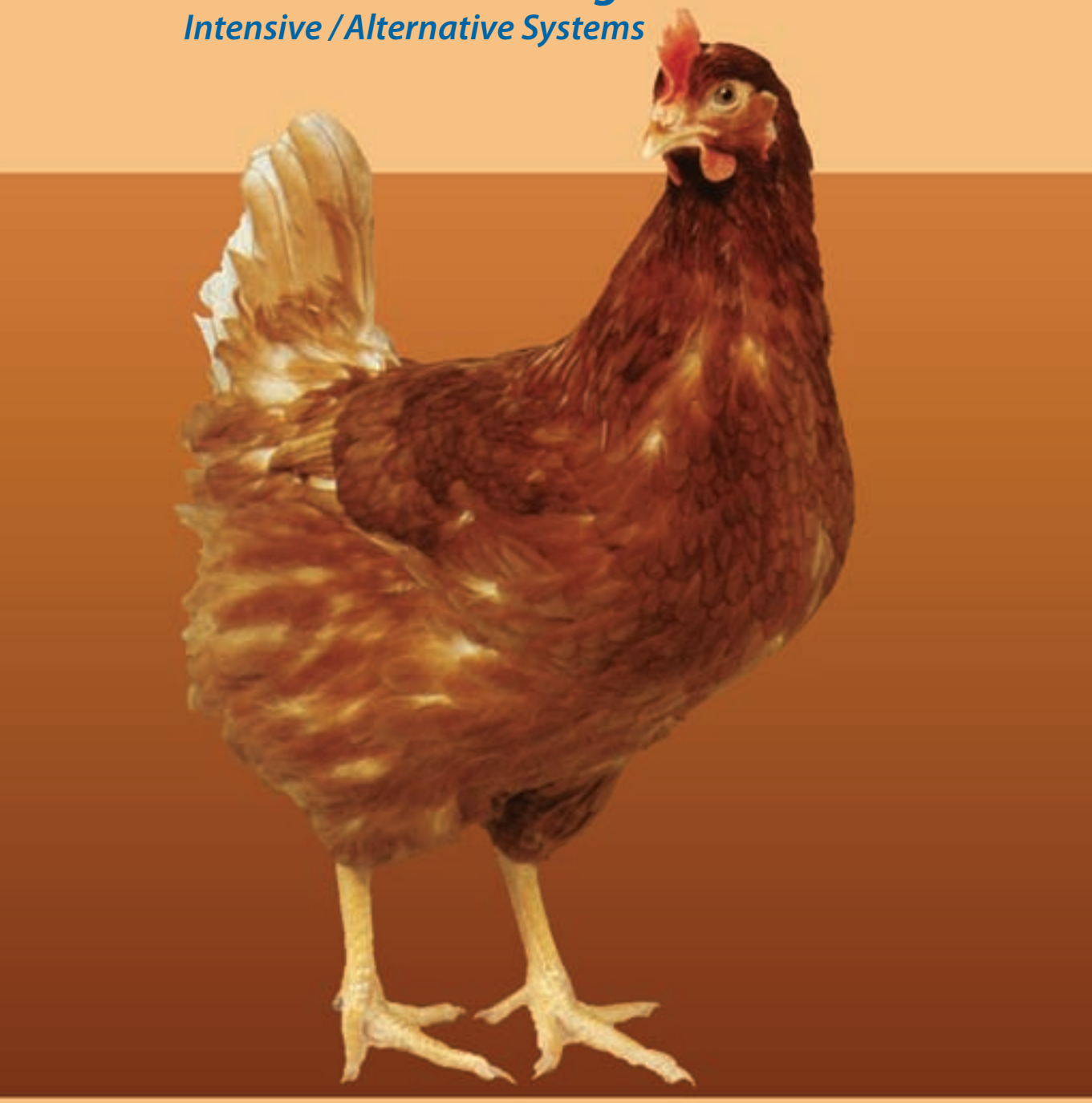
Hy-Line BROWN

Commercial Management Guide

Intensive / Alternative Systems



Hy-Line AUSTRALIA

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Performance Standards - 2011

Hy-Line Brown Capabilities - Intensive Systems	
Growing Period (to 17 weeks):	
Livability	97%
Feed Consumed	5.62 kg
Body Weight at 17 Weeks	1.49 kg
Laying Period (to 80 weeks):	
Percent Peak	94 - 96%
Hen-Day Eggs to 60 Weeks	253 - 259
Hen-Day Eggs to 80 Weeks	363 - 371
Hen-Housed Eggs to 60 Weeks	249 - 255
Hen-Housed Eggs to 80 Weeks	354 - 361
Livability to 60 Weeks	97%
Livability to 80 Weeks	94%
Days to 50% Production (from hatch)	140
Egg Weight at 26 Weeks	58 g
Egg Weight at 32 Weeks	61 g
Egg Weight at 70 Weeks	64 g
Total Egg Mass per Hen-housed (18 - 80 weeks)	22.0 kg
Body Weight at 32 Weeks	1.91 kg
Body Weight at 70 Weeks	1.97 kg
Freedom From Egg Inclusions	Excellent
Shell Strength	Excellent
Shell Colour at 38 Weeks	87
Shell Colour at 56 Weeks	85
Shell Colour at 70 Weeks	81
Haugh Units at 38 Weeks	90
Haugh Units at 56 Weeks	84
Haugh Units at 70 Weeks	81
Average Daily Feed Consumption (18 - 80 weeks)	107 g / day per bird
Feed Conversion Rate, kg Feed / kg Eggs (20 - 60 weeks)	1.99
Feed Conversion Rate, kg Feed / kg Eggs (20 - 80 weeks)	2.04
Feed Utilization, kg Egg/kg Feed (20 - 60 weeks)	0.503
Feed Utilization, kg Egg/kg Feed (20 - 80 weeks)	0.490
Feed per Dozen Eggs (20 - 60 weeks)	1.47 kg
Feed per Dozen Eggs (20 - 80 weeks)	1.53 kg
Skin Colour	Yellow
Condition of Droppings	Dry

The genetic potential of Hy-Line Brown can only be realized if good poultry husbandry practices and management are used. The above information is based on field experience compiled by Hy-Line, extensive commercial flock records catalogued by Hy-Line from all parts of the world and principles taken from industry technical literature. It should be used for guidance and educational purposes only, recognizing that local environmental and disease conditions may vary and a handout cannot cover all possible circumstances.

This page was last updated March 2011

Table 2 | Capabilities of the Hy-Line Brown - Alternative Systems

Performance Standards - 2011

Hy-Line Brown Capabilities - Alternative Systems	
Growing Period (to 17 weeks):	
Livability	97%
Feed Consumed	6.20 kg
Body Weight at 17 Weeks	1.43 kg
Laying Period (to 80 weeks):	
Percent Peak	94 - 96%
Hen-Day Eggs to 60 Weeks	241-259
Hen-Day Eggs to 80 Weeks	350-371
Hen-Housed Eggs to 60 Weeks	237-255
Hen-Housed Eggs to 80 Weeks	341-361
Livability to 60 Weeks	97%
Livability to 80 Weeks	94%
Days to 50% Production (from hatch)	142
Egg Weight at 26 Weeks	58 g
Egg Weight at 32 Weeks	61 g
Egg Weight at 70 Weeks	66 g
Total Egg Mass per Hen-housed (18 - 80 weeks)	21.6 kg
Body Weight at 32 Weeks	1.87 kg
Body Weight at 70 Weeks	1.98 kg
Freedom From Egg Inclusions	Excellent
Shell Strength	Excellent
Shell Colour at 38 Weeks	87
Shell Colour at 56 Weeks	85
Shell Colour at 70 Weeks	81
Haugh Units at 38 Weeks	90
Haugh Units at 56 Weeks	84
Haugh Units at 70 Weeks	81
Average Daily Feed Consumption (18 - 80 weeks)	114 g/day per bird
Feed Conversion Rate, kg Feed / kg Eggs (20 - 60 weeks)	2.06
Feed Conversion Rate, kg Feed / kg Eggs (20 - 80 weeks)	2.08
Feed Utilization, kg Egg / kg Feed (20 - 60 weeks)	0.485
Feed Utilization, kg Egg / kg Feed (20 - 80 weeks)	0.481
Feed per Dozen Eggs (20 - 60 weeks)	1.54 kg
Feed per Dozen Eggs (20 - 80 weeks)	1.58 kg
Skin Colour	Yellow
Condition of Droppings	Dry

The genetic potential of Hy-Line Brown can only be realized if good poultry husbandry practices and management are used. The above information is based on field experience compiled by Hy-Line, extensive commercial flock records catalogued by Hy-Line from all parts of the world and principles taken from industry technical literature. It should be used for guidance and educational purposes only, recognizing that local environmental and disease conditions may vary and a handout cannot cover all possible circumstances.

