Hy-Line® VARIETY BROWN

Commercial Management Guide

2002-2004

Table of Contents

Hy-Line International is committed to providing proper care for its flocks. Hy-Line subscribes to the husbandry practices for egg laying chickens as outlined by the United Egg Producers (UEP). We believe that it is our obligation to provide good management and husbandry practices for poultry, including proper housing, feeding, watering, lighting, ventilation, sanitation and vaccination programs to protect the health and welfare of all our flocks.

Capabilities of the Hy-Line® Variety Brown

GROWING PERIOD (to 17 weeks):

Livability	96-98%
Feed Consumed	6.0 Kg (13.2 Lbs.)
Body Weight at 17 Weeks	1.43 Kg (3.15 Lbs.)

LAYING PERIOD (to 80 weeks)

Percent Peak	94-96%
Hen-Day Eggs:	
To 60 Weeks	252
To 74 Weeks	328
To 80 Weeks	357
Hen-Housed Eggs:	
To 60 Weeks	249
To 74 Weeks	323
To 80 Weeks	351
Livability to 80 Weeks	96%
Days to 50% Production (from hatch)	145 days
Egg Weight at 32 Weeks	62.7 g/Egg (49.8 Lbs./Case)
Egg Weight at 70 Weeks	66.9 g/Egg (53.1 Lbs./Case)
Total Egg Mass Per Hen-Day	
18-74 Weeks	20.9 Kg (46.2 Lbs.)
18-80 Weeks	22.9 Kg (50.5 Lbs.)
Body Weight at 70 Weeks	2.00 Kg (4.41 Lbs.)
Freedom From Egg Inclusions	Excellent
Shell Color	Uniform, Dark Brown
Shell Strength	Excellent
Haugh Units at 70 Weeks	80
Average Daily Feed Consumption (18-80 weeks)	113 Grams/Bird/Day (25.0 Lbs./100 Birds/Day)
Kg of Feed per Kg of Eggs (21-74 weeks)	2.06
Feed per Dozen Eggs (21-74 weeks)	1.58 Kg (3.48 Lbs.)
Feather Color	Red with white underfeathers
Skin Color	Yellow
Condition of Droppings	Dry

Figures contained in this management guide have been compiled from extensive commercial flock records gathered from all parts of the world to the date of printing of this guide. Further management suggestions listed in this booklet are combined principles taken from industry technical literature and field experience with this variety. Neither the performance figures nor management suggestions are in any way a guarantee of performance. Productivity of a commercial flock of any variety layer will vary according to environment and disease conditions.

Chick Management

Hy-Line Brown chicks adapt equally well to floor and cage brooding systems. They require no special hatchery services except vaccination against Marek's disease.

General Recommendations

1. **Prior to delivery of chicks:**
   - **a.** Clean and disinfect cages or floor brooding area. Clean the building interior, attached service areas and equipment.
   - **b.** Check to make sure equipment is working properly and is adjusted to the right height.
   - **c.** Remove all old feed from bins, hoppers, and troughs. Disinfect and allow to dry before new feed is delivered.
   - **d.** Place rat/mouse poison where it will not be consumed by the chicks.
2. **One day before delivery:**
   - **a.** Set heating system at 35–37°C (95–99°F.) at chick level.
   - **b.** Check water system. Adjust to proper height for chicks. Disinfect and flush water lines.
3. **On delivery day:**
   - **a.** Have waterers full or water system in operation. Check brooder temperatures.
   - **b.** As chicks are placed, trigger water cups or nipples to encourage drinking.
   - **c.** When nipple drinkers are used, reduce the water pressure so birds can see the drop of water hanging on the drinker.
   - **d.** Feed should be placed on paper in cage. Operate feeders at highest feed level.
   - **e.** Keep lights at high intensity 20–23 hours per day for first week.

Growing Period Management

The first 17 weeks of a pullet's life are critical. Good management during this period can assure that she reaches the laying house ready to deliver her bred-in performance potential. Mistakes made during the first 17 weeks generally cannot be corrected in the laying house.

General Recommendations

1. Grow pullets in strict isolation from older birds. Maintain good sanitation. As much as possible, plan work routines so that disease organisms cannot be carried from older birds to the growing pullets.
2. During the first six weeks, operate feeders to provide feed twice daily, or more often. After six weeks, check feed consumption and body weights against the charts on pages 9 & 10. (Weigh 100 pullets to get a meaningful average.)
3. Check water availability in each cage row daily. Check for and repair leaks. Raise waterers as the birds grow (nipples higher than the birds' heads; cups or troughs level with their backs).
4. Plan and follow a vaccination schedule to fit your area.
5. Remove mortality daily and dispose of properly. Examine for causes of excessive mortality.
6. Three days before moving pullets to the laying house, begin using water-soluble vitamins and electrolytes in the drinking water. Continue for three days after housing. This helps minimize the stress of moving. Gentle handling will pay big dividends.

Growing Space Recommendations

CAGE		FLOOR	
Floor Space:	350 sq cm (54 sq. in.)	**Floor Space:**	1115 sq cm (1.2 sq. ft.)
Feeder Space:	8.0 cm/bird (3"/bird)	**Feeder Space:**	8.0 cm/bird (3"/bird) 1 pan/20 birds
Water Space:		**Water Space:**	
Trough:	3.0 cm/bird (1.2"/bird)	Trough:	3.0 cm/bird (1.2"/bird)
Cups/Nipples:	1 per 8 birds	Cups/Nipples:	1 per 8 birds
Fountains:	—	Fountains:	1 per 50 birds

Cage Brooding

Before the birds arrive, prepare the house as follows:

1. Put nonskid paper on the bottom of the cage. This paper may disintegrate and fall through the cage bottom or it should be removed at beak trimming time (10 days).
2. Start the heating system 24 hours before the birds arrive. Adjust the temperature to 35–37°C (95–99°F.).
3. Keep the relative humidity at 50% minimum. In cage brooding, adequate humidity is very important.

Temperature Management

In a cage or warm room brooding system, reduce the temperature 2°C (4°F.) per week from 36°C (97°F.) until 21°C (70°F.) is reached. Look for signs of overheating (panting and drowsiness) or chilling (huddling) and make appropriate adjustments. Heat control is more critical in cage brooding because the chicks cannot move to find their comfort zone.

Maintain adequate humidity if you brood in cages. Relative humidity for cage brooding must be maintained at 40-60%. If necessary, sprinkle water on the walks or floors to increase humidity.

Floor Brooding

Twenty-four hours before delivery of the chicks, prepare the house as follows:

1. Place a brooder ring around each brooder unit.
2. Adjust brooder temperature to 35°C (95°F.).
3. Fill jug waterers — two 4-liter (one gallon) waterers per 100 chicks.
4. Eliminate all drafts from the house.

Temperature Management

When using a gas fired hover, reduce the temperature under the hover by 3°C (5°F.) per week until 21°C (70°F.) is reached. Maintain adequate relative humidity for birds brooded on the floor. The chicks seem to be comfortable and do best when relative humidity is between 40 and 60%.

Observing the chicks will tell you whether or not the temperature is correct. If they are too cool, they will huddle near the heat source. If they are too warm, they will spread out away from the heat source. If there are drafts, they will huddle in groups to get away from the spot where the cool air enters the heated area. Comfortable chicks will spread out uniformly, without huddling, throughout the brooding area.

Beak Trimming

The Hy-Line Brown pullet is usually beak trimmed at between seven and 10 days of age using a precision cam activated beak trimmer with guide plate holes of 10/64, 11/64 and 12/64 inches (4.0, 4.37 and 4.75 mm). The proper size hole should be selected to provide the width of 2 mm between the nostrils and the cauterizing ring. The proper size hole will depend both on size and age of chicks.

A cherry red blade has been recommended for proper cautery. However, a better way to measure blade temperature is by use of a pyrometer to keep the blade at approximately 595°C (1100°F.). The use of a line voltage meter and chart available from Lyon will facilitate maintaining the proper blade temperature at all times. A variation of 56°C (100°F.) is common due to external influences and cannot be detected by the human eye.

The following precautions must be observed at all times.

1. Do not beak trim sick birds.
2. Do not hurry.
3. Use electrolytes and vitamins in the water (containing vitamin K) at beak trimming time.
4. Provide deeper feed for several days after beak trimming. If a coccidiostat is being used, supplement it with water soluble coccidiostats until feed consumption returns to normal.
5. Use only well trained crews for beak trimming.

Disease Control

A flock of pullets or layers can only perform up to its genetic potential when disease influence is minimized. The appearance of various diseases can vary from a subclinical effect on performance to outright severe mortality. The diseases of economic importance vary widely between locations, but in every case the challenge is to identify and control those diseases.

Biosecurity and Eradication

Obviously the best way to deal with a disease is to avoid it. Care should always be exercised to prevent introducing new diseases onto a pullet or layer farm. Common disease carriers include people, vehicles, equipment, wild birds, animals, and chickens themselves. New flocks should be tested before being brought onto a farm and should have a known vaccination program.

