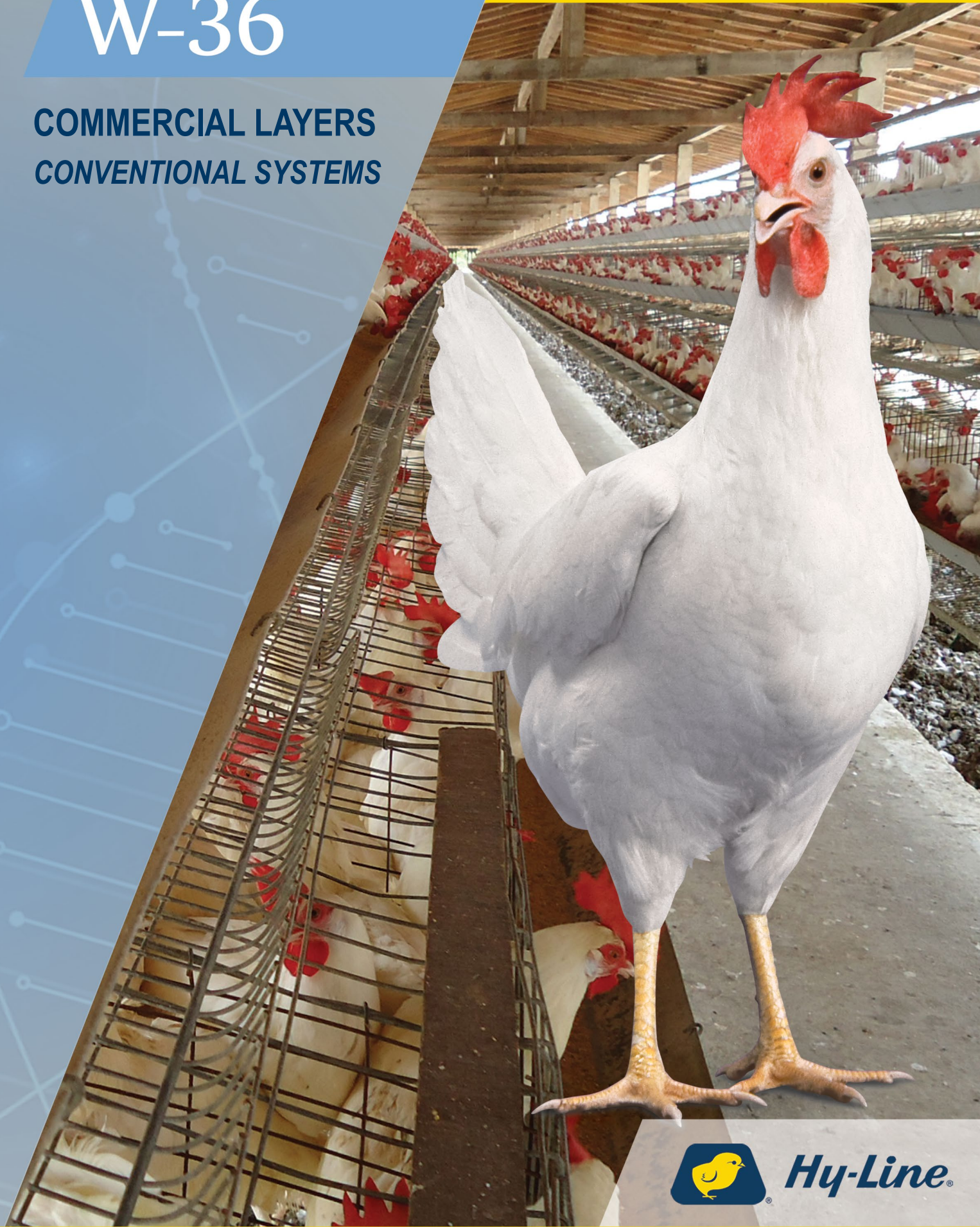


Hy-Line[®]

PERFORMANCE STANDARDS GUIDE

W-36

COMMERCIAL LAYERS
CONVENTIONAL SYSTEMS



Hy-Line[®]

Use of the Performance Guide

The genetic potential of Hy-Line W-36 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 W-36 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.



W-36 Online Management Guide

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Summary of Performance Standards

REARING PERIOD (TO 17 WEEKS):	
Livability	97%
Feed Consumed	5.36–5.94 kg
Body Weight at 17 Weeks	1190–1250 g
LAYING PERIOD (TO 100 WEEKS):	
Percent Peak	95–97%
Hen-Day Eggs to 60 Weeks	256–264
Hen-Day Eggs to 100 Weeks	471–487
Hen-Housed Eggs to 60 Weeks	252–260
Hen-Housed Eggs to 100 Weeks	456–472
Livability to 60 Weeks	97.1%
Livability to 100 Weeks	92.0%
Days to 50% Production (from hatch)	143
Egg Weight at 26 Weeks	54.7 g
Egg Weight at 32 Weeks	58.5 g
Egg Weight at 70 Weeks	63.3 g
Egg Weight at 100 Weeks	63.8 g
Total Egg Mass per Hen-Housed (18–100 weeks)	27.4–29.4 kg
Body Weight at 26 Weeks	1480–1540 g
Body Weight at 32 Weeks	1510–1570 g
Body Weight at 70 Weeks	1550–1610 g
Body Weight at 100 Weeks	1550–1610 g
Freedom From Egg Inclusions	Excellent
Shell Strength	Excellent
Haugh Units at 38 Weeks	91.4
Haugh Units at 56 Weeks	87.5
Haugh Units at 70 Weeks	86.0
Haugh Units at 100 Weeks	85.0
Average Daily Feed Consumption (18–100 weeks)	99.6 g/day per bird
Feed Conversion Rate, kg Feed/kg Eggs (20–60 weeks)	1.81–1.94
Feed Conversion Rate, kg Feed/kg Eggs (20–100 weeks)	1.93–2.08
Feed Utilization, kg Egg/kg Feed (20–60 weeks)	0.52–0.55
Feed Utilization, kg Egg/kg Feed (20–100 weeks)	0.48–0.52
Feed Consumption per 10 Eggs (20–60 weeks)	1.04–1.14 kg
Feed Consumption per 10 Eggs (20–100 weeks)	1.13–1.24 kg
Feed Consumption per Dozen Eggs (20–60 weeks)	1.25–1.37 kg
Feed Consumption per Dozen Eggs (20–100 weeks)	1.36–1.49 kg
Condition of Droppings	Dry

