	25.3
	Average	10.9	.43	412.9	74.8	46.5	24.9

A,B,C,D - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 46. EFFECT OF LAYING HOUSE ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF WHITE EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
Hy-Line (W-36)	Closed	63.9	0.4	2.6	6.8	23.1	66.7
	Open	60.7	0.5	4.5	8.2	23.4	63.1
	Average	62.3 ^{CD}	0.5	3.6	7.5	23.3 ^{ABC}	64.9 ^{BCD}
Hy-Line (W-77)	Closed	64.7	0.5	2.5	6.6	20.1	70.0
	Open	61.7	0.3	3.4	6.7	19.3	70.0
	Average	63.2 ^A	0.4	3.0	6.6	19.7 ^D	70.0 ^A
Bovans (White)	Closed	64.3	0.2	2.9	6.0	22.2	68.3
	Open	60.7	0.3	3.6	8.2	24.8	62.9
	Average	62.5 ^{ABCD}	0.3	3.2	7.1	23.5 ^{ABC}	65.6 ^{ABCD}
H & N ("Nick Chick")	Closed	64.9	0.1	2.6	6.4	21.0	69.5
	Open	61.4	0.6	3.6	6.6	20.2	68.8
	Average	63.2 ^{AB}	0.3	3.1	6.5	20.6 ^{CD}	69.2 ^{AB}
Shaver (White)	Closed	63.7	0.1	2.5	7.4	25.9	63.9
	Open	60.1	0.7	3.9	7.9	24.8	62.3
	Average	61.9 ^D	0.4	3.2	7.6	25.4 ^{AB}	63.1 ^{CD}
Shaver (2000)	Closed	65.0	0.4	3.2	6.4	21.7	67.8
	Open	60.8	0.4	3.6	7.2	21.3	67.3
	Average	62.9 ^{ABCD}	0.4	3.4	6.8	21.5 ^{CD}	67.6 ^{ABCD}
ISA/Babcock (B300)	Closed	63.9	0.1	2.7	6.4	24.6	65.8
	Open	60.1	0.8	3.9	7.8	26.5	60.6
	Average	62.0 ^{CD}	0.4	3.3	7.1	25.6 ^{AB}	63.2 ^{CD}
ISA (Experiment)	Closed	64.8	0.3	2.2	6.3	21.4	69.5
	Open	61.1	0.3	3.4	6.5	23.2	66.2
	Average	62.9 ^{ABC}	0.3	2.8	6.4	22.3 ^{BCD}	67.9 ^{ABC}
Bovans (Experiment)	Closed	64.1	0.5	2.7	4.8	24.4	66.9
	Open	59.9	0.4	3.9	8.8	27.9	58.7
	Average	62.0 ^{CD}	0.5	3.3	6.8	26.2 ^A	62.8 ^D
All Strains	Closed	64.4	0.3	2.7	6.3	22.7	67.6
	Open	60.7	0.5	3.8	7.5	23.5	64.4
	Average	62.5	0.4	3.2	6.9	23.1	66.0

A,B,C,D - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 47. EFFECT OF LAYING HOUSE ON EGG QUALITY, INCOME AND FEED COSTS OF WHITE EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
Hy-Line (W-36)	Closed	96.7	0.8	2.1	0.4	27.35	14.13
	Open	96.9	1.3	1.6	0.2	26.65	13.86
	Average	96.8 ^A	1.1 ^{BC}	1.8	0.3	27.00	14.00 ^{BC}
Hy-Line (W-77)	Closed	96.5	1.1	2.0	0.4	27.50	15.66
	Open	95.8	1.6	2.3	0.3	26.63	15.50
	Average	96.1 ^{ABCD}	1.3 ^{ABC}	2.2	0.4	27.06	15.58 ^A
Bovans (White)	Closed	96.8	0.9	2.2	0.2	27.32	14.87
	Open	96.1	1.1	2.6	0.3	26.51	14.17
	Average	96.4 ^{ABC}	1.0 ^C	2.4	0.2	26.91	14.52 ^{ABC}
H & N ("Nick Chick")	Closed	97.1	1.1	1.6	0.2	27.65	14.82
	Open	96.1	1.6	2.2	0.2	26.78	15.25
	Average	96.6 ^{AB}	1.3 ^{ABC}	1.9	0.2	27.22	15.03 ^{AB}
Shaver (White)	Closed	96.3	1.3	2.2	0.3	26.13	14.36
	Open	95.3	1.8	2.6	0.3	26.56	14.11
	Average	95.8 ^{BCD}	1.5 ^{ABC}	2.4	0.3	26.34	14.23 ^{BC}
Shaver (2000)	Closed	95.6	1.6	2.6	0.2	25.03	14.76
	Open	95.3	1.7	2.9	0.1	24.50	14.10
	Average	95.5 ^D	1.6 ^{AB}	2.8	0.2	24.76	14.43 ^{BC}
ISA/Babcock (B300)	Closed	96.1	1.5	2.1	0.2	25.98	13.83
	Open	95.2	2.2	2.3	0.3	25.25	13.71
	Average	95.6 ^{CD}	1.9 ^A	2.2	0.3	25.61	13.77 ^C
ISA (Experiment)	Closed	95.8	1.5	2.5	0.2	27.01	14.25
	Open	96.2	1.1	2.5	0.3	26.37	13.71
	Average	96.0 ^{ABCD}	1.3 ^{BC}	2.5	0.2	26.69	13.98 ^{BC}
Bovans (Experiment)	Closed	95.6	1.8	2.3	0.3	26.03	14.75
	Open	95.3	1.4	3.0	0.3	26.35	14.65
	Average	95.4 ^D	1.6 ^{AB}	2.6	0.3	26.19	14.70 ^{ABC}
All Strains	Closed	96.3	1.3	2.2	0.3	26.67	14.60
	Open	95.8	1.5	2.4	0.3	26.18	14.34
	Average	96.0	1.4	2.3	0.3	26.42	14.47