Some diseases are best controlled by eradication. Examples include *Mycoplasma gallisepticum,* cholera, coryza and typhoid. The continuing cost of medicating or vaccinating for these diseases often justifies some extra one-time effort and expense for eradication. These bacterial diseases are more easily eradicated than most viral diseases.

Vertically Transmitted Diseases

Some diseases are known to be transmitted from infected breeders to their progeny. This requires the production and maintenance of disease-free breeders as a first step in the control of these diseases at the commercial level. All breeders directly under Hy-Line's control are free of *Mycoplasma gallisepticum, Mycoplasma synoviae,* S. *pullorum,* S. *gallinarum* (typhoid), *S. enteritidis*, and lymphoid leukosis. Due to the possibility of horizontal transmission of any of these diseases, later generations may not remain free. It is the responsibility of the breeding stock and commercial flock owner to prevent horizontal transmission of these diseases and continue testing to be assured of a negative status.

Vaccination

Certain diseases are too widespread or difficult to eradicate and require a routine vaccination program. In general, all layer flocks should be vaccinated against Newcastle, bronchitis, IBD and AE. The exact vaccination schedule depends upon many things such as disease exposures expected, maternal immunities, vaccine types available and routes of administration preferred. Therefore, no one program can be recommended for all locations. Following is a basic program typical for the United States where breeders receive an inactivated Newcastle-bronchitis-IBD vaccine.

Day one	Marek's Disease, HVT, SB-1, ± Rispen's
18–20 days	IBD intermediate strain in water
25 days	Newcastle B-1 and bronchitis, mild Mass. in water
28–30 days	IBD intermediate strain in water
7–8 weeks	Newcastle B-1 and bronchitis, regular Mass. in water or spray
10 weeks	Pox wingweb and AE wingweb, water or spray
14 weeks	Newcastle LaSota and bronchitis, mild Holland spray or Newcastle-bronchitis killed virus injection

Infectious Bursal Disease

Special attention should be paid to IBD control. This disease can have many subtle effects which are detrimental to pullet health. The primary feature of IBD is immuno-suppression caused by damage to the bursa of Fabricius which leaves the bird unable to fend off other disease challenges. Secondary diseases such as gangrenous dermatitis, bacterial arthritis and even Marek's often result. Virtually all flocks are exposed to IBD and therefore, should be protected by vaccination. Most breeding stock receives a killed IBD vaccine to boost maternal titers in the chicks. Research at Hy-Line International has shown the optimum time to vaccinate such chicks with intermediate strain live vaccines is at 18–20 days and again at 28–30 days of age. Extremely severe IBD challenge may require even more frequent vaccination during this period. Bursas can be examined later to determine the extent of protection.

Lighting Program

Egg production is very closely related to the changes in daylength to which the pullets are exposed. Egg numbers, egg size, livability and total profitability can be favorably influenced by a proper lighting program. The basic rules of lighting are:

1. Start pullets with two days of continuous light at 1 ftc. (10 lux) intensity. From two days to three weeks, reduce light to 15 hours per day at ½ ftc. (5 lux) intensity. From three weeks to 18 weeks, maintain a constant daylength of 10 to 12 hours or that dictated by natural daylength in open or brownout houses. In summer months it may be beneficial to allow a decreasing daylength in open or brownout houses after three weeks, however, to avoid delays in maturity, daylength should be held constant after six weeks.
2. Provide light stimulation when body weight is 1.50 Kg (3.31 Lbs.). The initial increase should be no less than one hour. Increase light by 15–30 minutes per week or biweekly until 16 hours of light is reached. Preferably the period of stimulation should last until peak production. Light intensity should also be increased at housing to 1–2 ftc. (10–20 lux).
3. Allow no decrease in daylength or light intensity in adult layers.

Local sunrise-sunset timetables should be obtained to accurately design individual programs. Guidelines for various housing styles are as follows:

1. **Light-controlled growing to light-controlled laying:**
   a. Grow on a constant 10 to 12 hour daylength from three to 18 weeks.
   b. Increase daylength 1 hour at 1.50 Kg (3.31 Lbs.). Add 15-30 minutes per week until 16 hours total light is reached.
2. **Light-controlled growing to open or brownout laying:**
   a. Grow on a constant 10 to 12 hour daylength from three to 18 weeks.
   b. Increase to natural daylength or a minimum increase of 1 hour at 1.50 Kg (3.31 Lbs.). Add 15-30 minutes per week or biweekly to reach 16 hours total light, or at least the longest natural daylength of the year.
3. **Open or brownout growing to light-controlled laying:**
   a. Grow on a constant daylength equal to the longest natural daylength the flock will be exposed to from six to 18 weeks.
   b. Increase daylength one hour at 1.50 Kg (3.31 Lbs.). Add 15-30 minutes per week or biweekly until 16 hours of total light is reached.
4. **Open or brownout growing to open or brownout laying:**
   a. Grow on a constant daylength equal to the longest natural daylength the flock will be exposed to from six to 18 weeks.
   b. Increase daylength one hour at 1.50 Kg (3.31 Lbs.). Add 15-30 minutes per week or biweekly until 16 hours of total light is reached, or at least the longest natural daylength of the year.

Timing of Light Stimulation

Onset of sexual maturity or egg production generally depends on four requirements:

1. A minimum chronological age which is genetically determined (18 weeks).
2. A minimum body weight.
3. A nutrient intake to support production.
4. A constant or increasing daylength of at least 12 hours.

Light stimulation should not be provided until flocks reach the optimum body weight of 1500 grams (3.31 pounds). Flocks which are light-stimulated into production at lower body weights will likely produce below normal egg size and suffer from reduced peak production and post-peak drops in production.

Timing of light stimulation can be used as a tool to help attain desired egg size. In general, earlier light stimulation will result in a few more eggs per hen, but at a tradeoff for slightly reduced egg size. Later light stimulation will result in a few less total eggs, but a slightly larger egg size earlier in production.

In this way, lighting programs can be customized to best meet the egg size demand of a particular market.

Intermittent Lighting

Intermittent lighting can be used in light-controlled housing after 40 weeks of age to improve flock efficiency. The following effects have been shown:

1. Improved feed conversion of 5–7%.
2. Reduced feed intake of 5–7%.
3. Reduced egg size of 1–1.5%.
4. Reduced lighting power usage of 75%.
5. Slight improvement in shell strength.
6. Reduced heat stress morbidity and mortality.
7. Reduced cannibalism and activity problems.

A number of variations on intermittent lighting have been tried, but a commonly used one is to provide 15 minutes of light and 45 minutes of darkness for each hour of scheduled light in the day (15 Light 45 Darkness). The hens continue to recognize this as a full hour of light.

The program should be introduced gradually, starting with 45 L/15 D for every hour of light the first week, followed by 30 L/30 D for one week, and then 15 L/45 D thereafter. The final hour in the day should always end with 15 minutes of light (15 L/30 D/15 L) so that the total daylength does not decrease while instituting the program.

Planning Individual Light Programs

When open-type houses are used, which allow natural daylight to affect the flock, the lighting program must be planned in conjunction with changes in the natural daylength. Because no two places have the same sunrise-sunset times year-round, it is impractical to suggest timeclock settings that would apply to all locations. For the most precise planning, it is necessary to obtain local sunrise-sunset times for the entire year and construct a graph as the example on the following page demonstrates.

In this example, the growing flock is maturing in the spring when there is a naturally increasing daylength. To prevent early sexual development, find the natural daylength at 18 weeks of age and either hold that daylength constant with artificial lights from three to 18 weeks, or construct a stepdown program which will meet the natural daylength at 18 weeks, allowing for some twilight before sunrise and after sunset.