Rearing Period Performance Table

AGE (weeks)	MORTALITY Cumulative (%)	BODY WEIGHT (g)		FEED INTAKE (g/bird/day)		WATER INTAKE (ml/bird/day)		CUMULATIVE FEED INTAKE (g/bird to date)		UNIFORMITY %
		Low	High	Low	High	Low	High	Low	High	
1	0.75	60	73	13	16	20	32	60	111	>85%
2	1.30	100	118	17	20	25	41	209	253	
3	1.55	150	181	22	26	33	53	360	438	
4	1.66	200	259	29	34	43	67	560	673	>80%
5	1.77	290	349	34	38	51	76	798	940	
6	1.88	372	440	39	43	59	86	1074	1242	
7	1.99	472	531	43	47	64	93	1373	1569	>85%
8	2.10	549	621	46	51	69	102	1695	1927	
9	2.15	649	721	50	55	76	110	2047	2311	
10	2.20	739	812	54	58	80	116	2423	2717	
11	2.25	830	894	55	60	83	119	2810	3135	
12	2.30	921	971	56	61	84	123	3204	3564	
13	2.35	980	1039	58	64	87	128	3613	4013	
14	2.40	1039	1111	59	66	89	132	4027	4475	
15	2.45	1102	1161	61	68	91	135	4453	4948	
16	2.50	1152	1211	64	69	95	138	4898	5431	
17	2.55	1188	1252	67	72	100	144	5366	5936	>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 INTAKE (ml/bird/day)		HH EGG MASS Cumulative (kg)		AVG. EGG WT. (g/egg)
	Low	High	Low	High	Low	High		Low	High	Low	High	Low	High	Low	High	
18	2	3	0.1	0.2	0.1	0.2	0.1	1.23	1.30	63	74	95	148	0.01	0.01	44.2
19	15	22	1.2	1.8	1.2	1.7	0.1	1.27	1.37	68	77	102	155	0.06	0.09	45.0
20	35	50	3.6	5.3	3.6	5.2	0.1	1.32	1.43	73	80	109	161	0.2	0.3	45.9
21	60	67	7.8	9.9	7.8	9.9	0.2	1.38	1.47	76	84	114	169	0.4	0.5	48.0
22	80	84	13.4	15.8	13.4	15.8	0.2	1.41	1.49	80	88	120	177	0.6	0.8	49.8
23	88	92	19.6	22.3	19.6	22.2	0.3	1.43	1.50	85	93	128	186	0.9	1.1	51.3
24	91	94	26.0	28.9	25.9	28.8	0.4	1.45	1.51	89	96	134	192	1.3	1.5	52.6
25	93	95	32.5	35.5	32.4	35.4	0.5	1.47	1.53	93	99	139	197	1.6	1.8	53.7
26	94	96	39.1	42.2	39.0	42.1	0.5	1.48	1.54	94	101	142	202	2.0	2.2	54.7
27	95	96	45.7	49.0	45.6	48.8	0.6	1.48	1.55	96	102	143	205	2.3	2.6	55.5
28	95	96	52.4	55.7	52.1	55.5	0.6	1.49	1.55	96	103	144	205	2.7	3.0	56.3
29	95	97	59.0	62.5	58.7	62.2	0.7	1.50	1.56	97	103	145	206	3.1	3.4	57.0
30	95	97	65.6	69.2	65.3	68.9	0.7	1.50	1.56	97	103	146	206	3.4	3.8	57.6
31	95	97	72.3	76.0	71.9	75.6	0.8	1.51	1.57	97	103	146	207	3.8	4.1	58.1
32	95	96	78.9	82.7	78.5	82.3	0.9	1.51	1.57	98	104	146	207	4.2	4.5	58.5
33	94	96	85.5	89.5	85.0	89.0	0.9	1.52	1.58	98	104	147	208	4.6	4.9	59.0
34	94	96	92.1	96.2	91.5	95.6	1.0	1.52	1.58	98	104	147	208	4.9	5.4	59.3
35	94	95	98.7	102.9	98.1	102.2	1.0	1.53	1.59	98	104	147	209	5.3	5.8	59.7
36	94	95	105.2	109.5	104.6	108.8	1.1	1.53	1.59	98	105	147	209	5.7	6.2	60.0
37	93	95	111.8	116.2	111.0	115.4	1.1	1.53	1.59	98	105	147	209	6.1	6.6	60.3
38	93	95	118.3	122.8	117.5	122.0	1.2	1.54	1.60	98	105	147	209	6.5	7.0	60.5
39	93	95	124.8	129.5	123.9	128.5	1.3	1.54	1.60	98	105	148	209	6.8	7.4	60.7
40	93	94	131.3	136.1	130.3	135.0	1.3	1.54	1.60	99	105	148	209	7.2	7.8	60.9
41	92	94	137.7	142.7	136.6	141.5	1.4	1.54	1.60	99	105	148	209	7.6	8.2	61.1
42	92	94	144.2	149.2	143.0	148.0	1.5	1.55	1.61	99	105	148	209	8.0	8.6	61.3
43	92	93	150.6	155.8	149.3	154.4	1.6	1.55	1.61	99	105	148	209	8.4	9.0	61.5
44	91	93	156.9	162.3	155.5	160.9	1.6	1.55	1.61	99	105	148	209	8.7	9.4	61.6
45	91	93	163.3	168.8	161.8	167.2	1.7	1.55	1.61	99	105	148	209	9.1	9.8	61.8
46	90	92	169.6	175.2	168.0	173.6	1.8	1.55	1.61	99	105	148	209	9.5	10.2	61.9
47	90	92	175.9	181.7	174.2	179.9	1.9	1.55	1.61	99	105	148	209	9.9	10.6	62.0
48	90	92	182.2	188.1	180.4	186.2	1.9	1.55	1.61	99	105	148	209	10.3	11.0	62.1
49	90	92	188.5	194.5	186.5	192.5	2.0	1.55	1.61	99	105	148	209	10.6	11.4	62.2
50	89	91	194.7	200.9	192.6	198.8	2.1	1.55	1.61	99	105	148	209	11.0	11.8	62.3
51	89	91	200.9	207.3	198.7	205.0	2.2	1.55	1.61	99	105	148	209	11.4	12.2	62.4
52	89	91	207.2	213.7	204.8	211.2	2.2	1.55	1.61	99	105	148	209	11.7	12.6	62.5
53	88	91	213.4	220.0	210.8	217.4	2.3	1.55	1.61	99	105	148	209	12.1	13.0	62.5
54	88	90	219.5	226.3	216.8	223.6	2.4	1.55	1.61	99	105	148	209	12.5	13.4	62.6
55	88	90	225.6	232.6	222.8	229.8	2.5	1.55	1.61	99	105	148	209	12.9	13.8	62.7
56	87	90	231.8	238.9	228.8	235.9	2.6	1.55	1.61	99	105	148	209	13.2	14.2	62.7
57	87	89	237.8	245.1	234.7	241.9	2.7	1.55	1.61	99	105	148	209	13.6	14.6	62.8
58	87	89	243.9	251.3	240.6	248.0	2.8	1.55	1.61	99	105	148	209	13.9	14.9	62.9

Production Period Performance Table (cont.)