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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 and beak treatment.

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 correct height.
c. Remove all old feed from bins, hoppers and troughs. Disinfect and allow to dry before new feed is delivered.
d. Place rodent bait where it will not be consumed by chicks.

2. One day before delivery

a. Set the brooder thermostat to 34-36°C at chick level).
b. Check water system. Adjust to correct height for chicks. Disinfect and flush water lines.

3. On the day of delivery

a. Have drinkers full or water system in operation. Check brooder temperatures.
b. As chicks are placed, trigger water cups or nipples to encourage drinking.
c. Encourage drinking before eating. When nipple drinkers are used, adjust the water pressure so birds can see a droplet of water on each nipple.
d. Feed should be placed on paper either in the cage or on the floor depending on system. Operate feeders at highest level.
e. Keep lights at high intensity for the first week (ie 15-20 Lux).

Cage brooding

Before the birds arrive, prepare the house as follows:

1. Put non-skid paper on the bottom of the cage. This paper may disintegrate and fall through the cage bottom or it should be removed at 7-10 days.
2. Start the heating system 24 hours before the birds arrive. Adjust temperature to 34-36°C at chick level.
3. Keep the relative humidity between 40%-60%. In cage brooding, adequate humidity is very important.

Temperature management

Reduce the temperature by 2°C per week until 21°C is reached. Look for signs of overheating (panting, 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 between 40%-60%. If necessary, sprinkle water on the walks or floors to increase humidity.

Table 3 | Brooding temperatures - Cage rearing

AGE	Cage Brooding °C
Day 1-3	34-36
Day 4-7	30-32
Day 8-14	28-30
Day 15-21	26-28
Day 22-28	23-26
Day 29-35	21-23
Day 36 →	21

Table 4 | Light intensity - Cage rearing

AGE	LIGHT INTENSITY (LUX)
Days 1-7	20
Days 8-14	18
Week 2-13	15
Week 14-16 Gradual increase to	20
Light intensity at housing	20

Floor brooding

Twenty-four hours prior to chick delivery, prepare the house as follows:

a. Section the area required for brooding.
b. Adjust brooder temperature to 35-36°C .
c. Ensure supplementary drinkers are used where necessary. Keep water clean at all times.
d. Eliminate all draughts from the house.

Temperature management

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 away from the heat source. If there are draughts, they will huddle in groups away from the area where the cool air enters the building. Comfortable chicks will spread out uniformly through the brooding area, without huddling.

Maintain adequate relative humidity: The chicks are more comfortable and respond best when relative humidity is between 40% and 60%.

Table 5 | Brooding temperatures - Floor rearing

AGE	°C
Day 1-3	35-36
Day 4-7	33-35
Day 8-14	31-33
Day 15-21	29-31
Day 22-28	26-27
Day 29-35	23-25
Day 36-42	21

Table 6 | Light intensity - Floor rearing

AGE	LIGHT INTENSITY (LUX)
Days 1-7	20
Days 8-14	18
Week 2-13	15
Week 14-16 Gradual increase to	20
Light intensity at housing	20

Infra - red beak treatment

Important information about Hy-Line chicks and infra-red beak treatment

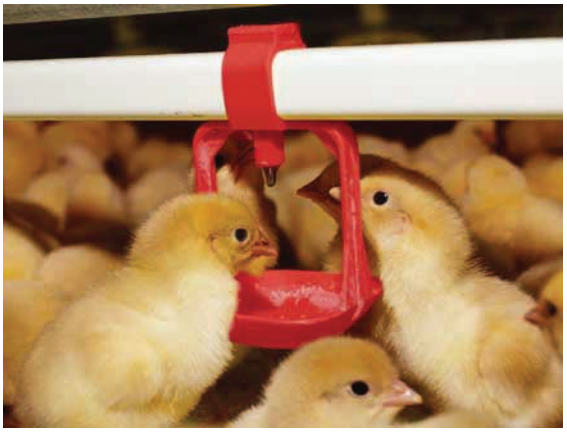
In conjunction with the manufacturers we have listed a number of guidelines to ensure your new consignment of chicks perform to their full potential.

Water

- Water intake is one of the most important factors for success with infra-red beak treated chicks. Chicks require immediate and easy access to water.
- Water should be kept fresh and clean. Ensure that palatable water is provided for the birds at all times.
- Where pressurised water systems are used, ensure the correct pressure is applied, allowing a droplet of water on the nipple.
- Again water is the key. Do whatever you can to encourage the chicks to drink.

Light

The minimum recommended light intensity is 20 lux while brooding. This level of light intensity will keep the chicks alert and encourage feed and water intake.



Infra-red beak treatment

Table 7 | Growing space recommendations

CAGE		FLOOR	
Floor Space:	310 cm^2	Floor Space:	20kg per sq metre live weight / 835 cm^2
Feeder Access:	5 cm/bird	Feeder Space:	5cm per bird single side minimum 2cm of circular feeding space per bird 1 pan/50 birds
Water Access: Cups/Nipples:	1 per 8 birds	Water Space:	15-20 birds per cup or nipple drinker 125-150 birds per bell drinker

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

General recommendations

1. To optimise biosecurity grow pullets in strict isolation from older birds. Where possible, plan work routines so that you always visit younger birds first, reducing the risk of disease organisms being transferred.
2. During the first six weeks run feeders a minimum of twice per day. Check feed consumption against Table 14.
3. Check water availability and raise drinkers as the birds grow (nipples should be higher than the birds' heads, cups to be level with their backs.
4. Plan and follow a vaccination schedule specific to your area.
5. Remove dead birds daily and dispose of correctly. Examine for causes of excessive mortality.
6. Ensure target body weights are achieved by weekly check weighing. Weigh 60-100 pullets to obtain an average weight.
7. Minimum 80% uniformity is necessary to achieve optimum performance.
8. Two weeks prior to moving gradually increase light intensity to match the laying quarters.
9. Three days before moving pullets to the laying house, begin using water-soluble vitamins and electrolytes in the drinking water. Continue using for three days after housing, which will help to minimise the stress of moving.
10. Water consumption during the last week on the growing farm should be noted and compared with water consumption in the laying house immediately after transfer. The time taken to match the previous level of water consumption and subsequently exceed it will be an indication of how well the birds have adapted to their new environment.

Lighting

It is important to provide floor reared birds with enough light intensity to allow them to explore their environment.

Perches

Perches improve the growing and laying house environment. During the growing period, perches allow birds to fully develop their leg and wing muscles, which enhances the bird's ability to move around the growing and laying house. Perches reduce the social pressure of the poultry house, allowing the birds to roost during rest periods. Efficient use of perches can increase the total available space within the poultry house environment. Perches also reduce the risk of smothering.

Bodyweight

To reduce the impact on bodyweight during transfer from the growing house, it is advisable that during the growing period, birds have access to the same type of feeder and water system as they will have in the laying house. Ideally the growing house should have perches as this improves body weight, growth, and uniformity.

Relative humidity

Birds are very sensitive to extremes of relative humidity. It is common to see young flocks in floor systems with relative humidity dropping below 30%. This will cause an increased agitation level among the birds and can result in aggressive behaviour. Excessive humidity at the incorrect time may cause poor litter conditions, poor air quality and increased ammonia and should be avoided to prevent respiratory problems. Ideally relative humidity should range between 40% and 60%.

Socialisation

It is important to socialise the birds to humans by walking through them daily. It is recommended after 7 days the birds are walked at two-hour intervals, giving the bird time to relax and settle between walking. Increase the light in house and walk briskly through the house to improve the process of socialisation. This results in flock being calmer and more easy to manage.

Table 8 | Recommended perch length per bird density

BIRD DENSITY	LENGTH PER BIRD
Birds/m^2	cm
7	4
8	6
9	8
10	12
12	14

Figure 1 | Perch dimensions

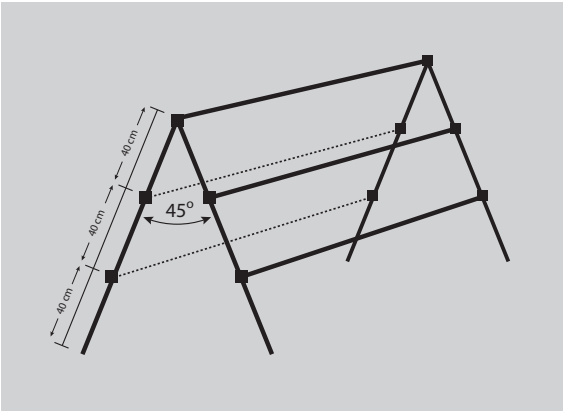


Table 9 | Recommended layer floor densities

Recommended Floor Densities for the Hy-Line Brown Layer		
Floor Space:	all litter all slat combination of litter/slat	8 birds/m^2 10 birds/m^2 9 birds/m^2
Feeder Access:	straight trough round pans	9cm 30 birds
Water Access:	1 nipple/cup 2.5cm water trough 46cm diameter circular automatic water fountain	per 10 birds per bird per 125 birds
Nest Space:	colony nest, single tier, 1.1-1.4m width individual nest	150 birds/nest (75 birds/side) 8 birds/nest

General management recommendations - Alternative systems

The following checklist has been compiled as a guide to ensure your Hy-Line Brown point of lay (P.O.L) pullets are able to maximise and achieve their full potential.