A,B,C,D - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 48. EFFECT OF DENSITY ON PERFORMANCE OF WHITE EGG STRAINS,
32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Feed Cons (kg/100 hens/d)	Feed Conver- sion (g egg/ g feed)	Eggs Per Bird Housed	Egg Produc- tion (HD%)	Egg Mass (g/HD)	Mortal- ity (%)
Hy-Line (W-36)	310	9.8	.47	410.5	74.4	45.3	13.6
	413	10.4	.45	436.8	74.0	46.1	13.3
Hy-Line (W-77)	310	10.7	.42	396.2	71.7	44.9	23.2
	413	11.9	.41	445.4	75.5	47.7	15.8
Bovans (White)	310	10.4	.44	393.9	73.2	44.7	28.0
	413	11.0	.44	448.7	76.4	47.0	15.6
H & N ("Nick Chick")	310	11.5	.43	412.6	79.1	49.7	34.0
	413	11.5	.43	434.3	78.2	49.5	26.3
Shaver (White)	310	10.4	.43	379.7	70.9	43.7	26.8
	413	10.5	.44	447.1	74.6	45.3	11.9
Shaver (2000)	310	11.1	.41	375.0	71.5	45.8	30.4
	413	12.0	.41	396.4	76.9	49.2	34.7
ISA/Babcock (B300)	310	10.5	.44	388.5	74.4	45.9	34.2
	413	10.8	.43	412.7	74.9	46.1	29.6
ISA (Experiment)	310	10.2	.45	387.7	72.5	45.8	32.8
	413	10.8	.46	440.6	78.1	49.4	24.6
Bovans (Experiment)	310	10.7	.42	386.9	73.6	44.6	30.9
	413	11.5	.42	439.8	76.9	46.9	21.9
All Strains	310	10.6 ^B	.44	392.4 ^B	73.5 ^B	45.6 ^B	28.2 ^A
	413	11.1 ^A	.43	433.5 ^A	76.2 ^A	47.5 ^A	21.5 ^B

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 49. EFFECT OF DENSITY ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF WHITE EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
Hy-Line (W-36)	310	62.0	0.3	4.0	7.8	25.4	62.1
	413	62.6	0.6	3.1	7.2	21.1	67.7
Hy-Line (W-77)	310	63.0	0.5	2.8	7.2	21.9	67.3
	413	63.5	0.3	3.1	6.1	17.6	72.6
Bovans (White)	310	62.5	0.1	3.7	7.0	23.5	65.4
	413	62.5	0.4	2.7	7.2	23.5	65.7
H & N ("Nick Chick")	310	62.8	0.4	3.3	6.5	22.1	67.5
	413	63.5	0.3	2.9	6.5	19.1	70.8
Shaver (White)	310	62.1	0.5	3.4	7.3	25.7	62.9
	413	61.7	0.4	3.0	8.0	25.1	63.3
Shaver (2000)	310	62.4	0.5	3.7	6.6	22.2	66.5
	413	63.4	0.2	3.1	7.0	20.8	68.7
ISA/Babcock (B300)	310	62.2	0.4	3.2	6.2	25.2	64.4
	413	61.8	0.5	3.5	7.9	25.9	62.0
ISA (Experiment)	310	63.1	0.2	2.6	6.3	21.9	68.6
	413	62.8	0.3	3.0	6.5	22.6	67.2
Bovans (Experiment)	310	61.6	0.5	3.7	7.4	27.4	60.4
	413	62.4	0.5	2.9	6.1	24.9	65.2
All Strains	310	62.4	0.4	3.4	6.9	23.9 ^A	65.0
	413	62.7	0.4	3.0	6.9	22.3 ^B	67.0

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 50. EFFECT OF DENSITY ON EGG QUALITY, INCOME AND FEED COSTS OF WHITE EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
Hy-Line (W-36)	310	96.3	1.1	2.1	0.5	25.98	13.17
	413	97.3	1.0	1.5	0.2	28.01	14.83
Hy-Line (W-77)	310	96.0	1.4	2.3	0.4	25.43	14.32
	413	96.3	1.3	2.0	0.4	28.69	16.84
Bovans (White)	310	96.8	1.0	2.1	0.1	25.18	13.53
	413	96.1	1.0	2.6	0.3	28.65	15.51
H & N ("Nick Chick")	310	96.5	1.4	2.0	0.1	26.43	14.54
	413	96.7	1.3	1.8	0.2	28.00	15.52
Shaver (White)	310	95.3	1.6	2.8	0.3	24.08	13.35
	413	96.2	1.5	2.1	0.2	28.61	15.11
Shaver (2000)	310	95.0	1.7	3.1	0.2	24.03	14.02
	413	95.9	1.5	2.5	0.1	25.50	14.84
ISA/Babcock (B300)	310	95.5	1.8	2.5	0.3	24.79	13.22
	413	95.8	2.0	2.0	0.3	26.43	14.31
ISA (Experiment)	310	95.6	1.4	2.7	0.3	24.86	13.22
	413	96.4	1.1	2.3	0.2	28.53	14.74
Bovans (Experiment)	310	95.2	1.6	2.9	0.3	24.44	13.63
	413	95.7	1.6	2.4	0.4	27.93	15.77
All Strains	310	95.8 ^B	1.4	2.5 ^A	0.3	25.03 ^B	13.67 ^B
	413	96.3 ^A	1.4	2.1 ^B	0.3	27.82 ^A	15.28 ^A

