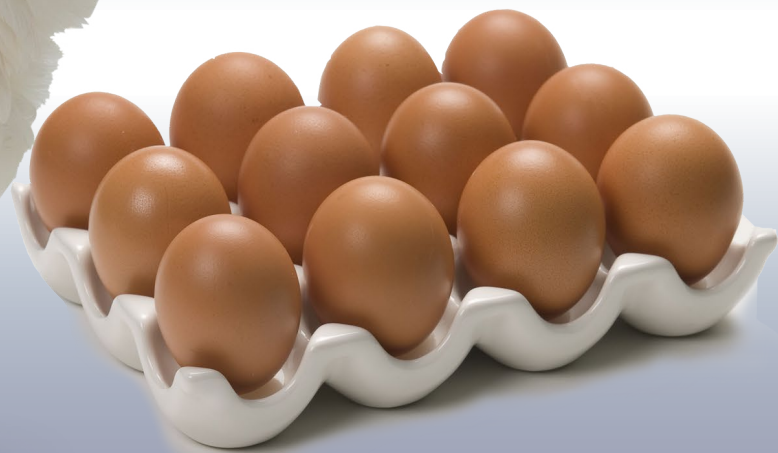


Hy-Line[®]

SILVER BROWN

Conventional Systems



Performance Guide



Use of the Performance Guide

The genetic potential of Hy-Line Silver Brown 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 Silver Brown 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 Silver Brown Online Management Guide

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Summary of Performance Standards

REARING PERIOD (TO 18 WEEKS):	
Livability	96.9%
Feed Consumed	6.51–6.91 kg
Body Weight at 18 Weeks	1.54–1.63 kg
LAYING PERIOD (TO 100 WEEKS):	
Percent Peak	94.1%–98.0%
Hen-Day Eggs to 60 Weeks	264.1–275.1
Hen-Day Eggs to 100 Weeks	487.6–508.0
Hen-Housed Eggs to 60 Weeks	260.1–270.9
Hen-Housed Eggs to 100 Weeks	473.1–492.8
Livability to 60 Weeks	96.87%
Livability to 100 Weeks	93.76%
Days to 50% Production (from hatch)	133 days
Average Egg Weight at 26 Weeks	56.2–58.5 g / egg
Average Egg Weight at 32 Weeks	59.1–61.6 g / egg
Average Egg Weight at 70 Weeks	61.8–64.3 g / egg
Average Egg Weight at 100 Weeks	62.5–65.1 g / egg
Total Egg Mass per Hen-Housed (19–100 weeks)	29.7 kg
Body Weight at 26 Weeks	1.88–2.00 kg
Body Weight at 32 Weeks	1.95–2.08 kg
Body Weight at 70 Weeks	2.04–2.17 kg
Body Weight at 100 Weeks	2.03–2.16 kg
Freedom From Egg Inclusions	Excellent
Shell Strength	Excellent
Shell Color at 38 Weeks	88
Shell Color at 56 Weeks	85
Shell Color at 70 Weeks	82
Haugh Units at 38 Weeks	92
Haugh Units at 56 Weeks	87
Haugh Units at 70 Weeks	82
Average Daily Feed Consumption (19–100 weeks)	107.8–113.8 g / day per bird
Feed Conversion Rate, kg Feed/kg Eggs (20–60 weeks)	2.00–2.08
Feed Conversion Rate, kg Feed/kg Eggs (20–100 weeks)	2.12–2.20
Feed Utilization, kg Egg/kg Feed (20–60 weeks)	0.48–0.50
Feed Utilization, kg Egg/kg Feed (20–100 weeks)	0.45–0.47
Feed Consumption per Dozen Eggs (20–60 weeks)	1.42–1.48 kg
Feed Consumption per Dozen Eggs (20–100 weeks)	1.52–1.58 kg
Skin Color	Yellow
Condition of Droppings	Dry

Rearing Period Performance Table

AGE (weeks)	MORTALITY Cumulative (%)	BODY WEIGHT (kg)	FEED INTAKE (g/bird/day)	CUMULATIVE FEED INTAKE (g/bird to date)	WATER INTAKE (ml/bird/day)	UNIFORMITY %
1	1.00	0.074 – 0.079	14 – 15	98 – 105	21 – 30	>85%
2	1.30	0.122 – 0.130	19 – 21	231 – 252	29 – 42	
3	1.50	0.191 – 0.202	24 – 26	399 – 434	36 – 52	
4	1.60	0.283 – 0.301	29 – 31	602 – 651	44 – 62	>80%
5	1.70	0.373 – 0.397	33 – 35	833 – 896	50 – 70	
6	1.80	0.462 – 0.490	37 – 39	1092 – 1169	56 – 78	
7	1.90	0.560 – 0.594	41 – 43	1379 – 1470	62 – 86	>85%
8	2.00	0.665 – 0.707	46 – 48	1701 – 1806	69 – 96	
9	2.10	0.777 – 0.825	50 – 54	2051 – 2184	75 – 108	
10	2.20	0.878 – 0.932	55 – 59	2436 – 2597	83 – 118	
11	2.30	0.968 – 1.028	60 – 64	2856 – 3045	90 – 128	
12	2.40	1.052 – 1.117	65 – 69	3311 – 3528	98 – 138	>85%
13	2.50	1.128 – 1.198	69 – 73	3794 – 4039	104 – 146	
14	2.60	1.218 – 1.294	72 – 76	4298 – 4571	108 – 152	
15	2.70	1.314 – 1.395	76 – 80	4830 – 5131	114 – 160	>85%
16	2.80	1.405 – 1.491	78 – 82	5376 – 5705	117 – 164	
17	3.00	1.489 – 1.581	80 – 84	5936 – 6293	120 – 168	>90%
18	3.10	1.538 – 1.633	82 – 88	6510 – 6909	123 – 176	

Production Period Performance Table

AGE (weeks)	% HEN-DAY Current	HEN-DAY EGGS Cumulative	HEN-HOUSED EGGS Cumulative	MORT- ALITY Cumulative (%)	BODY WEIGHT (kg)	FEED INTAKE (g / bird / day)	WATER INTAKE (ml / bird / day)	HH EGG MASS Cumulative (kg)	AVG. EGG WEIGHT (g / egg)
19	47.4–49.4	3.3–3.5	3.3–3.5	0.00	1.61–1.71	85–91	128–182	0.2–0.2	46.3–48.2
20	70.1–73.0	8.2–8.6	8.2–8.6	0.13	1.67–1.77	87–93	131–186	0.4–0.4	48.5–50.4
21	82.0–85.4	14.0–14.5	13.9–14.5	0.20	1.72–1.83	90–96	135–192	0.7–0.7	50.3–52.4
22	88.0–91.6	20.1–21.0	20.1–20.9	0.27	1.77–1.88	93–99	140–198	1.0–1.1	51.9–54.0
23	91.3–95.1	26.5–27.6	26.5–27.6	0.33	1.81–1.92	95–101	143–202	1.4–1.4	53.2–55.4
24	92.9–96.8	33.0–34.4	32.9–34.3	0.40	1.83–1.95	97–103	146–206	1.7–1.8	54.4–56.6
25	93.7–97.6	39.6–41.2	39.5–41.1	0.47	1.86–1.98	99–105	149–210	2.1–2.2	55.3–57.6
26	93.9–97.8	46.1–48.1	46.0–47.9	0.54	1.88–2.00	101–107	152–214	2.5–2.6	56.2–58.5
27	94.1–98.0	52.7–54.9	52.5–54.7	0.60	1.89–2.01	103–109	155–218	2.8–3.0	56.9–59.2
28	94.1–98.0	59.3–61.8	59.1–61.5	0.67	1.91–2.03	104–110	156–220	3.2–3.4	57.5–59.8
29	94.0–97.9	65.9–68.6	65.6–68.4	0.74	1.92–2.04	105–111	158–222	3.6–3.8	58.0–60.4
30	94.0–97.9	72.5–75.5	72.1–75.1	0.81	1.93–2.05	105–111	158–222	4.0–4.2	58.4–60.8
31	93.9–97.8	79.1–82.3	78.7–81.9	0.87	1.94–2.06	106–112	159–224	4.4–4.6	58.8–61.2
32	93.9–97.8	85.6–89.2	85.2–88.7	0.94	1.95–2.08	106–112	159–224	4.8–5.0	59.1–61.6
33	93.8–97.7	92.2–96.0	91.7–95.5	1.01	1.97–2.09	107–113	161–226	5.2–5.4	59.4–61.8
34	93.6–97.5	98.7–102.9	98.1–102.2	1.08	1.98–2.10	107–113	161–226	5.6–5.8	59.7–62.1
35	93.5–97.4	105.3–109.7	104.6–109.0	1.14	1.99–2.11	108–114	162–228	6.0–6.2	59.9–62.3
36	93.4–97.3	111.8–116.5	111.1–115.7	1.21	2.00–2.12	108–114	162–228	6.4–6.6	60.1–62.5
37	93.3–97.1	118.3–123.3	117.5–122.4	1.28	2.01–2.13	108–114	162–228	6.8–7.0	60.2–62.7
38	93.1–97.0	124.9–130.1	123.9–129.1	1.35	2.01–2.14	109–115	164–230	7.2–7.5	60.4–62.8
39	93.0–96.9	131.4–136.8	130.4–135.8	1.42	2.02–2.14	109–115	164–230	7.6–7.9	60.5–62.9
40	92.8–96.6	137.9–143.6	136.8–142.5	1.48	2.02–2.15	109–115	164–230	8.0–8.3	60.6–63.1
41	92.5–96.4	144.3–150.4	143.1–149.1	1.55	2.03–2.15	109–115	164–230	8.3–8.7	60.7–63.1
42	92.3–96.1	150.8–157.1	149.5–155.7	1.62	2.03–2.16	109–115	164–230	8.7–9.1	60.8–63.2
43	92.0–95.8	157.2–163.8	155.8–162.3	1.72	2.03–2.16	109–115	164–230	9.1–9.5	60.8–63.3
44	91.8–95.6	163.7–170.5	162.1–168.9	1.80	2.04–2.16	110–116	165–232	9.5–9.9	60.9–63.4
45	91.5–95.3	170.1–177.2	168.4–175.4	1.88	2.04–2.16	110–116	165–232	9.9–10.3	61.0–63.4
46	91.3–95.1	176.5–183.8	174.7–182.0	1.96	2.04–2.17	110–116	165–232	10.3–10.7	61.0–63.5
47	91.0–94.8	182.8–190.5	180.9–188.5	2.04	2.04–2.17	110–116	165–232	10.7–11.1	61.1–63.6
48	90.8–94.5	189.2–197.1	187.1–194.9	2.12	2.04–2.17	110–116	165–232	11.1–11.5	61.1–63.6
49	90.5–94.3	195.5–203.7	193.3–201.4	2.20	2.05–2.17	110–116	165–232	11.5–11.9	61.2–63.6
50	90.3–94.0	201.8–210.3	199.5–207.8	2.28	2.05–2.17	110–116	165–232	11.9–12.4	61.2–63.7
51	90.0–93.8	208.1–216.8	205.7–214.2	2.36	2.05–2.17	110–116	165–232	12.2–12.8	61.2–63.7
52	89.8–93.5	214.4–223.4	211.8–220.6	2.44	2.05–2.18	110–116	165–232	12.6–13.2	61.3–63.8
53	89.5–93.3	220.7–229.9	217.9–227.0	2.53	2.05–2.18	110–116	165–232	13.0–13.5	61.3–63.8
54	89.3–93.0	226.9–236.4	224.0–233.3	2.61	2.05–2.18	110–116	165–232	13.4–13.9	61.3–63.8
55	89.0–92.8	233.2–242.9	230.1–239.6	2.70	2.05–2.18	110–116	165–232	13.8–14.3	61.4–63.9
56	88.8–92.5	239.4–249.4	236.1–245.9	2.78	2.05–2.18	110–116	165–232	14.1–14.7	61.4–63.9
57	88.6–92.2	245.6–255.8	242.1–252.2	2.87	2.05–2.18	110–116	165–232	14.5–15.1	61.4–63.9
58	88.3–92.0	251.8–262.3	248.1–258.5	2.96	2.05–2.18	110–116	165–232	14.9–15.5	61.5–64.0