Egg Size Management

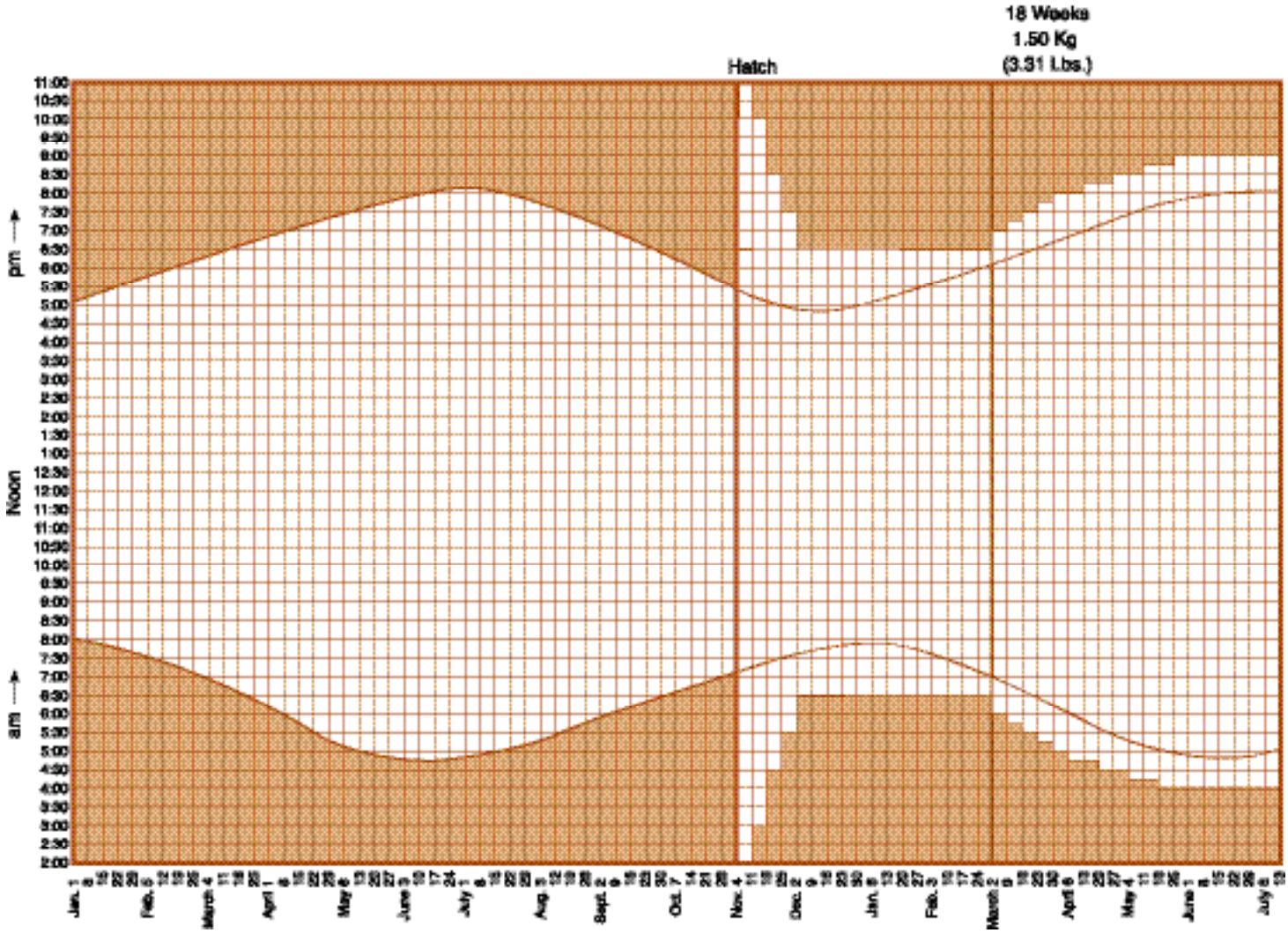
Egg size is to a large extent genetically determined, but within this given range, we can manage to either increase or decrease the egg size to suit the particular market needs.

The following management areas should be given particular attention.

1. **Body weight at maturity** — The larger the body weight at first egg, the larger that hen's eggs will be for her entire life. For maximum egg size, do not stimulate maturity with lights until a body weight of 1550–1600 grams (3.4–3.5 Lbs.) is attained.
2. **Rate of maturity** — This also relates to body size, but in general the earlier the age a flock begins production, the smaller the egg size will be, and likewise, the later the maturity, the larger the egg size. Lighting programs can be manipulated to influence rate of maturity. A decreasing light pattern during growing will delay maturity and increase average egg size. (See example below.)
3. **Nutrition** — Egg size is greatly affected by the intake of crude protein, specific amino acids such as methionine and cystine, energy, total fat, and the essential fatty acids such as linoleic acid. Levels of these nutrients can be increased to improve early egg size and gradually reduced to control late egg size. (See layer feeding program page 11.)

Sunrise and Sunset

42° Latitude Northern Hemisphere



Growing Period Nutrition Recommendations

Body Weight	Starter 0–6 Wks. to 480g (1.06 Lbs.)	Grower 6–9 Wks. to 680g (1.50 Lbs.)	Developer 9–16 Wks. to 1290g (2.84 Lbs.)	Pre-Layer 16 Wks. to 5% Production	Pre-Peak 5% to 50% Production
Nutrients:					
Protein, % (Min.)	19	16	15	16.5	20
Met. Energy, Kcal./Lb.	1250-1350	1250-1375	1225-1350	1240-1355	1250-1340
Met. Energy, Kcal./Kg(1)	2750-2970	2750-3025	2700-2970	2725-2980	2750-2948
Linoleic Acid, % (Min.)	1.0	1.0	1.0	1.0	1.5
Amino Acids (2) (Min.):					
Arginine, %	1.15	1.00	0.85	1.00	1.15
Lysine, %	1.10	0.90	0.70	0.75	1.05
Methionine, %	0.48	0.44	0.39	0.35	0.47
Methionine + Cystine, %	0.80	0.70	0.60	0.60	0.78
Tryptophan, %	0.20	0.18	0.15	0.17	0.21
Threomine,%	0.75	0.70	0.60	0.55	0.68
Minerals (Min.):					
Calcium, %	1.0	1.0	1.0	2.75(3)	4.20(4)
Phosphorus					
Total, %	0.75±	0.73±	0.70±	0.60±	0.75
Available, %	0.48	0.46	0.44	0.44	0.50
Sodium, %	0.18	0.18	0.18	0.18	0.20
Chloride, %	0.16	0.16	0.16	0.16	0.18
Potassium, %	0.50	0.50	0.50	0.50	0.60

(1) To convert Kcal./Kg to Megajoules, divide Kcal./Kg by 239.5.

(2) When the level of Met. energy in the ration is increased or decreased greatly from stated levels, amino acid levels should be adjusted accordingly.

(3) Calcium level should be raised to a minimum of 2.75% for pre-layer feed beginning at 16 weeks or two-three weeks prior to 5% egg production. At least 30% of the added limestone should have a minimum particle size of 2250 microns.

(4) A minimum of 50% of the added limestone should have an average particle size of 2250 microns.

Growing Period Feed Consumption

Age in Weeks	Daily			Cumulative		
	Grams/Bird/Day	Lbs./100/Day	Kcal./Bird/Day	Grams to Date	Lbs. to Date	Kcal. to Date
1	13	2.87	39	91	0.20	273
2	20	4.41	59	231	0.51	686
3	25	5.51	74	406	0.90	1204
4	29	6.39	88	609	1.34	1820
5	33	7.28	100	840	1.85	2520
6	37	8.16	113	1099	2.42	3311
7	41	9.04	124	1386	3.06	4179
8	46	10.14	141	1708	3.77	5166
9	51	11.24	157	2065	4.55	6265
10	56	12.35	172	2457	5.42	7469
11	61	13.45	189	2884	6.36	8792
12	66	14.55	204	3346	7.38	10220
13	70	15.43	216	3836	8.46	11732
14	73	16.09	225	4347	9.58	13307
15	75	16.53	231	4872	10.74	14924
16	77	16.98	234	5411	11.93	16562
17	80	17.64	239	5971	13.16	18235

Monitoring Body Weights

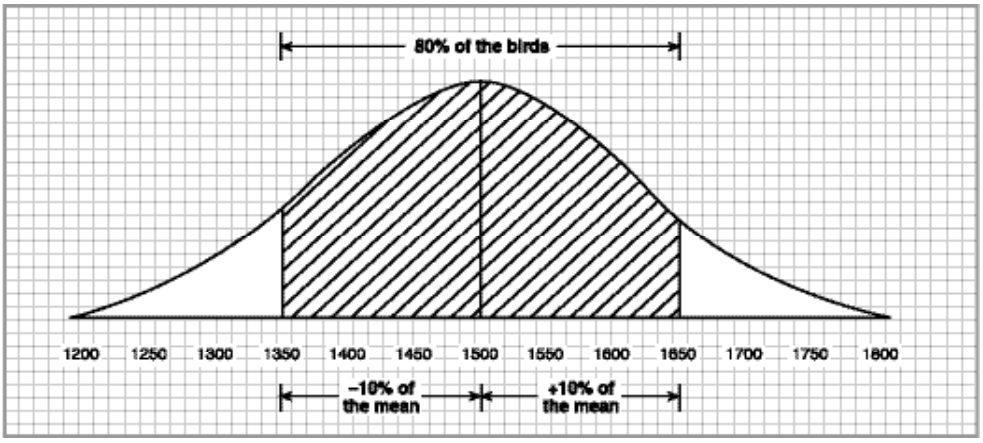
Body weights should be monitored periodically during the growing period and until after peak. At least 100 birds should be weighed individually with a scale having increments no larger than 50 grams or 1/10 Lb. Weighing should be started at five weeks of age and continued every two weeks during the growing period and until after peak. It is most critical to weigh just prior to a scheduled feed change. If the flock is below target body weight, it should be left on the higher nutrient feed formulation until the target weight for age is reached.