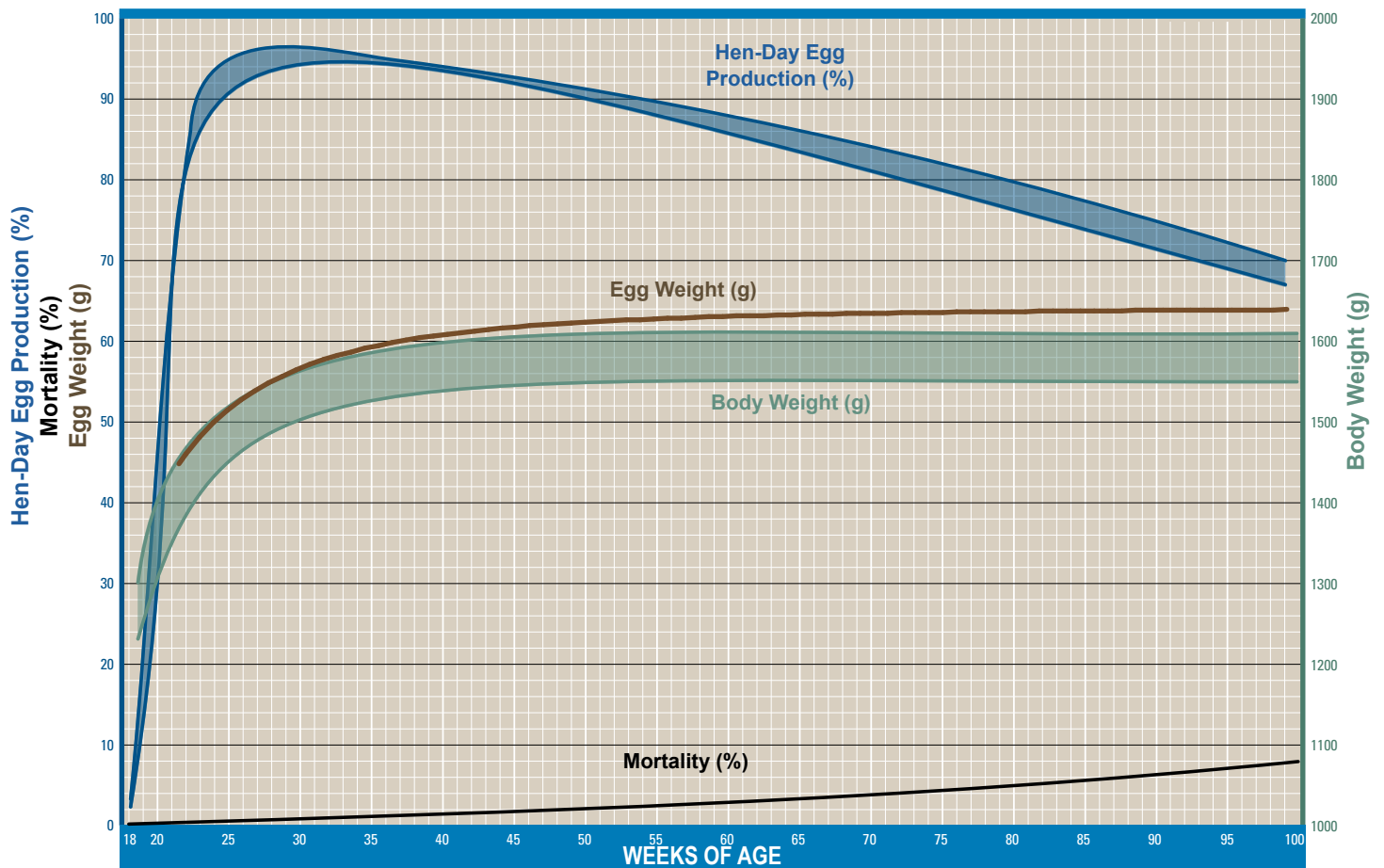
AGE (weeks)	% HEN-DAY Current		HEN-DAY EGGS Cumulative		HEN- HOUSED EGGS Cumulative		MORT- ALITY Cumulative (%)	BODY WEIGHT (g)		FEED INTAKE (g/bird/day)		WATER INTAKE (ml/bird/day)		HH EGG MASS Cumulative (kg)		AVG. EGG WT. (g/egg)
	Low	High	Low	High	Low	High		Low	High	Low	High	Low	High	Low	High	
59	86	88	249.9	257.5	246.5	254.0	2.8	1.55	1.61	99	105	148	209	14.3	15.3	62.9
60	86	88	256.0	263.7	252.3	259.9	2.9	1.55	1.61	99	105	148	209	14.7	15.7	63.0
61	86	88	261.9	269.8	258.1	265.9	3.0	1.55	1.61	99	105	148	209	15.0	16.1	63.0
62	85	88	267.9	276.0	263.9	271.9	3.1	1.55	1.61	99	105	148	209	15.4	16.5	63.0
63	85	87	273.9	282.1	269.6	277.8	3.2	1.55	1.61	99	105	148	209	15.7	16.9	63.1
64	85	87	279.8	288.1	275.4	283.6	3.3	1.55	1.61	99	105	148	209	16.1	17.2	63.1
65	84	86	285.7	294.2	281.1	289.5	3.4	1.55	1.61	99	105	148	209	16.4	17.6	63.2
66	84	86	291.5	300.2	286.7	295.3	3.5	1.55	1.61	99	105	148	209	16.8	18.0	63.2
67	83	85	297.3	306.2	292.3	301.0	3.6	1.55	1.61	99	105	148	209	17.1	18.4	63.2
68	83	85	303.1	312.1	297.9	306.8	3.7	1.55	1.61	99	105	148	209	17.5	18.7	63.3
69	82	85	308.9	318.1	303.4	312.5	3.8	1.55	1.61	99	105	148	209	17.8	19.1	63.3
70	82	84	314.6	324.0	308.9	318.1	3.9	1.55	1.61	99	105	148	209	18.2	19.5	63.3
71	81	84	320.3	329.8	314.4	323.8	4.0	1.55	1.61	99	105	148	209	18.5	19.8	63.3
72	81	83	325.9	335.7	319.8	329.4	4.0	1.55	1.61	99	105	148	209	18.8	20.2	63.4
73	80	83	331.6	341.5	325.2	335.0	4.1	1.55	1.61	99	105	148	209	19.2	20.5	63.4
74	80	83	337.2	347.3	330.6	340.5	4.2	1.55	1.61	99	105	148	209	19.5	20.9	63.4
75	80	82	342.7	353.0	335.9	346.0	4.3	1.55	1.61	99	105	148	209	19.8	21.3	63.4
76	79	82	348.3	358.8	341.2	351.5	4.3	1.55	1.61	99	105	148	209	20.2	21.6	63.5
77	79	81	353.8	364.5	346.5	357.0	4.4	1.55	1.61	99	105	148	209	20.5	22.0	63.5
78	78	81	359.3	370.2	351.7	362.4	4.6	1.55	1.61	99	105	148	209	20.8	22.3	63.5
79	78	81	364.7	375.8	356.9	367.8	4.6	1.55	1.61	99	105	148	209	21.2	22.7	63.5
80	77	80	370.1	381.4	362.0	373.1	4.7	1.55	1.61	99	105	148	209	21.5	23.0	63.5
81	77	80	375.5	387.0	367.1	378.4	4.9	1.55	1.61	99	105	148	209	21.8	23.4	63.5
82	76	79	380.8	392.6	372.2	383.7	5.0	1.55	1.61	99	105	148	209	22.1	23.7	63.6
83	76	79	386.1	398.1	377.2	388.9	5.2	1.55	1.61	99	105	148	209	22.4	24.0	63.6
84	75	78	391.4	403.6	382.2	394.1	5.3	1.55	1.61	99	105	148	209	22.7	24.4	63.6
85	75	78	396.6	409.0	387.1	399.3	5.5	1.55	1.61	99	105	148	209	23.0	24.7	63.6
86	74	77	401.8	414.4	392.0	404.4	5.6	1.55	1.61	99	105	148	209	23.3	25.0	63.6
87	74	77	406.9	419.8	396.9	409.4	5.8	1.55	1.61	99	105	148	209	23.6	25.4	63.6
88	73	76	412.1	425.1	401.7	414.5	6.0	1.55	1.61	99	105	148	209	23.9	25.7	63.6
89	73	76	417.1	430.4	406.5	419.5	6.1	1.55	1.61	99	105	148	209	24.2	26.0	63.7
90	72	75	422.2	435.7	411.2	424.4	6.3	1.55	1.61	99	105	148	209	24.5	26.3	63.7
91	72	75	427.2	440.9	415.9	429.3	6.5	1.55	1.61	99	105	148	209	24.8	26.7	63.7
92	71	74	432.2	446.1	420.6	434.1	6.7	1.55	1.61	99	105	148	209	25.1	27.0	63.7
93	71	74	437.1	451.3	425.2	439.0	6.8	1.55	1.61	99	105	148	209	25.4	27.3	63.7
94	70	73	442.0	456.4	429.7	443.7	7.0	1.55	1.61	99	105	148	209	25.7	27.6	63.7
95	70	73	446.9	461.5	434.3	448.5	7.2	1.55	1.61	99	105	148	209	26.0	27.9	63.7
96	69	72	451.8	466.6	438.7	453.1	7.4	1.55	1.61	99	105	148	209	26.3	28.2	63.7
97	69	72	456.6	471.6	443.2	457.8	7.6	1.55	1.61	99	105	148	209	26.5	28.5	63.7
98	68	71	461.3	476.6	447.6	462.4	7.8	1.55	1.61	99	105	148	209	26.8	28.8	63.7
99	68	71	466.1	481.6	451.9	466.9	7.9	1.55	1.61	99	105	148	209	27.1	29.1	63.7
100	67	70	470.8	486.5	456.3	471.5	8.0	1.55	1.61	99	105	148	209	27.4	29.4	63.8

Production Period Space Recommendations

check local regulations concerning space requirements)

WEEKS OF AGE											
4										15	20 30 40 50 60 70 80
CONVENTIONAL AND COLONY CAGES											
Floor Space											
100–200 cm ² (50–100 birds / m ²)										360 cm ² (28 birds / m ²)	490 cm ² (20 birds / m ²)
Nipple/Cup											
1 / 12 birds										1 / 8 birds	1 / 12 birds or access to 2 drinkers
Feeders											
4.5 cm / bird										5–7 cm / bird	7–9 cm / bird