Order/rearing period

- Check vaccination program and blood analysis results.
- Check compatibility of feed and water systems.
- Establish lighting regime.
- Discuss required light intensity.
- Discuss need for worming with pullet supplier.

Prior to arrival of P.O.L. pullets.

- Wash and disinfect the poultry house and equipment.
- Fumigate house and equipment and treat against red mite.
- Ensure all lights and dimmers are working.
- Check nest box lights (if installed) and egg collection belt. Close access to pullets.
- Where bell drinkers are used install at least 20% of them near edge of slats, initially to maximise water intake and avoid dehydration.
- Set drinker heights so pullets can either see water in the bell drinkers or droplets on nipples.
- Where nipple drinkers are used adjust water pressure to maximise water intake.
- Raise water levels in bell drinkers to improve uptake.
- Adjust light intensity to a minimum of 15-20 lux and set time clocks to required day length, checking that the clocks are functioning correctly.
- Check ventilation system is functioning correctly.

On delivery

Housing at 16 - 17 weeks of age

Multi-tier / conventional systems

- Handle pullets carefully and place on slats.
- Walk birds several times after housing to ensure that the pullets have found water and feed.
- Adjust day length as closely as possible to rearing program, i.e. 10 hours from 07.00 to 17.00.
- Set dawn and dusk lights to come on and off 30 mins prior to main lights.
- Ensure adequate ventilation, especially during hot spells, to reduce stress.
- Give water-soluble vitamins for three days to help pullets settle in.
- Take first water-meter reading.
- Check weight of pullets.

First week

- Monitor water intake and regularly check water lines for spillage or poor pressure.
- Compare water consumption each day until the water consumption prior to transfer has been reached.
- When you are satisfied that the pullets are consuming the correct amount of water, raise bell drinkers or nipple lines to desired height and adjust water levels/pressures accordingly.

- Initially, manually adjust number of feeds per day to ensure adequate intake and avoid wastage.
- Subsequently, set time clocks and monitor feeders. (Practice little and often if feed system will allow, to stimulate pullets to eat, keep feed fresh and avoid selective feeding.)
- First feed should be set 30 mins after main lights come on and last feed should be set for 1 1/2 hours before main lights go off. Allow an extended period between feeding during the middle of the day, increase the number of feeds early am and late pm, making adjustments accordingly to the birds' requirements and day length.
- If the birds are restrained on the slats, release them onto scratching area after 4-5 days. Avoid excessive litter.
- Ensure all pullets are roosting on slats or perches prior to lights out.
- Weigh 1% of the birds after seven days to monitor progress of pullets' body weight.
- Following the day of delivery, open nest boxes and set nest box lights if applicable, initially for 4 to 6 hours to encourage exploration.

Second and third weeks

- Continue to weigh birds weekly to ensure pullets follow recommended growth pattern.
- Make first light increase of one hour when average live weight reaches 1.50 kg and uniformity is between 80% and 85%.
- If uniformity has not reached 80% at 1500g bodyweight, delay light stimulation to allow the lighter birds in the flock to gain the sufficient body weight.
- Maintain lights at 20 lux to ensure there are no shaded areas thereby discouraging floor eggs.
- Set nest boxes to open 1 hour before main lights (and nest box lights if applicable).
- Regularly walk floors from the wall of the building to the nests and collect any floor eggs.
- Continue to monitor feed consumption and water intake. Investigate any discrepancy.

Fourth week onwards

- Continue increasing day length as advised.
- Co-ordinate nest box opening times with increased day length.
- Maintain vigilance concerning any floor eggs. Start collecting when lights come on.
- Check egg weight weekly and investigate if breed target has not been reached. If egg weight exceeds the target by 2g, consider changing down to next diet to avoid future problems with egg size. Please discuss with feed representative prior to any action being taken to control egg size.
- Maintain key performance records so that they can be used as an aid to flock management.
- Take blood samples as recommended to monitor antibody levels and re-vaccinate if low.

Smothering problems

Possible solutions

In nest boxes	Scratch area
a. Lift curtain of lid of nest box.	a. Block out shafts of light.
b. Remove mats (where possible).	b. Round off corners of scratch area.
c. Block off box where crowding is seen.	c. Maintain a good working litter over a wider area as possible.
d. Remove individual nest box light.	d. A deterrent may be necessary along edges of walls and around corners.

Broody birds

If found, remove to a separate pen with wire/slatted floor for 5-7 days or until birds cease to be broody.

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

Biosecurity is the best method of avoiding disease. A good biosecurity programme identifies and controls the most likely ways a disease can enter the farm. Movement of people and equipment onto the farm should be strictly controlled. Visitors to the farm should be limited to those who are essential for this operation. All visitors should use a log book to document their visits. Anyone who has visited another poultry facility within the last 48 hours should not be permitted to access. Clean boots, clothing and head cover should be provided for everyone working on or visiting the farm. Clean foot baths containing disinfectant should be placed outside the entries to all poultry houses. If possible, avoid using outside crews or equipment for vaccination, moving, and beak treatment. Ideally, workers should be limited to a single house. The number of flocks visited in a single day should be limited and the progression should be from younger to older flocks and from healthy to sick flocks. After visiting a sick flock, no other flock should be visited. Farm Assurance schemes usually require you to have a plan in place describing what biosecurity precautions you follow.

The removal of old hens from the farm is a time when disease can be introduced. The vehicles and crew used to transport old hens have often visited other farms. A plan should be developed to minimize the biosecurity risk during times outside crews or equipment are needed for vaccination, moving pullets, and beak treatment.

A single-age growing farm using the all-in/all-out principal is best. This will prevent the transmission of disease from older flocks to younger, susceptible flocks. All houses should be designed to prevent exposure of the flock to wild birds.

Rodents are known carriers of many poultry diseases and they are the most common reason for re-contamination of a cleaned and disinfected poultry facility. They are also responsible for house to house spread of disease on a farm. The farm should be free of debris and tall grass that might provide cover for rodents. The perimeter of the house should have a 1m area of crushed concrete or stone to prevent rodents burrowing under the houses. Feed and eggs should be stored in rodent-proof areas. Bait stations should be placed throughout the house and maintained with fresh rodenticide.

Cleaning and disinfection of the house between flocks serves to reduce the likelihood of infection pressure for a new incoming flock. Organic matter should be removed by high pressure spraying with warm water containing a detergent/disinfectant. Allow time for the detergent to soak. After drying, the house should be disinfected or fumigated and allowed to dry again before repopulating with birds.

Heating the house during washing improves the removal of organic matter. Wash all surfaces within the house including air inlets, fan housing, fan blades and fan louvres. Flush and sanitise the water lines.

All feed and manure should be removed from the house before cleaning. Allow a minimum of two weeks down time between flocks. Monitoring of poultry houses for the presence of pathogenic species of Salmonella, particularly Salmonella enteritidis, is recommended. This can be done by routine testing of the environment using large sponge swabs. Except for small non-commercial flocks, all layers must be monitored for Salmonella using boot swabs every 15 weeks in lay beginning at 22-26 weeks of age.

Sanitation

Cleanliness, sanitation and strict traffic control are the most effective and least expensive tools in a disease prevention program. Physical removal of all litter, manure, dust feathers and other poultry debris to a spot remote from the poultry house is the first step in an efficient clean-cut program.

An effective sanitation program must include removal, dismantling and disinfecting all equipment in the house, before the house itself is cleaned and disinfected. High pressure sprayers and an effective disinfectant are necessities for eliminating disease carry over. This must be supplemented by a rodent and insect control program. These efforts must be continued for maximum effect.

After housing the flock, dead birds must be removed and incinerated daily. Rubbish and debris should be moved out on a regular basis and not allowed to accumulate.

Traffic Control

Foot and vehicular traffic threaten constant import of disease organisms. Locked doors and a policy of no visitors is advisable. When it becomes necessary to permit entrance to visitors, clean disinfected footwear and outer garments should be provided. Feed and egg trucks and their drivers, must be isolated from the bird area.

Portable equipment should be confined to as few houses as possible and should be cleaned and disinfected when transported between houses.