In addition to body weight averages, the uniformity of body weights within the flock is an indicator of normal flock development. Uniformity is expressed as the percent of individual weights which occur within 10% of the current flock average. A realistic goal is for 80% uniformity.

Factors which can adversely affect body weight and uniformity are crowding, disease, poor beak trimming and inadequate nutrient intake. Weighing at frequent intervals will determine the age at which a flock deviates from normal and thereby help identify the problem so that corrective measures can be taken.

Variability Between Individual Birds Within A Flock

Uniformity of individual birds is important as well as appropriate average flock weights. A desirable goal is for 80% of birds to fall within 10% of the mean. That is, if the average flock weight at 18 weeks is 1500 grams, 80% of all birds should weigh between 1350 and 1650 grams. Graph individual weights to be sure there is a bell shaped or “normal” distribution as shown below. To evaluate uniformity, at least 100 birds should be weighed.



Target Weights of Hy-Line Brown Pullets – Rearing Period –

Age in Weeks	Body Weight Grams	Body Weight Pounds
1	70	0.15
2	115	0.25
3	190	0.42
4	280	0.62
5	380	0.84
6	480	1.06
7	580	1.28
8	680	1.50
9	770	1.70
10	870	1.92
11	960	2.12
12	1050	2.31
13	1130	2.49
14	1210	2.67
15	1290	2.84
16	1360	3.00
Move to Lay House 17	1430	3.15
18	1500	3.31

Laying Period Nutrition

Minimum Daily Intake Recommendations per Bird

	Peaking[2] 50% Prod. – 32 Weeks	32–44 Wks.[2]	44–55 Wks.[2]	55 Wks. +[2]
Protein, g/bird[1]	18.00	17.50	17.00	16.00
Methionine, mg/bird	460	460	440	420
Methionine + Cystine, mg/bird	760	760	725	690
Lysine, mg/bird	930	910	880	860
Tryptophan, mg/bird	190	185	180	170
Calcium, g/bird	3.90-4.10	4.00-4.20	4.10-4.30	4.20-4.40
Phosphorus, (Total) g/bird	0.70±	0.66±	0.61±	0.56±
Phosphorus, (Available) g/bird	0.44	0.41	0.38	0.34
Sodium, mg/bird	180	180	180	180
Chloride, mg/bird	170	170	170	170

Formula Nutrient Profiles to Provide Recommendations for Lay Cycle Nutrient Intake

50% to 32 Weeks Peaking[2]

Consumption — Recommended Feed Energy 1260–1300 Kcal./Lb. or 2770–2860 Kcal./Kg[3]

Bird/Day Grams	Bird/Day Lbs.	% Protein	% Methionine	% Methionine + Cystine	% Lysine	% Tryptophan	% Calcium[4]	% Total Phosphorus	% Avail. Phos.	% Sodium
91	0.20	19.80	0.51	0.84	1.02	0.21	4.30-4.50	0.77±	0.48	0.20
95	0.21	18.85	0.48	0.79	0.97	0.20	4.10-4.30	0.73±	0.46	0.19
100	0.22	18.00	0.46	0.76	0.93	0.19	3.90-4.10	0.70±	0.44	0.18
104	0.23	17.20	0.44	0.73	0.88	0.18	3.70-3.90	0.67±	0.42	0.17
109	0.24	16.50	0.42	0.69	0.85	0.17	3.60-3.80	0.64±	0.40	0.16

32–44 Weeks[2]

Consumption — Recommended Feed Energy 1240–1300 Kcal./Lb. or 2725–2860 Kcal./Kg[3]

Bird/Day Grams	Bird/Day Lbs.	% Protein	% Methionine	% Methionine + Cystine	% Lysine	% Tryptophan	% Calcium[4]	% Total Phosphorus	% Avail. Phos.	% Sodium
100	0.22	17.50	0.46	0.76	0.91	0.18	4.00-4.20	0.66±	0.41	0.18
104	0.23	16.75	0.44	0.73	0.87	0.18	3.80-4.00	0.63±	0.39	0.17
109	0.24	16.05	0.42	0.69	0.83	0.17	3.70-3.85	0.61±	0.38	0.17
113	0.25	15.50	0.40	0.66	0.80	0.16	3.55-3.70	0.58±	0.36	0.16

44–55 Weeks[2]

Consumption — Recommended Feed Energy 1215–1300 Kcal./Lb. or 2675–2860 Kcal./Kg[3]

Bird/Day Grams	Bird/Day Lbs.	% Protein	% Methionine	% Methionine + Cystine	% Lysine	% Tryptophan	% Calcium[4]	% Total Phosphorus	% Avail. Phos.	% Sodium
100	0.22	17.00	0.44	0.73	0.88	0.18	4.10-4.30	0.61±	0.38	0.18
104	0.23	15.80	0.42	0.69	0.84	0.17	3.90-4.10	0.58±	0.36	0.17
109	0.24	15.15	0.40	0.66	0.81	0.16	3.75-3.95	0.56±	0.34	0.17
113	0.25	14.50	0.39	0.64	0.77	0.15	3.60-3.80	0.54±	0.32	0.16

55 Weeks and Older[2]

Consumption — Recommended Feed Energy 1160–1285 Kcal./Lb. or 2550–2825 Kcal./Kg[3]

Bird/Day Grams	Bird/Day Lbs.	% Protein	% Methionine	% Methionine + Cystine	% Lysine	% Tryptophan	% Calcium[4]	% Total Phosphorus	% Avail. Phos.	% Sodium
100	0.22	16.00	0.44	0.73	0.86	0.17	4.20-4.40	0.58±	0.34	0.18
104	0.23	14.80	0.42	0.70	0.82	0.16	4.00-4.20	0.55±	0.32	0.17
109	0.24	14.20	0.40	0.66	0.79	0.15	3.85-4.00	0.52±	0.31	0.17
113	0.25	13.65	0.39	0.64	0.76	0.14	3.70-3.85	0.50±	0.30	0.16

(1) Protein (g/b/d) may be increased/decreased in conjunction with methionine + cystine and energy to optimize/manage egg size.
(2) Layer rations should be formulated to provide suggested nutrient intake on a per bird per day basis depending on feed intake.
(3) The lower dietary feed energy recommendations generally are for the higher feed intake value. See page 12 for expected feed energy intake basis Kcal./bird/day. Formula energy content must be such to provide the expected energy needs on a per bird per day basis.
(4) Approximately 65% of the added limestone should be in particle sizes of 2250 microns.

Added Vitamins and Minerals

Added Minerals per Ton: (minimum)	Growing Period 1,000 Kg	Growing Period 2,000 Lbs.	Laying Period* 1,000 Kg	Laying Period* 2,000 Lbs.
Manganese (g) as MnO or $MnSO_4.H_2O$	66	60	66	60
Zinc (g) as ZnO or $ZnSO_4.H_2O$	66	60	66	60
Iron (g) $FeSO_4.5H_2O$	33	30	33	30
Copper (g) CuO or $CuSO_4.5H_2O$	4.4	4.0	8.8	8.0
Iodine (g) Cal. Iodate or EDDI	0.9	0.8	0.9	0.8
Selenium (g) Sodium Selenite $NaSeO_3$	0.30	0.27	0.30	0.27
Added Vitamins per Ton:				
Vitamin A (IU)	8,800,000	8,000,000	7,700,000	7,000,000
Vitamin D_3 (IU) one half spray dried	3,300,000	3,000,000	3,300,000	3,000,000
Vitamin E (IU)	6,600	6,000	6,600	6,000
Vitamin K (mg) (menadione)	550	500	550	500
Riboflavin (g) - spray dried	4.4	4.0	4.4	4.0
Vitamin B_{12} (mg)	8.8	8.0	8.8	8.0
Pantothenic Acid (g)	5.5	5.0	5.5	5.0
Folic Acid (mg)	220	200	110	100
Biotin (mg)	55	50	†	†
Niacin (g)	27.5	25	22	20
Choline (g)	275**	250**	275	250

*Based on daily feed intake of 100 g/bird/day (22 lbs. per 100 birds/day).
**May be reduced by one half after 8 weeks.
† No Biotin in layer diets if corn based — otherwise supplement same as growing diets.

Laying Period Feed Consumption and Energy Intake

The amount of feed a flock consumes is dependent on several factors. Consumption will vary according to feed nutrient content (particularly caloric content), house temperature, rate of production, egg size and body weight.

The following table suggests expected feed consumption for the Brown layer under normal field conditions using an energy adequate diet. The daily energy values are based on the energy prediction equation on page 13 with modifications based on actual performance experience for the Hy-Line Brown egg layer, assuming standard body weight, production and egg size values from the performance table (pages 14 and 15) and an environmental temperature of approximately 26.7°C or 80°F. For every one degree Fahrenheit or one-half degree Celsius higher or lower average temperature, subtract or add about two Kcal. per bird per day respectively.