Performance Graph



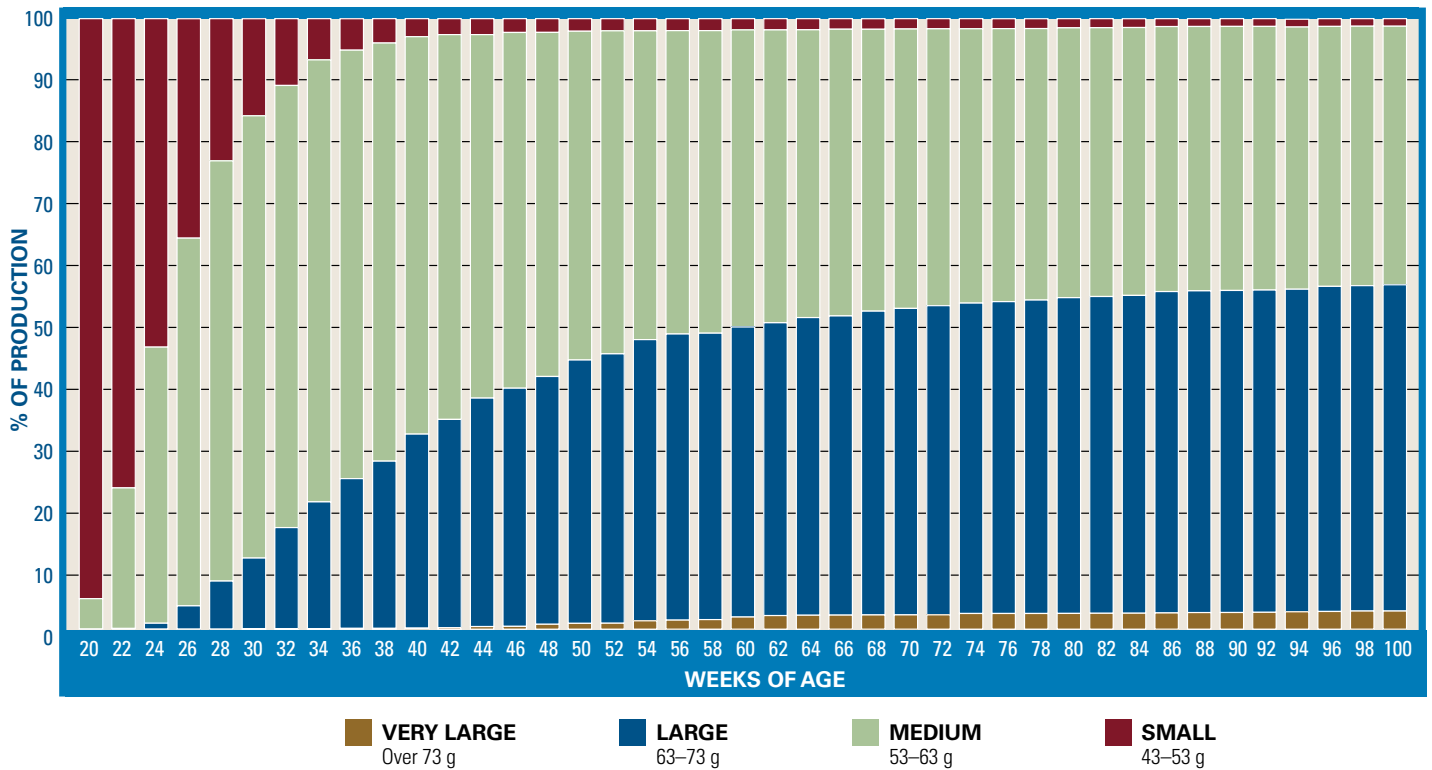
Egg Quality and Egg Size Distribution

EGG QUALITY			
AGE (weeks)	HAUGH UNITS	% SOLIDS	BREAKING STRENGTH
18	98.0	22.4	4280
20	97.6	22.9	4260
22	96.8	23.2	4250
24	96.0	23.5	4240
26	95.3	23.7	4220
28	94.6	23.9	4200
30	93.9	24.1	4180
32	93.2	24.3	4160
34	92.6	24.4	4140
36	92.0	24.5	4120
38	91.4	24.6	4110
40	90.8	24.6	4100
42	90.3	24.7	4090
44	89.7	24.7	4085
46	89.2	24.7	4080
48	88.9	24.7	4075
50	88.5	24.7	4070
52	88.1	24.7	4065
54	87.7	24.7	4060
56	87.5	24.7	4050
58	87.2	24.7	4045
60	87.0	24.7	4040
62	86.8	24.7	4030
64	86.6	24.7	4010
66	86.4	24.7	3990
68	86.2	24.7	3970
70	86.0	24.7	3955
72	85.8	24.7	3945
74	85.6	24.7	3940
76	85.4	24.7	3930
78	85.2	24.7	3920
80	85.0	24.7	3910
82	84.8	24.8	3900
84	84.6	24.8	3890
86	84.4	24.8	3880
88	84.2	24.8	3870
90	84.0	24.8	3860
92	83.8	24.8	3850
94	83.6	24.8	3840
96	83.4	24.8	3830
98	83.2	24.8	3820
100	83.0	24.8	3810

EGG SIZE DISTRIBUTION—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	45.9	0.00	0.00	5.00	95.00
22	49.8	0.00	0.12	23.02	76.86
24	52.6	0.00	0.97	45.23	53.80
26	54.7	0.00	3.82	60.23	35.94
28	56.3	0.00	7.88	68.83	23.29
30	57.6	0.04	11.61	72.44	15.90
32	58.5	0.06	16.58	72.42	10.94
34	59.3	0.09	20.76	72.40	6.75
36	60.0	0.13	24.53	70.18	5.15
38	60.5	0.13	27.39	68.49	3.99
40	60.9	0.17	31.78	65.10	2.95
42	61.3	0.25	34.11	63.03	2.61
44	61.6	0.43	37.42	59.54	2.61
46	61.9	0.46	39.01	58.27	2.26
48	62.1	0.80	40.59	56.36	2.25
50	62.3	0.95	43.14	53.85	2.06
52	62.5	0.97	44.13	52.91	1.99
54	62.6	1.37	46.06	50.58	1.99
56	62.7	1.48	46.87	49.69	1.96
58	62.9	1.57	46.91	49.56	1.96
60	63.0	1.99	47.51	48.66	1.84
62	63.0	2.23	47.96	47.97	1.84
64	63.1	2.28	48.76	47.14	1.82
66	63.2	2.30	49.01	46.96	1.73
68	63.3	2.33	49.76	46.17	1.73
70	63.3	2.34	50.20	45.77	1.69
72	63.4	2.35	50.64	45.35	1.66
74	63.4	2.57	50.84	44.94	1.65
76	63.5	2.57	51.08	44.72	1.62
78	63.5	2.57	51.34	44.47	1.61
80	63.5	2.58	51.72	44.20	1.50
82	63.6	2.60	51.89	44.03	1.48
84	63.6	2.61	52.06	43.88	1.44
86	63.6	2.66	52.64	43.41	1.29
88	63.6	2.72	52.70	43.30	1.28
90	63.7	2.73	52.75	43.25	1.27
92	63.7	2.76	52.79	43.18	1.27
94	63.7	2.85	52.83	42.95	1.27
96	63.7	2.90	53.25	42.58	1.27
98	63.7	2.97	53.30	42.49	1.24
100	63.8	2.97	53.44	42.35	1.24

Egg Size Distribution (cont.)