Production Period Performance Table (cont.)

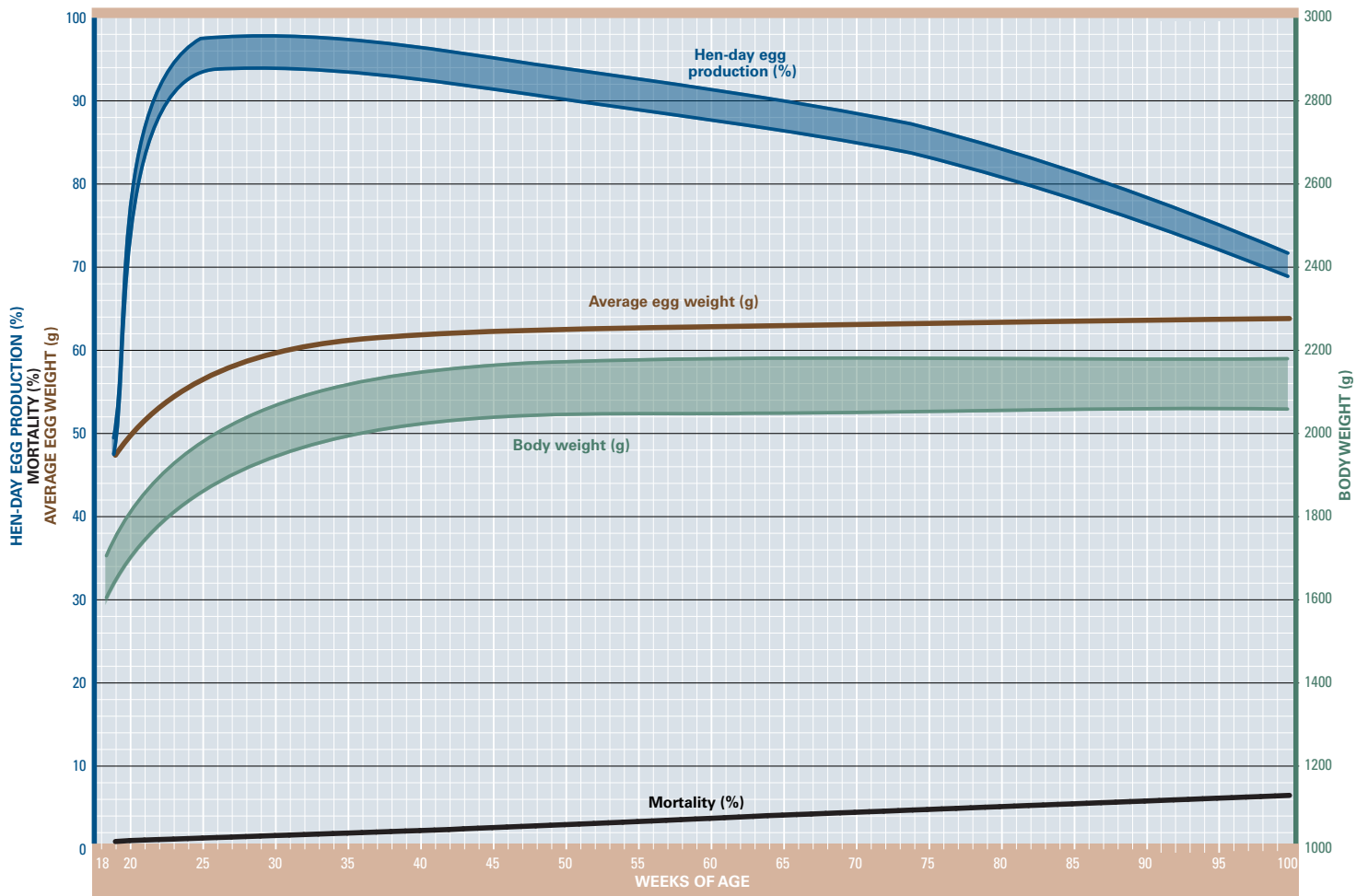
AGE (weeks)	% HEN-DAY Current	HEN-DAY EGGS Cumulative	HEN-HOUSED EGGS Cumulative	MORT- ALITY Cumulative (%)	BODY WEIGHT (kg)	FEED INTAKE (g / bird / day)	WATER INTAKE (ml / bird / day)	HH EGG MASS Cumulative (kg)	AVG. EGG WEIGHT (g / egg)
59	88.1–91.7	257.9 – 268.7	254.1 – 264.7	3.05	2.05 – 2.18	110 – 116	165 – 232	15.3 – 15.9	61.5–64.0
60	87.8–91.5	264.1 – 275.1	260.1 – 270.9	3.13	2.05 – 2.18	110 – 116	165 – 232	15.6 – 16.3	61.5–64.0
61	87.6–91.2	270.2 – 281.5	266.0 – 277.1	3.22	2.05 – 2.18	110 – 116	165 – 232	16.0 – 16.7	61.5–64.1
62	87.3–91.0	276.3 – 287.8	271.9 – 283.2	3.31	2.05 – 2.18	110 – 116	165 – 232	16.4 – 17.1	61.6–64.1
63	87.1–90.7	282.4 – 294.2	277.8 – 289.4	3.40	2.05 – 2.18	110 – 116	165 – 232	16.8 – 17.5	61.6–64.1
64	86.9–90.5	288.5 – 300.5	283.7 – 295.5	3.50	2.05 – 2.18	110 – 116	165 – 232	17.1 – 17.8	61.6–64.1
65	86.6–90.2	294.6 – 306.8	289.5 – 301.6	3.57	2.05 – 2.18	110 – 116	165 – 232	17.5 – 18.2	61.6–64.2
66	86.3–89.9	300.6 – 313.1	295.3 – 307.6	3.65	2.05 – 2.18	110 – 116	165 – 232	17.9 – 18.6	61.7–64.2
67	85.9–89.5	306.6 – 319.4	301.1 – 313.7	3.72	2.05 – 2.18	110 – 116	165 – 232	18.2 – 19.0	61.7–64.2
68	85.6–89.2	312.6 – 325.6	306.9 – 319.7	3.80	2.05 – 2.18	110 – 116	165 – 232	18.6 – 19.4	61.7–64.2
69	85.3–88.9	318.6 – 331.9	312.6 – 325.6	3.88	2.05 – 2.18	110 – 116	165 – 232	19.0 – 19.7	61.8–64.3
70	85.1–88.6	324.6 – 338.1	318.3 – 331.6	3.95	2.05 – 2.18	110 – 116	165 – 232	19.3 – 20.1	61.8–64.3
71	84.8–88.3	330.5 – 344.3	324.0 – 337.5	4.03	2.05 – 2.18	110 – 116	165 – 232	19.7 – 20.5	61.8–64.3
72	84.5–88.0	336.4 – 350.4	329.7 – 343.4	4.10	2.05 – 2.18	110 – 116	165 – 232	20.0 – 20.9	61.8–64.4
73	84.1–87.7	342.3 – 356.5	335.3 – 349.3	4.18	2.05 – 2.18	110 – 116	165 – 232	20.4 – 21.2	61.9–64.4
74	83.8–87.3	348.2 – 362.7	341.0 – 355.2	4.26	2.05 – 2.18	110 – 116	165 – 232	20.7 – 21.6	61.9–64.4
75	83.2–86.7	354.0 – 368.7	346.5 – 361.0	4.33	2.05 – 2.18	110 – 116	165 – 232	21.1 – 22.0	61.9–64.4
76	82.8–86.3	359.8 – 374.8	352.1 – 366.7	4.41	2.06 – 2.18	110 – 116	165 – 232	21.4 – 22.3	61.9–64.5
77	82.4–85.8	365.5 – 380.8	357.6 – 372.5	4.48	2.06 – 2.18	110 – 116	165 – 232	21.8 – 22.7	62.0–64.5
78	81.9–85.4	371.3 – 386.7	363.1 – 378.2	4.56	2.06 – 2.18	110 – 116	165 – 232	22.1 – 23.1	62.0–64.5
79	81.5–84.9	377.0 – 392.7	368.5 – 383.9	4.64	2.06 – 2.18	110 – 116	165 – 232	22.5 – 23.4	62.0–64.5
80	81.0–84.4	382.7 – 398.6	373.9 – 389.5	4.71	2.06 – 2.18	110 – 116	165 – 232	22.8 – 23.8	62.0–64.6
81	80.5–83.9	388.3 – 404.5	379.3 – 395.1	4.79	2.06 – 2.18	110 – 116	165 – 232	23.2 – 24.1	62.1–64.6
82	80.0–83.4	393.9 – 410.3	384.6 – 400.6	4.87	2.06 – 2.18	110 – 116	165 – 232	23.5 – 24.5	62.1–64.6
83	79.5–82.8	399.5 – 416.1	389.9 – 406.1	4.94	2.06 – 2.18	110 – 116	165 – 232	23.8 – 24.8	62.1–64.6
84	78.9–82.2	405.0 – 421.9	395.1 – 411.6	5.02	2.06 – 2.18	110 – 116	165 – 232	24.2 – 25.2	62.1–64.7
85	78.4–81.7	410.5 – 427.6	400.4 – 417.0	5.09	2.06 – 2.18	110 – 116	165 – 232	24.5 – 25.5	62.2–64.7
86	77.9–81.1	415.9 – 433.3	405.5 – 422.4	5.17	2.06 – 2.18	110 – 116	165 – 232	24.8 – 25.9	62.2–64.7
87	77.4–80.6	421.3 – 438.9	410.7 – 427.8	5.25	2.06 – 2.18	110 – 116	165 – 232	25.2 – 26.2	62.2–64.7
88	76.7–79.9	426.7 – 444.5	415.7 – 433.1	5.32	2.06 – 2.18	110 – 116	165 – 232	25.5 – 26.5	62.2–64.8
89	76.1–79.3	432.0 – 450.0	420.8 – 438.3	5.40	2.06 – 2.18	110 – 116	165 – 232	25.8 – 26.9	62.3–64.8
90	75.5–78.6	437.3 – 455.5	425.8 – 443.5	5.47	2.06 – 2.18	110 – 116	165 – 232	26.1 – 27.2	62.3–64.8
91	74.8–78.0	442.6 – 461.0	430.7 – 448.7	5.55	2.06 – 2.18	110 – 116	165 – 232	26.4 – 27.5	62.3–64.8
92	74.2–77.3	447.8 – 466.4	435.6 – 453.8	5.63	2.06 – 2.18	110 – 116	165 – 232	26.7 – 27.9	62.3–64.9
93	73.6–76.7	452.9 – 471.8	440.5 – 458.8	5.70	2.06 – 2.18	110 – 116	165 – 232	27.1 – 28.2	62.4–64.9
94	72.9–75.9	458.0 – 477.1	445.3 – 463.8	5.78	2.06 – 2.18	110 – 116	165 – 232	27.4 – 28.5	62.4–64.9
95	72.2–75.2	463.1 – 482.4	450.0 – 468.8	5.86	2.06 – 2.18	110 – 116	165 – 232	27.7 – 28.8	62.4–65.0
96	71.5–74.5	468.1 – 487.6	454.8 – 473.7	5.93	2.06 – 2.18	110 – 116	165 – 232	28.0 – 29.1	62.4–65.0
97	70.9–73.8	473.0 – 492.7	459.4 – 478.6	6.01	2.06 – 2.18	110 – 116	165 – 232	28.3 – 29.4	62.5–65.0
98	70.2–73.1	477.9 – 497.9	464.0 – 483.4	6.08	2.06 – 2.18	110 – 116	165 – 232	28.6 – 29.7	62.5–65.0
99	69.5–72.4	482.8 – 502.9	468.6 – 488.1	6.16	2.06 – 2.18	110 – 116	165 – 232	28.8 – 30.0	62.5–65.1
100	68.9–71.7	487.6 – 508.0	473.1 – 492.8	6.24	2.06 – 2.18	110 – 116	165 – 232	29.1 – 30.3	62.5–65.1