Age in Weeks	Grams/Bird/Day	Lbs./100/Day	Kcal./Bird/Day	Age in Weeks	Grams/Bird/Day	Lbs./100/Day	Kcal./Bird/Day
18	86	19.0	245	50	116	25.6	302
19	95	20.9	250	51	116	25.6	301
20	100	22.0	255	52	116	25.6	301
21	103	22.7	262	53	116	25.6	300
22	105	23.1	268	54	116	25.6	300
23	106	23.4	274	55	116	25.6	299
24	107	23.6	280	56	116	25.6	299
25	108	23.8	286	57	116	25.6	298
26	110	24.3	293	58	116	25.6	297
27	111	24.5	297	59	116	25.6	297
28	111	24.5	300	60	116	25.6	296
29	112	24.7	303	61	116	25.6	296
30	112	24.7	305	62	116	25.6	295
31	112	24.7	306	63	116	25.6	295
32	113	24.9	308	64	116	25.6	294
33	113	24.9	309	65	116	25.6	293
34	114	25.1	310	66	116	25.6	292
35	114	25.1	310	67	116	25.6	292
36	115	25.4	311	68	116	25.6	291
37	115	25.4	311	69	116	25.6	291
38	115	25.4	310	70	116	25.6	290
39	115	25.4	310	71	116	25.6	290
40	116	25.6	309	72	116	25.6	289
41	116	25.6	309	73	116	25.6	289
42	116	25.6	308	74	116	25.6	288
43	116	25.6	307	75	116	25.6	287
44	116	25.6	307	76	116	25.6	287
45	116	25.6	306	77	116	25.6	286
46	116	25.6	305	78	116	25.6	286
47	116	25.6	304	79	116	25.6	285
48	116	25.6	303	80	116	25.6	285
49	116	25.6	302				

Energy Management

Energy requirements of growing and laying flocks need to be determined and managed as with the other common nutrients. Although birds do tend to adjust consumption to meet energy need, this is not always done precisely enough to insure optimum growth or performance. Added energy in the feed will at times result in better body weight gain, or egg production.

The energy need of a brown egg layer under a moderate temperature range can be marginally estimated with the following equation:

$$\text{Kcal./bird/day} = W(140 - 2T) + 2E + 5\triangle W$$

where W = current body weight in kilograms

T = average ambient temperature in degrees celsius.

E = daily egg mass in g/bird/day

$$\frac{(\%\ \text{production} \times \text{egg weight in grams})}{100}$$

$\triangle$ W = body weight gain in g/bird/day

The current energy consumption of a flock can be determined as follows:

Kcal./Lb. feed × Lb./100/day ÷ 100 = Kcal./bird/day

Kcal./Kg feed × g/bird/day ÷ 1000 = Kcal./bird/day

Likewise the calorie content needed in the feed to achieve a certain daily intake can be calculated as follows:

$$\text{Kcal./Lb. feed} = \frac{\text{Kcal./bird/day (desired)} \times 100}{\text{current Lbs./100/day}}$$

$$\text{Kcal./Kg feed} = \frac{\text{Kcal./bird/day (desired)} \times 1000}{\text{current g/bird/day}}$$

Increased nutrient density of feed is useful at certain times, especially when energy consumption may be a restricting factor. This includes the critical period between housing and peak production. Flocks consuming less than 285 Kcal./bird/day at peak production tend to suffer post-peak dips in production and reduced egg size. Heat stress will also result in lower feed and energy consumption. Increased nutrient density, to include energy (added fat) will help maintain production and egg size when environmental temperatures are high.

Fat is a concentrated source of energy which can be useful in increasing feed energy. It also has the benefit of a relatively low heat increment which is useful during periods of heat stress. Vegetable oils are typically high in linoleic acid which benefits egg size, although a blend of vegetable oil and animal fat may be acceptable.

The table below is a guideline for using fat at different ages and environmental temperatures. As fat is added to the ration, care should be exercised to increase the other nutrients in proportion to energy.

	Added Fat (%)		
Daily Highs	**Growing**	**Housing To Peak**	**Post Peak**
Above 35°C (95°F.)	3%	3%	2%
30°C (86°F.) to 35°C (95°F.)	2%	2%	1%
Below 30°C (86°F.)	0	1%	0

Recommended Cage Densities for the Hy-Line Brown Layer

	EU Guidelines	U.S. Recommended (UEP)
Cage space	450 sq cm (70 sq. in.)	432-555 sq. cm. (64 sq. in.)
Feeder space	10 cm/bird (4"/bird)	7.6 cm./bird (3"/bird)
Water space	access to 2 cups or nipples/cage	2 cups or nipples/12 birds or 1 trough/bird

Ventilation

Ventilation should be used as a major management tool to provide the optimum micro-environment per bird. Controlled ventilation can do a great deal to dilute pathogenic organisms as well as provide an optimum micro-environment when ventilation equipment is designed and operated to give correct air speed and direction.

A general rule for figuring required fan capacity is four cubic meters of air movement per kilogram of body weight per hour (one cubic foot per minute per pound of body weight).

The birds' optimum environmental temperatures and humidity should be in the range of 21-27°C (70-80°F.) and 40-60% relative humidity.

SUGGESTED MINIMUM VENTILATION RATES

CUBIC FEET PER MINUTE PER BIRD AGE OF BIRDS							CUBIC METERS PER HOUR PER BIRD AGE OF BIRDS						
Outside Temperature	**First Week**	**3 Weeks**	**6 Weeks**	**12 Weeks**	**18 Weeks**	**Beyond 18 Weeks**	**Outside Temperature**	**First Week**	**3 Weeks**	**6 Weeks**	**12 Weeks**	**18 Weeks**	**Beyond 18 Weeks**
90°F	1.0	1.5	2.0	3.0	4.0	6-7	35°C	2.0	3.0	4.0	6.0	8.0	12-14
70°F	0.7	1.0	1.5	2.0	3.0	4-5	20°C	1.4	2.0	3.0	4.0	6.0	8-10
50°F	0.4	0.7	1.0	1.5	2.0	2.5-3	10°C	0.8	1.4	2.0	3.0	4.0	5-6
30°F	0.3	0.5	0.7	1.0	1.5	2-2.5	0°C	0.6	1.0	1.5	2.0	3.0	4.5
10°F	0.2	0.3	0.5	0.7	1.0	1.5-2	–10°C	0.5	0.8	1.2	1.7	2.5	3-4
–10°F	0.1	0.2	0.3	0.5	0.5	1-1.5	–20°C	0.3	0.6	0.9	1.2	1.5	2.3