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. galinarum (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 Programmes

Vaccination programs need to be individually designed with consideration for maternal immunities of the chicks, disease exposures expected, vaccines available, routes of administration preferred and planned use of inactivated injectable vaccine. Because of the extreme variability of these factors among producers worldwide, we cannot recommend one program which would be satisfactory for all. We therefore recommend that you consult your Veterinary Adviser on a program suitable for your particular circumstances.

External parasites

Red mite/ Northern fowl mite

Red mite is a cause of increasing problems in layers, both free range and in colony systems. It is particularly severe in the summer months when the weather is warm and mites are able to multiply quickly. Even light infestations can irritate the birds leading to poor performance and feed intake, and in more severe cases infestations can lead to some or all of the following:

- Mites irritate the birds and can make the flock unsettled and nervous.
- The incidence of peritonitis may increase and there may be increased vent pecking.
- Feed intake may be depressed.
- Heavy mite infestation can depress egg production by up to 5%.
- Heavy infestation will cause birds to become anaemic due to blood loss. These birds will be evident in the flock by their pale combs. If severely affected, mortality may increase.
- There may be loss of shell or yolk colour and, with heavy infestations of red mite, there will be evidence of mites and mite faeces on eggs and egg belts, which may lead to downgrading of speckled eggs.
- There may be an increase in floor eggs as birds will be reluctant to use heavily infested nests.
- Where there are heavy mite infestations, egg collectors may experience skin irritation.

Lighting programs

Egg production is very closely related to changes in day length to which the pullets are exposed. Egg numbers, egg size, livability and total profitability can be favourably influenced by a proper lighting program.

1. Start pullets with 20-22 hours of light the first week at 20 lux intensity. Reduce light to 18 hours the second week. The following weeks, reduce light duration to reach 10-12 hours day length by 7-9 weeks of age or in open houses, the longest natural day length between 6 and 17 weeks of age.
2. Provide the light stimulation when body weight is 1.50 kg, 80% uniformity. The initial increase should be one hour or less. 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 28-32 weeks of age. Light intensity should also be increased at housing to 10-20 lux.
3. Allow no decrease in day length or light intensity in adult layers.

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

1. Light-controlled growing to light-controlled laying:

a. Step-down day length from 20-22 hours the first week to 10 hours by 7-9 weeks of age. Then maintain a constant day length to 17 weeks.
b. Increase day length 1 hour at 1.50 kg, min 80% uniformity. Add 15-30 minutes per week until 16 hours total light is reached.

2. Light-controlled growing to open or brownout laying:

a. Step-down day length from 20-22 hours the first week to 10 hours by 7-9 weeks of age, or one hour less than natural day length at 17 weeks of age.
b. Increase to natural day length or a minimum increase of 1 hour at 1.50 kg, min 80% uniformity. Add 15-30 minutes per week biweekly until 16 hours total light, or at least the longest natural day length of the year.

3. Open or brownout growing to light-controlled laying:

a. Step-down day length from 20-22 hours the first week to 10 hours by 7-9 weeks of age or, if longer, the longest natural day length between 6 and 17 weeks of age.
b. Increase day length one hour at 1.50 kg, min 80% uniformity. Add 15-30 minutes per week or every 2 weeks until 16 hours of total light is reached.

4. Open brownout growing to open or brownout laying:

a. Step-down day length from 20-22 hours the first week to 10 hours by 7-9 weeks of age or the longest natural day length between 6 and 17 weeks of age.
b. Increase one hour at 1.50 kg, min 80% uniformity. Add 15-30 minutes per week or every 2 weeks until 16 hours of total light is reached, or at least the longest natural day length of 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 (1.50 kg) min 80% uniformity.
3. A nutrient intake to support production.
4. A constant or increasing day length of at least 12 hours.

Light stimulation should not be provided until flocks reach the optimum body weight of 1.50 kg min 80% uniformity. 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 trade-off 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.

Midnight feeding

An optional lighting technique that will promote more feed consumption is the 'midnight feeding'. The technique involves turning the lights on for 1 hour in the middle of the dark period and running the feeders during this time. For a typical layer lighting program with 16 hours of light and 8 hours dark, the night would consist of 3.5 hours of darkness, one hour of light, and 3.5 hours of darkness. The regular 16 hour light period should not be changed. The hour of light can be added all at once, but if it is removed at a later time, that should be done gradually, at the rate of 15 minutes per week. Midnight feeding will generally increase feed intake about 2-5 g/day per bird (0.4-1.0 lb/day per100 birds). The technique is applicable for heat stress conditions, or any time more feed intake is desired in either growing or laying flocks.

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 day length. Because no two places have the same sunrise-sunset times year-round, it is impractical to suggest time clock settings that would apply to all locations. To prevent early sexual development, find the natural day length at 17 weeks of age and hold that day length constant with artificial lights from 8 to 17 weeks.

For the most precise planning, custom lighting programs for any location worldwide are available on the Hy-Line website (www.hyline.com).

Table 10 | Recommended lighting programs - Light controlled housing

AGE (WEEKS)	AGE (DAYS)	EARLY MATURITY CAGE REARED (HOURS)	DELAYED MATURITY CAGE REARED (HOURS)	LIGHT INTENSITY (LUX)
1	0-7	20	20	20
2	8-14	17	18	15
3	15-21	14	16	15
4	22-28	11	14	15
5	29-35	10	12	15
6	36-42	10	10	15
7	43-49	10	10	15
8	50-56	10	10	15
9	57-63	10	10	15
10	64-70	10	10	15
11	71-77	10	10	15
12	78-84	10	10	15
13	85-91	10	10	15
14	92-98	10	10	15
15	99-105	10	10	15
16	106-112	10	10	10-15
17	113-119	10	10	10-15
18	120-126	11	10	10-15
19	127-133	12	10	10-15
20	134-140	12.5	11	10-15
21	141-147	13	12	10-15
22	148-154	13.5	12.5	10-15
23	155-161	14	13	10-15
24	162-168	14.25	13.5	10-15
25	169-175	14.5	14	10-15
26	176-182	14.75	14.25	10-15
27	183-189	15	14.5	10-15
28	190-196	15.25	14.75	10-15
29	197-203	15.5	15	10-15
30	204-210	15.75	15.25	10-15
31	211-217	16	15.5	10-15
32	218-224	16	15.75	10-15
33	225-231	16	16	10-15

It is very important on transfer into laying quarters that light intensity is compatible with rearing house.

The recommendation on light intensity is only a guide, as wide variations will be seen in some cage laying systems.

It is important the Hy-Line Brown does not have a large light increase at any one time, because this could result in an over consumption of feed and may cause EODES, (Erratic Ovulation and Defective Egg Syndrome).

Gradual light increases during peak help maintain the high levels of the two hormones - Luteinizing Hormone and the Follicle Stimulating Hormone.

If additional egg weight is required, the 'delayed lighting' program should be used. This will delay maturity by approximately 7 days but egg weight will be increased. In addition light stimulation should not be introduced until body weight has reached 1500g. Reduce light intensity if and when necessary. Ensure all birds have equal light intensity.

Table 11 | Recommended lighting programs - Natural ventilated housing

AGE (WEEKS)	AGE (DAYS)	ALTERNATIVE SYSTEMS FOR EARLY MATURITY (HOURS)	ALTERNATIVE SYSTEMS FOR DELAYED MATURITY (HOURS)	NATURAL VENTILATED AND OPEN HOUSES	LIGHT INTENSITY (LUX)
1	0-7	22	22	22	20
2	8-14	19	20	20	18
3	15-21	16	18	18	15
4	22-28	14	16	16	15
5	29-35	12	14	15	15
6	36-42	10	12	14	15
7	43-49	10	11	13	15
8	50-56	10	10	12	15
9	57-63	10	10	12	15
10	64-70	10	10	12	15
11	71-77	10	10	12	15
12	78-84	10	10	12	15
13	85-91	10	10	12	15
14	92-98	10	10	12	15-20
15	99-105	10	10	12	15-20
16	106-112	11	10	12	15-20
17	113-119	12	10	13	20
18	120-126	12.5	11	14	20
19	127-133	13	12	14.5	20
20	134-140	13.5	12.5	15	20
21	141-147	14	13	15.5	20
22	148-154	14.5	13.5	16	20
23	155-161	15	14	16	15-20
24	162-168	15.5	14.5	16	15-20
25	169-175	16	15	16	15-20
26	176-182	16	15.5	16	15-20
27	183-189	16	16	16	15-20
28	190-196	16	16	16	15-20

Gradual increase in light intensity during peak helps to maintain the high levels of luteinising hormone and the follicle-stimulating hormone.