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

E.U. Standards–Weekly*

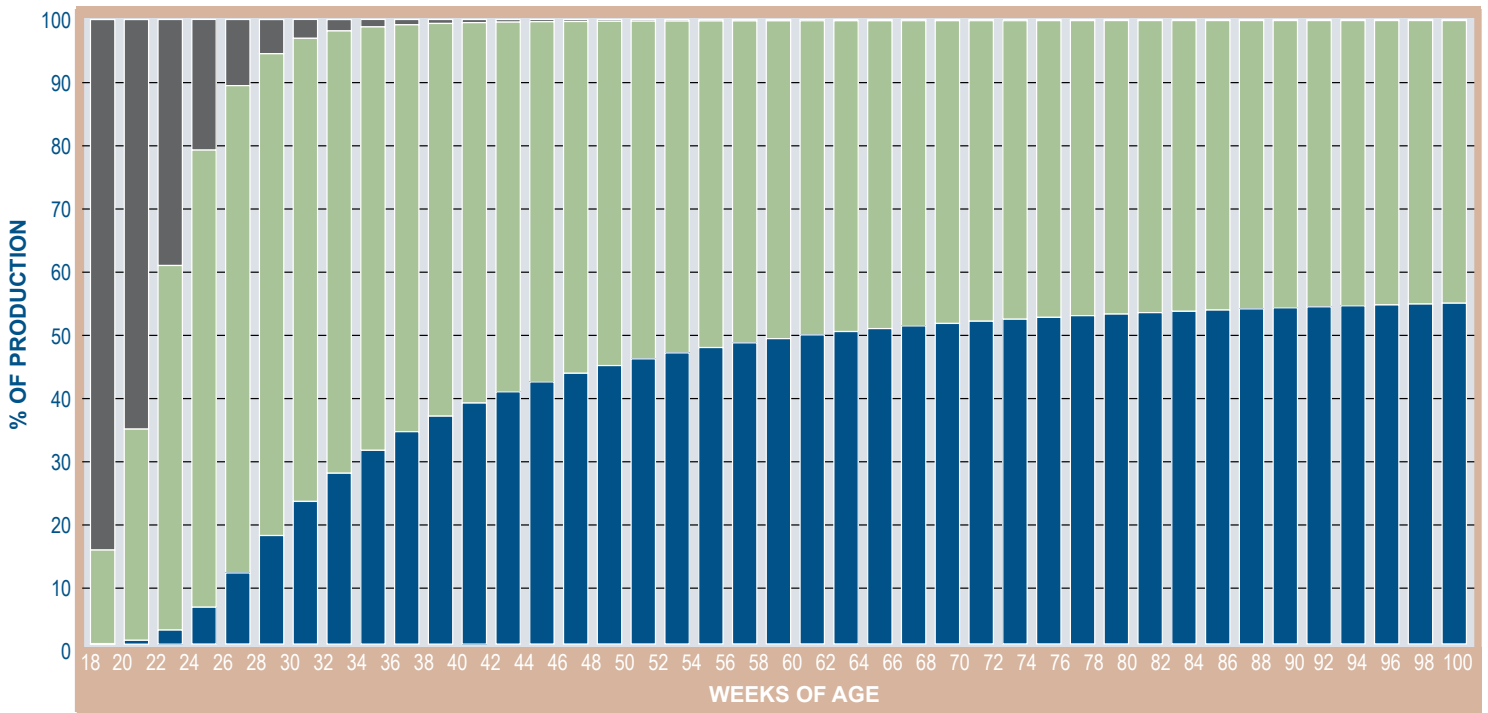
AGE (weeks)	HAUGH UNITS	BREAKING STRENGTH	SHELL COLOR
20	97.4	4660	93
22	96.8	4640	92
24	96.2	4620	91
26	95.6	4600	90
28	95.0	4580	90
30	94.4	4560	89
32	93.8	4540	89
34	93.2	4520	89
36	92.6	4500	88
38	92.0	4480	88
40	91.4	4460	88
42	90.8	4440	88
44	90.2	4420	87
46	89.6	4400	87
48	89.0	4380	87
50	88.4	4360	86
52	87.8	4340	86
54	87.2	4320	86
56	86.6	4300	85
58	86.0	4280	85
60	85.4	4260	84
62	84.8	4240	84
64	84.2	4220	83
66	83.6	4200	83
68	83.0	4180	82
70	82.4	4160	82
72	81.8	4140	81
74	81.2	4120	81
76	80.6	4100	80
78	80.0	4080	80
80	79.4	4060	80

