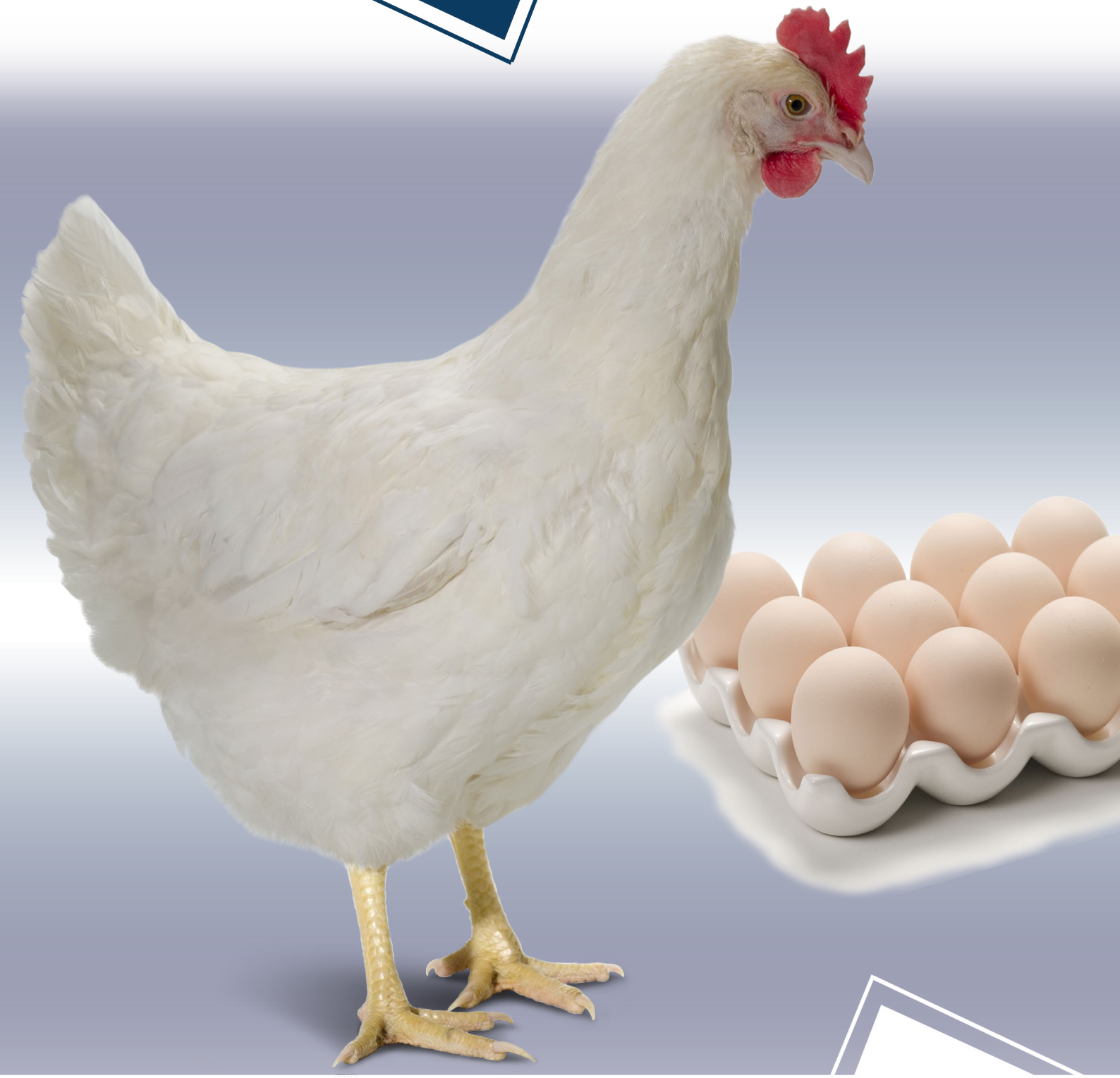
Hy-Line®

PINK



Performance Guide

Hy-Line®

Use of the Performance Guide

The genetic potential of Hy-Line Pink Commercial can only be realized if good poultry husbandry practices and management are used. This management guide outlines successful flock management programmes for Hy-Line Variety Pink Commercial based on field experience compiled by Hy-Line International and using an extensive commercial layer flock database of Hy-Line flocks from all parts of the world. Hy-Line International Management Guides are periodically updated as new performance data and/or nutrition information become available.

The information and suggestions contained in this management guide should be used for guidance and educational purposes only, recognising that local environmental and disease conditions may vary and a guide cannot cover all possible circumstances. While every attempt has been made to ensure that the information presented is accurate and reliable at the time of publication, Hy-Line International cannot accept responsibility for any errors, omissions or inaccuracies in such information or management suggestions. Further, Hy-Line International does not warrant or make any representations or guarantees regarding the use, validity, accuracy, or reliability of, or flock performance or productivity resulting from the use of, or otherwise respecting, such information or management suggestions. In no event shall Hy-Line International be liable for any special, indirect or consequential damages or special damages whatsoever arising out of or in connection with the use of the information or management suggestions contained in this management guide.

Always consult hyline.com for the latest performance, nutrition, and management information.

Hy-Line Pink
Online Management Guide

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Summary of Performance Standards

REARING PERIOD (TO 17 WEEKS):	
Livability	98%
Feed Consumed	5.78–6.15 kg
Body Weight at 17 Weeks	1440–1480 g
LAYING PERIOD (TO 90 WEEKS):	
Percent Peak	94–97%
Hen-Day Eggs to 60 Weeks Hen-Day Eggs to 90 Weeks	255–268 417–440
Hen-Housed Eggs to 60 Weeks Hen-Housed Eggs to 90 Weeks	251–265 406–428
Livability to 60 Weeks Livability to 90 Weeks	97% 93%
Days to 50% Production (from hatch)	146 days
Average Egg Weight at 26 Weeks Average Egg Weight at 32 Weeks Average Egg Weight at 70 Weeks	56.0–59.0 g/egg 60.0–62.0 g/egg 64.0–66.0 g/egg
Total Egg Mass per Hen-Housed (18–90 weeks)	26.0 kg
Body Weight at 32 Weeks Body Weight at 70 Weeks	1840–1930 g 1900–1980 g
Freedom From Egg Inclusions	Excellent
Shell Strength	Excellent
Shell Color at 38 Weeks Shell Color at 56 Weeks Shell Color at 70 Weeks	46 43 41
Haugh Units at 38 Weeks Haugh Units at 56 Weeks Haugh Units at 70 Weeks	93.0 86.9 83.0
Average Daily Feed Consumption (18–90 weeks)	103–109 g/day per bird
Feed Conversion Rate, kg Feed/kg Eggs (20–60 weeks) Feed Conversion Rate, kg Feed/kg Eggs (20–90 weeks)	1.95–2.06 1.97–2.08
Feed Utilization, kg Egg/kg Feed (20–60 weeks) Feed Utilization, kg Egg/kg Feed (20–90 weeks)	0.49–0.50 0.48–0.49
Feed Consumption per Dozen Eggs (20–60 weeks) Feed Consumption per Dozen Eggs (20–90 weeks)	1.46–1.54 kg 1.51–1.60 kg
Skin Color	Yellow
Condition of Droppings	Dry

Performance Summary data is based on results obtained from customers around the world. Please send your results to info@hyline.com. An easy to use record-keeping program, Hy-Line International EggCel, can be found at www.hyline.com.

Rearing Period Performance Table

AGE (weeks)	MORTALITY Cumulative (%)	BODY WEIGHT (g)	FEED INTAKE (g / bird per day)	CUMULATIVE FEED INTAKE (g to date)	WATER CONSUMPTION (ml / bird/ day)	UNIFORMITY (Cage)
1	0.5	70 – 80	13 – 14	91 – 98	19 – 27	>85%
2	0.7	110 – 120	18 – 22	217 – 252	27 – 44	
3	0.8	190 – 200	24 – 26	385 – 434	36 – 52	
4	0.9	280 – 290	28 – 30	581 – 644	42 – 60	>80%
5	1.0	370 – 390	32 – 34	805 – 882	48 – 68	
6	1.1	480 – 500	36 – 38	1057 – 1148	54 – 76	
7	1.2	580 – 600	40 – 42	1337 – 1442	60 – 84	
8	1.2	700 – 720	45 – 47	1652 – 1771	68 – 94	
9	1.3	800 – 820	49 – 53	1995 – 2142	74 – 106	
10	1.3	910 – 930	54 – 58	2373 – 2548	81 – 116	
11	1.4	1010 – 1030	59 – 63	2786 – 2989	89 – 126	
12	1.5	1110 – 1130	64 – 68	3234 – 3465	96 – 136	
13	1.6	1180 – 1200	68 – 72	3710 – 3969	102 – 144	>85%
14	1.7	1250 – 1280	71 – 75	4207 – 4494	107 – 150	
15	1.8	1310 – 1350	73 – 77	4718 – 5033	110 – 154	
16	1.9	1380 – 1420	75 – 79	5243 – 5586	113 – 158	
17	2.0	1440 – 1480	76 – 80	5775 – 6146	114 – 160	>90%