Please note: Light intensity can be gradually reduced over the slat/perch area once the initial training period has been completed, i.e. 22 - 23 weeks.

If additional egg weight is required, the 'delayed lighting' program should be used. This will delay maturity by approximately 7 days but egg weight will be increased. In addition light stimulation should not be introduced until body weight has reached 1500g. Most importantly, uniformity of the flock is a minimum of 80%.

Table 12 | Growing period nutritional recommendations

	STARTER	GROWER	DEVELOPER	PRE-LAYER
Feed to a body weight of (gms) - Cage Reared	500	1170	1370	1490
Feed to a body weight of (gms) - Floor Reared	480	1050	1290	1430
Age (weeks) approximate	0-6 weeks	7-12 weeks	13-15 weeks	16-17 weeks
Metabolisable energy kcal/kg	2900	2850	2750	2775
Metabolisable energy mj/kg	12.14	11.93	11.51	11.61
Minimum recommended concentration Standardised (true) ileal digestible amino-acids				
Lysine, %	0.95	0.80	0.65	0.70
Methionine, %	0.43	0.38	0.31	0.34
Methionine+cystine, %	0.73	0.65	0.57	0.63
Threonine, %	0.61	0.54	0.44	0.48
Tryptophan, %	0.18	0.17	0.14	0.15
Arginine, %	1.01	0.86	0.70	0.75
Isoleucine, %	0.67	0.59	0.49	0.56
Valine, %	0.69	0.62	0.52	0.60
Total amino acids3				
Lysine, %	1.04	0.88	0.71	0.77
Methionine, %	0.47	0.40	0.33	0.37
Methionine+cystine, %	0.82	0.73	0.65	0.71
Threonine, %	0.72	0.63	0.52	0.57
Tryptophan, %	0.21	0.20	0.17	0.18
Arginine, %	1.09	0.92	0.75	0.81
Isoleucine, %	0.73	0.64	0.52	0.60
Valine, %	0.76	0.69	0.57	0.66
Crude protein (nitrogen x 6.25), 3%	19.50	17.50	16.0	16.50
Calcium, 4%	1.00	1.00	1.40	2.50
Phosphorus (available), %	0.45	0.43	0.45	0.48
Sodium, %	0.18	0.17	0.18	0.18
Chloride, %	0.18	0.17	0.18	0.18
Linoleic acid (C18:2 n-6), %	1.00	1.00	1.00	1.00

[3] The minimum recommendations for total amino-acids and crude protein are only appropriate with a corn and soybean meal diet; please formulate the diet on a digestible amino-acid basis instead if alternative ingredients are used.
[4] Calcium should be supplied as a fine calcium carbonate source (mean particle size less than 2mm).

Table 13 | Laying period nutritional recommendations

ITEM	EARLY LAY 96% - 89% POL - 50 Weeks	MID LAY 88% - 85% 51 - 60 weeks	LATE LAY 84% ➔ 61 Weeks
Suggested ME	2800	2775	2750
Suggested ME	11.72	11.61	11.51
Minimum Amino Acid in Feed % Standardized (true) ileal digestible amino acids			
Lysine, %	0.89	0.80	0.71
Methionine, %	0.44	0.39	0.35
Methionine+cystine, %	0.75	0.69	0.61
Threonine, %	0.63	0.56	0.50
Tryptophan, %	0.19	0.17	0.15
Arginine, %	0.96	0.78	0.75
Isoleucine, %	0.71	0.63	0.56
Valine, %	0.81	0.65	0.63
Total amino acids 3			
Lysine, %	0.98	0.88	0.78
Methionine,%	0.47	0.42	0.37
Methionine+cystine, %	0.85	0.78	0.69
Threonine, %	0.74	0.66	0.59
Tryptophan, %	0.22	0.20	0.17
Arginine, %	1.03	0.84	0.81
Isoleucine, %	0.76	0.68	0.61
Valine, %	0.89	0.72	0.70
Crude protein (nitrogen × 6.25), %	17.9	15.0	14.1
Calcium, 4 %	4.20	4.30	4.40
Phosphorus (available), %	0.46	0.36	0.33
Crude fibre,%	3.00	3.30	3.50
Sodium, %	0.19	0.16	0.17
Chloride, %	0.19	0.16	0.17
Linoleic acid (C18:2 n-6), %	1.20	1.10	1.10
Choline, mg/kg	105.3	93.5	90.9

[1] Consumption of crude protein, methionine+cystine, fat, linoleic acid, and/or energy may be changed to optimize egg size.
[2] The daily feed intake will vary with house environment and ambient temperature. Figures are a guide only.
[3] Total amino-acids are only appropriate with a corn and soybean diet; please formulate the diet on digestible amino-acid basis if a substantial amount of other protein-supplying ingredients are used.
[4] Approximately 65% of the added calcium carbonate (limestone) should be in particle sizes of 2-4mm.

Rearing period

Table 14 | Expected feed consumption

	FLOOR REARING		CAGE REARING	
Weeks of age	Grams per day	Grams cumulative	Grams per day	Grams cumulative
1	13	91	10	70
2	19	224	18	196
3	24	392	21	343
4	29	595	27	532
5	34	833	30	742
6	37	1092	36	994
7	42	1386	40	1274
8	48	1722	43	1575
9	55	2107	49	1918
10	61	2534	54	2296
11	65	2989	58	2702
12	70	3479	62	3136
13	73	3990	65	3591
14	77	4529	68	4067
15	78	5075	70	4557
16	80	5635	75	5082
17	81	6202	77	5621

Table 15 | Rearing period bodyweight targets

	FLOOR REARING	CAGE REARING
Weeks of age	Body weight (g)	Body weight (g)
1	70	70
2	120	120
3	190	200
4	280	280
5	380	390
6	480	500
7	580	620
8	680	750
9	770	860
10	870	970
11	960	1080
12	1050	1170
13	1130	1250
14	1210	1310
15	1290	1370
16	1360	1430
17	1430	1490

Water consumption

Water is the most important nutrient, and good-quality water must be available to the birds at all times. Drinking water should only be restricted during the process of vaccinating the birds. Water and feed consumption are directly related: When birds drink less, they consume less feed and production quickly declines. As a general rule, healthy birds will consume twice as much water as feed. In some instances high ambient temperatures, or differing concentrations of minerals (e.g.sodium) may give rise to additional water consumption.

Table 16 | Guide to water consumption

Weeks of age	Litres per 1000 birds per day	Weeks of age	Litres per 1000 birds per day
1	11	12	113
2	19	13	118
3	27	14	131
4	38	15	136
5	47	16	142
6	57	17	145
7	68	18	149
8	80	19	158
9	95	20	167
10	102	Laying (Nipple drinkers with drip trough)	208
11	108		
Water consumed will vary due to factors, such as ie. vaccination program, time of year.			

The data in this publication is based on selected field and test results. It is reproduced here only to show the performance capability under carefully controlled conditions and in no way constitutes a warranty or guarantee and should not be relied upon for the fact that equal or similar performance will be achieved.

Monitoring body weights

Body weights should be monitored weekly up to 35 weeks of age and thereafter every three weeks. Around 60 -100 birds should be weighed individually using a scale with increments no larger than 20g. It is critical to weigh birds prior to scheduled feed change. If a flock is below target for body weight it should remain on a high energy diet until the target weight is reached.

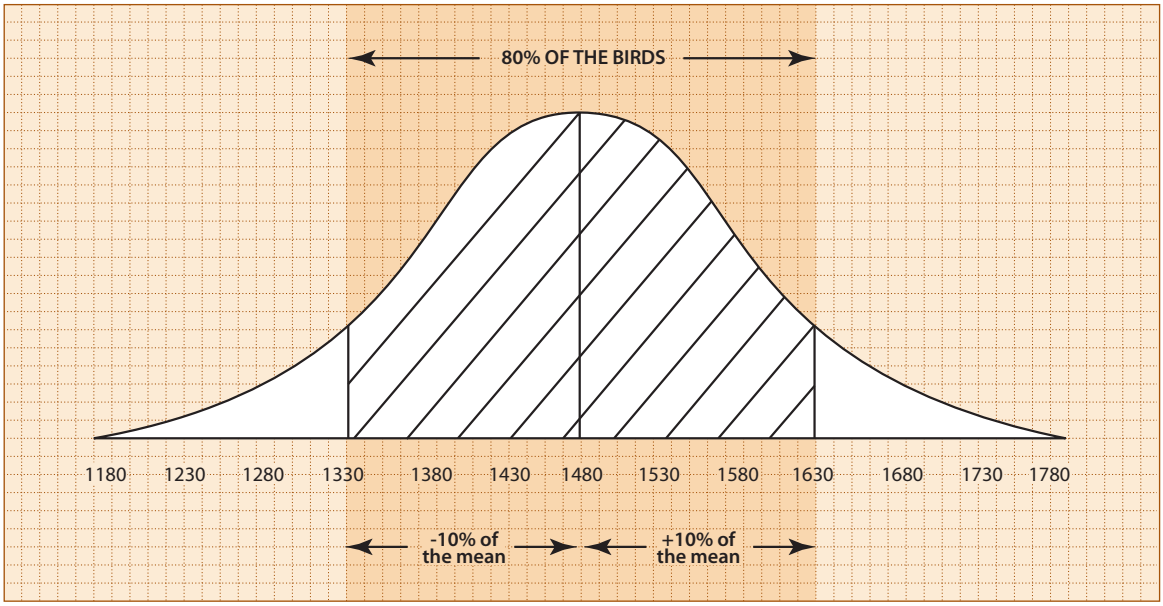
In addition to body-weight averages, the uniformity of the body weights within the flock is an indicator of flock development. Uniformity is expressed as a percentage of the bird's bodyweight that falls within plus or minus ±10% of any given weight. Ideally prior to P.O.L., flocks should have a minimum uniformity of 80%.