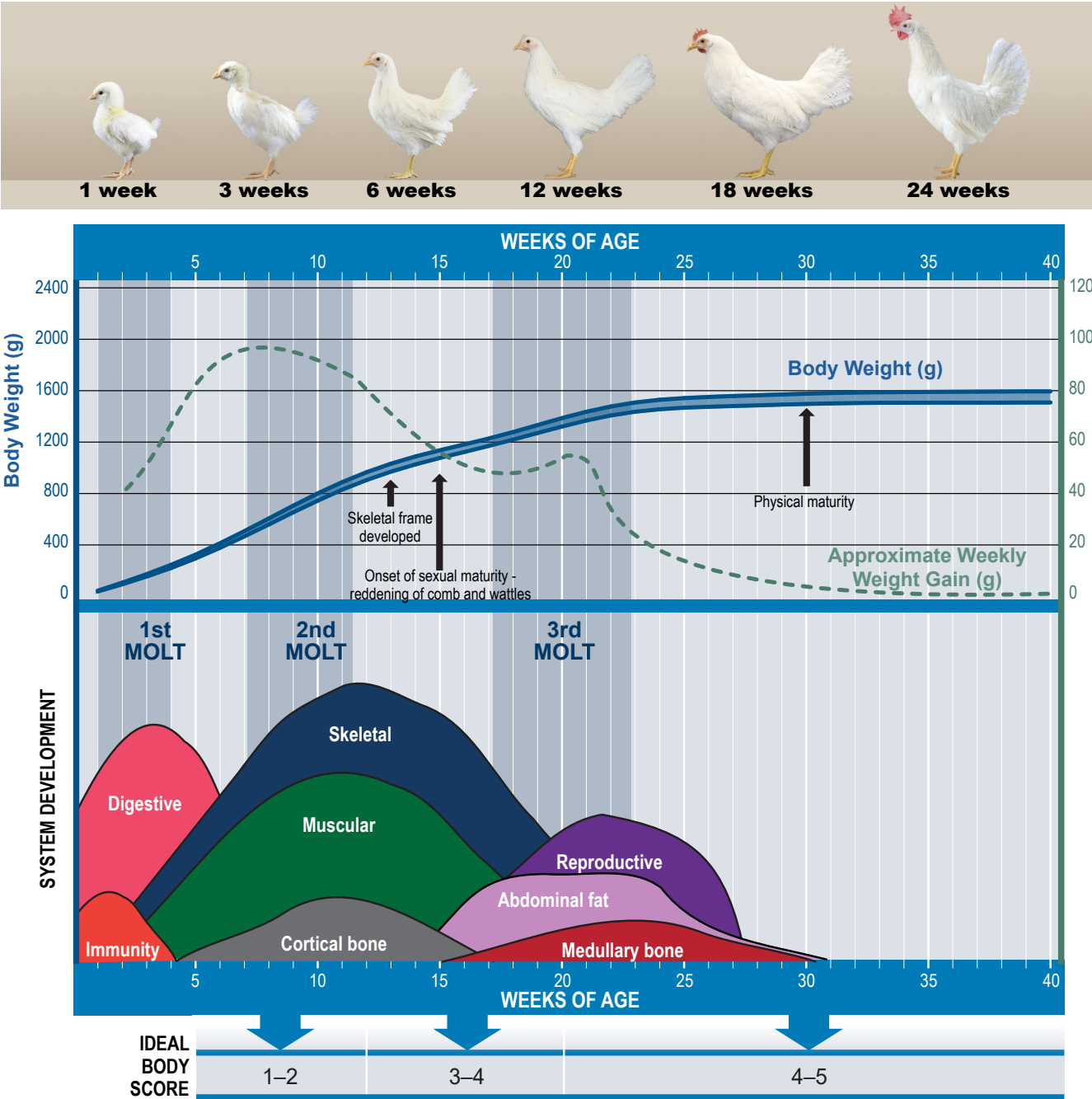
E.U. Standards



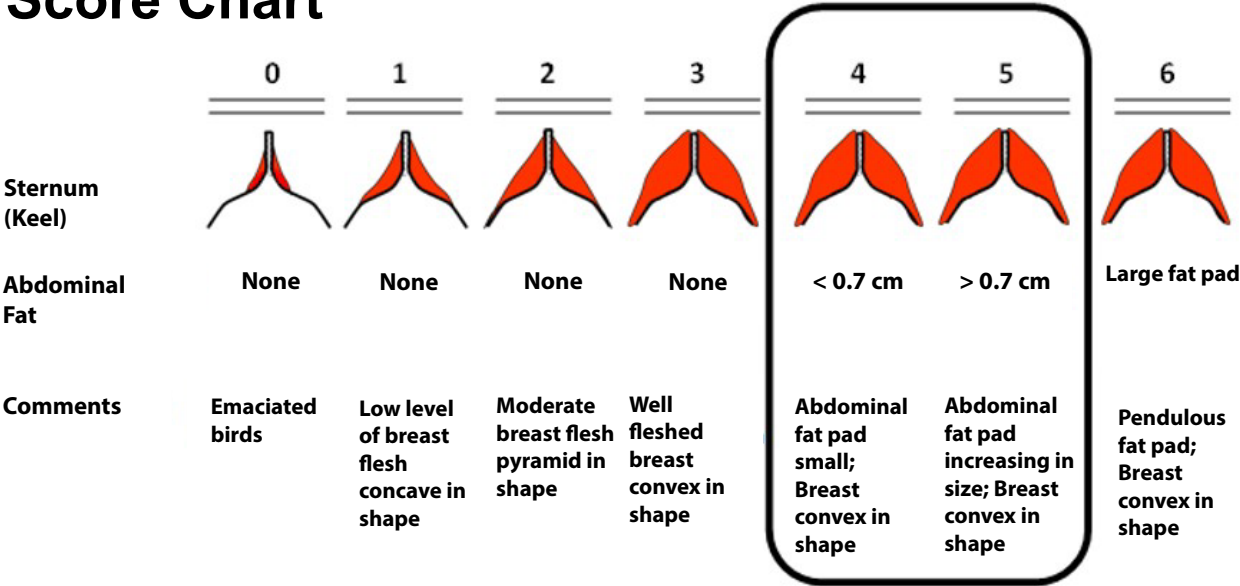
Brooding Temperature and Lighting Recommendations

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)	32–33° C	30–32° C	28–30° C	26–28° C	23–26° C	21–23° C	21° C
AIR TEMP. (FLOOR)	33–35° C	31–33° C	29–31° C	27–29° C	24–27° C	22–24° C	21° C
LIGHT INTENSITY	30–50 lux	30–50 lux	30–50 lux	25 lux	25 lux	10 lux	10 lux
LIGHT HOURS	Intermittent Program or 22 hours	Intermittent Program or 21 hours	20 hours	19 hours	18 hours	17 hours	16 hours