Production Period Performance Table

AGE (weeks)	% HEN-DAY Current	HEN-DAY EGGS Cumulative	HEN-HOUSED EGGS Cumulative	MORT-ALITY Cumulative (%)	BODY WEIGHT (g)	FEED INTAKE (g / bird / day)	WATER CONSUMP-TION (ml / bird / day)	HEN-HOUSED EGG MASS Cumulative (kg)	AVG. EGG WEIGHT (g / egg)
18	2 – 7	0.1 – 0.5	0.1 – 0.5	0.1	1450 – 1550	78 – 82	116 – 164	0.0 – 0.0	45.0
19	13 – 28	1.1 – 2.5	1.0 – 2.4	0.1	1490 – 1600	78 – 84	117 – 168	0.0 – 0.1	47.0
20	40 – 52	3.9 – 6.1	3.8 – 6.1	0.2	1590 – 1650	82 – 88	123 – 176	0.2 – 0.3	48.0
21	66 – 74	8.5 – 11.3	8.5 – 11.3	0.2	1670 – 1700	88 – 94	131 – 186	0.4 – 0.6	49.0
22	82 – 90	14.2 – 17.6	14.2 – 17.5	0.3	1710 – 1750	92 – 98	138 – 196	0.7 – 0.9	51.0
23	89 – 94	20.4 – 24.2	20.4 – 24.1	0.3	1730 – 1800	96 – 100	143 – 202	1.0 – 1.2	54.0
24	90 – 95	26.7 – 30.8	26.7 – 30.7	0.4	1740 – 1830	98 – 104	146 – 206	1.4 – 1.6	55.0
25	91 – 96	33.1 – 37.5	33.0 – 37.4	0.4	1760 – 1850	100 – 106	149 – 210	1.7 – 2.0	56.0
26	93 – 96	39.6 – 44.2	39.5 – 44.1	0.5	1770 – 1870	102 – 108	152 – 214	2.1 – 2.4	57.0
27	94 – 97	46.2 – 51.0	46.0 – 50.9	0.5	1780 – 1890	104 – 110	155 – 218	2.4 – 2.8	58.0
28	94 – 97	52.8 – 57.8	52.6 – 57.6	0.6	1800 – 1900	104 – 110	156 – 220	2.8 – 3.2	59.0
29	94 – 97	59.4 – 64.6	59.1 – 64.4	0.6	1810 – 1910	105 – 111	158 – 222	3.2 – 3.6	60.0
30	94 – 97	65.9 – 71.4	65.7 – 71.1	0.7	1820 – 1920	105 – 111	158 – 222	3.6 – 4.0	60.0
31	94 – 97	72.5 – 78.2	72.2 – 77.9	0.7	1830 – 1930	106 – 112	159 – 224	4.0 – 4.4	61.0
32	93 – 97	79.0 – 85.0	78.7 – 84.6	0.8	1840 – 1930	106 – 112	159 – 224	4.4 – 4.8	61.0
33	94 – 97	85.6 – 91.8	85.2 – 91.3	0.8	1850 – 1940	106 – 112	159 – 224	4.8 – 5.3	61.0
34	93 – 97	92.1 – 98.6	91.6 – 98.1	0.9	1850 – 1940	106 – 112	159 – 224	5.2 – 5.7	62.0
35	92 – 97	98.6 – 105.4	98.0 – 104.8	0.9	1860 – 1950	107 – 113	161 – 226	5.5 – 6.1	62.0
36	92 – 96	105.0 – 112.1	104.4 – 111.4	1.0	1860 – 1950	107 – 113	161 – 226	5.9 – 6.5	62.0
37	92 – 96	111.4 – 118.8	110.8 – 118.1	1.0	1860 – 1950	107 – 113	161 – 226	6.3 – 6.9	62.0
38	92 – 96	117.9 – 125.5	117.2 – 124.7	1.1	1870 – 1950	107 – 113	161 – 226	6.7 – 7.4	62.0
39	92 – 95	124.3 – 132.2	123.5 – 131.3	1.1	1870 – 1950	107 – 113	161 – 226	7.1 – 7.8	62.0
40	92 – 95	130.8 – 138.8	129.9 – 137.9	1.2	1870 – 1950	107 – 113	161 – 226	7.5 – 8.2	62.0
41	92 – 95	137.2 – 145.5	136.2 – 144.5	1.2	1870 – 1950	107 – 113	161 – 226	7.9 – 8.6	62.0
42	91 – 95	143.6 – 152.1	142.5 – 151.0	1.3	1870 – 1950	107 – 113	161 – 226	8.3 – 9.0	63.0
43	91 – 94	149.9 – 158.7	148.8 – 157.5	1.3	1870 – 1950	107 – 113	161 – 226	8.7 – 9.4	63.0
44	90 – 94	156.2 – 165.3	155.0 – 164.0	1.4	1880 – 1950	107 – 113	161 – 226	9.0 – 9.9	63.0
45	90 – 94	162.5 – 171.9	161.3 – 170.5	1.4	1880 – 1950	107 – 113	161 – 226	9.4 – 10.3	63.0
46	90 – 94	168.8 – 178.4	167.5 – 177.0	1.5	1880 – 1960	107 – 113	161 – 226	9.8 – 10.7	63.0
47	89 – 94	175.1 – 185.0	173.6 – 183.5	1.5	1880 – 1960	107 – 113	161 – 226	10.2 – 11.1	63.0
48	89 – 93	181.3 – 191.5	179.7 – 189.9	1.6	1880 – 1960	107 – 113	161 – 226	10.6 – 11.5	63.0
49	89 – 93	187.5 – 198.0	185.9 – 196.3	1.7	1880 – 1960	107 – 113	161 – 226	11.0 – 11.9	63.0
50	89 – 93	193.8 – 204.5	192.0 – 202.7	1.8	1880 – 1960	106 – 112	161 – 226	11.3 – 12.3	63.0
51	88 – 92	199.9 – 211.0	198.0 – 209.0	1.9	1880 – 1960	106 – 112	161 – 226	11.7 – 12.7	63.0
52	88 – 92	206.1 – 217.4	204.0 – 215.3	2.0	1880 – 1960	106 – 112	161 – 226	12.1 – 13.1	64.0
53	88 – 92	212.2 – 223.9	210.1 – 221.6	2.1	1880 – 1960	106 – 112	161 – 226	12.5 – 13.6	64.0
54	87 – 91	218.3 – 230.2	216.0 – 227.8	2.2	1890 – 1960	106 – 112	161 – 226	12.8 – 14.0	64.0
55	87 – 91	224.4 – 236.6	222.0 – 234.1	2.3	1890 – 1960	106 – 112	161 – 226	13.2 – 14.4	64.0
56	87 – 91	230.5 – 243.0	227.9 – 240.3	2.4	1890 – 1970	106 – 112	161 – 226	13.6 – 14.8	64.0
57	86 – 91	236.5 – 249.3	233.8 – 246.5	2.5	1890 – 1970	106 – 112	161 – 226	14.0 – 15.2	64.0
58	86 – 90	242.6 – 255.6	239.7 – 252.6	2.6	1890 – 1970	106 – 112	161 – 226	14.3 – 15.6	64.0

Production Period Performance Table (cont.)