Hy-Line Variety Brown Performance Table

Age in Weeks	% Hen-Day	% Mortality Cum.	Hen-Day Eggs Cum.	Hen-Housed Eggs Cum.	Body Weight		Average Egg Weight*			Egg Mass Cum.		Egg Quality		
					Kg	Lbs.	g/Egg	Oz./Doz.	Net Lbs./ 30 Doz. Case	Kg	Lbs.	Haugh Units	Shell Thickness (mm)	Specific Gravity
18		.0			1.50	3.31								
19	9	.1	0.6	0.6	1.56	3.44	46.6	19.7	37.0	0.0	0.1	103.2	0.352	1.088
20	26	.1	2.5	2.4	1.61	3.55	47.7	20.2	37.9	0.1	0.3	102.7	0.352	1.088
21	52	.2	6.1	6.1	1.66	3.66	50.0	21.2	39.7	0.3	0.7	102.2	0.352	1.088
22	77	.2	11.5	11.5	1.70	3.75	52.5	22.2	41.7	0.6	1.3	101.7	0.352	1.088
23	90	.3	17.8	17.7	1.74	3.84	54.8	23.2	43.5	0.9	2.0	101.3	0.352	1.088
24	93	.3	24.3	24.2	1.78	3.92	57.0	24.1	45.2	1.3	2.9	100.8	0.352	1.088
25	94	.4	30.9	30.8	1.82	4.01	59.0	25.0	46.8	1.7	3.7	100.4	0.352	1.088
26	94	.4	37.5	37.3	1.86	4.10	60.0	25.4	47.6	2.1	4.6	99.9	0.351	1.088
27	95	.5	44.1	44.0	1.90	4.19	60.6	25.7	48.1	2.5	5.5	99.5	0.351	1.087
28	95	.5	50.8	50.6	1.93	4.26	61.3	26.0	48.7	2.9	6.4	99.0	0.351	1.087
29	95	.6	57.4	57.2	1.96	4.32	61.6	26.1	48.9	3.3	7.3	98.6	0.351	1.087
30	94	.6	64.0	63.7	1.97	4.34	62.0	26.3	49.2	3.7	8.2	98.1	0.351	1.087
31	94	.7	70.6	70.3	1.98	4.37	62.4	26.4	49.5	4.1	9.1	97.7	0.351	1.087
32	94	.7	77.1	76.8	1.98	4.37	62.7	26.6	49.8	4.5	10.0	97.2	0.351	1.087
33	94	.8	83.7	83.3	1.99	4.39	63.0	26.7	50.0	4.9	10.9	96.7	0.351	1.087
34	94	.8	90.3	89.9	1.99	4.39	63.3	26.8	50.2	5.4	11.8	96.3	0.351	1.086
35	94	.9	96.9	96.4	1.99	4.39	63.5	26.9	50.4	5.8	12.7	95.8	0.351	1.086
36	93	.9	103.4	102.8	1.99	4.39	63.7	27.0	50.6	6.2	13.7	95.4	0.351	1.086
37	93	1.0	109.9	109.3	2.00	4.41	63.9	27.1	50.7	6.6	14.6	94.9	0.351	1.086
38	93	1.0	116.4	115.7	2.00	4.41	64.1	27.2	50.9	7.0	15.5	94.5	0.351	1.086
39	93	1.1	122.9	122.2	2.00	4.41	64.2	27.2	51.0	7.4	16.4	94.0	0.351	1.086
40	93	1.1	129.4	128.6	2.00	4.41	64.3	27.2	51.0	7.9	17.3	93.6	0.351	1.086
41	92	1.2	135.9	135.0	2.00	4.41	64.4	27.3	51.1	8.3	18.3	93.1	0.351	1.086
42	92	1.2	142.3	141.3	2.00	4.41	64.5	27.3	51.2	8.7	19.2	92.7	0.350	1.085
43	91	1.3	148.7	147.6	2.00	4.41	64.6	27.4	51.3	9.1	20.1	92.2	0.350	1.085
44	91	1.3	155.1	153.9	2.00	4.41	64.7	27.4	51.3	9.5	21.0	91.7	0.350	1.085
45	90	1.4	161.4	160.1	2.00	4.41	64.8	27.4	51.4	9.9	21.9	91.3	0.350	1.085
46	90	1.4	167.7	166.3	2.00	4.41	64.9	27.5	51.5	10.3	22.8	90.8	0.350	1.085
47	90	1.5	174.0	172.6	2.00	4.41	65.0	27.5	51.6	10.7	23.7	90.4	0.350	1.085
48	89	1.5	180.2	178.7	2.00	4.41	65.1	27.6	51.7	11.2	24.6	89.9	0.350	1.085
49	88	1.6	186.3	184.8	2.00	4.41	65.2	27.6	51.7	11.6	25.5	89.5	0.350	1.085
50	88	1.7	192.5	190.8	2.00	4.41	65.3	27.7	51.8	12.0	26.4	89.0	0.350	1.084

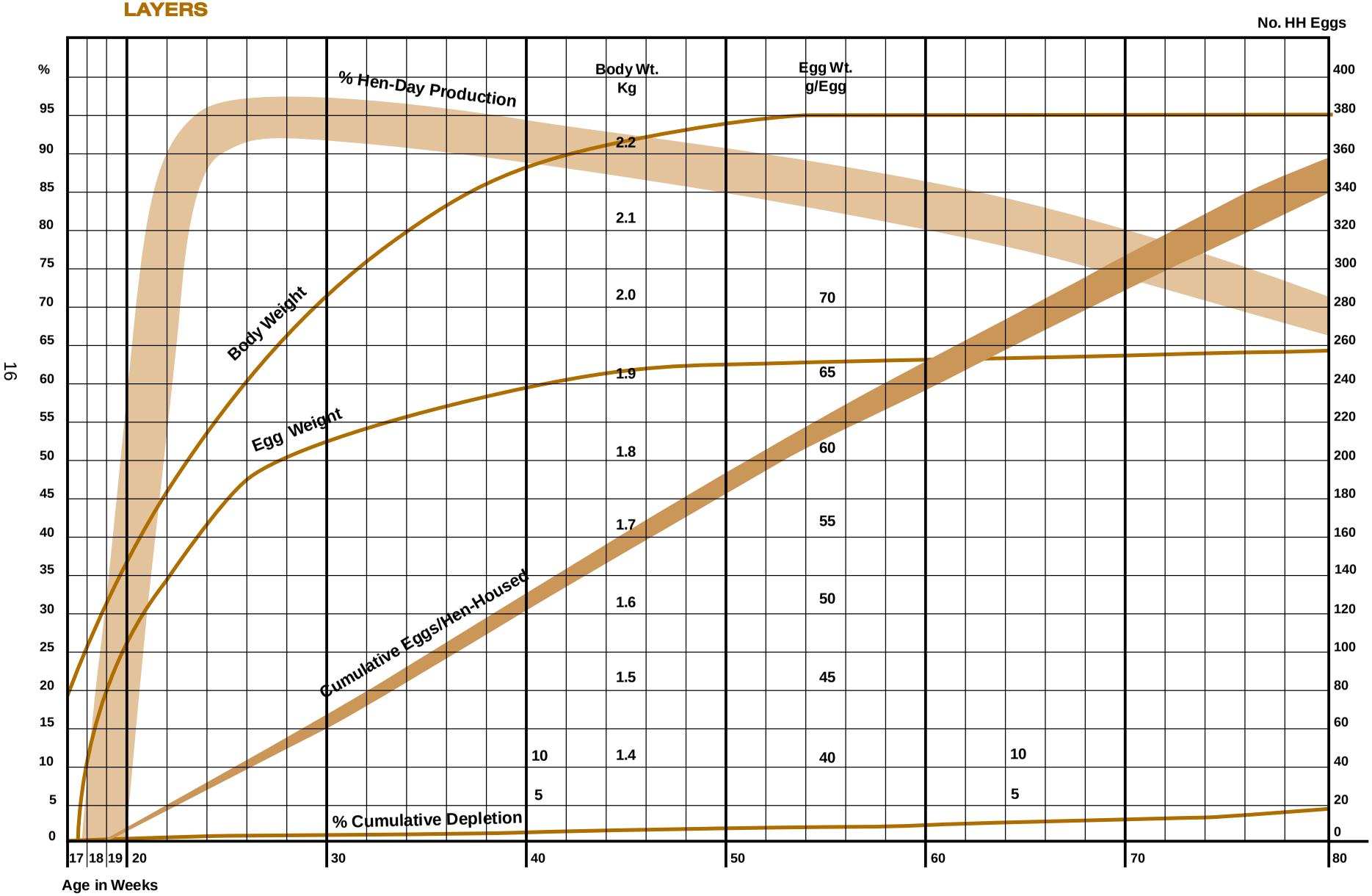
*Egg weights after 40 weeks of age assume phase feeding of protein to limit egg size.

Hy-Line Variety Brown Performance Table

Age in Weeks	% Hen-Day	% Mortality Cum.	Hen-Day Eggs Cum.	Hen-Housed Eggs Cum.	Body Weight		Average Egg Weight*			Egg Mass Cum.		Egg Quality		
					Kg	Lbs.	g/Egg	Oz./Doz.	Net Lbs./ 30 Doz. Case	Kg	Lbs.	Haugh Units	Shell Thickness (mm)	Specific Gravity
51	88	1.7	198.7	196.9	2.00	4.41	65.4	27.7	51.9	12.4	27.2	88.6	0.350	1.084
52	87	1.8	204.8	202.8	2.00	4.41	65.5	27.7	52.0	12.8	28.1	88.1	0.350	1.084
53	87	1.8	210.8	208.8	2.00	4.41	65.6	27.8	52.1	13.2	29.0	87.7	0.350	1.084
54	86	1.9	216.9	214.7	2.00	4.41	65.7	27.8	52.1	13.6	29.9	87.2	0.350	1.084
55	86	2.0	222.9	220.6	2.00	4.41	65.8	27.9	52.2	13.9	30.8	86.7	0.350	1.084
56	85	2.0	228.8	226.5	2.00	4.41	65.9	27.9	52.3	14.3	31.6	86.3	0.350	1.084
57	84	2.1	234.7	232.2	2.00	4.41	66.0	28.0	52.4	14.7	32.5	85.8	0.349	1.083
58	84	2.1	240.6	238.0	2.00	4.41	66.1	28.0	52.5	15.1	33.3	85.4	0.349	1.083
59	83	2.2	246.4	243.7	2.00	4.41	66.2	28.0	52.5	15.5	34.2	84.9	0.349	1.083
60	83	2.3	252.2	249.3	2.00	4.41	66.3	28.1	52.6	15.9	35.0	84.5	0.349	1.083
61	82	2.3	258.0	254.9	2.00	4.41	66.4	28.1	52.7	16.3	35.9	84.0	0.349	1.083
62	82	2.4	263.7	260.5	2.00	4.41	66.5	28.2	52.8	16.6	36.7	83.6	0.349	1.083
63	81	2.5	269.4	266.1	2.00	4.41	66.5	28.2	52.8	17.0	37.5	83.1	0.349	1.083
64	80	2.6	275.0	271.5	2.00	4.41	66.6	28.2	52.9	17.4	38.4	82.7	0.349	1.083
65	79	2.6	280.5	276.9	2.00	4.41	66.7	28.3	52.9	17.8	39.2	82.2	0.349	1.082
66	78	2.7	286.0	282.2	2.00	4.41	66.8	28.3	53.0	18.1	40.0	81.7	0.349	1.082
67	78	2.8	291.4	287.5	2.00	4.41	66.8	28.3	53.0	18.5	40.8	81.3	0.349	1.082
68	77	2.9	296.8	292.8	2.00	4.41	66.9	28.3	53.1	18.9	41.6	80.8	0.349	1.082
69	76	3.0	302.1	297.9	2.00	4.41	66.9	28.3	53.1	19.2	42.4	80.4	0.349	1.082
70	76	3.1	307.4	303.1	2.00	4.41	66.9	28.3	53.1	19.6	43.2	79.9	0.349	1.082
71	75	3.2	312.7	308.2	2.00	4.41	67.0	28.4	53.2	19.9	43.9	79.5	0.349	1.082
72	74	3.4	317.9	313.2	2.00	4.41	67.0	28.4	53.2	20.3	44.7	79.0	0.349	1.081
73	73	3.5	323.0	318.1	2.00	4.41	67.0	28.4	53.2	20.6	45.4	78.6	0.348	1.081
74	72	3.6	328.0	323.0	2.00	4.41	67.0	28.4	53.2	20.9	46.2	78.1	0.348	1.081
75	71	3.7	333.0	327.7	2.00	4.41	67.1	28.4	53.3	21.3	46.9	77.7	0.348	1.081
76	70	3.9	337.9	332.5	2.00	4.41	67.1	28.4	53.3	21.6	47.7	77.2	0.348	1.081
77	69	4.0	342.7	337.1	2.00	4.41	67.1	28.4	53.3	21.9	48.4	76.7	0.348	1.081
78	68	4.1	347.5	341.7	2.00	4.41	67.1	28.4	53.3	22.3	49.1	76.3	0.348	1.081
79	67	4.3	352.2	346.1	2.00	4.41	67.2	28.5	53.3	22.6	49.8	75.8	0.348	1.081
80	66	4.4	356.8	350.6	2.00	4.41	67.2	28.5	53.3	22.9	50.5	75.4	0.348	1.080