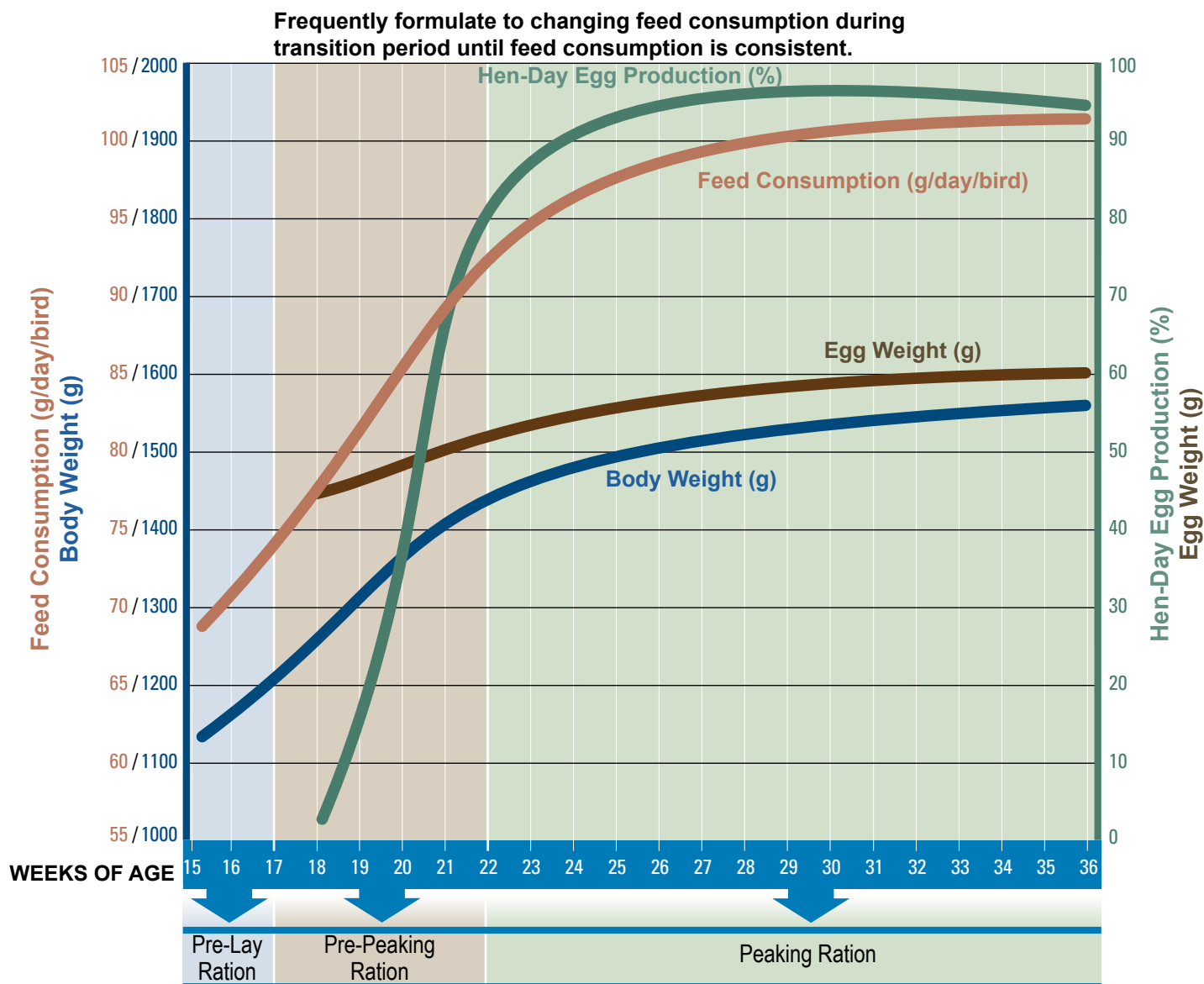
Development of the Organ Systems in Pullets



Body Score Chart



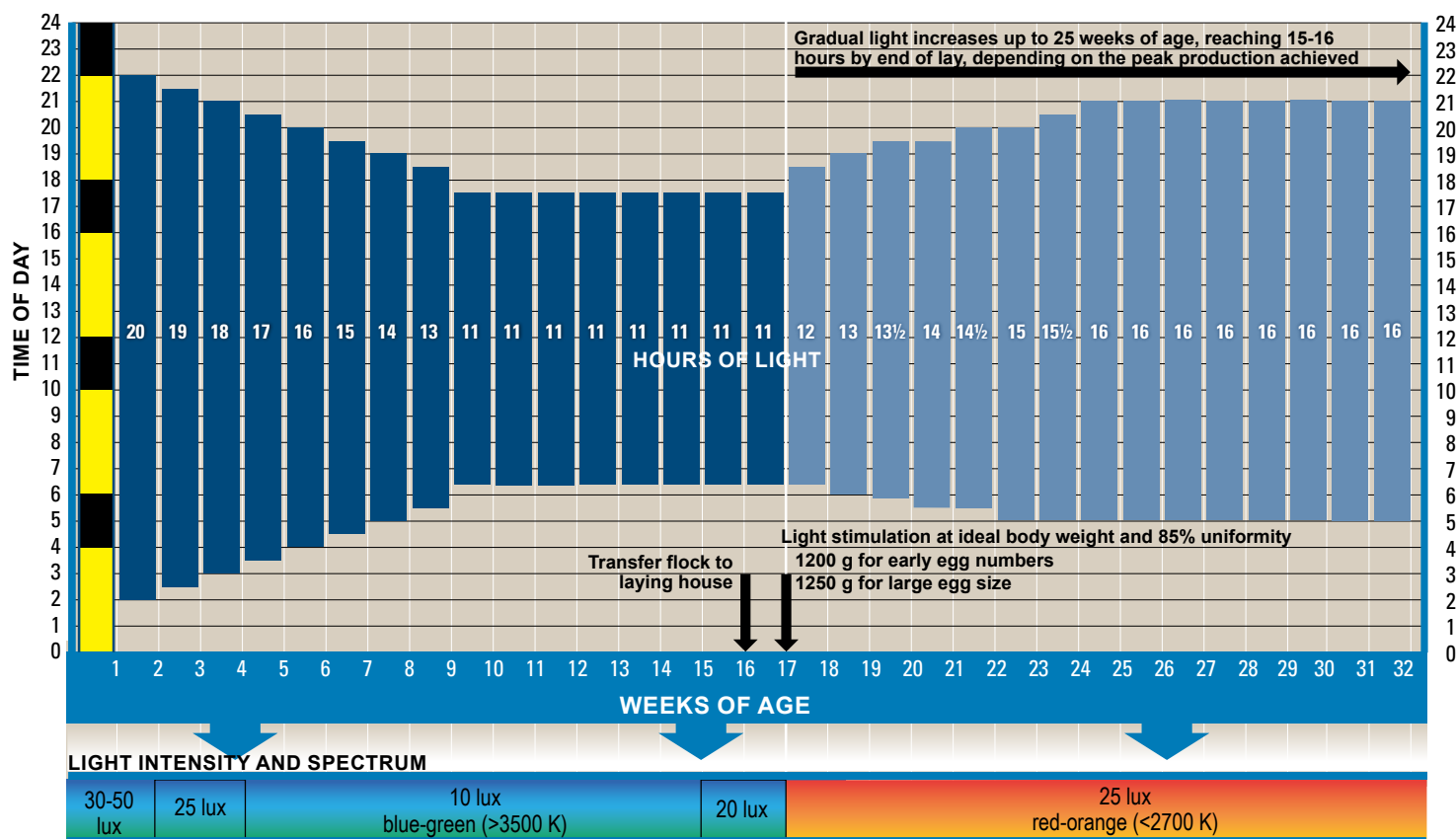
Transition Period from Rear to Peak Egg Production



Pre-Peak

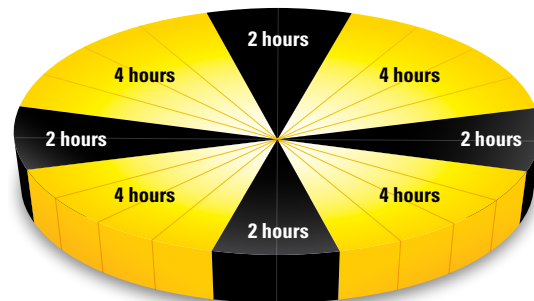
- Pre-Peak diets are intended for flocks with low feed intake and are fed for a limited period from first egg to the beginning of peak production. The nutrient specification of the Pre-Peak diet should be dense enough to allow for lower feed intake and also cater to the increased nutritional needs of 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