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 51. EFFECT OF LAYING HOUSE ON PERFORMANCE OF BROWN EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Feed Cons (kg/100 hens/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)
ISA (Brown)	Closed	11.5	.41	399.2	72.9	47.6	33.5
	Open	11.4	.39	366.4	71.8	44.9	49.4
	Average	11.4	.40	382.8 ^{BC}	72.3	46.2	41.5 ^A
Shaver (Brown 579)	Closed	11.6	.40	378.5	70.2	46.0	32.3
	Open	11.4	.40	368.1	73.1	44.8	40.3
	Average	11.5	.40	373.3 ^C	71.6	45.4	36.3 ^{AB}
H & N ("Brown Nick")	Closed	11.4	.43	413.7	74.0	48.9	24.7
	Open	11.9	.39	409.7	74.7	46.8	33.4
	Average	11.6	.41	411.7 ^{AB}	74.4	47.9	29.0 ^{BC}
Bovans (Brown)	Closed	12.1	.40	428.7	74.7	48.9	21.4
	Open	11.9	.39	432.9	74.5	46.1	21.7
	Average	12.0	.40	430.8 ^A	74.6	47.5	21.6 ^C
Hy-Line (Brown)	Closed	11.6	.39	402.6	69.2	45.6	20.3
	Open	11.3	.39	405.2	70.5	43.6	20.9
	Average	11.5	.39	403.9 ^{ABC}	69.9	44.6	20.6 ^C
All Strains (2000)	Closed	11.6	.41	404.5	72.2	47.4	26.4
	Open	11.6	.39	396.5	72.9	45.2	33.1
	Average	11.6	.40	400.5	72.6	46.3	29.8

A,B,C - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 52. EFFECT OF LAYING HOUSE ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF BROWN EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
ISA (Brown)	Closed	64.9	0.6	2.6	6.1	22.4	68.1
	Open	62.0	0.4	3.5	6.0	22.0	67.7
	Average	63.5	0.5	3.0	6.1	22.2	67.9
Shaver (Brown 579)	Closed	65.7	0.3	2.5	6.4	20.9	69.5
	Open	61.1	0.8	3.8	6.5	24.3	64.3
	Average	63.4	0.6	3.1	6.5	22.6	66.9
H & N ("Brown Nick")	Closed	66.2	0.1	2.5	5.3	18.7	72.9
	Open	61.9	0.4	3.7	6.4	21.1	68.2
	Average	64.0	0.2	3.1	5.8	19.9	70.5
Bovans (Brown)	Closed	65.0	0.6	2.6	7.3	22.0	67.3
	Open	61.8	0.5	3.4	7.0	20.6	68.1
	Average	63.4	0.5	3.0	7.2	21.3	67.7
Hy-Line (Brown)	Closed	65.7	0.2	3.1	6.4	20.1	69.9
	Open	61.6	0.3	3.9	6.9	22.0	66.6
	Average	63.6	0.2	3.5	6.6	21.1	68.2
All Strains	Closed	65.5	0.4	2.7	6.3	20.8	69.5
	Open	61.7	0.5	3.7	6.6	22.0	67.0
	Average	63.6	0.4	3.1	6.4	21.4	68.2

*There are no differences among these means.

TABLE 53. EFFECT OF LAYING HOUSE ON EGG QUALITY, INCOME AND FEED COSTS OF BROWN EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
ISA (Brown)	Closed	96.4	1.6	1.5	0.1	25.90	14.39
	Open	95.5	1.9	2.6	0.0	23.60	13.09
	Average	96.0	1.7	2.0	0.1	24.75 ^{BC}	13.74 ^C
Shaver (Brown 579)	Closed	96.2	2.1	1.6	0.1	24.47	14.24
	Open	95.6	1.9	2.4	0.1	23.68	13.01
	Average	95.9	2.0	2.0	0.1	24.08 ^C	13.62 ^C
H & N ("Brown Nick")	Closed	96.2	1.9	1.7	0.2	26.82	14.55
	Open	95.4	1.8	2.5	0.2	26.49	14.87
	Average	95.8	1.9	2.1	0.2	26.65 ^{AB}	14.71 ^B
Bovans (Brown)	Closed	96.9	1.6	1.4	0.2	27.81	15.87
	Open	95.9	1.7	2.4	0.0	27.92	15.84
	Average	96.4	1.6	1.9	0.1	27.87 ^A	15.85 ^A
Hy-Line (Brown)	Closed	96.5	1.5	1.9	0.1	26.19	15.47
	Open	95.2	2.1	2.5	0.2	26.02	15.03
	Average	95.9	1.8	2.2	0.1	26.11 ^{ABC}	15.25 ^{AB}
All Strains	Closed	96.4	1.7	1.6	0.1	26.24	14.90
	Open	95.5	1.9	2.5	0.1	25.54	14.37
	Average	96.0	1.8	2.0	0.1	25.89	14.63