Factors that can adversely affect body weight are chick quality, poor beak treatment, inadequate nutrition, water intake, over-crowding and disease. Weighing at frequent intervals will help to identify when the flock is deviating from its expected performance target, thus enabling you to take corrective action as required.

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 1480 grams, 80 % of all birds should weight between 1330 and 1630 grams. Graph individual bird weights to be sure there is a bell shaped or "normal" distribution as shown in Figure 2. To evaluate uniformity, at least 100 birds should be weighed.

Figure 2 | Normal distribution of body weights



Variability and coefficient of variation between individual birds within a flock

The uniformity of individual birds is just as important as the appropriate average flock weight for age. A desirable goal is for 80% of birds to fall within ±10% of the target weight. For example, if a flock average weight at 18 weeks is 1470g, 80% of all birds should weigh between 1320g and 1620g. Record individual body weights to ensure a bell shaped or 'normal' distribution as shown in Figure 2.

Coefficient of variation

The coefficient of variation (CV%) is a mathematical method of expressing the uniformity or evenness of a flock. The precise method of calculation is as follows:-

$$\frac{\text{Standard Deviation}}{\text{Average Weight}} \times 100 = \text{CV\%}$$

Standard deviation may be calculated using an electronic calculator, or from electronic scales. In the absence of an electric calculator the following formula can be used to estimate CV%

$$\frac{\text{Weight Range} \times 100}{\text{Average Weight} \times F} = \text{CV\%}$$

Range is defined as the difference in weight between the heaviest and the lightest birds. F is a constant and depends on the size of the sample.

One method of calculation should be used consistently throughout the rearing period, because the numerical result obtained will differ slightly depending on the method used.

A second method of measuring evenness is to express it in terms of percentage of birds within the range of the average weight, ±10%. Whilst this method gives an accurate indication of the number of birds close to the given weight it does not, unlike the CV%, take into account the very light and heavy birds. Table 10 illustrates the approximate relationship between CV% and ±10% of the average weight in populations with a normal (i.e. bell-shaped) weight distribution.

Table 17 | Sample size and F values

SAMPLE SIZE	F VALUE	SAMPLE SIZE	F VALUE
25	3.94	75	4.81
30	4.09	80	4.87
35	4.20	85	4.90
40	4.30	90	4.94
45	4.40	95	4.98
50	4.50	100	5.02
55	4.57	>150	5.03

Table 18 | Relationship between CV% and±10% of average weight of populations with a normal weight distribution

CV%	% UNIFORMITY +/- 10%
5	95.4
6	90.4
7	84.7
8	78.8
9	73.3
10	68.3
11	63.7
12	58.2
13	55.8
14	52.0
15	49.5
16	46.8

Table 19 | Hy-Line Brown performance - For Intensive systems

AGE IN WEEKS	% HEN DAY CURRENT		MORTALITY CUM. %	HEN DAY EGGS CUMULATIVE		HEN HOUSE EGGS CUMULATIVE		BODY WEIGHT (kg)	AVERAGE EGG WEIGHT* (g/EGG)	FEED CONSUMPTION g/DAY PER BIRD	HEN HOUSED EGG MASS CUM. (kg)	EGG QUALITY		
	UNDER OPT CONDITIONS	UNDER AVG CONDITIONS		UNDER OPT CONDITIONS	UNDER AVG CONDITIONS	UNDER OPT CONDITIONS	UNDER AVG CONDITIONS					HAUGH UNITS	BREAKING STRENGTH	SHELL COLOUR
18	9	3	0.0	0.6	0.2	0.6	0.2	1.54	50.0	78	0.0	98.2	4620	90
19	16	11	0.1	1.8	1.0	1.7	1.0	1.60	50.6	80	0.0	98.0	4610	90
20	49	32	0.1	5.2	3.2	5.2	3.2	1.65	51.2	89	0.2	97.8	4605	89
21	72	65	0.2	10.2	7.8	10.2	7.8	1.72	53.2	93	0.4	97.2	4595	89
22	89	78	0.3	16.5	13.2	16.4	13.2	1.78	54.4	96	0.7	97.0	4590	89
23	93	87	0.3	23.0	19.3	22.9	19.3	1.80	55.5	100	1.0	96.5	4585	89
24	96	93	0.4	29.7	25.8	29.6	25.8	1.84	56.6	103	1.4	96.0	4580	89
25	96	93	0.4	36.4	32.3	36.3	32.2	1.85	57.7	104	1.8	95.5	4575	88
26	96	93	0.5	43.1	38.9	43.0	38.7	1.86	58.5	105	2.2	95.1	4570	88
27	96	94	0.6	49.8	45.4	49.6	45.2	1.88	58.9	106	2.5	94.7	4565	88
28	96	94	0.6	56.6	52.0	56.3	51.8	1.89	59.8	108	2.9	94.2	4560	88
29	96	94	0.7	63.3	58.6	63.0	58.3	1.90	60.2	108	3.3	93.7	4550	88
30	95	94	0.7	69.9	65.2	69.6	64.8	1.90	61.2	108	3.7	93.3	4540	88
31	95	93	0.8	76.6	71.7	76.2	71.3	1.90	61.4	109	4.1	92.8	4525	88
32	95	93	0.9	83.2	78.2	82.8	77.8	1.91	61.6	109	4.5	92.2	4515	88
33	94	93	0.9	89.8	84.7	89.3	84.2	1.91	62.0	110	4.9	92.0	4505	88
34	94	93	1.0	96.4	91.2	95.8	90.6	1.91	62.2	110	5.3	91.5	4490	88
35	94	92	1.1	103.0	97.7	102.3	97.0	1.91	62.3	110	5.7	91.1	4475	87
36	93	92	1.1	109.5	104.1	108.7	103.4	1.92	62.4	110	6.1	90.6	4450	87
37	93	92	1.2	116.0	110.5	115.2	109.7	1.92	62.5	110	6.5	90.4	4440	87
38	93	91	1.3	122.5	116.9	121.6	116.0	1.92	62.6	110	6.9	90.0	4425	87
39	93	91	1.4	129.0	123.3	128.0	122.3	1.93	62.7	110	7.3	89.6	4415	87
40	92	91	1.5	135.5	129.6	134.4	128.6	1.93	62.8	110	7.7	89.3	4405	87
41	92	90	1.5	141.9	135.9	140.7	134.8	1.93	63.0	110	8.1	88.9	4390	87
42	91	90	1.6	148.3	142.2	147.0	141.0	1.94	63.1	110	8.5	88.5	4375	87
43	91	90	1.7	154.6	148.6	153.2	147.2	1.94	63.1	110	8.9	88.0	4365	87
44	91	90	1.8	161.0	154.9	159.5	153.4	1.94	63.1	110	9.3	87.8	4355	87
45	90	90	1.9	167.3	161.2	165.7	159.6	1.95	63.2	110	9.7	87.4	4340	87
46	90	90	2.0	173.6	167.5	171.8	165.8	1.95	63.2	110	10.0	87.1	4320	87
47	89	90	2.1	179.8	173.8	177.9	171.9	1.95	63.2	110	10.4	86.7	4310	87
48	89	89	2.2	186.1	180.0	184.0	178.0	1.95	63.3	110	10.8	86.4	4305	87
49	89	89	2.3	192.3	186.3	190.1	184.1	1.95	63.3	110	11.2	86.1	4295	86
50	88	88	2.4	198.5	192.4	196.1	190.1	1.95	63.3	110	11.6	85.6	4280	86
51	88	88	2.5	204.6	198.6	202.1	196.1	1.95	63.3	110	12.0	85.0	4265	86
52	88	87	2.6	210.8	204.7	208.1	202.1	1.95	63.3	110	12.3	85.0	4250	86
53	87	87	2.7	216.9	210.8	214.0	208.0	1.95	63.4	110	12.7	84.8	4240	86
54	87	87	2.8	223.0	216.9	220.0	213.9	1.95	63.4	110	13.1	84.6	4225	86
55	87	86	2.9	229.0	222.9	225.9	219.7	1.96	63.4	110	13.5	84.3	4210	86
56	86	86	3.0	235.1	228.9	231.7	225.6	1.96	63.4	110	13.8	84.0	4190	85
57	86	85	3.1	241.1	234.9	237.5	231.3	1.96	63.5	110	14.2	83.8	4180	85
58	86	85	3.3	247.1	240.8	243.4	237.1	1.96	63.5	110	14.6	83.1	4170	85
59	86	85	3.4	253.1	246.8	249.2	242.8	1.96	63.5	110	14.9	82.8	4160	85
60	85	84	3.5	259.1	252.6	254.9	248.5	1.96	63.6	110	15.3	82.6	4150	85
61	85	84	3.6	265.0	258.5	260.6	254.2	1.96	63.6	110	15.6	82.4	4140	84
62	84	83	3.7	270.9	264.3	266.3	259.8	1.96	63.7	110	16.0	82.2	4130	84
63	84	83	3.9	276.8	270.1	272.0	265.4	1.96	63.7	110	16.4	82.0	4120	84
64	83	83	4.0	282.6	275.9	277.5	270.9	1.96	63.8	110	16.7	81.9	4110	83
65	83	82	4.1	288.4	281.7	283.1	276.4	1.96	63.8	110	17.1	81.8	4095	83
66	82	82	4.2	294.1	287.4	288.6	281.9	1.96	63.9	109	17.4	81.6	4080	83
67	82	81	4.3	299.9	293.1	294.1	287.4	1.96	63.9	109	17.8	81.5	4070	82
68	81	81	4.5	305.6	298.8	299.5	292.8	1.96	64.0	109	18.1	81.5	4060	82
69	81	81	4.6	311.2	304.4	304.9	298.2	1.96	64.0	109	18.5	81.3	4050	82
70	80	80	4.7	316.8	310.0	310.2	303.5	1.97	64.1	109	18.8	81.1	4040	81
71	80	79	4.8	322.4	315.6	315.6	308.8	1.97	64.1	109	19.1	81.1	4030	81
72	79	79	5.0	328.0	321.1	320.8	314.0	1.97	64.2	109	19.5	81.0	4020	81
73	78	78	5.1	333.4	326.6	326.0	319.2	1.97	64.2	109	19.8	80.9	4010	80
74	78	77	5.2	338.9	331.9	331.2	324.3	1.97	64.3	109	20.1	80.8	4000	80
75	77	76	5.4	344.3	337.3	336.3	329.3	1.97	64.3	109	20.5	80.7	3995	80
76	77	76	5.5	349.7	342.6	341.4	334.4	1.97	64.4	109	20.8	80.5	3990	80
77	76	75	5.7	355.0	347.8	346.4	339.3	1.97	64.4	109	21.1	80.4	3985	80
78	75	74	5.8	360.2	353.0	351.3	344.2	1.97	64.5	109	21.4	80.2	3980	80
79	75	74	6.0	365.5	358.2	356.3	349.1	1.97	64.5	109	21.7	80.1	3975	80
80	74	74	6.1	370.7	363.4	361.1	353.9	1.97	64.6	109	22.0	80.0	3970	80