AGE (weeks)	AVERAGE EGG WEIGHT (g)	WEEKLY % EXTRA LARGE Over 73 g	WEEKLY % LARGE 63–73 g	WEEKLY % MEDIUM 53–63 g	WEEKLY % SMALL 43–53 g
20	47.2	0.50	0.10	14.90	84.49
22	51.3	0.51	0.61	33.64	65.23
24	54.3	0.51	2.24	58.07	39.18
26	56.5	0.53	5.86	72.81	20.81
28	58.0	0.54	11.31	77.62	10.53
30	59.2	0.53	17.28	76.74	5.44
32	60.0	0.53	22.71	73.76	3.01
34	60.6	0.52	27.21	70.45	1.81
36	61.1	0.52	30.86	67.44	1.19
38	61.4	0.52	33.83	64.81	0.84
40	61.7	0.52	36.30	62.55	0.63
42	61.9	0.52	38.39	60.59	0.50
44	62.1	0.52	40.18	58.88	0.41
46	62.2	0.53	41.75	57.37	0.35
48	62.3	0.53	43.12	56.03	0.31
50	62.4	0.54	44.34	54.84	0.28
52	62.5	0.54	45.41	53.79	0.26
54	62.6	0.54	46.36	52.85	0.24
56	62.6	0.55	47.20	52.02	0.23
58	62.7	0.55	47.95	51.28	0.22
60	62.7	0.55	48.62	50.62	0.21
62	62.8	0.55	49.22	50.03	0.20
64	62.9	0.55	49.75	49.50	0.20
66	62.9	0.55	50.22	49.03	0.19
68	63.0	0.55	50.65	48.61	0.19
70	63.0	0.55	51.04	48.22	0.19
72	63.1	0.55	51.39	47.87	0.18
74	63.1	0.55	51.71	47.55	0.18
76	63.2	0.55	52.01	47.26	0.18
78	63.2	0.55	52.28	46.99	0.18
80	63.3	0.55	52.53	46.75	0.17
82	63.3	0.55	52.76	46.52	0.17
84	63.4	0.55	52.97	46.31	0.17
86	63.4	0.55	53.17	46.11	0.17
88	63.5	0.55	53.36	45.92	0.17
90	63.5	0.55	53.53	45.75	0.17
92	63.6	0.55	53.69	45.59	0.17
94	63.6	0.55	53.85	45.43	0.17
96	63.7	0.55	53.99	45.29	0.17
98	63.7	0.55	54.13	45.15	0.17
100	63.8	0.55	54.26	45.02	0.17

* Distribution of egg sizes based on weekly (not cumulative) average egg weights.

Egg Size Distribution (cont.)

E.U. Standards–Weekly*



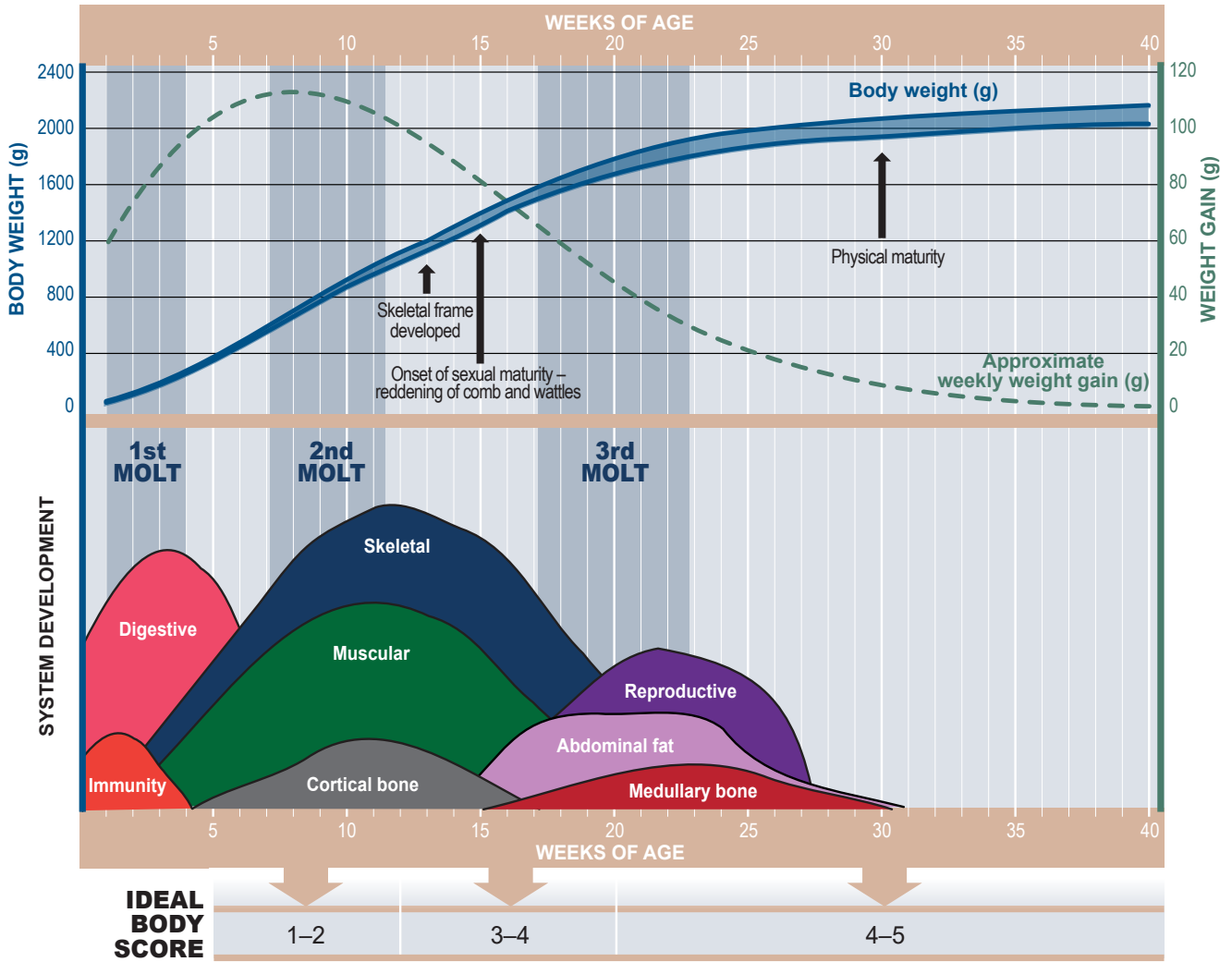
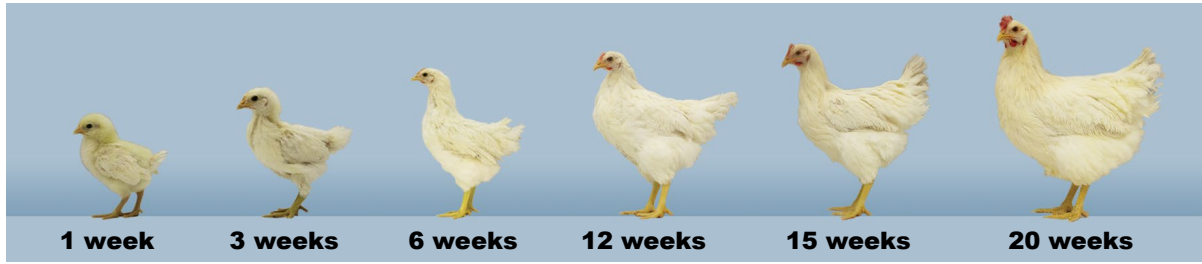
SMALL
43–53 g
 MEDIUM
53–63 g
 LARGE
63–73 g
 EXTRA LARGE
Over 73 g

* Distribution of egg sizes based on weekly (not cumulative) average egg weights.

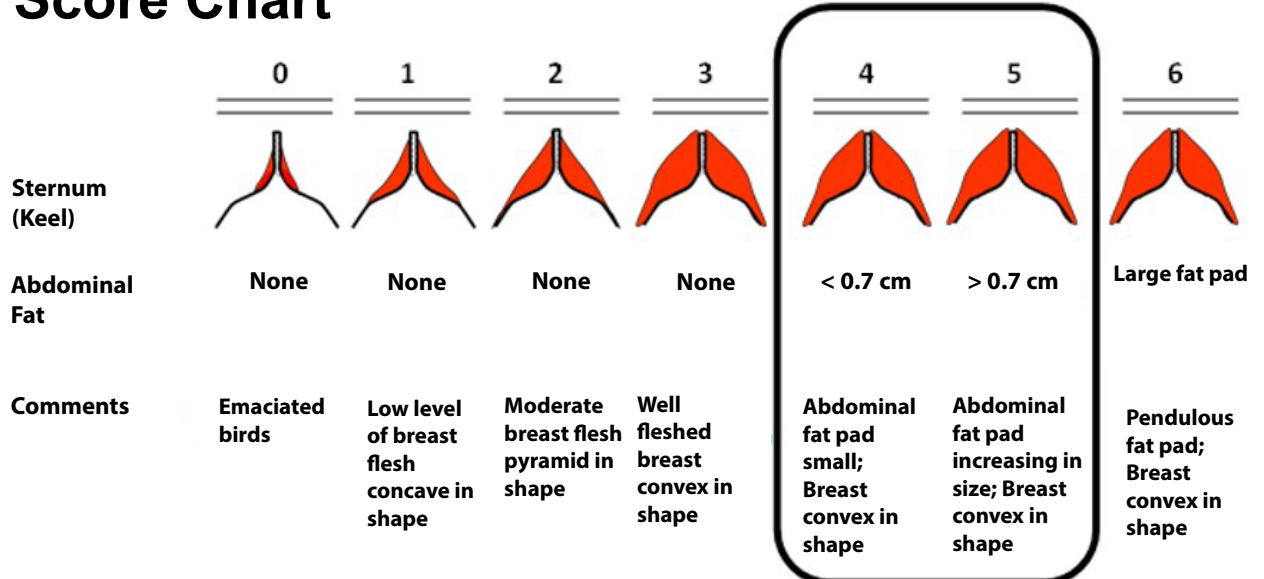
Brooding Temperature and Lighting Recommendations