*Egg weights after 40 weeks of age assume phase feeding of protein to limit egg size.

Hy-Line Brown Hen-Day Production Graph



Egg Size Distribution – U.S. Standards

Age in Weeks	Average Egg Weight (Lbs./Case)	Jumbo Over 30 Oz./Doz.	Extra Large 27–30 Oz./Doz.	Large 24–27 Oz./Doz.	Medium 21–24 Oz./Doz.	Small 18–21 Oz./Doz.	Peewee Under 18 Oz./Doz.
20	37.9	0.0	0.0	2.5	31.5	53.0	13.1
22	41.7	0.0	0.9	18.2	53.6	25.4	1.9
24	45.2	0.3	8.8	43.2	40.3	7.1	0.2
26	47.6	2.0	21.7	49.6	24.2	2.4	0.1
28	48.7	3.5	28.4	48.8	17.9	1.4	0.0
30	49.2	4.4	32.2	48.1	14.6	0.9	0.0
32	49.8	5.1	36.3	47.1	11.1	0.4	0.0
34	50.2	6.1	39.9	45.1	8.6	0.3	0.0
36	50.6	7.1	42.1	43.1	7.5	0.2	0.0
38	50.9	7.5	45.2	41.6	5.7	0.1	0.0
40	51.0	8.5	45.7	40.1	5.6	0.1	0.0
42	51.2	9.2	46.6	38.9	5.2	0.1	0.0
44	51.3	10.4	47.0	37.5	5.0	0.1	0.0
46	51.5	11.1	47.6	36.5	4.7	0.1	0.0
48	51.7	12.4	48.0	35.0	4.6	0.1	0.0
50	51.8	13.2	48.7	33.9	4.2	0.1	0.0
52	52.0	14.6	48.8	32.4	4.1	0.1	0.0
54	52.1	15.5	49.1	31.5	3.8	0.1	0.0
56	52.3	16.5	49.4	30.3	3.8	0.1	0.0
58	52.5	17.8	49.4	29.3	3.5	0.1	0.0
60	52.6	19.3	49.3	28.0	3.3	0.1	0.0
62	52.8	20.4	49.1	27.2	3.2	0.1	0.0
64	52.9	21.1	48.9	26.8	3.1	0.1	0.0
66	53.0	22.5	48.6	25.8	3.0	0.1	0.0
68	53.1	23.2	48.3	25.5	3.0	0.1	0.0
70	53.1	23.5	48.1	25.4	3.0	0.1	0.0
72	53.2	24.0	48.0	24.9	3.0	0.1	0.0
74	53.2	24.0	48.0	24.9	3.0	0.1	0.0
76	53.3	25.1	47.3	24.6	3.0	0.1	0.0
78	53.3	25.1	47.3	24.6	3.0	0.1	0.0
80	53.3	26.1	46.6	24.2	3.0	0.1	0.0

Egg Size Distribution – European Standards

Age in Weeks	Average Egg Weight (g)	Very Large Over 73g	Large 63–73g	Medium 53–63g	Small 43–53g
20	47.7	0.0	0.0	12.4	87.5
22	52.5	0.0	1.4	44.4	54.2
24	57.0	0.1	11.9	66.4	21.6
26	60.0	0.7	27.9	62.1	9.3
28	61.3	1.4	36.1	56.7	5.9
30	62.0	1.7	40.7	53.5	4.2
32	62.7	2.0	45.6	49.8	2.6
34	63.3	2.4	50.1	45.8	1.8
36	63.7	2.9	52.8	42.9	1.5
38	64.1	2.9	56.3	39.7	1.1
40	64.3	3.5	57.2	38.4	0.9
42	64.5	3.8	58.4	36.9	0.9
44	64.7	4.5	59.1	35.6	0.9
46	64.9	4.9	60.1	34.2	0.8
48	65.1	5.7	60.6	33.0	0.7
50	65.3	6.2	61.6	31.6	0.7
52	65.5	7.1	62.2	30.1	0.7
54	65.7	7.6	62.5	29.2	0.7
56	65.9	8.6	62.7	28.0	0.6
58	66.1	9.2	63.2	27.0	0.6
60	66.3	10.3	63.5	25.6	0.6
62	66.5	11.0	63.6	24.9	0.5
64	66.6	11.4	63.8	24.3	0.5
66	66.8	12.5	63.5	23.6	0.5
68	66.9	13.0	63.1	23.5	0.5
70	66.9	13.4	62.9	23.2	0.5
72	67.0	13.8	62.9	22.8	0.5
74	67.0	13.8	62.9	22.8	0.5
76	67.1	14.7	62.2	22.6	0.5
78	67.1	14.7	62.2	22.6	0.5
80	67.2	15.6	61.5	22.4	0.5

Feed Ingredient Analysis Table[1]