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

Table 20 | Hy-Line Brown performance - For Alternative systems

AGE IN WEEKS	% HEN DAY CURRENT		MORTALITY CUM. %	HEN DAY EGGS CUMULATIVE		HEN HOUSE EGGS CUMULATIVE		BODY WEIGHT (kg)	AVERAGE EGG WEIGHT* (g/EGG)	FEED CONSUMPTION g/DAY PER BIRD	HEN HOUSED EGG MASS CUM. (kg)	EGG QUALITY		
	UNDER OPT CONDITIONS	UNDER AVG CONDITIONS		UNDER OPT CONDITIONS	UNDER AVG CONDITIONS	UNDER OPT CONDITIONS	UNDER AVG CONDITIONS					HAUGH UNITS	BREAKING STRENGTH	SHELL COLOUR
18	0	0	0.0	0.0	0.0	0.0	0.0	1.50	50.0	78	0.0	98.2	4620	90
19	9	1	0.1	0.6	0.1	0.6	0.1	1.57	50.6	80	0.0	98.0	4610	90
20	31	11	0.1	2.8	0.8	2.8	0.8	1.61	51.2	89	0.0	97.8	4605	89
21	71	32	0.2	7.8	3.1	7.8	3.1	1.64	53.2	93	0.2	97.2	4595	89
22	90	58	0.3	14.1	7.1	14.0	7.1	1.74	54.4	96	0.4	97.0	4590	89
23	92	72	0.3	20.5	12.2	20.5	12.2	1.78	55.5	100	0.7	96.5	4585	89
24	94	83	0.4	27.1	18.0	27.0	17.9	1.80	56.6	103	1.0	96.0	4580	89
25	94	90	0.4	33.7	24.3	33.6	24.2	1.81	57.7	104	1.4	95.5	4575	88
26	95	91	0.5	40.3	30.7	40.2	30.5	1.82	58.5	105	1.7	95.1	4570	88
27	95	92	0.6	47.0	37.1	46.8	36.9	1.83	58.7	106	2.1	94.7	4565	88
28	95	93	0.6	53.6	43.6	53.4	43.4	1.84	58.9	108	2.5	94.2	4560	88
29	95	93	0.7	60.3	50.1	60.0	49.9	1.85	59.8	108	2.9	93.7	4550	88
30	95	93	0.7	66.9	56.6	66.6	56.3	1.86	60.2	108	3.3	93.3	4540	88
31	95	92	0.8	73.6	63.1	73.2	62.7	1.86	61.2	109	3.6	92.8	4525	88
32	95	92	0.9	80.2	69.5	79.8	69.1	1.87	61.4	109	4.0	92.2	4515	88
33	95	92	0.9	86.9	76.0	86.4	75.5	1.87	61.6	111	4.4	92.0	4505	88
34	95	91	1.0	93.5	82.3	92.9	81.8	1.88	62.0	111	4.8	91.5	4490	88
35	94	91	1.1	100.1	88.7	99.4	88.1	1.88	62.2	112	5.2	91.1	4475	87
36	94	91	1.1	106.7	95.1	106.0	94.4	1.89	62.4	112	5.6	90.6	4450	87
37	94	91	1.2	113.3	101.4	112.4	100.7	1.89	62.6	114	6.0	90.4	4440	87
38	94	91	1.3	119.8	107.8	118.9	107.0	1.90	62.8	114	6.4	90.0	4425	87
39	94	91	1.4	126.4	114.2	125.4	113.2	1.90	63.0	114	6.8	89.6	4415	87
40	93	90	1.5	132.9	120.5	131.8	119.4	1.91	63.1	114	7.2	89.3	4405	87
41	93	90	1.5	139.4	126.8	138.2	125.6	1.91	63.2	114	7.6	88.9	4390	87
42	93	90	1.6	146.0	133.1	144.6	131.8	1.91	63.3	114	8.0	88.5	4375	87
43	93	89	1.7	152.5	139.3	151.0	138.0	1.92	63.4	114	8.4	88.0	4365	87
44	92	89	1.8	158.9	145.5	157.4	144.1	1.92	63.5	114	8.7	87.8	4355	87
45	92	88	1.9	165.3	151.7	163.7	150.1	1.92	63.6	114	9.1	87.4	4340	87
46	92	88	2.0	171.8	157.9	170.0	156.2	1.93	63.7	114	9.5	87.1	4320	87
47	91	88	2.1	178.2	164.0	176.2	162.2	1.93	63.8	114	9.9	86.7	4310	87
48	91	87	2.2	184.5	170.1	182.5	168.1	1.93	63.9	114	10.3	86.4	4305	87
49	91	87	2.3	190.9	176.2	188.7	174.1	1.94	64.0	114	10.7	86.1	4295	86
50	90	86	2.4	197.2	182.2	194.8	180.0	1.94	64.1	114	11.0	85.6	4280	86
51	90	86	2.5	203.5	188.2	201.0	185.8	1.94	64.2	114	11.4	85.0	4265	86
52	90	86	2.6	209.8	194.3	207.1	191.7	1.95	64.3	114	11.8	85.0	4250	86
53	89	85	2.7	216.0	200.2	213.2	197.5	1.95	64.4	114	12.2	84.8	4240	86
54	89	85	2.8	222.3	206.2	219.2	203.3	1.95	64.5	114	12.5	84.6	4225	86
55	88	84	2.9	228.4	212.0	225.2	209.0	1.96	64.6	114	12.9	84.3	4210	86
56	88	84	3.0	234.6	217.9	231.2	214.7	1.96	64.7	114	13.3	84.0	4190	85
57	88	84	3.1	240.7	223.8	237.1	220.4	1.96	64.8	114	13.6	83.8	4180	85
58	87	83	3.3	246.8	229.6	243.0	226.0	1.97	64.9	114	14.0	83.1	4170	85
59	87	83	3.4	252.9	235.4	248.9	231.6	1.97	65.0	114	14.4	82.8	4160	85
60	86	82	3.5	258.9	241.2	254.7	237.1	1.97	65.1	114	14.7	82.6	4150	85
61	86	82	3.6	265.0	246.9	260.5	242.7	1.98	65.2	114	15.1	82.4	4140	84
62	85	82	3.7	270.9	252.6	266.2	248.2	1.98	65.3	114	15.4	82.2	4130	84
63	85	81	3.9	276.9	258.3	272.0	253.6	1.98	65.4	114	15.8	82.0	4120	84
64	84	81	4.0	282.7	264.0	277.6	259.1	1.98	65.5	114	16.2	81.9	4110	83
65	83	80	4.1	288.5	269.6	283.2	264.4	1.98	65.6	114	16.5	81.8	4095	83
66	83	80	4.2	294.4	275.2	288.7	269.8	1.98	65.7	114	16.9	81.6	4080	83
67	82	80	4.3	300.1	280.8	294.2	275.2	1.98	65.8	114	17.2	81.5	4070	82
68	82	79	4.5	305.8	286.3	299.7	280.4	1.98	65.9	114	17.6	81.5	4060	82
69	81	79	4.6	311.5	291.8	305.1	285.7	1.98	66.0	114	17.9	81.3	4050	82
70	80	78	4.7	317.1	297.3	310.4	290.9	1.98	66.1	114	18.3	81.1	4040	81
71	80	78	4.8	322.7	302.8	315.8	296.1	1.98	66.2	114	18.6	81.1	4030	81
72	79	77	5.0	328.2	308.1	321.0	301.2	1.98	66.3	114	18.9	81.0	4020	81
73	79	77	5.1	333.8	313.5	326.3	306.3	1.98	66.4	114	19.3	80.9	4010	80
74	78	76	5.2	339.2	318.9	331.4	311.4	1.98	66.5	114	19.6	80.8	4000	80
75	77	76	5.4	344.6	324.2	336.5	316.4	1.98	66.6	114	20.0	80.7	3995	80
76	77	75	5.5	350.0	329.4	341.6	321.4	1.98	66.7	114	20.3	80.5	3990	80
77	76	74	5.7	355.3	334.6	346.7	326.3	1.98	66.8	114	20.6	80.4	3985	80
78	75	74	5.8	360.6	339.8	351.6	331.1	1.98	66.9	114	20.9	80.2	3980	80
79	75	73	6.0	365.8	344.9	356.5	335.9	1.98	67.0	114	21.3	80.1	3975	80
80	74	73	6.1	371.0	350.0	361.4	340.7	1.98	67.0	114	21.6	80.0	3970	80