A,B,C - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 54. EFFECT OF DENSITY ON PERFORMANCE OF BROWN EGG STRAINS,
32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Feed Cons (kg/100 hens/d)	Feed Conver- sion (g egg/ g feed)	Eggs Per Bird Housed	Egg Produc- tion (HD%)	Egg Mass (g/HD)	Mortal- ity (%)
ISA (Brown)	310	11.1	.40	369.5	70.8	44.8	40.5
	413	11.8	.40	396.1	73.9	47.7	42.5
Shaver (Brown 579)	310	10.8	.42	364.4	70.8	44.5	36.3
	413	12.2	.38	382.2	72.5	46.3	36.3
H & N ("Brown Nick")	310	11.2	.42	393.5	72.9	46.9	29.1
	413	12.1	.41	429.9	75.9	48.9	29.0
Bovans (Brown)	310	12.0	.39	406.7	73.3	46.2	26.8
	413	12.0	.41	454.9	75.9	48.8	16.3
Hy-Line (Brown)	310	11.2	.39	392.7	68.6	43.9	20.0
	413	11.7	.39	415.0	71.2	45.3	21.1
All Strains	310	11.3 ^B	.40	385.4 ^B	71.3	45.3 ^B	30.5
	413	11.9 ^A	.40	415.6 ^A	73.9	47.4 ^A	29.0

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 55. EFFECT OF DENSITY ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF BROWN EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
ISA (Brown)	310	63.1	0.7	2.7	6.9	23.4	66.1
	413	63.8	0.3	3.3	5.3	21.0	69.7
Shaver (Brown 579)	310	63.2	0.5	3.1	6.4	23.3	66.4
	413	63.6	0.6	3.2	6.6	21.9	67.3
H & N ("Brown Nick")	310	63.8	0.2	3.4	6.3	20.3	69.2
	413	64.2	0.3	2.8	5.4	19.5	71.8
Bovans (Brown)	310	62.9	0.6	3.2	7.1	22.2	66.6
	413	63.9	0.5	2.8	7.2	20.4	68.8
Hy-Line (Brown)	310	63.7	0.1	3.5	6.5	21.1	68.4
	413	63.6	0.3	3.5	6.8	21.0	68.1
All Strains	310	63.3	0.4	3.2	6.6	22.1	67.4
	413	63.8	0.4	3.1	6.3	20.8	69.1

*There are no significant differences among these means.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 56. EFFECT OF DENSITY ON EGG QUALITY, INCOME AND FEED COSTS OF BROWN EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FORCE MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
ISA (Brown)	310	95.8	1.8	1.9	0.0	23.77	13.18
	413	96.1	1.7	2.1	0.1	25.73	14.31
Shaver (Brown 579)	310	96.0	1.8	2.0	0.2	23.46	12.67
	413	95.8	2.2	2.0	0.1	24.69	14.58
H & N ("Brown Nick")	310	95.4	1.7	2.5	0.3	25.35	13.83
	413	96.2	2.0	1.7	0.1	27.96	15.59
Bovans (Brown)	310	95.8	1.9	2.1	0.2	26.16	15.16
	413	96.9	1.4	1.6	0.0	29.57	16.54
Hy-Line (Brown)	310	95.7	2.0	2.3	0.1	25.36	14.80
	413	96.1	1.7	2.1	0.2	26.85	15.69
All Strains	310	95.8	1.8	2.2	0.2	24.82 ^B	13.93 ^B
	413	96.2	1.8	1.9	0.1	26.96 ^A	15.34 ^A

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 57. EFFECT OF LAYING HOUSE ON PERFORMANCE OF WHITE EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Feed Cons (kg/100 hens/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)
Hy-Line (W-36)	Closed	10.3	.47	430.8	75.1	48.1	17.6
	Open	10.4	.45	448.3	76.3	46.0	14.3
	Average	10.4 ^B	.46 ^A	439.5	75.7	47.0	15.9 ^D
Hy-Line (W-77)	Closed	11.2	.42	417.8	73.6	47.3	17.6
	Open	11.6	.38	414.6	71.2	43.7	20.3
	Average	11.4 ^A	.40 ^B	416.2	72.4	45.5	18.9 ^{CD}
Bovans (White)	Closed	10.6	.42	397.0	68.6	43.0	19.1
	Open	10.4	.43	440.6	74.9	44.4	20.8
	Average	10.5 ^B	.42 ^{AB}	418.8	71.7	43.7	19.9 ^{BCD}
H & N ("Nick Chick")	Closed	12.0	.42	424.4	77.1	50.4	27.4
	Open	11.1	.42	418.7	76.7	46.9	31.0
	Average	11.6 ^A	.42 ^{AB}	421.5	76.9	48.6	29.2 ^{ABC}
Shaver (White)	Closed	10.7	.45	433.2	75.4	47.6	20.5
	Open	11.0	.42	440.0	75.3	44.9	18.2
	Average	10.8 ^{AB}	.44 ^{AB}	436.6	75.3	46.3	19.4 ^{BCD}
Shaver (2000)	Closed	11.8	.42	404.6	75.5	49.4	27.4
	Open	11.6	.39	375.4	72.6	45.3	33.3
	Average	11.7 ^A	.40 ^B	390.0	74.1	47.3	30.4 ^{AB}
ISA/Babcock (B300)	Closed	11.6	.43	425.7	76.1	49.0	27.4
	Open	11.4	.39	378.6	72.4	43.9	39.0
	Average	11.5 ^A	.41 ^B	402.1	74.2	46.4	33.2 ^A
ISA (Experiment)	Closed	10.5	.47	408.4	75.3	49.4	26.5
	Open	10.4	.45	423.3	76.0	47.5	25.3
	Average	10.4 ^B	.46 ^A	415.9	75.7	48.5	25.9 ^{ABCD}
Bovans (Experiment)	Closed	10.9	.43	429.9	73.7	46.2	16.7
	Open	10.9	.42	414.9	76.5	45.3	31.3
	Average	10.9 ^{AB}	.43 ^{AB}	422.4	75.1	45.8	24.0 ^{ABCD}
All Strains	Closed	11.1	.44	419.1	74.5	47.8	22.2
	Open	11.0	.42	417.2	74.7	45.3	25.9
	Average	11.0	.43	418.1	74.6	46.6	24.1