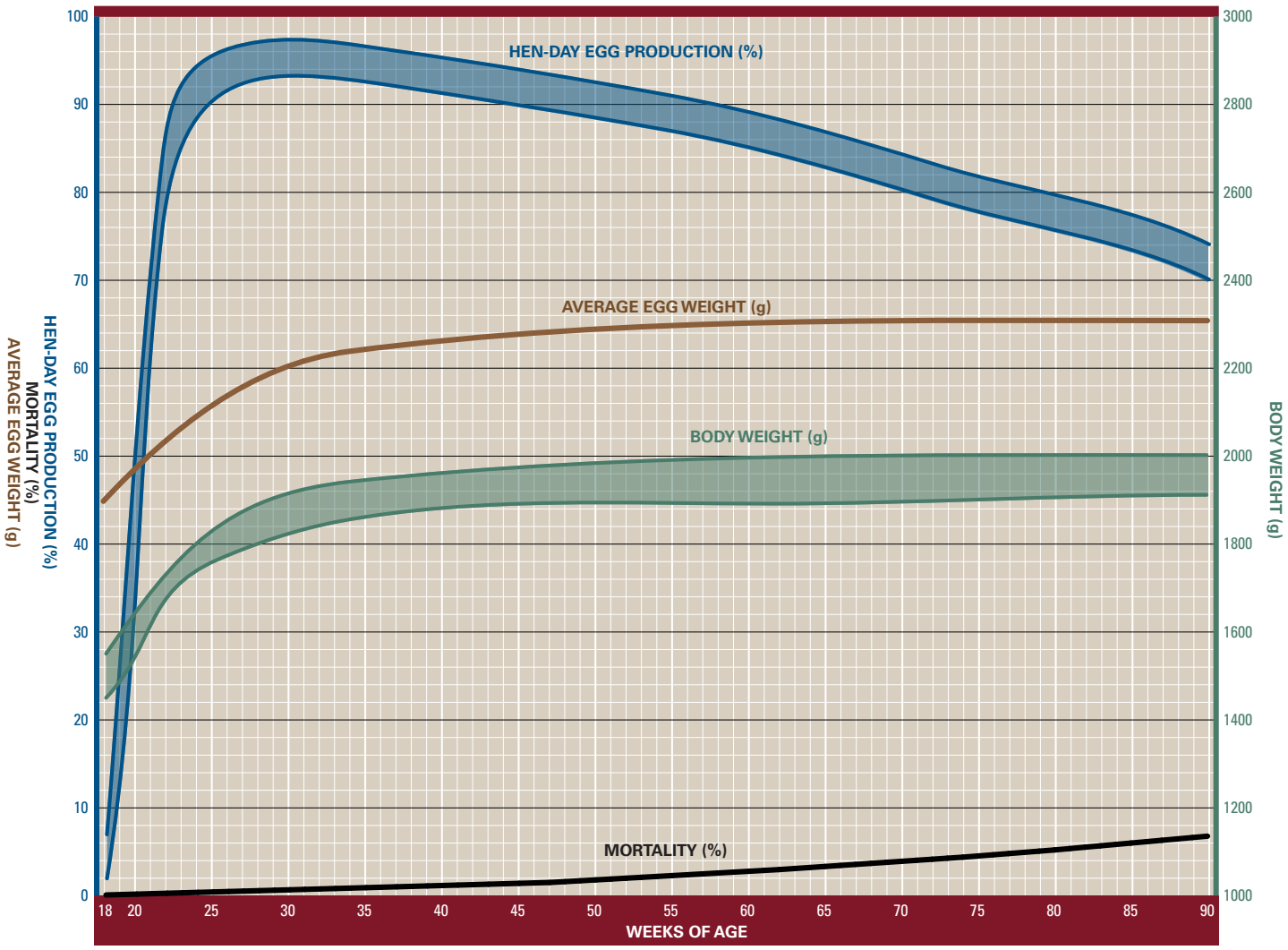
AGE (weeks)	% HEN-DAY Current	HEN-DAY EGGS Cumulative	HEN-HOUSED EGGS Cumulative	MORT-ALITY Cumulative (%)	BODY WEIGHT (g)	FEED INTAKE (g / bird / day)	WATER CONSUMP-TION (ml / bird / day)	HEN-HOUSED EGG MASS Cumulative (kg)	AVG. EGG WEIGHT (g / egg)
59	86 – 90	248.6 – 261.9	245.5 – 258.8	2.7	1890 – 1970	106 – 112	161 – 226	14.7 – 16.0	64.0
60	85 – 90	254.5 – 268.2	251.3 – 264.9	2.8	1890 – 1970	105 – 111	161 – 226	15.1 – 16.4	64.0
61	85 – 89	260.5 – 274.5	257.1 – 270.9	2.9	1890 – 1970	105 – 111	161 – 226	15.4 – 16.8	64.0
62	84 – 89	266.4 – 280.7	262.8 – 277.0	3.0	1890 – 1970	105 – 111	161 – 226	15.8 – 17.2	64.0
63	84 – 88	272.2 – 286.9	268.5 – 282.9	3.1	1890 – 1970	105 – 111	161 – 226	16.1 – 17.5	64.0
64	83 – 87	278.0 – 293.0	274.1 – 288.8	3.2	1890 – 1970	105 – 111	161 – 226	16.5 – 17.9	64.0
65	83 – 87	283.9 – 299.0	279.7 – 294.7	3.4	1890 – 1970	105 – 111	161 – 226	16.9 – 18.3	64.0
66	82 – 86	289.6 – 305.1	285.2 – 300.5	3.5	1890 – 1980	104 – 110	161 – 226	17.2 – 18.7	65.0
67	82 – 86	295.3 – 311.1	290.8 – 306.3	3.6	1900 – 1980	104 – 110	161 – 226	17.6 – 19.1	65.0
68	81 – 85	301.0 – 317.0	296.2 – 312.0	3.7	1900 – 1980	104 – 110	161 – 226	17.9 – 19.4	65.0
69	81 – 85	306.7 – 323.0	301.7 – 317.7	3.8	1900 – 1980	104 – 110	161 – 226	18.3 – 19.8	65.0
70	80 – 84	312.3 – 328.9	307.0 – 323.3	4.0	1900 – 1980	104 – 110	161 – 226	18.6 – 20.2	65.0
71	80 – 84	317.9 – 334.7	312.4 – 329.0	4.1	1900 – 1980	104 – 110	161 – 226	18.9 – 20.6	65.0
72	79 – 83	323.4 – 340.6	317.7 – 334.5	4.2	1900 – 1980	103 – 109	161 – 226	19.3 – 20.9	65.0
73	79 – 83	328.9 – 346.4	322.9 – 340.1	4.3	1900 – 1980	103 – 109	161 – 226	19.6 – 21.3	65.0
74	78 – 82	334.4 – 352.1	328.2 – 345.6	4.4	1900 – 1980	103 – 109	161 – 226	20.0 – 21.7	65.0
75	78 – 82	339.9 – 357.8	333.4 – 351.0	4.6	1900 – 1990	103 – 109	161 – 226	20.3 – 22.0	65.0
76	77 – 81	345.2 – 363.5	338.5 – 356.4	4.7	1900 – 1990	103 – 109	161 – 226	20.6 – 22.4	65.0
77	77 – 81	350.6 – 369.2	343.6 – 361.8	4.9	1900 – 1990	103 – 109	161 – 226	20.9 – 22.7	65.0
78	76 – 80	356.0 – 374.8	348.7 – 367.2	5.0	1900 – 1990	103 – 109	161 – 226	21.3 – 23.1	65.0
79	76 – 80	361.3 – 380.4	353.7 – 372.5	5.1	1900 – 1990	103 – 109	161 – 226	21.6 – 23.4	65.0
80	75 – 79	366.5 – 385.9	358.7 – 377.7	5.3	1900 – 1990	103 – 109	161 – 226	21.9 – 23.8	65.0
81	75 – 79	371.8 – 391.4	363.7 – 382.9	5.4	1910 – 2000	102 – 108	161 – 226	22.2 – 24.1	65.5
82	74 – 78	377.0 – 396.9	368.5 – 388.1	5.6	1910 – 2000	102 – 108	161 – 226	22.5 – 24.5	65.5
83	74 – 78	382.1 – 402.4	373.4 – 393.2	5.8	1910 – 2000	102 – 108	161 – 226	22.9 – 24.8	65.5
84	73 – 77	387.2 – 407.8	378.2 – 398.3	5.9	1910 – 2000	102 – 108	161 – 226	23.2 – 25.2	65.5
85	73 – 77	392.4 – 413.1	383.0 – 403.4	6.1	1910 – 2000	102 – 108	161 – 226	23.5 – 25.5	65.5
86	72 – 76	397.4 – 418.5	387.8 – 408.3	6.2	1910 – 2000	102 – 108	161 – 226	23.8 – 25.8	65.5
87	72 – 76	402.4 – 423.8	392.5 – 413.3	6.4	1910 – 2000	101 – 107	161 – 226	24.1 – 26.2	65.5
88	71 – 75	407.4 – 429.0	397.1 – 418.2	6.6	1910 – 2000	101 – 107	161 – 226	24.4 – 26.5	65.5
89	71 – 75	412.4 – 434.3	401.7 – 423.1	6.7	1910 – 2000	101 – 107	161 – 226	24.7 – 26.8	65.5
90	70 – 74	417.3 – 439.5	406.3 – 427.9	6.9	1910 – 2000	101 – 107	161 – 226	25.0 – 27.1	65.5

Production Period Space Recommendations

check local regulations concerning space requirements)

WEEKS OF AGE	3	17	20 30 40 50 60 70 80
CONVENTIONAL AND COLONY CAGES			
Floor Space			
	100–200 cm^2 (50–100 birds / m^2)	310 cm^2 (32 birds / m^2)	490 cm^2 (20 birds / m^2) – 750 cm^2 (13 birds / m^2)
Nipple/Cup			
	1 / 12 birds	1 / 8 birds	1 / 12 birds or access to 2 drinkers
Feeders			
	5 cm / bird	8 cm / bird	7–12 cm / bird

Performance Graph



Egg Quality and Egg Size Distribution

Egg Quality

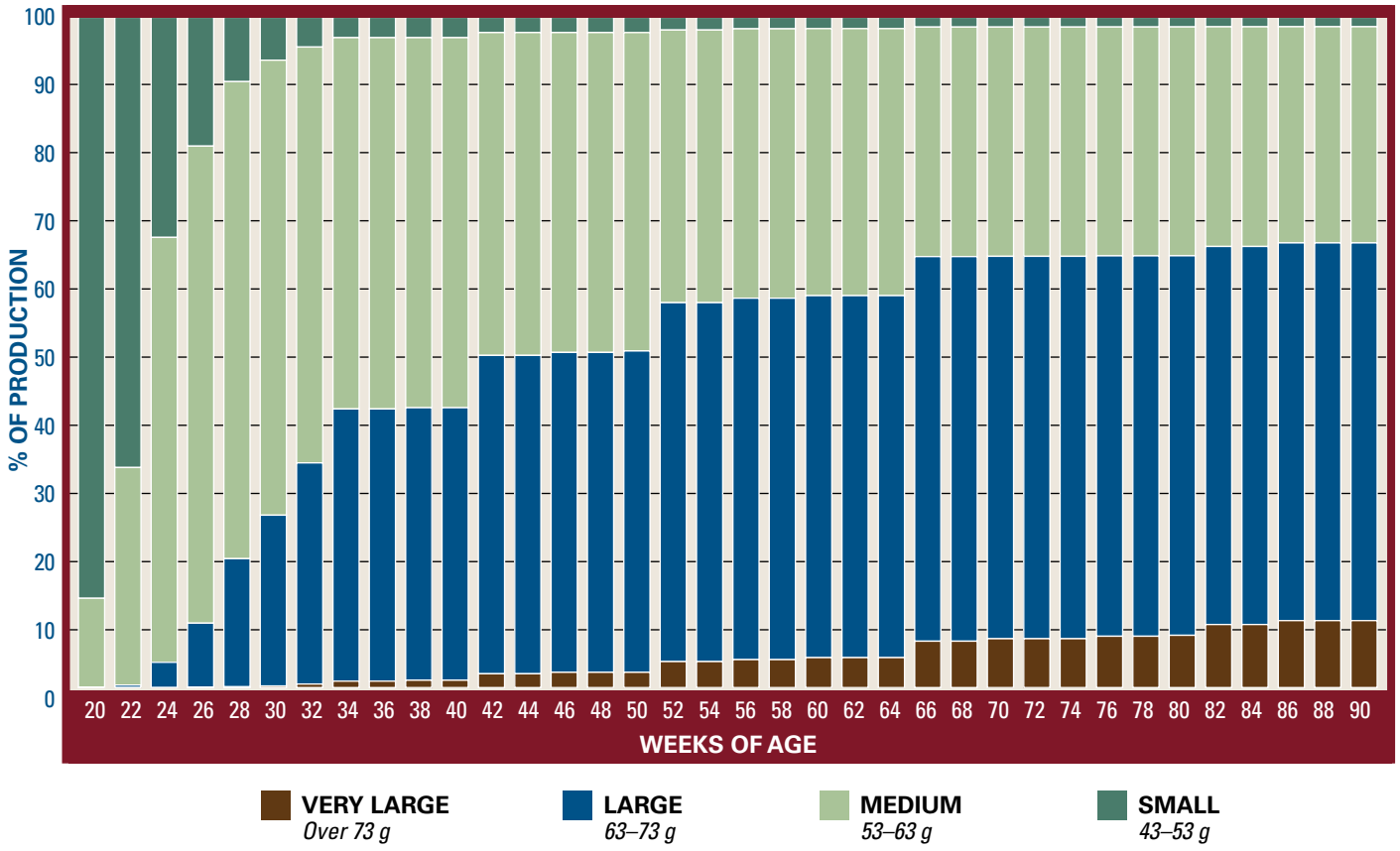
AGE (weeks)	HAUGH UNITS	BREAKING STRENGTH	SHELL COLOR
20	98.1	4440	50
22	97.5	4450	50
24	97.1	4460	49
26	96.7	4440	49
28	96.3	4420	48
30	95.9	4400	48
32	95.2	4380	48
34	94.5	4360	47
36	93.7	4340	47
38	93.0	4320	46
40	92.2	4300	46
42	91.5	4280	46
44	90.7	4260	45
46	90.0	4240	45
48	89.4	4220	44
50	88.7	4200	44
52	88.1	4180	44
54	87.4	4160	44
56	86.9	4140	43
58	86.3	4120	43
60	85.7	4100	43
62	85.2	4080	42
64	84.7	4060	42
66	84.1	4040	42
68	83.5	4020	41
70	83.0	4000	41
72	82.6	3980	41
74	82.1	3960	40
76	81.7	3940	40
78	81.2	3920	40
80	80.8	3900	40
82	80.4	3880	39
84	80.0	3860	39
86	79.6	3840	38
88	79.2	3820	38
90	78.8	3800	38