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	25 lux	25 lux	25 lux	5–15 lux	5–15 lux
LIGHT HOURS	Intermittent Programme or 22 hours	Intermittent Programme or 21 hours	Intermittent Programme or 20 hours	19 hours	18 hours	17 hours	16 hours

Development of the Organ Systems in Pullets

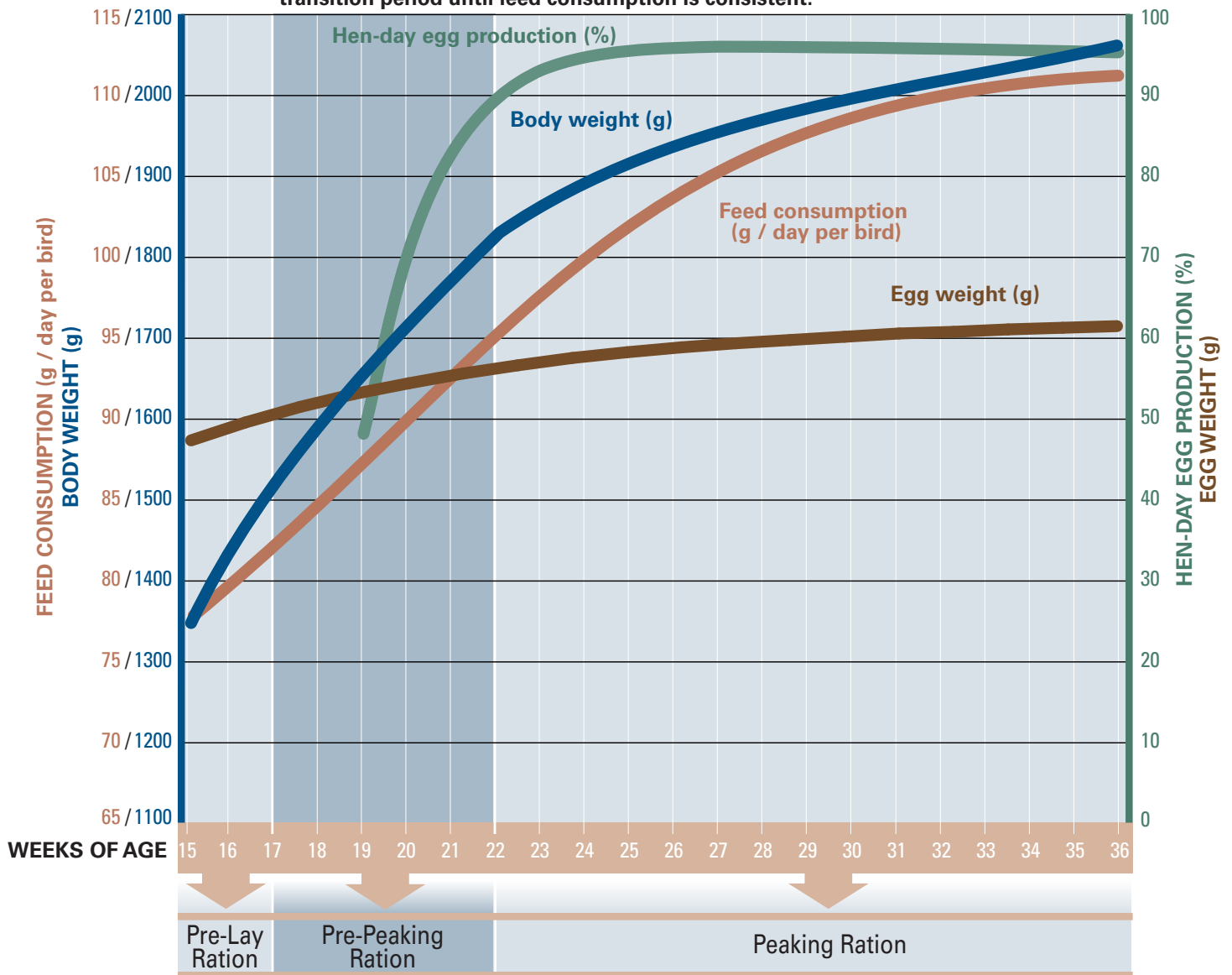


Body Score Chart



Transition Period from Rear to Peak Egg Production

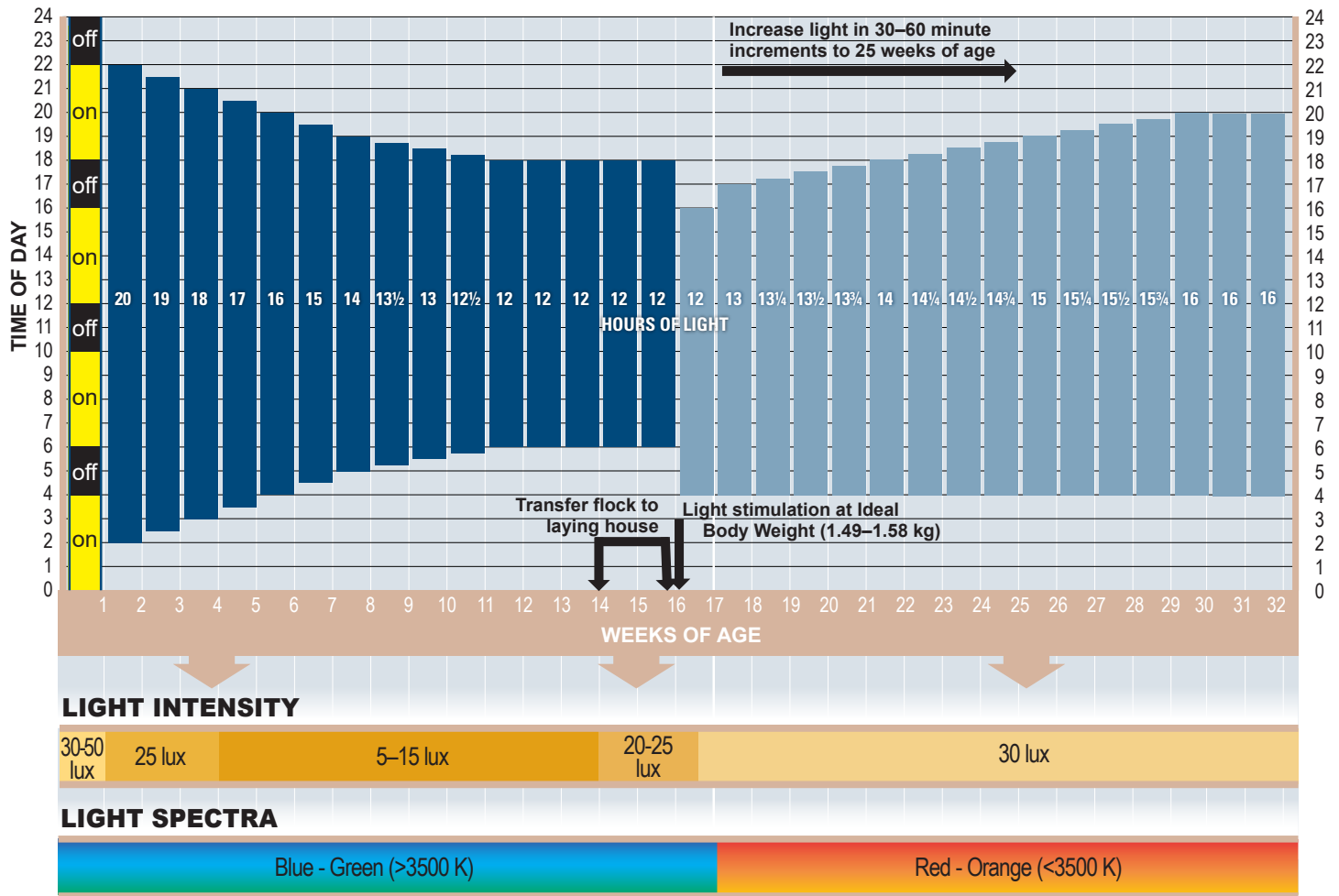
Frequently formulate to changing feed consumption during transition period until feed consumption is consistent.