A,B,C,D - Different letters denote significant differences (P<.01), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 58. EFFECT OF LAYING HOUSE ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF WHITE EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
Hy-Line (W-36)	Closed	65.2	0.0	3.0	4.1	20.4	72.1
	Open	61.2	0.4	4.2	4.7	21.9	68.8
	Average	63.2	0.2	3.6	4.4	21.1	70.4
Hy-Line (W-77)	Closed	64.4	0.2	2.9	6.8	21.0	68.8
	Open	61.3	0.4	4.0	7.2	22.3	65.9
	Average	62.8	0.3	3.4	7.0	21.7	67.3
Bovans (White)	Closed	64.2	0.7	2.6	5.3	21.5	69.4
	Open	60.1	0.7	4.1	8.1	24.3	62.5
	Average	62.2	0.7	3.4	6.7	22.9	65.9
H & N ("Nick Chick")	Closed	65.1	0.1	3.1	5.0	19.6	71.1
	Open	60.7	1.4	3.8	7.5	22.5	64.7
	Average	62.9	0.7	3.5	6.3	21.0	67.9
Shaver (White)	Closed	64.3	0.5	2.2	4.3	23.4	69.3
	Open	60.4	0.7	3.2	8.2	22.6	65.3
	Average	62.3	0.6	2.7	6.2	23.0	67.3
Shaver (2000)	Closed	65.4	0.3	2.1	5.5	20.4	71.5
	Open	61.9	0.3	4.0	6.3	17.7	70.8
	Average	63.6	0.3	3.0	5.9	19.0	71.2
ISA/Babcock (B300)	Closed	65.1	0.2	2.4	5.5	20.3	71.3
	Open	60.4	0.7	3.8	6.7	22.5	65.2
	Average	62.8	0.4	3.1	6.1	21.4	68.3
ISA (Experiment)	Closed	65.2	0.0	2.0	5.8	18.3	73.5
	Open	60.8	0.9	3.6	7.2	24.7	63.4
	Average	63.0	0.4	2.8	6.5	21.5	68.4
Bovans (Experiment)	Closed	63.5	0.1	3.3	5.4	25.9	65.1
	Open	60.0	0.5	4.3	6.2	26.2	62.4
	Average	61.7	0.3	3.8	5.8	26.1	63.7
All Strains	Closed	64.7	0.2	2.6	5.3	21.2	70.2
	Open	60.8	0.7	3.9	6.9	22.7	65.4
	Average	62.7	0.4	3.3	6.1	22.0	67.8

*There are no significant differences among these means.

TABLE 59. EFFECT OF LAYING HOUSE ON EGG QUALITY, INCOME AND FEED COSTS OF WHITE EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
Hy-Line (W-36)	Closed	97.7	0.6	1.3	0.4	27.69	14.34
	Open	95.3	1.4	2.9	0.4	28.51	14.73
	Average	96.5	1.0	2.1	0.4	28.10	14.54
Hy-Line (W-77)	Closed	96.8	0.8	2.2	0.3	26.83	15.41
	Open	96.3	0.8	2.2	0.7	26.58	16.17
	Average	96.5	0.8	2.2	0.5	26.71	15.79
Bovans (White)	Closed	95.8	1.7	2.3	0.2	25.34	14.74
	Open	95.8	2.1	2.0	0.2	28.11	14.75
	Average	95.8	1.9	2.2	0.2	26.72	14.74
H & N ("Nick Chick")	Closed	96.7	1.3	1.9	0.1	27.32	15.91
	Open	95.6	2.8	1.5	0.2	26.71	14.64
	Average	96.1	2.0	1.7	0.1	27.01	15.28
Shaver (White)	Closed	97.0	1.0	1.8	0.2	27.82	14.94
	Open	95.6	1.9	2.3	0.2	28.15	15.34
	Average	96.3	1.4	2.0	0.2	27.98	15.14
Shaver (2000)	Closed	95.0	1.3	3.5	0.3	25.84	15.28
	Open	94.8	2.7	2.5	0.0	24.06	14.34
	Average	94.9	2.0	3.0	0.2	24.95	14.81
ISA/Babcock (B300)	Closed	96.7	0.9	2.2	0.2	27.42	15.61
	Open	95.7	2.3	1.7	0.3	24.12	14.18
	Average	96.2	1.6	2.0	0.2	25.77	14.89
ISA (Experiment)	Closed	96.8	1.4	1.7	0.1	26.41	13.75
	Open	96.4	1.2	2.2	0.2	27.35	13.99
	Average	96.6	1.3	2.0	0.1	26.88	13.87
Bovans (Experiment)	Closed	95.6	1.6	2.6	0.3	27.29	15.29
	Open	95.4	1.7	2.5	0.4	26.34	14.17
	Average	95.5	1.6	2.5	0.4	26.81	14.73
All Strains	Closed	96.5	1.2	2.2	0.2	26.88	15.03
	Open	95.7	1.9	2.2	0.3	26.66	14.70
	Average	96.0	1.5	2.2	0.3	26.77	14.87

*There are no significant differences among these means.