Egg Size Disribution–E.U. Standards

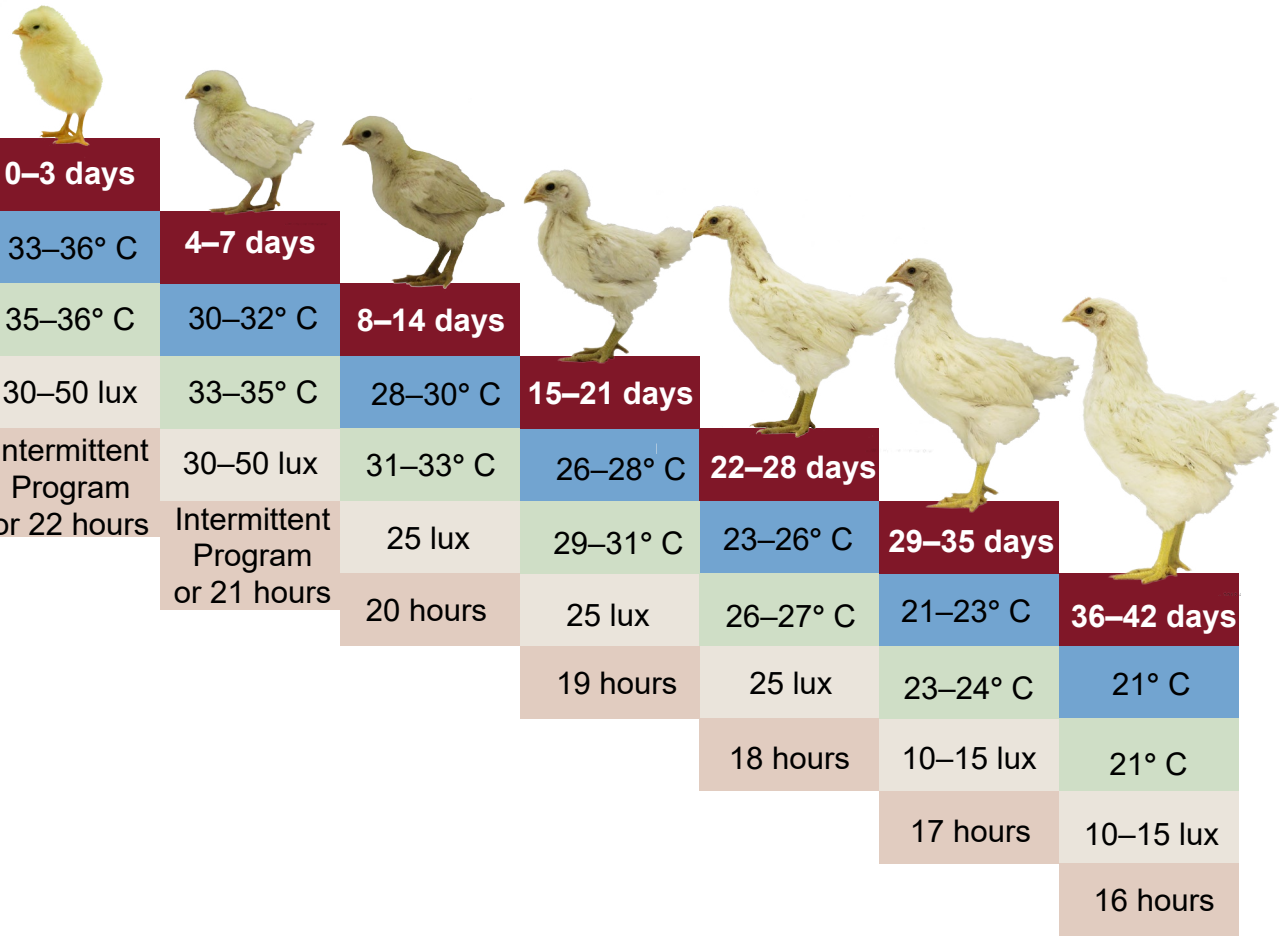
AGE (weeks)	AVERAGE EGG WEIGHT (g)	% VERY LARGE Over 73 g	% LARGE 63–73 g	% MEDIUM 53–63 g	% SMALL 43–53 g
20	48.0	0.00	0.04	13.28	86.68
22	51.0	0.00	0.38	32.45	67.17
24	55.0	0.00	3.77	63.39	32.84
26	57.0	0.03	9.58	71.17	19.22
28	59.0	0.12	19.11	71.17	9.60
30	60.0	0.24	25.48	67.88	6.40
32	61.0	0.53	32.99	62.04	4.44
34	62.0	0.96	40.61	55.39	3.04
36	62.0	0.96	40.61	55.39	3.04
38	62.0	1.10	40.65	55.21	3.04
40	62.0	1.10	40.65	55.21	3.04
42	63.0	2.06	47.50	48.16	2.28
44	63.0	2.06	47.50	48.16	2.28
46	63.0	2.28	47.72	47.72	2.28
48	63.0	2.28	47.72	47.72	2.28
50	63.0	2.28	47.94	47.50	2.28
52	64.0	3.88	53.54	40.68	1.90
54	64.0	3.88	53.54	40.68	1.90
56	64.0	4.17	53.92	40.19	1.72
58	64.0	4.17	53.92	40.19	1.72
60	64.0	4.47	54.00	39.84	1.69
62	64.0	4.47	54.00	39.84	1.69
64	64.0	4.47	54.00	39.84	1.69
66	65.0	6.92	57.38	34.24	1.46
68	65.0	6.92	57.38	34.24	1.46
70	65.0	7.29	57.05	34.20	1.46
72	65.0	7.29	57.05	34.20	1.46
74	65.0	7.29	57.05	34.20	1.46
76	65.0	7.66	56.75	34.14	1.45
78	65.0	7.66	56.75	34.14	1.45
80	65.0	7.80	56.62	34.14	1.44
82	65.5	9.41	56.40	32.77	1.42
84	65.5	9.41	56.40	32.77	1.42
86	65.5	9.99	56.35	32.25	1.41
88	65.5	9.99	56.35	32.25	1.41
90	65.5	9.99	56.35	32.25	1.41

Egg Size Distribution (cont.)

Egg Size Disribution–E.U. Standards

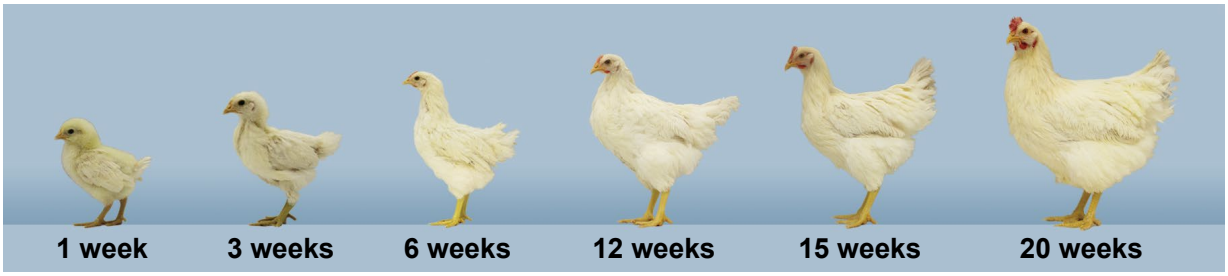


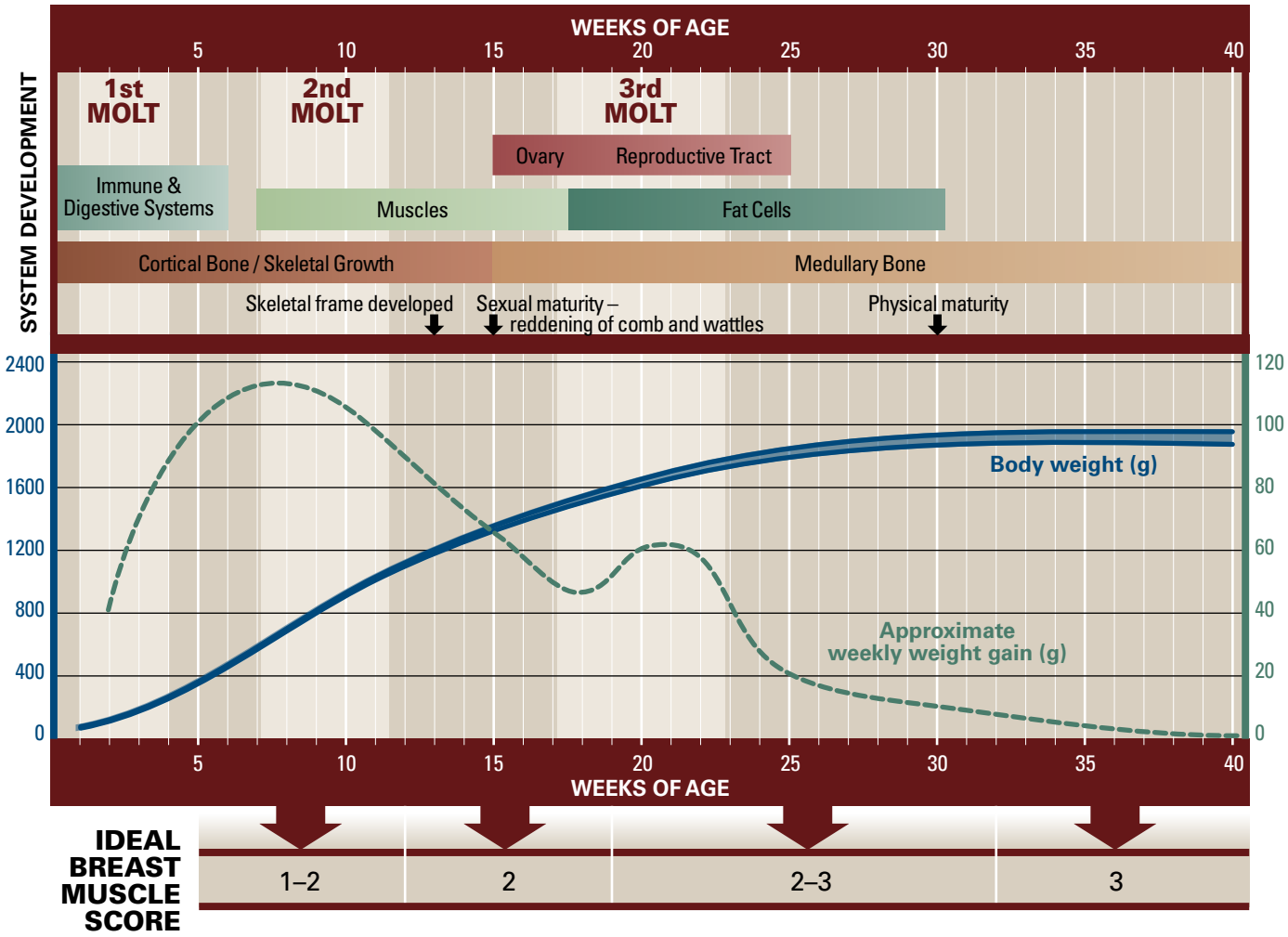
Brooding Temperature and Lighting Recommendations