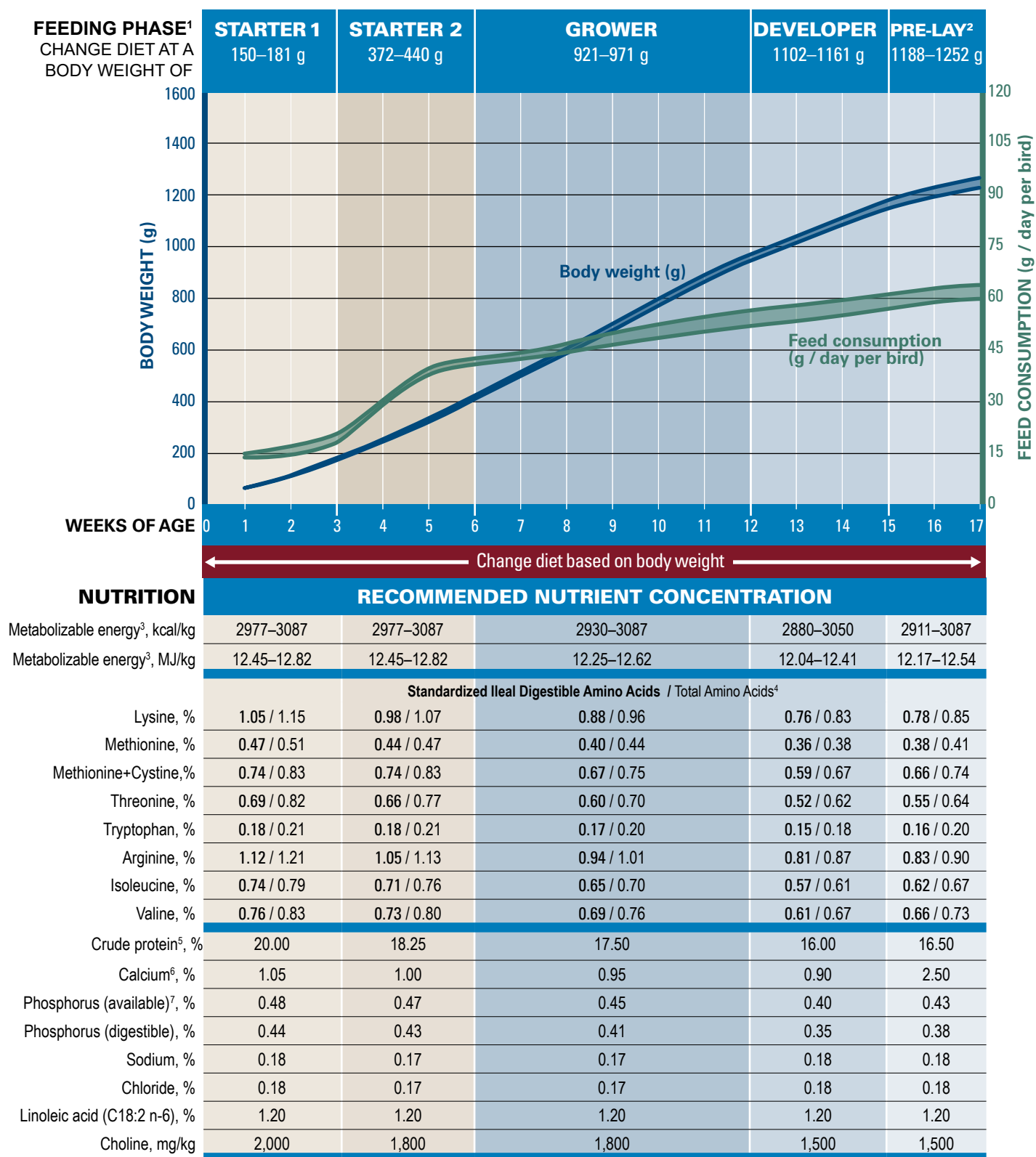


Intermittent Lighting Program for Chicks

- 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



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.

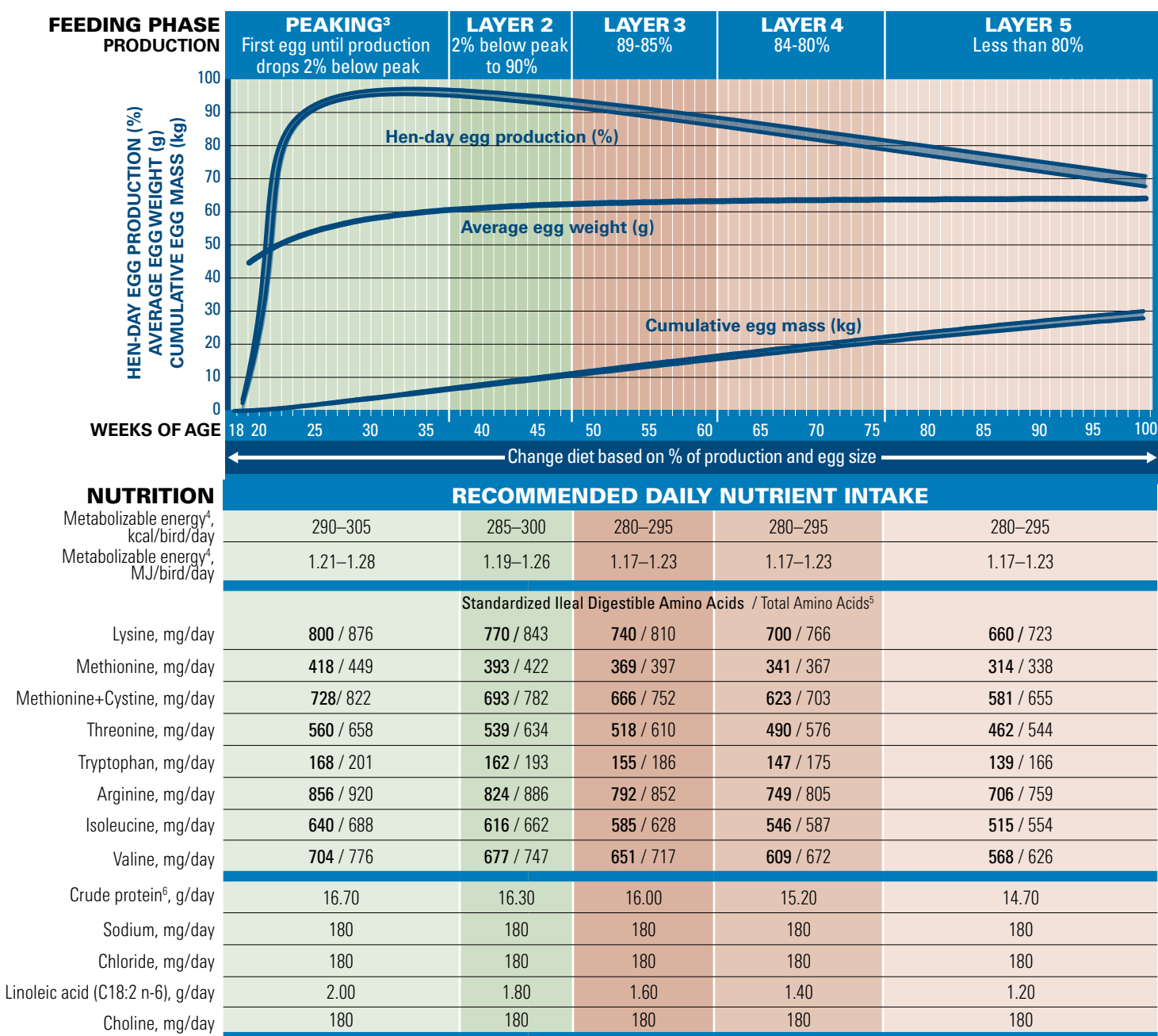
⁴ Recommendation for Total Amino Acids is only appropriate to corn and soybean meal diet. Where diets utilise other ingredients, recommendations for Standardised Ileal Digestible Amino Acids must be followed.