TABLE 60. EFFECT OF DENSITY ON PERFORMANCE OF WHITE EGG STRAINS,
32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Feed Cons (kg/100 hens/d)	Feed Conver- sion (g egg/ g feed)	Eggs Per Bird Housed	Egg Produc- tion (HD%)	Egg Mass (g/HD)	Mortal- ity (%)
Hy-Line (W-36)	310	10.2	.47	428.1	74.9	46.3	18.8
	413	10.5	.46	451.0	76.6	47.8	13.1
Hy-Line (W-77)	310	11.1	.41	399.6	71.2	44.7	22.4
	413	11.8	.39	432.8	73.5	46.3	15.5
Bovans (White)	310	10.4	.44	427.7	72.7	43.9	19.7
	413	10.7	.41	410.0	70.8	43.5	20.2
H & N ("Nick Chick")	310	11.6	.41	397.2	74.6	47.1	35.7
	413	11.5	.43	445.9	79.2	50.2	22.6
Shaver (White)	310	10.5	.44	405.9	73.1	44.5	23.2
	413	11.2	.44	467.3	77.6	48.0	15.5
Shaver (2000)	310	11.5	.40	362.2	71.4	46.0	35.7
	413	11.8	.41	417.8	76.7	48.7	25.0
ISA/Babcock (B300)	310	11.5	.41	388.3	74.5	46.3	40.2
	413	11.6	.41	416.0	73.9	46.6	26.2
ISA (Experiment)	310	10.6	.44	394.3	74.5	48.0	30.4
	413	10.3	.47	437.4	76.8	48.9	21.4
Bovans (Experiment)	310	10.8	.40	387.5	70.6	42.8	27.7
	413	10.9	.45	457.2	79.6	48.8	20.2
All Strains	310	10.9	.43	399.0 ^B	73.1	45.5 ^B	28.2 ^A
	413	11.1	.43	437.3 ^A	76.1	47.6 ^A	20.0 ^B

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 61. EFFECT OF DENSITY ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF WHITE EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
Hy-Line (W-36)	310	63.3	0.0	4.2	3.3	20.6	71.5
	413	63.0	0.4	3.1	5.5	21.6	69.3
Hy-Line (W-77)	310	62.9	0.3	3.6	6.7	22.0	67.1
	413	62.8	0.3	3.2	7.3	21.3	67.5
Bovans (White)	310	62.3	0.9	2.9	5.1	24.1	66.5
	413	62.0	0.5	3.8	8.3	21.7	65.3
H & N ("Nick Chick")	310	63.2	0.4	3.3	5.7	21.0	68.9
	413	62.6	1.0	3.7	6.9	21.0	66.9
Shaver (White)	310	62.2	0.6	1.9	6.7	25.1	65.7
	413	62.9	0.5	3.5	5.8	20.9	68.9
Shaver (2000)	310	63.7	0.4	2.4	6.3	19.9	70.3
	413	63.6	0.2	3.6	5.6	18.2	72.0
ISA/Babcock (B300)	310	62.5	0.7	3.3	5.8	22.3	67.3
	413	63.0	0.1	2.9	6.4	20.5	69.3
ISA (Experiment)	310	63.2	0.3	2.8	6.0	20.7	69.9
	413	62.8	0.5	2.8	7.0	22.2	66.9
Bovans (Experiment)	310	61.8	0.2	4.2	5.4	24.9	65.2
	413	61.7	0.4	3.3	6.2	27.2	62.3
All Strains	310	62.8	0.4	3.2	5.6	22.3	68.0
	413	62.7	0.4	3.3	6.6	21.6	67.6

*There are no significant differences among these means.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 62. EFFECT OF DENSITY ON EGG QUALITY, INCOME AND FEED COSTS OF WHITE EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
Hy-Line (W-36)	310	97.1	1.0	1.5 ^Z	0.4	27.32	14.06
	413	95.8	1.0	2.8 ^{XYZ}	0.4	28.87	15.01
Hy-Line (W-77)	310	96.0	0.9	2.5 ^{YZ}	0.7	25.58	14.93
	413	97.0	0.7	1.9 ^{YZ}	0.4	27.83	16.65
Bovans (White)	310	95.3	2.4	2.2 ^{YZ}	0.1	27.08	14.65
	413	96.2	1.4	2.1 ^{YZ}	0.3	26.36	14.83
H & N ("Nick Chick")	310	96.2	2.0	1.7 ^Z	0.1	25.39	14.77
	413	96.1	2.1	1.7 ^Z	0.2	28.64	15.78
Shaver (White)	310	96.0	1.4	2.4 ^{YZ}	0.2	25.87	14.09
	413	96.6	1.4	1.7 ^Z	0.3	30.10	16.19
Shaver (2000)	310	94.1	1.8	4.0 ^X	0.2	23.12	14.02
	413	95.6	2.1	2.1 ^{YZ}	0.2	26.77	15.60
ISA/Babcock (B300)	310	95.5	2.4	2.0 ^{YZ}	0.1	24.64	14.13
	413	96.9	0.8	2.0 ^{YZ}	0.3	26.90	15.65
ISA (Experiment)	310	97.3	0.9	1.6 ^Z	0.2	25.75	13.52
	413	95.9	1.7	2.4 ^{YZ}	0.0	28.01	14.22
Bovans (Experiment)	310	94.9	1.4	3.3 ^{XY}	0.4	24.59	14.33
	413	96.1	1.8	1.8 ^{YZ}	0.3	29.03	15.14
All Strains	310	95.8 ^B	1.6	2.3	0.3	25.48 ^B	14.28 ^B
	413	96.3 ^A	1.4	2.0	0.3	28.06 ^A	15.45 ^A

A,B - Different letters denote significant differences (P<.01).