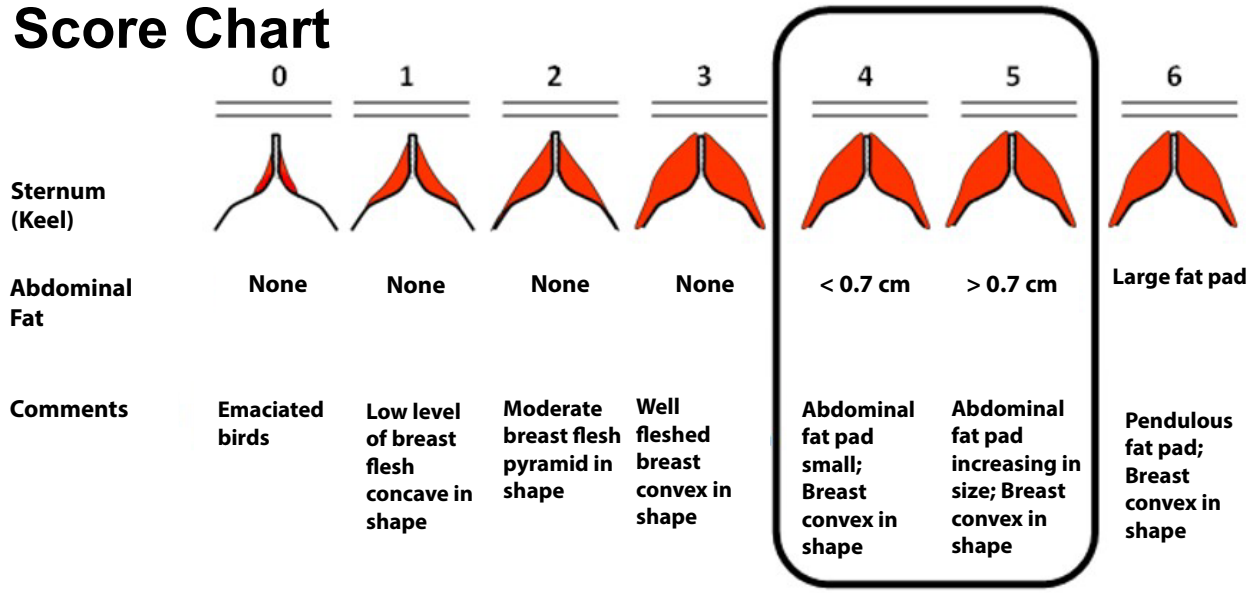
AGE	0–3 days	4–7 days	8–14 days	15–21 days	22–28 days	29–35 days	36–42 days
AIR TEMP. (CAGE)	33–36° C	30–32° C	28–30° C	26–28° C	23–26° C	21–23° C	21° C
AIR TEMP. (FLOOR)	35–36° C	33–35° C	31–33° C	29–31° C	26–27° C	23–24° C	21° C
LIGHT INTENSITY	30–50 lux	30–50 lux	25 lux	25 lux	25 lux	10–15 lux	10–15 lux
LIGHT HOURS	Intermittent Program or 22 hours	Intermittent Program or 21 hours	20 hours	19 hours	18 hours	17 hours	16 hours