Ingredient	Dry Matter %	Crude Protein %	Fat % (Ether Extract)	Fiber %	M.E. Kcal/Lb. Poultry	Calcium %	Phosphorus %	Avail. Phosphorus %	Potassium %	Sodium %	Chlorine %	Ash %	Choline mg/Lb.	Arginine %	Lysine %	Methionine %	Cystine %	Tryptophan %	Threonine %	Bulk Density (Lb./Cu. Ft.)	Linoleic Acid %	Xanthophyll (mg/Lb.)
Alfalfa Meal, dehydrated	93.0	17.5	3.0	25.0	750	1.30	0.27	0.27	2.49	0.09	0.46	9.0	680	0.75	0.73	0.28	0.18	0.45	0.75	20	—	100.0
Bakery Product, dried	91.5	10.0	11.5	0.7	1700	0.06	0.40	0.10	0.80	1.14	1.48	5.4	560	0.40	0.30	0.50	0.16	0.09	0.60	40	1.5	—
Barley	89.0	11.6	1.8	5.0	1250	0.07	0.36	0.11	0.49	0.05	0.03	3.0	450	0.50	0.50	0.16	0.25	0.13	0.36	25	—	—
Barley, West Coast	88.0	9.7	2.0	6.5	1255	0.05	0.33	0.10	0.44	0.02	0.10	2.4	425	0.43	0.36	0.16	0.20	0.13	0.30	22	—	—
Beet Pulp	92.0	8.0	0.6	20.0	300	0.56	0.10	0.03	0.20	0.18	0.04	4.0	370	0.30	0.60	0.01	0.01	0.09	0.35	13	—	—
Blood Meal, flash dried	91.0	85.0	1.6	1.0	1400	0.30	0.22	0.20	0.09	0.32	0.27	4.4	440	3.00	7.60	1.00	1.40	1.10	3.90	38	—	—
Brewers Dried Grains	93.0	27.0	7.5	12.0	1000	0.27	0.66	0.18	0.08	0.25	0.12	4.6	960	1.30	0.90	0.57	0.39	0.40	1.00	20	—	—
Canola Meal	92.5	38.0	3.8	11.0	960	0.70	1.17	0.30	1.30	0.05	0.06	7.2	3042	2.30	2.30	0.68	0.47	0.44	1.70	25	—	—
Coconut Meal, Mech	93.0	21.5	5.8	12.0	680	0.15	0.60	0.20	1.85	0.04	0.03	6.9	510	2.30	0.55	0.33	0.20	0.20	0.60	27	—	—
Corn Germ Meal (wet milled)	93.0	20.0	1.0	12.0	770	0.30	0.50	0.16	0.34	0.04	0.10	3.8	800	1.30	0.90	0.57	0.40	0.18	1.10	26	—	—
Corn, yellow	86.0	7.9	3.8	1.9	1560	0.02	0.25	0.08	0.31	0.03	0.04	1.1	250	0.36	0.26	0.20	0.18	0.07	0.26	39	1.9	10.0
Corn, yellow (hi-oil)	86.0	8.2	6.0	1.9	1625	0.02	0.26	0.09	0.31	0.03	0.04	1.2	250	0.40	0.28	0.20	0.19	0.07	0.30	40	3.0	10.0
Corn Glutten Feed	90.0	22.0	2.1	10.0	800	0.20	0.80	0.21	0.60	0.14	0.20	7.8	1100	1.30	0.45	0.20	0.50	0.10	0.80	30	1.0	10.0
Corn Glutten Meal, 60%	90.0	62.0	2.0	2.0	1690	0.02	0.50	0.18	0.45	0.03	0.06	1.5	1000	1.90	1.00	1.90	1.10	0.26	2.00	34	1.0	140.0
Cottonseed Meal, expeller	91.0	41.0	3.9	12.5	1000	0.15	0.93	0.28	1.25	0.04	0.04	6.2	1270	4.30	1.60	0.50	0.59	0.50	1.35	37	1.2	—
Cottonseed Meal, solvent	90.5	41.0	0.8	12.4	900	0.15	0.98	0.28	1.26	0.04	0.04	6.4	1300	4.60	1.70	0.46	0.62	0.45	1.35	40	0.4	—
Crab Meal	93.0	31.0	1.8	14.0	750	16.00	1.50	1.50	0.80	0.88	1.51	30.8	920	1.70	1.40	0.50	0.20	0.30	1.00	26	—	—
Distillers Dried Grains w/solubles	91.0	28.0	8.0	8.0	1090	0.27	0.77	0.34	0.86	0.55	0.17	4.5	1780	1.00	0.80	0.45	0.50	0.20	1.00	25	4.0	1.0
Fat, animal (stabilized)	98.0	—	95.0	—	3700	—	—	—	—	—	—	—	—	—	—	—	—	—	—	54	—	—
Fat, feed (vegetable/animal blend)	98.0	—	95.0	—	3800	—	—	—	—	—	—	—	—	—	—	—	—	—	—	55	20.0	—
Fat, poultry	98.0	—	96.0	—	3850	—	—	—	—	—	—	—	—	—	—	—	—	—	—	55	20.5	—
Fat or Oil, vegetable	98.0	—	96.0	—	4000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	52	38.0	—
Feather Meal	92.0	85.0	2.5	1.5	1050	0.20	0.70	0.70	0.30	0.70	0.28	3.7	400	3.90	1.05	0.55	4.00	0.37	3.00	34	—	—
Fish Meal (Anchovy) 65%	92.0	65.0	10.0	1.0	1290	4.00	2.80	2.80	0.74	0.87	1.00	15.0	2200	3.60	4.80	1.90	0.60	0.70	2.80	35	—	—
Fish Meal (Menhaden) 60%	92.0	62.0	9.5	1.0	1340	5.00	2.90	2.90	0.73	0.59	0.60	19.6	1400	3.60	4.80	1.70	0.50	0.55	2.86	35	—	—
Fish Solubles (50% solids)	51.0	31.0	4.5	0.5	870	0.10	0.49	0.49	1.48	1.00	1.70	9.4	1800	1.30	1.47	0.44	0.20	0.11	0.60	—	—	—
Hominy Feed, yellow	90.0	11.5	6.0	5.6	1360	0.04	0.50	0.17	0.63	0.08	0.05	2.7	630	0.55	0.44	0.22	0.13	0.12	0.40	26	—	1.5
Meat & Bone Meal 50%	94.0	50.0	9.5	2.8	1075	9.70	4.40	4.40	0.46	0.72	0.84	32.0	870	3.40	2.50	0.65	0.35	0.29	1.70	37	—	—
Molasses, cane	75.0	3.0	0.0	0.0	890	0.90	0.05	0.02	2.38	0.16	2.00	8.0	400	—	—	—	—	—	—	88	—	—
Oats	89.0	11.5	4.0	11.0	1150	0.10	0.35	0.10	0.42	0.08	0.10	3.2	425	0.80	0.38	0.18	0.20	0.14	0.30	20	—	—
Peanut Meal, hydraulic or expeller	92.0	45.0	5.2	12.0	1050	0.15	0.55	0.20	1.12	0.08	0.03	5.7	700	4.80	1.60	0.41	0.70	0.46	1.40	29	—	—
Poultry By-Product Meal	93.0	60.0	13.0	2.0	1325	3.60	1.90	1.90	0.55	0.28	0.54	1.77	2720	3.80	2.55	1.00	1.00	0.50	2.00	35	—	—
Rice (broken)	89.0	7.3	1.4	8.0	1340	0.04	0.24	0.10	0.13	0.04	0.06	4.5	400	0.56	0.16	0.14	0.10	0.12	0.25	34	—	—
Rice Bran, unextracted	89.0	12.5	15.5	11.0	1175	0.06	1.60	0.16	1.50	0.05	0.06	5.0	515	0.95	0.55	0.21	0.21	0.13	0.43	30	3.0	—
Rice Bran, solvent	90.0	14.0	1.0	13.5	660	0.10	1.40	0.15	1.34	0.04	0.06	11.1	520	1.00	0.60	0.30	0.30	0.14	0.40	21	—	—
Rice Polishings	90.0	12.0	12.0	5.0	1400	0.05	1.20	0.20	0.02	0.17	0.15	9.0	600	0.90	0.60	0.25	0.26	0.10	0.36	26	3.0	—
Sorghum	89.0	9.8	2.8	2.0	1500	0.04	0.30	0.10	0.35	0.03	0.06	1.8	300	0.36	0.27	0.12	0.18	0.10	0.30	34	—	—
Soybean Hulls	90.0	11.0	1.9	36.5	668	0.40	0.19	0.04	1.16	0.01	0.01	4.5	223	0.89	0.66	0.14	0.17	0.17	0.50	20	—	—
Soybean Meal, solvent	90.0	45.0	0.8	6.5	1020	0.25	0.60	0.20	1.92	0.04	0.03	5.8	1245	3.20	2.85	0.65	0.67	0.60	1.70	37	—	—
Soybean Meal, dehulled	90.0	48.5	1.0	3.0	1100	0.20	0.65	0.20	2.05	0.04	0.05	5.8	1295	3.60	3.05	0.70	0.71	0.66	2.00	40	—	—
Sunflower Meal Solvent	90.0	34.0	1.0	13.0	1000	0.30	1.25	0.26	1.60	0.20	0.21	7.0	850	2.80	1.40	0.60	0.55	0.35	1.45	31	—	—
Wheat, hard	89.0	12.5	1.7	2.9	1450	0.05	0.38	0.15	0.45	0.06	0.07	2.1	390	0.62	0.39	0.24	0.26	0.16	0.36	39	—	—
Wheat, soft, western	89.0	10.5	1.8	2.6	1455	0.05	0.30	0.12	0.39	0.06	0.07	1.8	395	0.45	0.30	0.15	0.21	0.12	0.28	38	—	—
Wheat Bran	89.0	15.0	3.5	11.0	590	0.12	1.15	0.40	1.23	0.06	0.07	6.1	445	1.05	0.57	0.18	0.30	0.27	0.50	18	—	—
Wheat Middlings, flour	89.0	16.0	4.0	6.0	1150	0.10	0.66	0.18	0.89	0.06	0.05	7.8	430	1.00	0.80	0.20	0.26	0.22	0.49	20	—	—
Wheat Middlings, standard	89.0	15.5	3.6	8.5	940	0.14	0.88	0.23	0.59	0.06	0.07	5.4	480	1.10	0.70	0.16	0.20	0.20	0.50	21	—	—

1. Formula nutrient profile recommendations (page 11) are based on calculations utilizing these ingredient nutrient values.

Hy-Line® BRAND LAYERS

A PUBLICATION OF
HY-LINE INTERNATIONAL
P.O. Box 65190
West Des Moines, Iowa 50265
TELEPHONE: 515-225-6030
FAX: 515-225-6425
www.hyline.com

(01/02) Printed in U.S.A.