X,Y,Z - Different letters denote significant differences among individual strain and density averages (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 63. EFFECT OF LAYING HOUSE ON PERFORMANCE OF BROWN EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Feed Cons (kg/100 hens/d)	Feed Conversion (g egg/g feed)	Eggs Per Bird Housed	Egg Production (HD%)	Egg Mass (g/HD)	Mortality (%)
ISA (Brown)	Closed	11.5	.41	369.7	72.1	47.5	47.6
	Open	11.6	.40	375.1	74.6	46.4	44.7
	Average	11.6	.40	372.4	73.3	47.0	46.1 ^A
Shaver (Brown 579)	Closed	11.6	.40	394.4	71.0	46.4	31.6
	Open	11.3	.40	370.4	71.8	44.9	40.8
	Average	11.5	.40	382.4	71.4	45.7	36.2 ^{AB}
H & N ("Brown Nick")	Closed	11.3	.42	403.1	73.2	47.9	23.2
	Open	11.8	.41	384.8	75.9	47.1	39.6
	Average	11.6	.41	393.9	74.5	47.5	31.4 ^{ABC}
Bovans (Brown)	Closed	12.5	.38	416.0	72.6	48.2	22.0
	Open	11.9	.39	410.7	74.2	47.4	26.8
	Average	12.2	.39	413.3	73.4	47.8	24.4 ^{BC}
Hy-Line (Brown)	Closed	11.7	.41	419.1	72.5	48.1	17.3
	Open	11.7	.37	407.4	70.7	43.4	15.8
	Average	11.7	.39	413.2	71.6	45.8	16.5 ^C
All Strains (2000)	Closed	11.7	.40	400.5	72.3	47.6	28.3
	Open	11.7	.39	389.7	73.4	45.8	33.5
	Average	11.7	.40	395.0	72.8	46.8	30.9

A,B,C - Different letters denote significant differences ($P < .01$), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 64. EFFECT OF LAYING HOUSE ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF BROWN EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
ISA (Brown)	Closed	64.9	0.2	2.8	7.2	21.8	66.7
	Open	61.2	1.5	2.7	6.4	20.8	68.6
	Average	63.1	0.8	2.8	6.8	21.3	67.6
Shaver (Brown 579)	Closed	65.7	0.5	2.7	6.2	21.9	68.4
	Open	62.4	0.4	3.4	6.8	19.1	69.6
	Average	64.1	0.4	3.0	6.5	20.5	69.0
H & N ("Brown Nick")	Closed	65.0	0.0	2.4	6.4	22.1	68.8
	Open	60.2	1.0	4.3	6.8	19.6	67.9
	Average	62.6	0.5	3.4	6.6	20.9	68.3
Bovans (Brown)	Closed	65.1	0.3	2.4	7.7	21.1	68.1
	Open	63.1	1.0	3.0	5.4	20.0	70.3
	Average	64.1	0.6	2.7	6.5	20.6	69.2
Hy-Line (Brown)	Closed	65.5	0.0	3.2	6.1	19.6	70.6
	Open	61.3	0.5	4.4	6.8	21.5	66.6
	Average	63.4	0.3	3.8	6.5	20.5	68.6
All Strains	Closed	65.2	0.2	2.7	6.7	21.3	68.5
	Open	61.6	0.9	3.6	6.4	20.2	68.6
	Average	63.5	0.5	3.1	6.6	20.8	68.5

*There are no differences among these means.

TABLE 65. EFFECT OF LAYING HOUSE ON EGG QUALITY, INCOME AND FEED COSTS OF BROWN EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Laying House	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
ISA (Brown)	Closed	96.9	1.5	1.6	1.1	23.97	13.49
	Open	95.5	2.3	2.0	0.2	24.17	13.44
	Average	96.2	1.9	1.8	0.7	24.07	13.47 ^B
Shaver (Brown 579)	Closed	97.6	1.1	1.2	0.1	25.74	14.63
	Open	96.5	1.5	1.9	0.1	23.98	13.36
	Average	97.0	1.3	1.5	0.1	24.86	14.00 ^{AB}
H & N ("Brown Nick")	Closed	95.3	2.6	2.0	0.1	26.07	14.45
	Open	95.8	1.6	2.5	0.3	24.64	13.84
	Average	95.5	2.1	2.3	0.2	25.35	14.15 ^{AB}
Bovans (Brown)	Closed	97.2	1.4	1.3	0.1	27.02	16.27
	Open	95.5	1.4	3.2	0.1	26.67	15.29
	Average	96.3	1.4	2.2	0.1	26.85	15.78 ^A
Hy-Line (Brown)	Closed	97.0	1.4	1.5	0.0	27.35	15.63
	Open	95.9	2.3	1.5	0.3	26.32	15.67
	Average	96.5	1.9	1.5	0.2	26.83	15.65 ^A
All Strains	Closed	96.8	1.6	1.5	0.3	26.03	14.89
	Open	95.8	1.8	2.2	0.2	25.16	14.32
	Average	96.3	1.7	1.9	0.3	25.59	14.61

A,B - Different letters denote significant differences ($P < .01$), comparisons made among strain average values. Differences among individual laying house and strain averages are not significant.