Development of the Organ Systems in Pullets

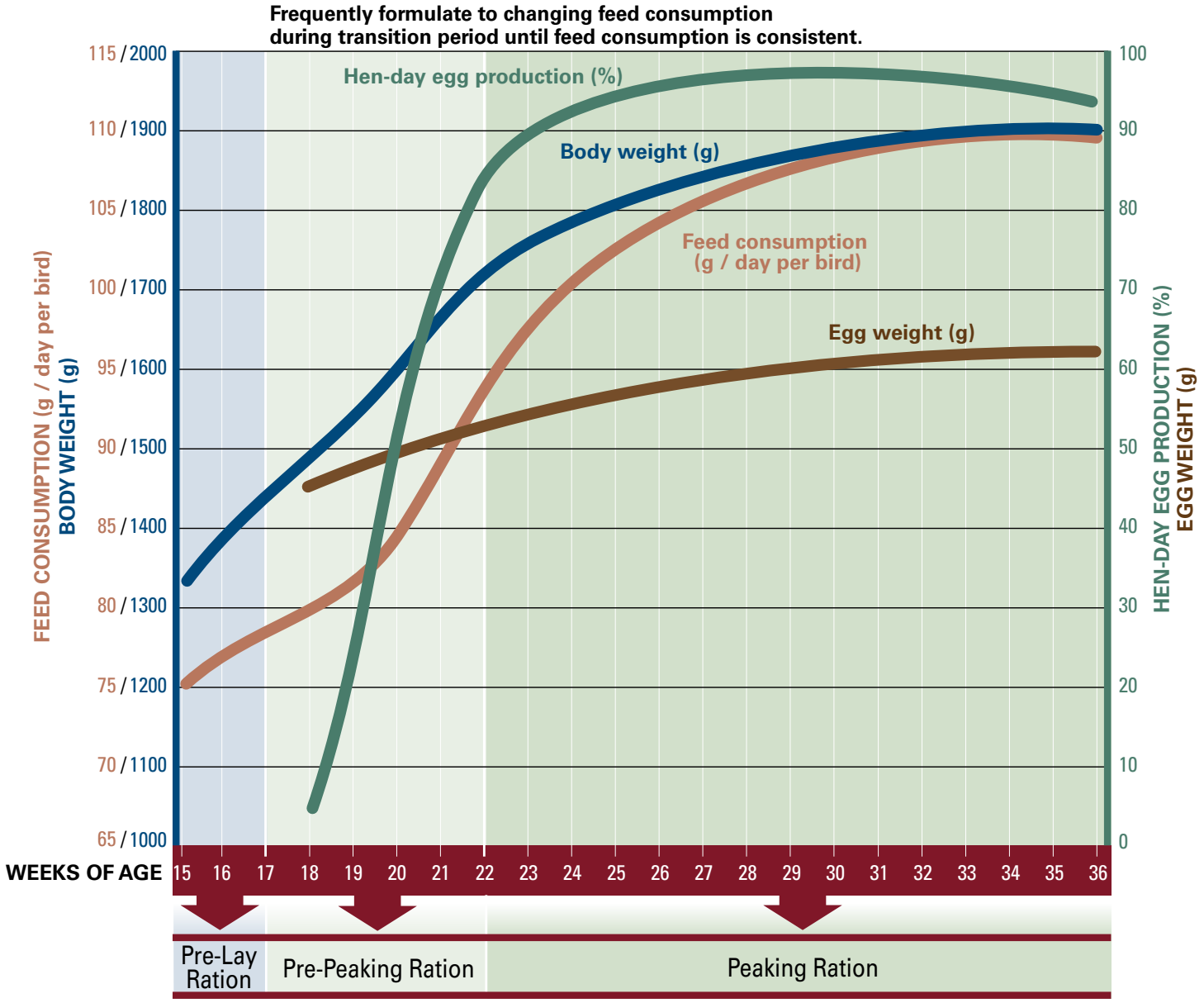




Body Score Chart



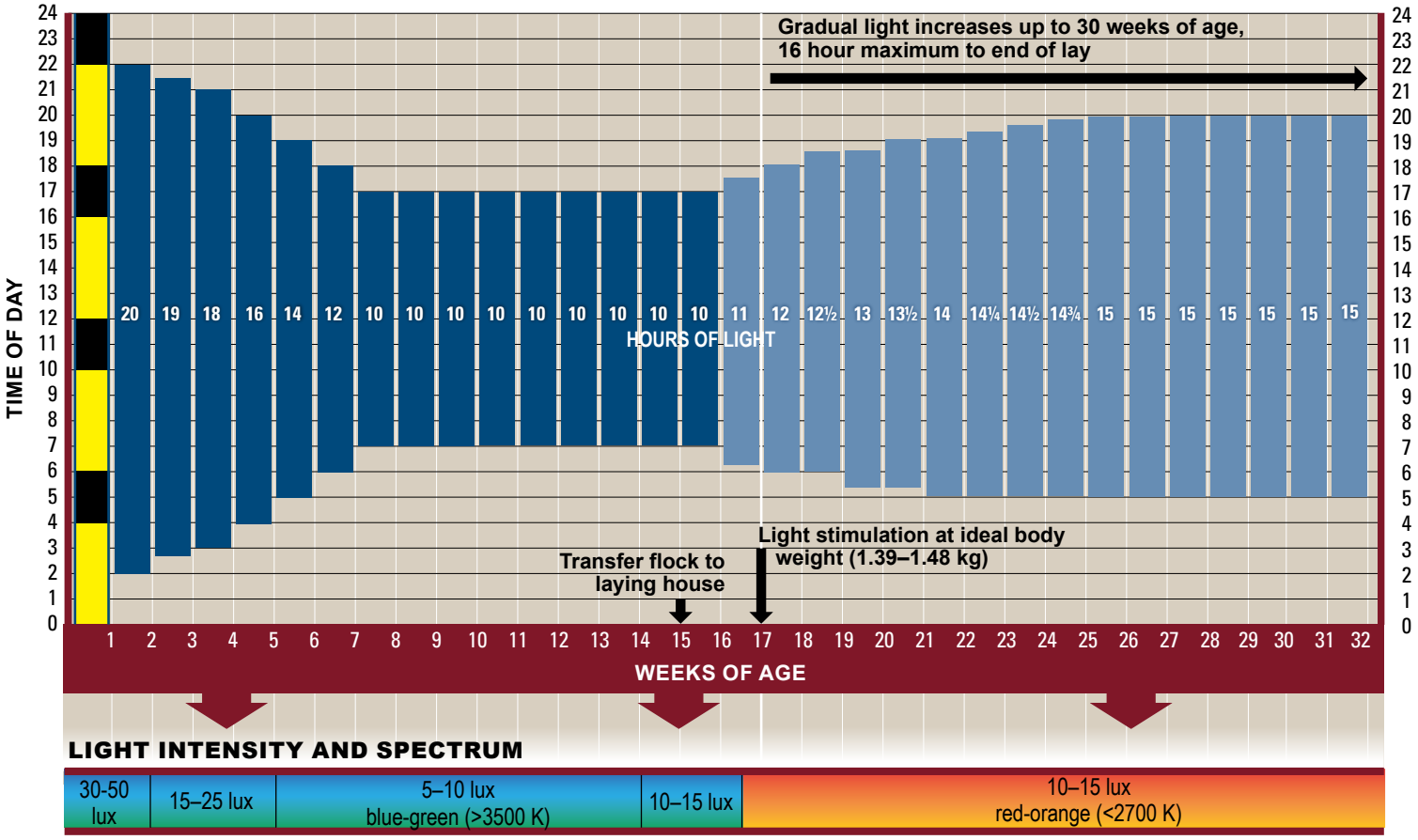
Transition Period from Rear to Peak Egg Production



Pre-Peak

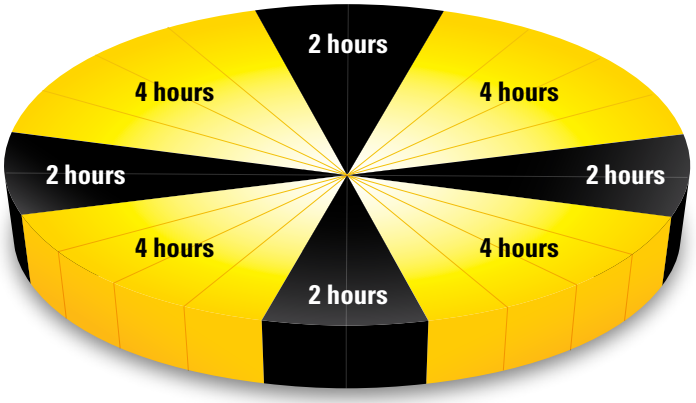
- Pre-Peak diets are intended for flocks with low feed intake and are fed for a limited period from first egg to the beginning of peak production. The nutrient specification of the Pre-Peak diet should be dense enough to allow for lower feed intake and also cater to the increased nutritional needs of the bird entering egg production. Continue to feed the Pre-Peak until feed intake has developed sufficiently to allow transition to the Peak diet.
- If utilized until no more than 50–70% HD, a Pre-Peak diet with reduced energy concentration can be beneficial to stimulate feed intake. Pre-Peaking diets are useful in situations where local conditions may result in reduced feed intake, such as hot climates where feed intake may be depressed.
- Increasing the vitamins and trace mineral inclusion to 30% can be useful to cope with the lower feed intake during the Pre-Peak phase.

Light Program for Light-Controlled Housing

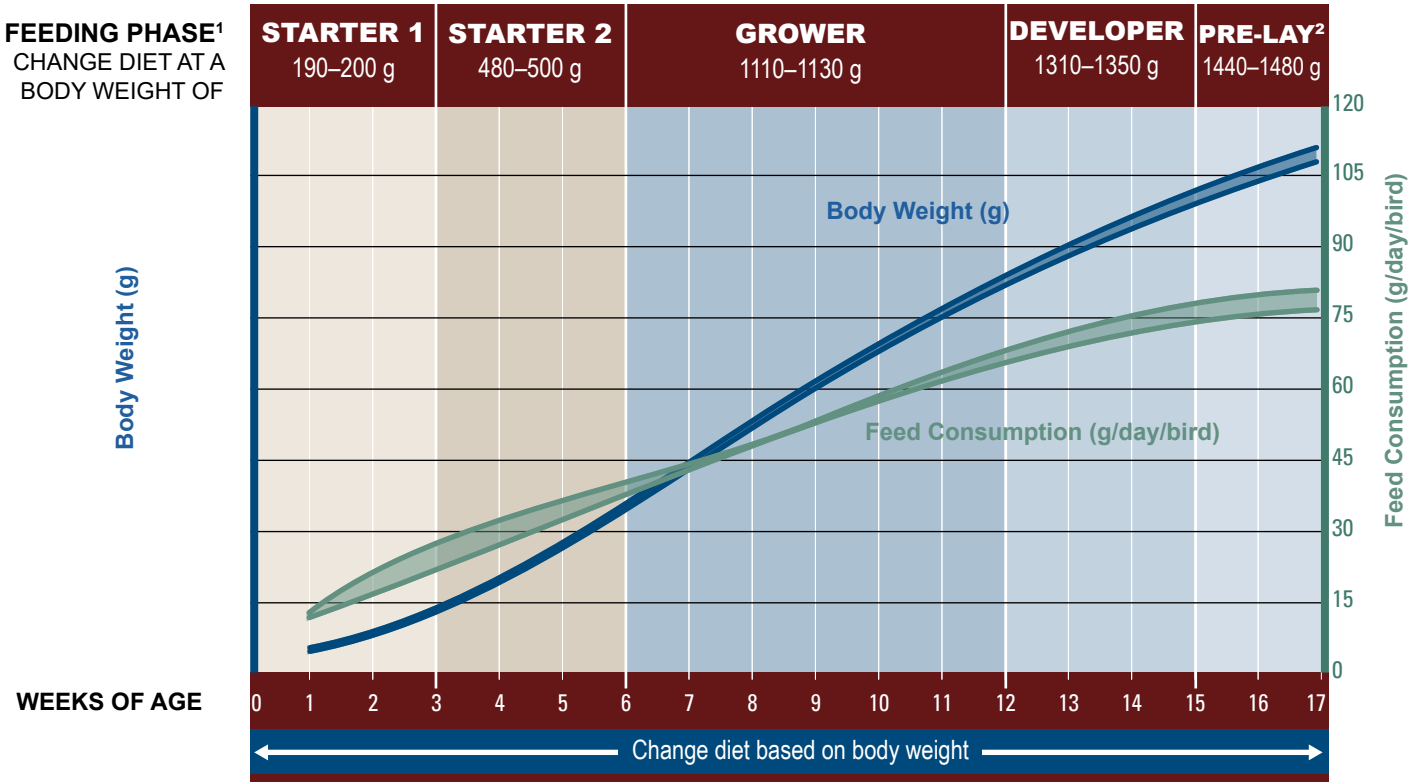


Intermittent Lighting Program for Chicks

- Preferred lighting technique.
- Use from 0–7 days (can be used up to 14 days of age).
- Intermittent dark periods provide rest periods for chicks.
- Synchronises chicks' activities and feedings.
- Establishes more natural behaviour of rest and activity.
- May improve 7-day livability and pullet body weight.
- Some dark periods may be shortened or removed to accommodate work schedules.



Rearing Period Nutritional Recommendations



NUTRITION	RECOMMENDED NUTRIENT CONCENTRATION				
Metabolizable energy[3], kcal/kg	2867–3043	2867–3043	2800–3021	2734–2951	2778–2999
Metabolizable energy[3], MJ/kg	12.00–12.74	12.00–12.74	11.72–12.64	11.44–12.35	11.63–12.55
	Standardized Ileal Digestible Amino Acids / Total Amino Acids[4]				
Lysine, %	**1.01** / 1.11	**0.92** / 1.01	**0.82** / 0.90	**0.67** / 0.73	**0.72** / 0.79
Methionine, %	**0.45** / 0.49	**0.42** / 0.46	**0.39** / 0.41	**0.31** / 0.34	**0.35** / 0.38
Methionine+Cystine,%	**0.77** / 0.87	**0.72** / 0.81	**0.66** / 0.75	**0.56** / 0.63	**0.62** / 0.70
Threonine, %	**0.65** / 0.76	**0.60** / 0.70	**0.55** / 0.65	**0.46** / 0.54	**0.50** / 0.58
Tryptophan, %	**0.18** / 0.22	**0.17** / 0.21	**0.17** / 0.21	**0.15** / 0.18	**0.16** / 0.19
Arginine, %	**1.05** / 1.13	**0.96** / 1.03	**0.85** / 0.92	**0.70** / 0.75	**0.75** / 0.81
Isoleucine, %	**0.71** / 0.76	**0.66** / 0.71	**0.61** / 0.65	**0.50** / 0.54	**0.56** / 0.60
Valine, %	**0.73** / 0.80	**0.68** / 0.75	**0.64** / 0.71	**0.54** / 0.59	**0.61** / 0.68
Crude protein[5], %	20.00	18.25	17.50	16.00	16.50
Calcium[6], %	1.05	1.00	0.95	0.90	2.50
Phosphorus (available)[7], %	0.45	0.44	0.43	0.38	0.42
Phosphorus (digestible), %	0.41	0.40	0.39	0.34	0.38
Sodium, %	0.18	0.17	0.17	0.18	0.18
Chloride, %	0.18	0.17	0.17	0.18	0.18
Linoleic acid (C18:2 n-6), %	1.00	1.00	1.00	1.00	1.00
Choline, mg	2,000	1,900	1,800	1,800	1,800

[1] Body weights are approximate. Ages shown are a guide only. Please note that at time of transfer, there will be some loss in body weight (normally 10–12%) due to reduced water intake.