Pre-Peak

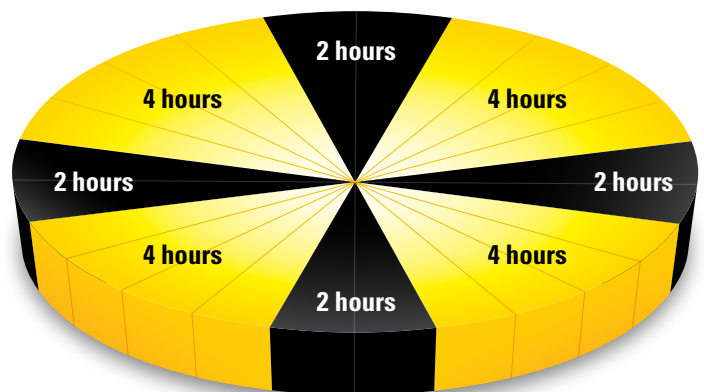
- Pre-Peak diets are intended for flocks with low feed intake and are fed for a limited period from first egg to the beginning of peak production. The nutrient specification of the Pre-Peak diet should be dense enough to allow for lower feed intake and also cater to the increased nutritional needs of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

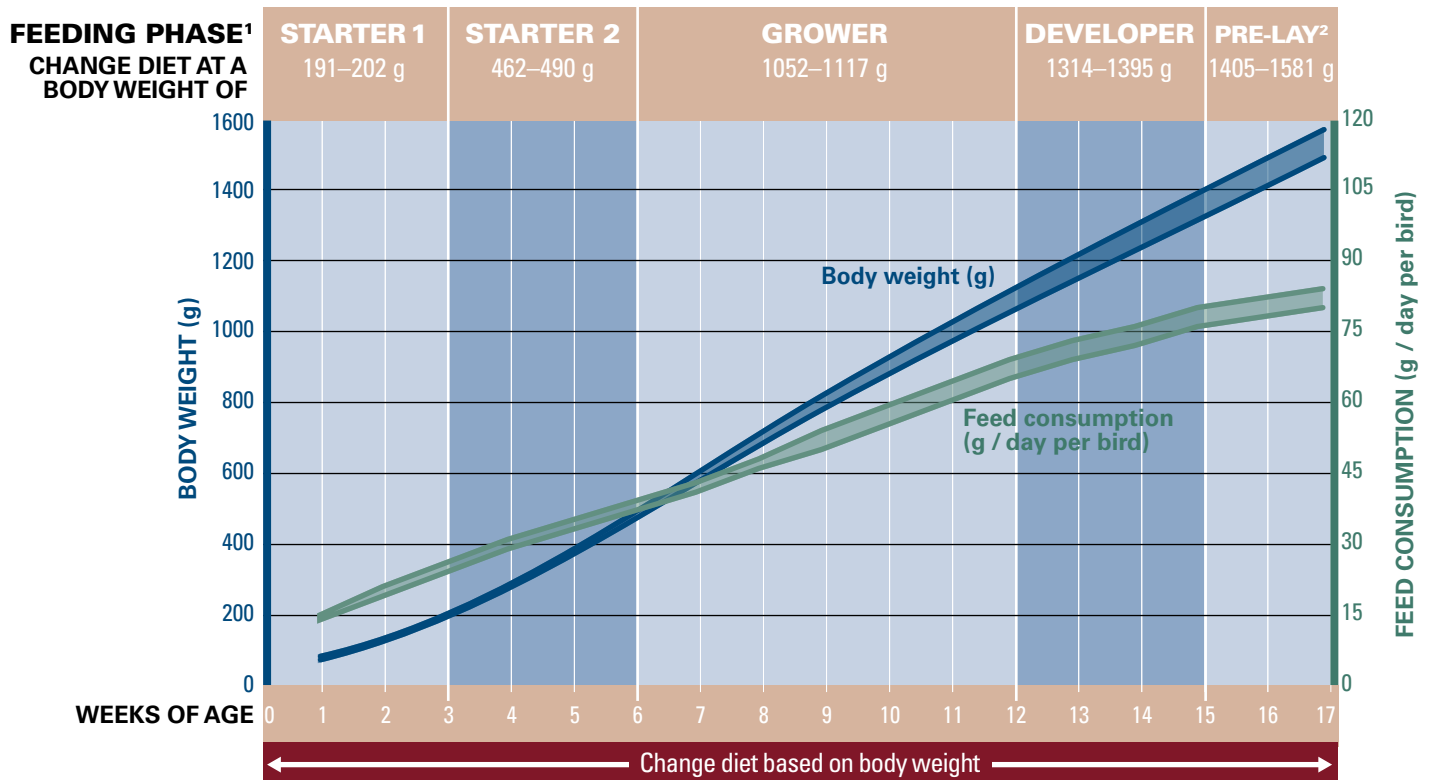


Intermittent Lighting Program for Chicks

- 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	2844–2922	2822–2900	2756–2867	2690–2756	2690–2756
Metabolizable energy ³ , MJ/kg	11.90–12.23	11.81–12.13	11.53–12.00	11.25–11.53	11.25–11.53
	Standardized Ileal Digestible Amino Acids / Total Amino Acids⁴				
Lysine, %	0.95 / 1.04	0.90 / 0.98	0.80 / 0.87	0.57 / 0.62	0.70 / 0.76
Methionine, %	0.43 / 0.47	0.41 / 0.44	0.38 / 0.42	0.27 / 0.28	0.34 / 0.37
Methionine+Cystine, %	0.72 / 0.81	0.70 / 0.79	0.65 / 0.73	0.50 / 0.57	0.63 / 0.71
Threonine, %	0.61 / 0.72	0.59 / 0.69	0.54 / 0.63	0.39 / 0.47	0.48 / 0.56
Tryptophan, %	0.18 / 0.21	0.17 / 0.20	0.17 / 0.20	0.13 / 0.16	0.15 / 0.19
Arginine, %	1.02 / 1.10	0.96 / 1.03	0.86 / 0.92	0.61 / 0.66	0.75 / 0.81
Isoleucine, %	0.67 / 0.72	0.65 / 0.70	0.59 / 0.64	0.43 / 0.46	0.57 / 0.62
Valine, %	0.68 / 0.74	0.67 / 0.73	0.62 / 0.68	0.46 / 0.51	0.63 / 0.70
Crude protein ⁵ , %	20.00	18.25	17.50	15.50	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	0.16	0.16	0.17
Chloride, %	0.18	0.17	0.16	0.16	0.17
Linoleic acid (C18:2 n-6) ⁸ , %	1.20	1.20	1.20	1.20	1.20
Choline, mg/kg	1,300	1,300	1,300	1,300	1,300

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.

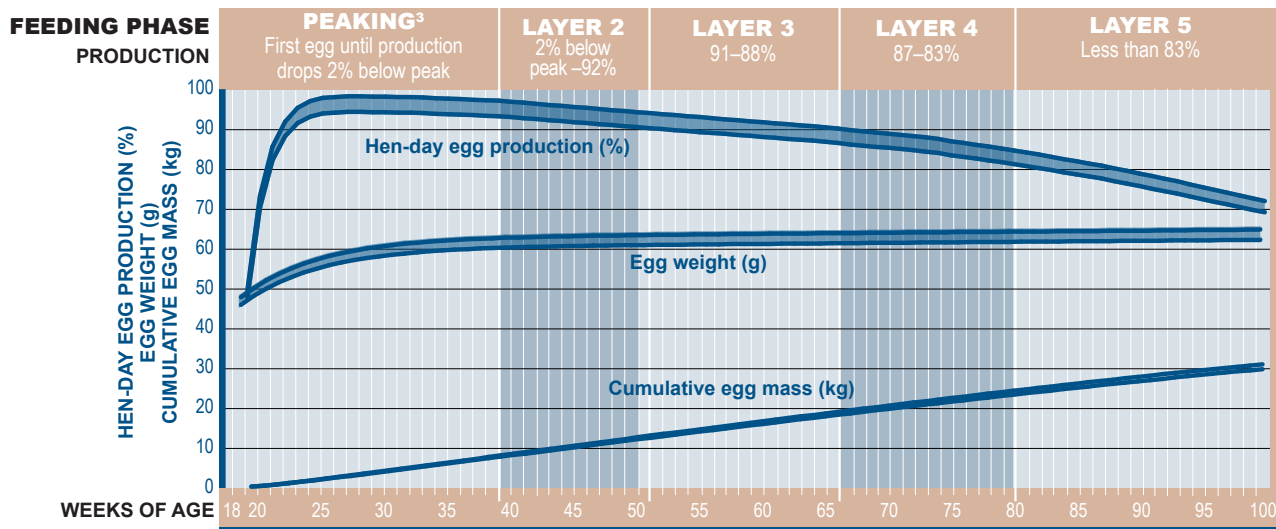
⁴ Recommendation for Total Amino Acids is only appropriate to corn and soybean meal diet. Where diets utilise other ingredients, recommendations for Standardised Ileal Digestible Amino Acids must be followed.

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 for Economical Performance^{1,2}



Change diet based on % of production and egg size

NUTRITION

RECOMMENDED DAILY NUTRIENT INTAKE

Metabolizable energy ⁴ , kcal/bird/day	325–335	325–335	320–330	315–325	310–320
Metabolizable energy ⁴ , MJ/bird/day	1.36–1.40	1.36–1.40	1.34–1.38	1.32–1.36	1.30–1.34
Standardized Ileal Digestible Amino Acids / Total Amino Acids⁵					
Lysine, mg/day	830 / 909	825 / 903	815 / 854	780 / 854	755 / 827
Methionine, mg/day	415 / 446	413 / 444	408 / 419	390 / 419	378 / 406
Methionine+Cystine, mg/day	747 / 842	743 / 837	734 / 792	702 / 792	680 / 766
Threonine, mg/day	581 / 684	578 / 679	571 / 642	546 / 642	529 / 622
Tryptophan, mg/day	183 / 218	182 / 217	179 / 205	172 / 205	166 / 199
Arginine, mg/day	863 / 928	858 / 923	848 / 872	811 / 872	785 / 844
Isoleucine, mg/day	664 / 714	660 / 710	652 / 671	624 / 671	604 / 649
Valine, mg/day	730 / 806	726 / 801	717 / 757	686 / 757	664 / 733
Crude protein ⁶ , g/day	17.50	17.25	17.00	16.50	16.00
Sodium, mg/day	180	180	180	180	180
Chloride, mg/day	180	180	180	180	180
Linoleic acid (C18:2 n-6), g/day	1.80	1.60	1.40	1.20	1.00
Choline, mg/day	180	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)
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%