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}



	CALCIUM AND PHOSPHORUS			
	Calcium ^{7,8} g/day	Phosphorus (available) ^{7,9} mg/day	Phosphorus (digestible) mg/day	Calcium Particle Size (fine : coarse)
18–32 Weeks	4.00	447	401	40% : 60%
Weeks 33–55	4.15	421	381	35% : 65%
Weeks 56–72	4.30	395	356	30% : 70%
Weeks 73–85	4.45	369	334	25% : 75%
Weeks 86+	4.60	344	309	25% : 75%

	IDEAL PROTEIN REFERENCE				
	PEAKING	PHASE 2	PHASE 3	PHASE 4	PHASE 5
Lysine	100%	100%	100%	100%	100%
Methionine	50%	50%	50%	50%	50%
M+C	90%	90%	90%	90%	89%
Threonine	70%	70%	70%	70%	70%
Tryptophan	22%	22%	22%	22%	22%
Arginine	104%	104%	104%	104%	104%
Isoleucine	80%	80%	80%	80%	80%
Valine	88%	88%	88%	88%	88%

Production Period Dietary Nutrient Concentrations^{1,2}

FEEDING PHASE PRODUCTION NUTRITION	PEAKING ³ First egg until production drops 2% below peak					LAYER 2 2% below peak to 90%					LAYER 3 89–85%					LAYER 4 84–80%					LAYER 5 Less than 80%				
	RECOMMENDED CONCENTRATION																								
Metabolizable energy ⁴ , kcal/bird/day	290–305					285–300					280–295					280–295					280–295				
Metabolizable energy ⁴ , MJ/bird/day	1.21–1.28					1.19–1.26					1.17–1.23					1.17–1.23					1.17–1.23				
FEED CONSUMPTION (*Typical Feed Consumption)																									
g/day per bird	95	100	105*	110	115	95	100	105*	110	115	95	100	105*	110	115	95	100	105*	110	115	95	100	105*	110	115
Standardized Ileal Digestible Amino Acids																									
Lysine, %	0.94	0.89	0.84	0.80	0.76	0.86	0.81	0.77	0.73	0.70	0.82	0.78	0.74	0.70	0.67	0.78	0.74	0.70	0.67	0.64	0.73	0.69	0.66	0.63	0.60
Methionine, %	0.49	0.46	0.44	0.42	0.40	0.44	0.41	0.39	0.37	0.36	0.41	0.39	0.37	0.35	0.34	0.38	0.36	0.34	0.32	0.31	0.35	0.33	0.31	0.30	0.29
Methionine+Cystine, %	0.86	0.81	0.77	0.73	0.69	0.77	0.73	0.69	0.66	0.63	0.74	0.70	0.67	0.63	0.61	0.69	0.66	0.62	0.59	0.57	0.65	0.61	0.58	0.55	0.53
Threonine, %	0.66	0.62	0.59	0.56	0.53	0.60	0.57	0.54	0.51	0.49	0.58	0.55	0.52	0.49	0.47	0.54	0.52	0.49	0.47	0.45	0.51	0.49	0.46	0.44	0.42
Tryptophan, %	0.20	0.19	0.18	0.17	0.16	0.18	0.17	0.16	0.15	0.15	0.17	0.16	0.16	0.15	0.14	0.16	0.15	0.15	0.14	0.13	0.15	0.15	0.14	0.13	0.13
Arginine, %	1.01	0.95	0.90	0.86	0.82	0.92	0.87	0.82	0.78	0.75	0.88	0.83	0.79	0.75	0.72	0.83	0.79	0.75	0.71	0.68	0.78	0.74	0.71	0.67	0.64
Isoleucine, %	0.75	0.71	0.67	0.64	0.61	0.68	0.65	0.62	0.59	0.56	0.65	0.62	0.59	0.56	0.53	0.61	0.57	0.55	0.52	0.50	0.57	0.54	0.52	0.49	0.47
Valine, %	0.83	0.78	0.74	0.70	0.67	0.75	0.71	0.68	0.64	0.62	0.72	0.69	0.65	0.62	0.59	0.68	0.64	0.61	0.58	0.55	0.63	0.60	0.57	0.54	0.52
Total Amino Acids ⁵																									
Lysine, %	1.03	0.97	0.92	0.88	0.83	0.94	0.89	0.84	0.80	0.77	0.90	0.85	0.81	0.77	0.74	0.85	0.81	0.77	0.73	0.70	0.80	0.76	0.72	0.69	0.66
Methionine, %	0.53	0.50	0.47	0.45	0.43	0.47	0.44	0.42	0.40	0.38	0.44	0.42	0.40	0.38	0.36	0.41	0.39	0.37	0.35	0.33	0.38	0.36	0.34	0.32	0.31
Methionine+Cystine, %	0.97	0.91	0.87	0.82	0.78	0.87	0.82	0.78	0.74	0.71	0.84	0.79	0.75	0.72	0.68	0.78	0.74	0.70	0.67	0.64	0.73	0.69	0.66	0.62	0.60
Threonine, %	0.77	0.73	0.69	0.66	0.63	0.70	0.67	0.63	0.60	0.58	0.68	0.64	0.61	0.58	0.55	0.64	0.61	0.58	0.55	0.52	0.60	0.57	0.54	0.52	0.49
Tryptophan, %	0.24	0.22	0.21	0.20	0.19	0.21	0.20	0.19	0.18	0.18	0.21	0.20	0.19	0.18	0.17	0.19	0.18	0.18	0.17	0.16	0.18	0.17	0.17	0.16	0.15
Arginine, %	1.08	1.02	0.97	0.92	0.88	0.98	0.93	0.89	0.84	0.81	0.95	0.90	0.85	0.81	0.77	0.89	0.85	0.81	0.77	0.73	0.84	0.80	0.76	0.72	0.69
Isoleucine, %	0.81	0.76	0.72	0.69	0.66	0.74	0.70	0.66	0.63	0.60	0.70	0.66	0.63	0.60	0.57	0.65	0.62	0.59	0.56	0.53	0.62	0.58	0.55	0.53	0.50
Valine, %	0.91	0.86	0.82	0.78	0.74	0.83	0.79	0.75	0.71	0.68	0.80	0.75	0.72	0.68	0.65	0.75	0.71	0.67	0.64	0.61	0.70	0.66	0.63	0.60	0.57
Crude protein ⁶ , %	19.65	18.56	17.58	16.70	15.90	18.11	17.16	16.30	15.52	14.82	17.78	16.84	16.00	15.24	14.55	16.89	16.00	15.20	14.48	13.82	16.33	15.47	14.70	14.00	13.36
Sodium, %	0.21	0.20	0.19	0.18	0.17	0.20	0.19	0.18	0.17	0.16	0.20	0.19	0.18	0.17	0.16	0.20	0.19	0.18	0.17	0.16	0.20	0.19	0.18	0.17	0.16
Chloride, %	0.21	0.20	0.19	0.18	0.17	0.20	0.19	0.18	0.17	0.16	0.20	0.19	0.18	0.17	0.16	0.20	0.19	0.18	0.17	0.16	0.20	0.19	0.18	0.17	0.16
Linoleic acid (C18:2 n-6), %	2.35	2.22	2.11	2.00	1.90	2.00	1.89	1.80	1.71	1.64	1.78	1.68	1.60	1.52	1.45	1.56	1.47	1.40	1.33	1.27	1.33	1.26	1.20	1.14	1.09
Choline, mg/kg	2118	2000	1895	1800	1714	2000	1895	1800	1714	1636	2000	1895	1800	1714	1636	2000	1895	1800	1714	1636	2000	1895	1800	1714	1636
CALCIUM AND PHOSPHORUS CHANGES BASED ON FEED INTAKE																									
Feed Consumption, g/day per bird	Weeks 18–32					Weeks 33–55					Weeks 56–72					Weeks 73–85					Weeks 86+				
	85	90	95	100	105	110	115	95	100	105	110	115	95	100	105	110	115	95	100	105	110	115	95	100	105
Calcium ^{7,8} , %	4.71	4.44	4.21	4.00	3.81	3.64	3.48	4.37	4.15	3.95	3.77	3.61	4.53	4.30	4.10	3.91	3.74	4.68	4.45	4.24	4.05	3.87	4.84	4.60	4.38
Phosphorus (available) ^{7,9} , %	0.53	0.50	0.47	0.45	0.43	0.41	0.39	0.44	0.42	0.40	0.38	0.37	0.42	0.39	0.38	0.36	0.34	0.39	0.37	0.35	0.34	0.32	0.36	0.34	0.33
Phosphorus (digestible), %	0.47	0.45	0.42	0.40	0.38	0.36	0.35	0.40	0.38	0.36	0.35	0.33	0.38	0.36	0.34	0.32	0.31	0.35	0.33	0.32	0.30	0.29	0.33	0.31	0.29

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 1.8 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
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 150-200 mg/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 D₃ can be supplemented as 25-hydroxy D₃ 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.

⁸ Supplementing with up to 500 ppm of magnesium may be beneficial to support eggshell quality, particularly in aged hens or during periods of increased metabolic demand.

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 ($\text{NO}_3\text{-N}$) 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 ($\text{NO}_2\text{-N}$) 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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