[2] Do not feed Pre-Lay Diet earlier than 15 weeks of age. Do not feed Pre-Lay later than first egg as it contains insufficient calcium to support egg production.

[3] Recommended energy range is based on raw material energy values shown in feed ingredient table at back of this guide. It is important that target concentrations of dietary energy are adjusted according to energy system applied to raw material matrix.

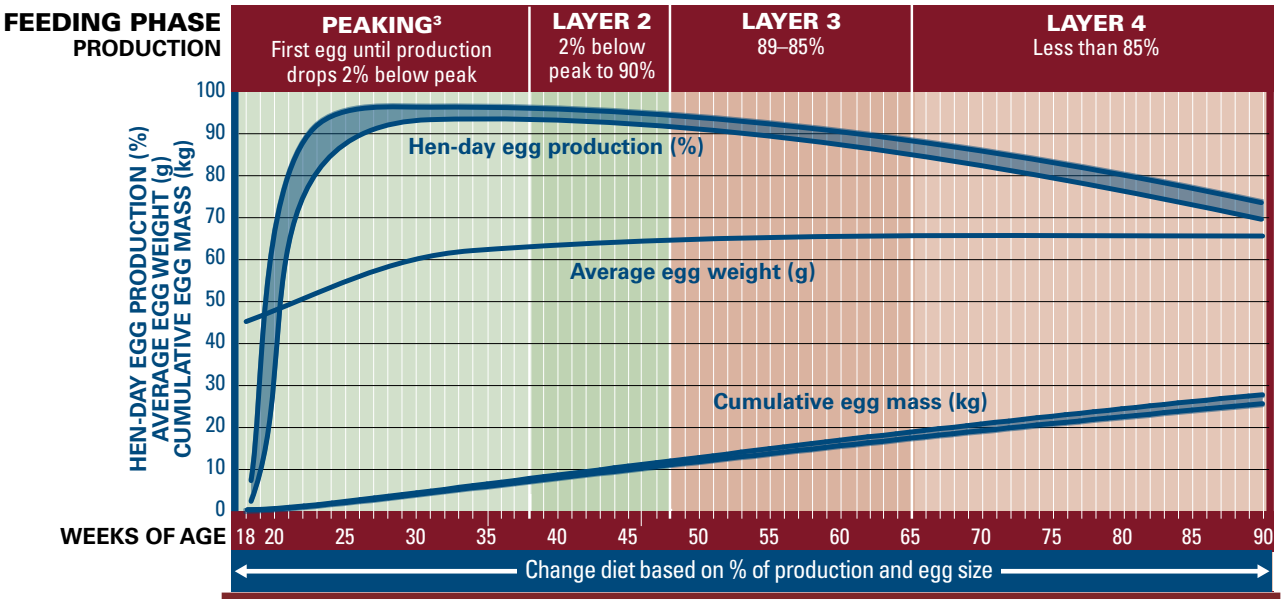
[4] Recommendation for Total Amino Acids is only appropriate to corn and soybean meal diet. Where diets utilise other ingredients, recommendations for Standardised Ileal Digestible Amino Acids must be followed.

[5] Diets should always be formulated to provide required intake of amino acid. Concentration of crude protein in diet will vary with raw material used. Crude protein value provided is an estimated typical value only.

[6] Calcium should be supplied as fine calcium carbonate (mean particle size less than 2 mm). Coarse limestone (2–4 mm) can be introduced in Pre-Lay Diet at up to 50% of total limestone.

[7] Where other phosphorus systems are used, diets should contain recommended minimum level of available phosphorus.

Production Period Nutritional Recommendations[1,2]



NUTRITION	RECOMMENDED DAILY NUTRIENT INTAKE			
Metabolizable energy[4], kcal/bird/day	315–330	310–325	305–320	300–315
Metabolizable energy[4], MJ/bird/day	1.318–1.380	1.297–1.359	1.276–1.338	1.255–1.318
	Standardized Ileal Digestible Amino Acids / Total Amino Acids[5]			
Lysine, mg/day	**780** / 850	**740** / 820	**710** / 780	**670** / 740
Methionine , mg/day	**397** / 425	**362** / 393	**340** / 366	**314** / 340
Methionine+Cystine,mg/day	**717** / 773	**666** / 729	**624** / 678	**576** / 629
Threonine, mg/day	**546** / 586	**518** / 565	**497** / 538	**469** / 510
Tryptophan, mg/day	**163** / 170	**155** / 164	**149** / 156	**140** / 148
Arginine, mg/day	**834** / 893	**791** / 861	**759** / 819	**716** / 777
Isoleucine, mg/day	**592** / 646	**562** / 623	**539** / 592	**509** / 562
Valine, mg/day	**670** / 731	**636** / 705	**610** / 670	**576** / 636
Crude protein[6], g/day	17.50	17.00	16.00	15.00
Sodium, mg/day	180	180	180	180
Chloride, mg/day	180	180	180	180
Linoleic acid (C18:2 n-6), g/day	1.00	1.00	1.00	1.00
Choline, mg/day	180	180	180	180

	CALCIUM AND PHOSPHORUS			
	Calcium[7,8] g/day	**Phosphorus (available)**[7,9] mg/day	**Phosphorus (digestible)** mg/day	**Calcium Particle Size** (fine : coarse) (see p. 17)
Weeks 18–33	4.00	432	389	40% : 60%
Weeks 34–48	4.20	405	366	35% : 65%
Weeks 49–62	4.40	373	337	30% : 70%
Weeks 63–76	4.60	347	314	25% : 75%
Weeks 77+	4.70	324	291	25% : 75%

Production Period Dietary Nutrient Concentrations[1,2]

FEEDING PHASE / PRODUCTION	PEAKING[3] First egg until production drops 2% below peak					LAYER 2 2% below peak to 90%					LAYER 3 89–85%					LAYER 4 Less than 85%				
NUTRITION	**RECOMMENDED CONCENTRATION**																			
Metabolizable energy[4], kcal/kg	2778–2867					2756–2867					2701–2867					2701–2867				
Metabolizable energy[4], MJ/kg	11.63–12.00					11.54–12.00					11.31–12.00					11.31–12.00				
FEED CONSUMPTION (*Typical Feed Consumption)																				
g/day per bird	90	95	**100***	105	110	100	105	**110***	115	120	100	105	**110***	115	120	100	105	**110***	115	120
Standardized Ileal Digestible Amino Acids																				
Lysine, %	0.90	0.85	0.81	0.77	0.74	0.78	0.74	0.70	0.67	0.65	0.74	0.70	0.67	0.64	0.62	0.71	0.67	0.64	0.61	0.59
Methionine, %	0.44	0.42	0.40	0.38	0.36	0.36	0.34	0.32	0.31	0.30	0.34	0.32	0.31	0.30	0.28	0.32	0.30	0.29	0.28	0.26
Methionine+Cystine,%	0.74	0.70	0.66	0.63	0.60	0.61	0.58	0.55	0.53	0.50	0.57	0.54	0.52	0.50	0.48	0.53	0.50	0.48	0.46	0.44
Threonine, %	0.63	0.60	0.57	0.54	0.52	0.54	0.52	0.49	0.47	0.45	0.52	0.49	0.47	0.45	0.43	0.49	0.47	0.45	0.43	0.41
Tryptophan, %	0.19	0.18	0.17	0.16	0.15	0.16	0.16	0.15	0.14	0.14	0.16	0.15	0.14	0.13	0.13	0.15	0.14	0.13	0.13	0.12
Arginine, %	0.96	0.91	0.87	0.83	0.79	0.83	0.79	0.75	0.72	0.69	0.79	0.75	0.72	0.69	0.66	0.75	0.72	0.69	0.66	0.63
Isoleucine, %	0.71	0.67	0.64	0.61	0.58	0.61	0.58	0.56	0.53	0.51	0.59	0.56	0.53	0.51	0.49	0.56	0.53	0.51	0.48	0.46
Valine, %	0.81	0.77	0.73	0.69	0.66	0.70	0.66	0.63	0.61	0.58	0.67	0.63	0.61	0.58	0.56	0.64	0.60	0.58	0.55	0.53
Total Amino Acids[5]																				
Lysine, %	0.99	0.93	0.89	0.84	0.81	0.85	0.81	0.77	0.74	0.71	0.81	0.77	0.74	0.70	0.68	0.77	0.74	0.70	0.67	0.64
Methionine, %	0.47	0.45	0.43	0.41	0.39	0.38	0.36	0.35	0.33	0.32	0.37	0.35	0.33	0.32	0.31	0.34	0.32	0.31	0.30	0.28
Methionine+Cystine,%	0.83	0.79	0.75	0.71	0.68	0.68	0.65	0.62	0.59	0.57	0.64	0.61	0.58	0.56	0.54	0.60	0.57	0.54	0.52	0.50
Threonine, %	0.74	0.70	0.67	0.64	0.61	0.64	0.61	0.58	0.55	0.53	0.61	0.58	0.55	0.53	0.51	0.58	0.55	0.53	0.51	0.48
Tryptophan, %	0.23	0.21	0.20	0.19	0.18	0.20	0.19	0.18	0.17	0.16	0.19	0.18	0.17	0.16	0.16	0.18	0.17	0.16	0.15	0.15
Arginine, %	1.04	0.98	0.93	0.89	0.85	0.89	0.85	0.81	0.78	0.74	0.85	0.81	0.77	0.74	0.71	0.81	0.77	0.74	0.71	0.68
Isoleucine, %	0.76	0.72	0.69	0.66	0.63	0.66	0.63	0.60	0.57	0.55	0.63	0.60	0.57	0.55	0.52	0.60	0.57	0.54	0.52	0.50
Valine, %	0.89	0.85	0.80	0.77	0.73	0.77	0.73	0.70	0.67	0.64	0.74	0.70	0.67	0.64	0.61	0.70	0.67	0.64	0.61	0.58
Crude protein[6], %	19.44	18.42	17.50	16.67	15.91	17.00	16.19	15.45	14.78	14.17	16.00	15.24	14.55	13.91	13.33	15.00	14.29	13.64	13.04	12.50
Sodium, %	0.20	0.19	0.18	0.17	0.16	0.18	0.17	0.16	0.16	0.15	0.18	0.17	0.16	0.16	0.15	0.18	0.17	0.16	0.16	0.15
Chloride, %	0.20	0.19	0.18	0.17	0.16	0.18	0.17	0.16	0.16	0.15	0.18	0.17	0.16	0.16	0.15	0.18	0.17	0.16	0.16	0.15
Linoleic acid (C18:2 n-6), %	1.11	1.05	1.00	0.95	0.91	1.00	0.95	0.91	0.87	0.83	1.00	0.95	0.91	0.87	0.83	1.00	0.95	0.91	0.87	0.83