IDEAL PROTEIN REFERENCE

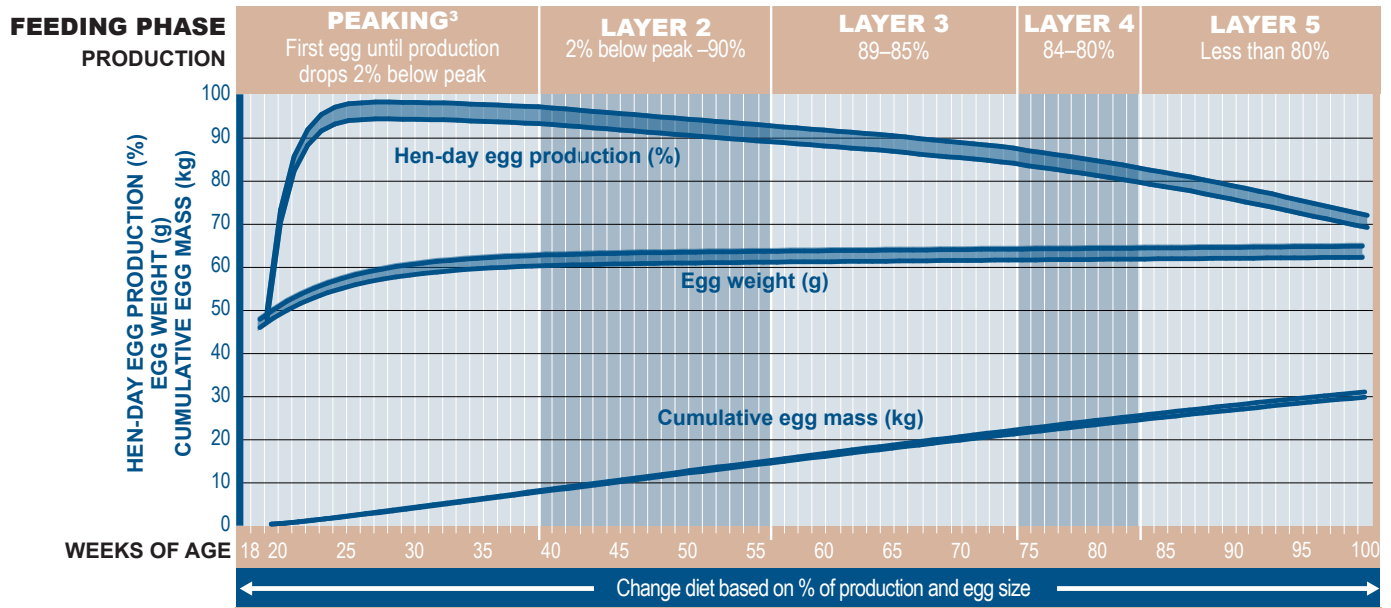
	PEAKING	PHASE 2	PHASE 3	PHASE 4	PHASE 5
Lysine	100%	100%	100%	100%	100%
Methionine	50%	50%	50%	50%	50%
M+C	90%	90%	90%	90%	90%
Threonine	70%	70%	70%	70%	70%
Tryptophan	22%	22%	22%	22%	22%
Arginine	104%	104%	104%	104%	104%
Isoleucine	80%	80%	80%	80%	80%
Valine	88%	88%	88%	88%	88%

Production Period Dietary Nutrient Concentrations for Economical Performance^{1,2}

FEEDING PHASE PRODUCTION NUTRITION	PEAKING ³ First egg until production drops 2% below peak					LAYER 2 2% below peak to 92%					LAYER 3 91–88%					LAYER 4 87–83%					LAYER 5 Less than 83%						
	RECOMMENDED CONCENTRATION																										
Metabolizable energy ⁴ , kcal/bird/day	325–335					325–335					320–330					315–325					310–320						
Metabolizable energy ⁴ , MJ/bird/day	1.36–1.40					1.36–1.40					1.34–1.38					1.32–1.36					1.30–1.34						
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	100	105	110*	115	120		
Standardized Ileal Digestible Amino Acids																											
Lysine, %	0.92	0.87	0.83	0.79	0.75	0.83	0.79	0.75	0.72	0.69	0.82	0.78	0.74	0.71	0.68	0.78	0.74	0.71	0.68	0.65	0.76	0.72	0.69	0.66	0.63		
Methionine, %	0.46	0.44	0.42	0.40	0.38	0.41	0.39	0.38	0.36	0.34	0.41	0.39	0.37	0.35	0.34	0.39	0.37	0.35	0.34	0.33	0.38	0.36	0.34	0.33	0.32		
Methionine+Cystine, %	0.83	0.79	0.75	0.71	0.68	0.74	0.71	0.68	0.65	0.62	0.73	0.70	0.67	0.64	0.61	0.70	0.67	0.64	0.61	0.59	0.68	0.65	0.62	0.59	0.57		
Threonine, %	0.65	0.61	0.58	0.55	0.53	0.58	0.55	0.53	0.50	0.48	0.57	0.54	0.52	0.50	0.48	0.55	0.52	0.50	0.47	0.46	0.53	0.50	0.48	0.46	0.44		
Tryptophan, %	0.20	0.19	0.18	0.17	0.17	0.18	0.17	0.17	0.16	0.15	0.18	0.17	0.16	0.16	0.15	0.17	0.16	0.16	0.15	0.14	0.17	0.16	0.15	0.14	0.14		
Arginine, %	0.96	0.91	0.86	0.82	0.78	0.86	0.82	0.78	0.75	0.72	0.85	0.81	0.77	0.74	0.71	0.81	0.77	0.74	0.71	0.68	0.79	0.75	0.71	0.68	0.65		
Isoleucine, %	0.74	0.70	0.66	0.63	0.60	0.66	0.63	0.60	0.57	0.55	0.65	0.62	0.59	0.57	0.54	0.62	0.59	0.57	0.54	0.52	0.60	0.58	0.55	0.53	0.50		
Valine, %	0.81	0.77	0.73	0.70	0.66	0.73	0.69	0.66	0.63	0.61	0.72	0.68	0.65	0.62	0.60	0.69	0.65	0.62	0.60	0.57	0.66	0.63	0.60	0.58	0.55		
Total Amino Acids ⁵																											
Lysine, %	1.01	0.96	0.91	0.87	0.83	0.90	0.86	0.82	0.79	0.75	0.89	0.85	0.81	0.78	0.74	0.85	0.81	0.78	0.74	0.71	0.83	0.79	0.75	0.72	0.69		
Methionine, %	0.50	0.47	0.45	0.42	0.41	0.44	0.42	0.40	0.39	0.37	0.44	0.42	0.40	0.38	0.37	0.42	0.40	0.38	0.36	0.35	0.41	0.39	0.37	0.35	0.34		
Methionine+Cystine, %	0.94	0.89	0.84	0.80	0.77	0.84	0.80	0.76	0.73	0.70	0.83	0.79	0.75	0.72	0.69	0.79	0.75	0.72	0.69	0.66	0.77	0.73	0.70	0.67	0.64		
Threonine, %	0.76	0.72	0.68	0.65	0.62	0.68	0.65	0.62	0.59	0.57	0.67	0.64	0.61	0.58	0.56	0.64	0.61	0.58	0.56	0.54	0.62	0.59	0.57	0.54	0.52		
Tryptophan, %	0.24	0.23	0.22	0.21	0.20	0.22	0.21	0.20	0.19	0.18	0.21	0.20	0.19	0.19	0.18	0.21	0.20	0.19	0.18	0.17	0.20	0.19	0.18	0.17	0.17		
Arginine, %	1.03	0.98	0.93	0.88	0.84	0.92	0.88	0.84	0.80	0.77	0.91	0.87	0.83	0.79	0.76	0.87	0.83	0.79	0.76	0.73	0.84	0.80	0.77	0.73	0.70		
Isoleucine, %	0.79	0.75	0.71	0.68	0.65	0.71	0.68	0.65	0.62	0.59	0.70	0.67	0.64	0.61	0.58	0.67	0.64	0.61	0.58	0.56	0.65	0.62	0.59	0.56	0.54		
Valine, %	0.90	0.85	0.81	0.77	0.73	0.80	0.76	0.73	0.70	0.67	0.79	0.75	0.72	0.69	0.66	0.76	0.72	0.69	0.66	0.63	0.73	0.70	0.67	0.64	0.61		
Crude protein ⁶ , %	19.44	18.42	17.50	16.67	15.91	17.25	16.43	15.68	15.00	14.38	17.00	16.19	15.45	14.78	14.17	16.50	15.71	15.00	14.35	13.75	16.00	15.24	14.55	13.91	13.33		
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	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	0.18	0.17	0.16	0.16	0.15		
Linoleic acid (C18:2 n-6), %	2.00	1.89	1.80	1.71	1.64	1.60	1.52	1.45	1.39	1.33	1.40	1.33	1.27	1.22	1.17	1.20	1.14	1.09	1.04	1.00	1.00	0.95	0.91	0.87	0.83		
Choline, mg/kg	2000	1895	1800	1714	1636	1800	1714	1636	1565	1500	1800	1714	1636	1565	1500	1800	1714	1636	1565	1500	1800	1714	1636	1565	1500		
CALCIUM AND PHOSPHORUS CHANGES BASED ON FEED INTAKE																											
Feed Consumption, g/day per bird	Weeks 18–33					Weeks 34–48					Weeks 49–62					Weeks 63–76					Weeks 77+						
	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.