TABLE 66. EFFECT OF DENSITY ON PERFORMANCE OF BROWN EGG STRAINS,
32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Feed Cons (kg/100 hens/d)	Feed Conver- sion (g egg/ g feed)	Eggs Per Bird Housed	Egg Produc- tion (HD%)	Egg Mass (g/HD)	Mortal- ity (%)
ISA (Brown)	310	11.4	.40	363.7	73.0	46.7	44.7
	413	11.7	.40	381.2	73.7	47.2	47.6
Shaver (Brown 579)	310	11.2	.41	381.1	70.4	45.2	33.1
	413	11.7	.40	383.6	72.4	46.1	39.3
H & N ("Brown Nick")	310	11.4	.42	377.5	73.9	46.9	40.2
	413	11.7	.41	410.4	75.2	48.1	22.6
Bovans (Brown)	310	11.7	.40	408.4	72.8	47.5	25.0
	413	12.7	.37	418.3	74.0	48.1	23.8
Hy-Line (Brown)	310	11.3	.40	393.2	71.2	44.8	18.8
	413	12.1	.38	433.3	72.0	46.8	14.3
All Strains	310	11.4	.40	384.8	72.3	46.2	32.3
	413	12.0	.39	405.3	73.4	47.3	29.5

*There are no significant differences among these means.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 67. EFFECT OF DENSITY ON EGG WEIGHT AND EGG SIZE DISTRIBUTION OF BROWN EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Egg Weight (g/egg)	Pee Wee (%)	Small (%)	Medium (%)	Large (%)	Extra Large (%)
ISA (Brown)	310	62.7	1.1	2.2	7.4	20.6	68.5
	413	63.3	0.6	3.3	6.2	21.9	66.8
Shaver (Brown 579)	310	64.3	0.5	2.6	6.1	19.8	70.7
	413	63.9	0.4	3.4	6.9	21.2	67.3
H & N ("Brown Nick")	310	63.5	0.0	3.4	5.9	21.5	68.9
	413	62.1	1.0	3.3	7.3	20.2	67.8
Bovans (Brown)	310	64.3	0.6	2.1	6.2	19.9	70.8
	413	64.0	0.7	3.4	6.9	21.2	67.6
Hy-Line (Brown)	310	62.5	0.1	4.4	6.8	24.4	63.7
	413	64.3	0.5	3.2	6.1	16.6	73.5
All Strains	310	63.4	0.4	3.0	6.5	21.2	68.5
	413	63.5	0.6	3.3	6.7	20.2	68.6

*There are no significant differences among these means.

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

TABLE 68. EFFECT OF DENSITY ON EGG QUALITY, INCOME AND FEED COSTS OF BROWN EGG STRAINS, 32ND NCLP&MT (126-770 DAYS), FEED RESTRICTION MOLTED

Breeder (Strain)	Density ¹ (cm ²)	Grade A (%)	Grade B (%)	Cracks (%)	Loss (%)	Egg Income (\$/hen)	Feed Costs (\$/hen)
ISA (Brown)	310	96.3	1.8	1.7	0.2	23.57	12.97
	413	96.1	2.0	1.9	1.1	24.57	13.97
Shaver (Brown 579)	310	96.3	1.9	1.8	0.1	24.63	13.81
	413	97.8	0.8	1.3	0.1	25.09	14.18
H & N ("Brown Nick")	310	95.7	1.8	2.2	0.3	24.26	13.39
	413	95.4	2.3	2.3	0.1	26.45	14.90
Bovans (Brown)	310	95.5	1.9	2.6	0.0	26.40	15.12
	413	97.2	0.8	1.8	0.2	27.30	16.44
Hy-Line (Brown)	310	96.5	1.8	1.7	0.0	25.47	14.47
	413	96.4	2.0	1.3	0.3	28.20	16.83
All Strains	310	96.1	1.8	2.0	0.1	24.86	13.95 ^B
	413	96.5	1.6	1.7	0.4	26.32	15.26 ^A

A,B - Different letters denote significant differences (P<.01).

¹The following is the conversion from square centimeters to square inches: 310 equals 48 square inches; 413 equals 64 square inches.

Entries 32nd NCLP&MT
Stock Suppliers and Categories

<u>Breeder</u>	<u>Stock</u>	<u>Category</u> ¹	<u>Source</u>
H & N International 3825 154th Ave., N.E. Redmond, WA 98052	"Nick Chick"	I-A	Wheelock Hatchery 2170 Wayne Road Chambersburg, PA 17201
	"Brown Nick"	I-A	(Same)
Hy-Line International P.O. Box 310 Dallas Center, IA 50063	W-36	I-A	Hy-Line International 4432 Highway 213, Box 309 Mansfield, GA 30255
	W-77	I-A	(Same)
	Hy-Line Brown	I-A	Hy-Line International 1915 Sugar Grove Dallas Center, IA 50063
ISA/Babcock P.O. Box 280 Ithaca, NY 14850-0280	B300	I-A	American Selected Products Milton Hatchery 55 Lawton Lane Milton, PA 17847
	ISA Experimental	III-A	ISA Babcock P.O. Box 280 Ithaca, NY 14851
Shaver Poultry Breeding Farms Ltd. P.O. Box 400 Cambridge, Ontario Canada N1R5V9	Shaver White	I-A	American Selected Products Inc. Milton Hatchery 55 Lawton Lane Milton, PA 17847
	Shaver 2000	II-A	(Same)
	Shaver 579	II-A	Archer Poultry Limited RR #3 Brighton, Ontario, Canada K0K 1H0
Centurion Poultry 1471 Lane Creek Road Bogart, GA 30622	Bovans White	I-A	Centurion Poultry Inc. 1471 Lane Creek Road Bogart, GA 30622
	Bovans Experimental	III-A	(Same)
	Bovans Brown	I-A	(Same)
ISA/Babcock P.O. Box 280 Ithaca, NY 14850-0280	ISA Brown	I-A	American Selected Products Inc. Milton Hatchery 55 Lawton Lane Milton, PA 17847

¹ I = Extensive distribution in southeast United States
 II = Little or no distribution in southeast United States
 III = Unavailable for commercial distribution in United States
 A = Entry requested
 C = Entry not requested