CALCIUM AND PHOSPHORUS CHANGES BASED ON FEED INTAKE																									
	Weeks 18–33							Weeks 34–48					Weeks 49–62					Weeks 63–76					Weeks 77+				
Feed Consumption, g/day per bird	90	95	100	**105**	110	115	120	100	105	**110**	115	120	100	105	**110**	115	120	100	105	**110**	115	120	100	105	**110**	115	120
Calcium[7,8], %	4.44	4.21	4.00	**3.81**	3.64	3.48	3.33	4.20	4.00	**3.82**	3.65	3.50	4.40	4.19	**4.00**	3.83	3.67	4.60	4.38	**4.18**	4.00	3.83	4.70	4.48	**4.27**	4.09	3.92
Phosphorus (available)[7,9], %	0.48	0.46	0.43	**0.41**	0.39	0.38	0.36	0.41	0.39	**0.37**	0.35	0.34	0.37	0.36	**0.34**	0.32	0.31	0.35	0.33	**0.32**	0.30	0.29	0.32	0.31	**0.29**	0.28	0.27
Phosphorus (digestible), %	0.43	0.41	0.39	**0.37**	0.35	0.34	0.32	0.37	0.35	**0.33**	0.32	0.31	0.34	0.32	**0.31**	0.29	0.28	0.31	0.30	**0.29**	0.27	0.26	0.29	0.28	**0.26**	0.25	0.24

[1] All nutrient requirements are based on the Feed Ingredient Tables.
[2] Crude protein, methionine+cystine, fat, linoleic acid, and / or energy may be changed to optimize egg size.
[3] Peaking nutrient levels are calculated for birds at peak egg production. Prior to achieving peak egg production, the nutrient requirements will be lower.
[4] A good approximation of the influence of temperature on energy needs is that for each 0.5°C change higher or lower than 22°C, subtract or add about 2 kcal /bird /day, respectively.
[5] Recommendation for Total Amino Acids is only appropriate to corn and soybean meal diet. Where diets utilize other ingredients, recommendations for Standardized Ileal Digestible Amino Acids must be followed.
[6] Diets should always be formulated to provide required intake of amino acid. Concentration of crude protein in diet will vary with raw material used. Crude protein value provided is an estimated typical value only.
[7] Calcium and available phosphorus requirements are determined by flock age. When production remains higher and diets are fed for longer than ages shown, it is recommended to increase to calcium and phosphorus concentrations of next feeding phase.
[8] Calcium carbonate particle size recommendation varies throughout lay. Refer to Calcium Particle Size. Dietary calcium levels and fine to coarse ratio may need to be adjusted based on limestone solubility.
[9] Where other phosphorus systems are used, diets should contain recommended minimum level of available phosphorus.

Vitamins and Trace Minerals

ITEM [1,2,3,4]	IN 1000 KG COMPLETE DIET	
	Rearing Period	Production Period
Vitamin A, IU	10,000,000	8,000,000
Vitamin D_3[5], IU	3,300,000	3,300,000
Vitamin E, g	30.00	25.00
Vitamin K (menadione), g	3.50	3.00
Thiamin (B_1), g	2.20	2.50
Riboflavin (B_2), g	6.60	5.50
Niacin (B_3)[6], g	40.00	30.00
Pantothenic acid (B_5), g	10.00	10.00
Pyridoxine (B_6), g	4.50	5.00
Biotin (B_7), mg	100.00	75.00
Folic acid (B_9), g	1.00	0.90
Cobalamine (B_{12}), mg	23.00	23.00
Manganese[7], g	100.00	100.00
Zinc[7], g	85.00	80.00
Iron[7], g	30.00	40.00
Copper[7], g	15.00	8.00
Magnesium[7], g	600.00	500.00
Iodine, g	1.50	1.20
Selenium[7], g	0.25	0.25

[1] Minimum recommendations for rearing and laying periods. Local regulations may limit dietary content of individual vitamins or minerals. Levels of 150-200mg/kg of Vitamin C can be beneficial during periods of stress.

[2] Store premixes according to supplier's recommendations and observe 'use by' dates to ensure vitamin activity is maintained. Inclusion of antioxidant may improve premix stability.

[3] Vitamin and mineral recommendations vary according to activity.

[4] Where heat treatment is applied to diet, higher levels of vitamins may be required. Consult with vitamin supplier regarding stability through individual production processes.

[5] A proportion of Vitamin D_3 can be supplemented as 25-hydroxy D_3 according to supplier's recommendations and applicable limits.

[6] Higher levels of Niacin are recommended in non-cage systems.

[7] Greater bioavailability and productivity may be possible with use of chelated mineral sources.

Drinking Water Quality for Poultry

ITEM	MAXIMUM CONCENTRATION (ppm or mg/L)*	
Nitrate NO_3^- [1]	25	Older birds will tolerate higher levels up to 20 ppm. Stressed or disease challenged birds may be more sensitive to effects of Nitrate.
Nitrate Nitrogen (NO_3-N) [1]	6	
Nitrite NO_2^- [1]	4	Nitrite is considerably more toxic than Nitrate, especially for young birds, where 1 ppm Nitrite may be considered toxic.
Nitrite Nitrogen (NO_2-N) [1]	1	
Total dissolved solids [2]	1000	Levels up to 3000 ppm may not affect performance but could increase manure moisture.
Chloride (Cl^-) [1]	250	Levels as low as 14 mg may be problematic if sodium is higher than 50 ppm.
Sulphate (SO_4^-) [1]	250	Higher levels may be laxative.
Iron (Fe) [1]	<0.3	Higher levels result in bad odour and taste.
Magnesium (Mg) [1]	125	Higher levels may be laxative. Levels above 50 ppm may be problematic if sulphate levels are high.
Potassium (K) [2]	20	Higher levels may be acceptable depending on sodium level, alkalinity, and pH.
Sodium (Na) [1,2]	50	Higher concentration is acceptable but concentrations above 50 ppm should be avoided if high levels of chloride, sulphate, or potassium exist.
Manganese (Mn) [3]	0.05	Higher levels may be laxative.
Arsenic (As) [2]	0.5	
Fluoride (F^-) [2]	2	
Aluminium (Al) [2]	5	
Boron (B) [2]	5	
Cadmium (Cd) [2]	0.02	
Cobalt (Co) [2]	1	
Copper (Cu) [1]	0.6	Higher levels result in bitter taste.
Lead (Pb) [1]	0.02	Higher levels are toxic.
Mercury (Hg) [2]	0.003	Higher levels are toxic.
Zinc (Zn) [1]	1.5	Higher levels are toxic.
pH [1]	5–7	Birds may adapt to lower pH. Below pH 5 may reduce water intake and corrode metal fittings. Above pH 8 may reduce intake and reduce effectiveness of water sanitation.
Total bacteria counts [3]	1000 CFU/ml	This is likely to indicate dirty water.
Total Coliform bacteria [3]	50 CFU/ml	
Faecal Coliform bacteria [3]	0 CFU/ml	
Oxygen Reduction Potential (ORP) [3]	650–750 mEq	The ORP range at which 2–4 ppm of free chlorine will effectively sanitise water at a favourable pH range of 5–7.

* Limits may be lower as interactions exist between magnesium and sulphate; and between sodium, potassium, chloride, and sulphate.

[1] Carter & Sneed, 1996. Drinking Water Quality for Poultry, Poultry Science and Technology Guide, North Carolina State University Poultry Extension Service. Guide no. 42

[2] Marx and Jaikaran, 2007. Water Analysis Interpretation. Agri-Facts, Alberta Ag-Info Centre. Refer to http://www.agric.gov.ab.ca/app84/rwqit for online Water Analysis Tool

[3] Watkins, 2008. Water: Identifying and Correcting Challenges. Avian Advice 10(3): 10–15 University of Arkansas Cooperative Extension Service, Fayetteville

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TECHNICAL UPDATES

Diseases

An Overview of Focal Duodenal Necrosis (FDN)
MG Control in Commercial Layers
Colibacillosis in Layers: An Overview
Fowl Pox in Layers
Avian Urolithiasis (Visceral Gout)
Infectious Bursal Disease (IBD, Gumboro)
Fatty Liver Hemorrhagic Syndrome
Infectious Laryngotracheitis (ILT)
Intestinal Dilation Syndrome (IDS)
Newcastle Disease
Mycoplasma Synoviae (MS)
Low Pathogenic Avian Influenza (LPAI)

Diagnostic Samples and Breeder Flock Monitoring

Salmonella, *Mycoplasma*, and Avian Influenza Monitoring in Parent Breeder Flocks
Proper Collection and Handling of Diagnostic Samples

Management

Growing Management of Commercial Pullets
Understanding the Role of the Skeleton in Egg Production
The Science of Egg Quality
Understanding Poultry Lighting
Understanding Heat Stress in Layers
Infrared Beak Treatment
Feed Granulometry and the Importance of Feed Particle Size in Layers
Impact of Tarp Colour on Poultry Lighting
SPIDES (Short Period Incubation During Egg Storage)
Fly Management: Surveillance and Control
Optimising Egg Size in Commercial Layers
Vaccination Recommendations
Egg Drop Syndrome (EDS)
Managing Fully Beaked Flocks
Thiamin Deficiency in Pullets
Understanding Nesting Behaviour

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