Production Period Nutritional Recommendations for Optimal Performance^{1,2}



FEEDING PHASE PRODUCTION	PEAKING ³	LAYER 2	LAYER 3	LAYER 4	LAYER 5
	First egg until production drops 2% below peak	2% below peak -90%	89-85%	84-80%	Less than 80%
RECOMMENDED DAILY NUTRIENT INTAKE					
Metabolizable energy ¹ , kcal/bird/day	315-330	310-325	305-320	300-315	300-315
Metabolizable energy ¹ , MJ/bird/day	1.32-1.38	1.30-1.36	1.28-1.34	1.26-1.32	1.26-1.32
Standardized Ileal Digestible Amino Acids / Total Amino Acids⁵					
Lysine, mg/day	870 / 953	845 / 925	820 / 898	795 / 870	770 / 843
Methionine, mg/day	435 / 468	423 / 454	410 / 441	398 / 427	385 / 414
Methionine+Cystine, mg/day	800 / 903	769 / 867	738 / 832	716 / 807	693 / 782
Threonine, mg/day	609 / 716	592 / 696	574 / 675	557 / 655	539 / 634
Tryptophan, mg/day	191 / 229	186 / 222	180 / 216	175 / 209	169 / 202
Arginine, mg/day	905 / 973	879 / 945	853 / 917	827 / 889	801 / 861
Isoleucine, mg/day	713 / 767	684 / 736	656 / 705	636 / 684	616 / 662
Valine, mg/day	783 / 864	752 / 829	722 / 796	700 / 772	678 / 747
Crude protein ⁶ , g/day	18.25	17.85	17.42	16.30	15.50
Sodium, mg/day	180	170	170	170	170
Chloride, mg/day	180	170	170	170	170
Linoleic acid (C18:2 n-6), g/day	2.00	2.00	1.60	1.50	1.40
Choline, mg/day	160	180	180	180	180

	CALCIUM AND PHOSPHORUS			Calcium Particle Size (fine : coarse)
	Calcium ^{7,8} g/day	Phosphorus (available) ^{7,9} mg/day	Phosphorus (digestible) mg/day	
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%

	IDEAL PROTEIN REFERENCE				
	PEAKING	LAYER 2	LAYER 3	LAYER 4	LAYER 5
Lysine	100%	100%	100%	100%	100%
Methionine	50%	50%	50%	50%	50%
M+C	92%	91%	90%	90%	90%
Threonine	70%	70%	70%	70%	70%
Tryptophan	22%	22%	22%	22%	22%
Arginine	104%	104%	104%	104%	104%
Isoleucine	82%	81%	80%	80%	80%
Valine	90%	89%	88%	88%	88%

Production Period Dietary Nutrient Concentrations for Optimal Performance^{1,2}

FEEDING PHASE PRODUCTION NUTRITION	PEAKING ³ First egg until production drops 2% below peak					LAYER 2 2% below peak to 91%					LAYER 3 90–87%					LAYER 4 86–82%					LAYER 5 Less than 82%						
	RECOMMENDED CONCENTRATION																										
Metabolizable energy ⁴ , kcal/bird/day	315–330					310–325					305–320					300–315					300–315						
Metabolizable energy ⁴ , MJ/bird/day	1.32–1.38					1.30–1.36					1.28–1.34					1.26–1.32					1.26–1.32						
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	100	105	110*	115	120		
Standardized Ileal Digestible Amino Acids																											
Lysine, %	0.97	0.92	0.87	0.83	0.79	0.85	0.80	0.77	0.73	0.70	0.82	0.78	0.75	0.71	0.68	0.80	0.76	0.72	0.69	0.66	0.77	0.73	0.70	0.67	0.64		
Methionine, %	0.48	0.46	0.44	0.41	0.40	0.42	0.40	0.38	0.37	0.35	0.41	0.39	0.37	0.36	0.34	0.40	0.38	0.36	0.35	0.33	0.39	0.37	0.35	0.33	0.32		
Methionine+Cystine, %	0.89	0.84	0.80	0.76	0.73	0.77	0.73	0.70	0.67	0.64	0.74	0.70	0.67	0.64	0.62	0.72	0.68	0.65	0.62	0.60	0.69	0.66	0.63	0.60	0.58		
Threonine, %	0.68	0.64	0.61	0.58	0.55	0.59	0.56	0.54	0.51	0.49	0.57	0.55	0.52	0.50	0.48	0.56	0.53	0.51	0.48	0.46	0.54	0.51	0.49	0.47	0.45		
Tryptophan, %	0.21	0.20	0.19	0.18	0.17	0.19	0.18	0.17	0.16	0.16	0.18	0.17	0.16	0.16	0.15	0.18	0.17	0.16	0.15	0.15	0.17	0.16	0.15	0.15	0.14		
Arginine, %	1.01	0.95	0.91	0.86	0.82	0.88	0.84	0.80	0.76	0.73	0.85	0.81	0.78	0.74	0.71	0.83	0.79	0.75	0.72	0.69	0.80	0.76	0.73	0.70	0.67		
Isoleucine, %	0.79	0.75	0.71	0.68	0.65	0.68	0.65	0.62	0.59	0.57	0.66	0.62	0.60	0.57	0.55	0.64	0.61	0.58	0.55	0.53	0.62	0.59	0.56	0.54	0.51		
Valine, %	0.87	0.82	0.78	0.75	0.71	0.75	0.72	0.68	0.65	0.63	0.72	0.69	0.66	0.63	0.60	0.70	0.67	0.64	0.61	0.58	0.68	0.65	0.62	0.59	0.57		
Total Amino Acids ⁵																											
Lysine, %	1.06	1.00	0.95	0.91	0.87	0.93	0.88	0.84	0.80	0.77	0.90	0.86	0.82	0.78	0.75	0.87	0.83	0.79	0.76	0.73	0.84	0.80	0.77	0.73	0.70		
Methionine, %	0.52	0.49	0.47	0.45	0.43	0.45	0.43	0.41	0.39	0.38	0.44	0.42	0.40	0.38	0.37	0.43	0.41	0.39	0.37	0.36	0.41	0.39	0.38	0.36	0.35		
Methionine+Cystine, %	1.00	0.95	0.90	0.86	0.82	0.87	0.83	0.79	0.75	0.72	0.83	0.79	0.76	0.72	0.69	0.81	0.77	0.73	0.70	0.67	0.78	0.74	0.71	0.68	0.65		
Threonine, %	0.80	0.75	0.72	0.68	0.65	0.70	0.66	0.63	0.61	0.58	0.68	0.64	0.61	0.59	0.56	0.66	0.62	0.60	0.57	0.55	0.63	0.60	0.58	0.55	0.53		
Tryptophan, %	0.25	0.24	0.23	0.22	0.21	0.22	0.21	0.20	0.19	0.19	0.22	0.21	0.20	0.19	0.18	0.21	0.20	0.19	0.18	0.17	0.20	0.19	0.18	0.18	0.17		
Arginine, %	1.08	1.02	0.97	0.93	0.88	0.95	0.90	0.86	0.82	0.79	0.92	0.87	0.83	0.80	0.76	0.89	0.85	0.81	0.77	0.74	0.86	0.82	0.78	0.75	0.72		
Isoleucine, %	0.85	0.81	0.77	0.73	0.70	0.74	0.70	0.67	0.64	0.61	0.71	0.67	0.64	0.61	0.59	0.68	0.65	0.62	0.59	0.57	0.66	0.63	0.60	0.58	0.55		
Valine, %	0.96	0.91	0.86	0.82	0.79	0.83	0.79	0.75	0.72	0.69	0.80	0.76	0.72	0.69	0.66	0.77	0.74	0.70	0.67	0.64	0.75	0.71	0.68	0.65	0.62		
Crude protein ⁶ , %	20.28	19.21	18.25	17.38	16.59	17.85	17.00	16.23	15.52	14.88	17.42	16.59	15.84	15.15	14.52	16.30	15.52	14.82	14.17	13.58	15.50	14.76	14.09	13.48	12.92		
Sodium, %	0.20	0.19	0.18	0.17	0.16	0.17	0.16	0.15	0.15	0.14	0.17	0.16	0.15	0.15	0.14	0.17	0.16	0.15	0.15	0.14	0.17	0.16	0.15	0.15	0.14		
Chloride, %	0.20	0.19	0.18	0.17	0.16	0.17	0.16	0.15	0.15	0.14	0.17	0.16	0.15	0.15	0.14	0.17	0.16	0.15	0.15	0.14	0.17	0.16	0.15	0.15	0.14		
Linoleic acid (C18:2 n-6), %	2.22	2.11	2.00	1.90	1.82	2.00	1.90	1.82	1.74	1.67	1.60	1.52	1.45	1.39	1.33	1.50	1.43	1.36	1.30	1.25	1.40	1.33	1.27	1.22	1.17		
Choline, mg/kg	1778	1684	1600	1524	1455	1800	1714	1636	1565	1500	1800	1714	1636	1565	1500	1800	1714	1636	1565	1500	1800	1714	1636	1565	1500		
CALCIUM AND PHOSPHORUS CHANGES BASED ON FEED INTAKE																											
Feed Consumption, g/day per bird	Weeks 18–33					Weeks 34–48					Weeks 49–62					Weeks 63–76					Weeks 77+						
	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 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.

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.

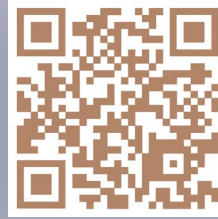
* Limits may be lower as interactions exist between magnesium and sulphate; and between sodium, potassium, chloride, and sulphate.

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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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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