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

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Hy-Line Brown performance graph 2011

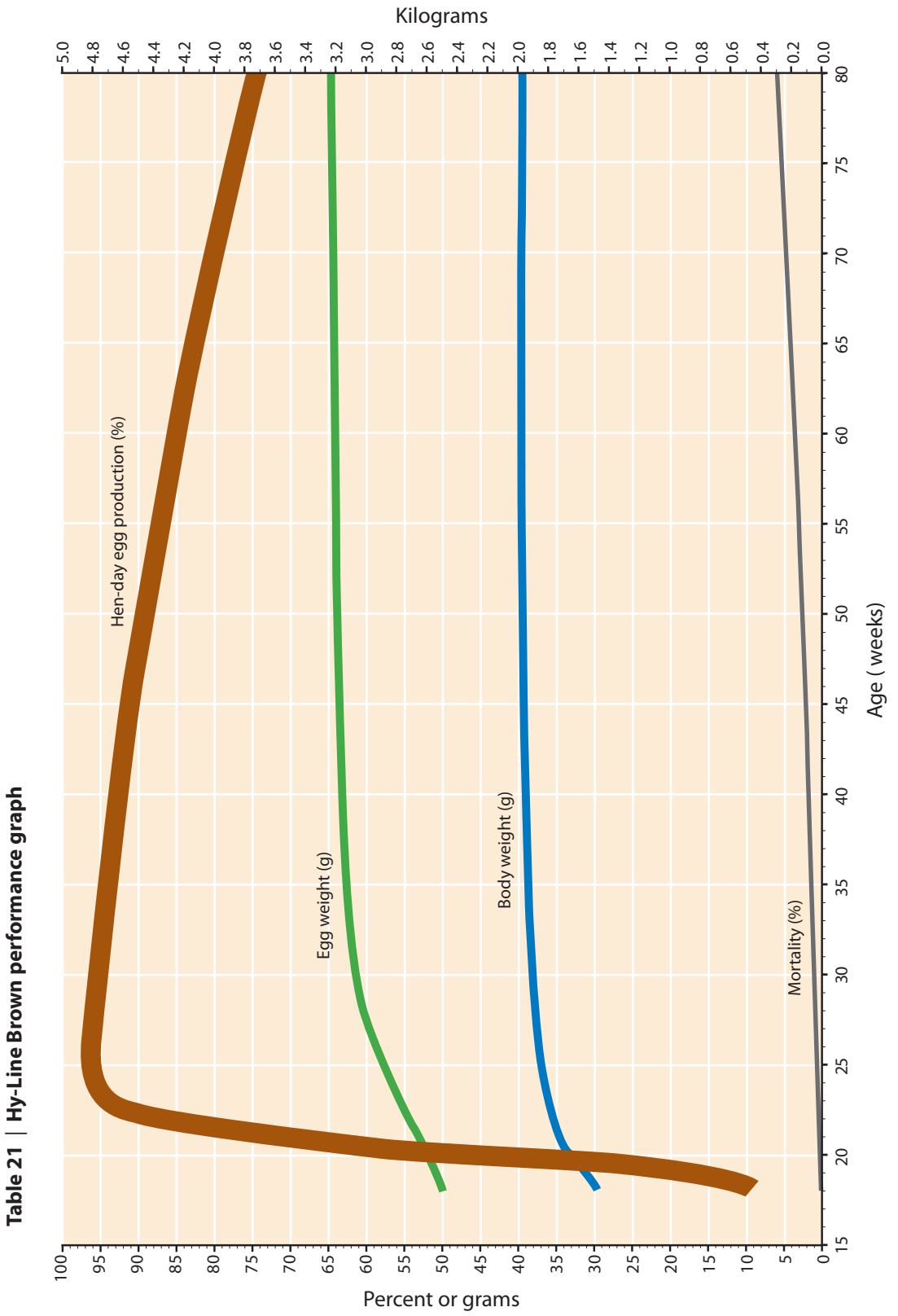

Table 21 | Hy-Line Brown performance graph

Table 22 | Hy-Line Brown egg size distribution - Intensive systems

Egg Size Distribution - E.U. Standards					
Age in Weeks	Average Egg Weight (g)	Very Large Over 73g	Large 63-73g	Medium 53-63g	Small 43-53g
20	51.2	0.0	0.5	34.3	65.2
22	54.4	0.0	3.7	57.8	38.5
24	56.6	0.1	10.4	65.5	24.0
26	58.5	0.4	21.1	64.8	13.7
28	59.8	0.6	26.7	62.7	10.0
30	61.2	1.2	35.3	57.8	5.7
32	61.6	1.3	37.7	56.8	4.3
34	62.2	1.4	42.1	53.5	3.0
36	62.4	1.4	43.6	52.2	2.8
38	62.6	1.5	45.3	51.1	2.2
40	62.8	1.7	46.7	49.6	2.1
42	63.1	2.0	48.7	47.4	2.0
44	63.1	2.2	48.9	47.0	2.0
46	63.2	2.3	49.4	46.4	2.0
48	63.3	2.6	49.5	46.0	2.0
50	63.3	2.6	49.8	45.6	2.0
52	63.3	2.9	49.9	45.2	2.0
54	63.4	3.0	50.2	44.8	2.0
56	63.4	3.2	50.3	44.4	2.0
58	63.5	3.4	50.5	44.1	2.0
60	63.6	3.8	50.7	43.5	2.0
62	63.7	4.0	51.4	42.7	2.0
64	63.8	4.1	51.9	41.9	2.0
66	63.9	4.6	52.0	41.4	2.0
68	64.0	4.8	52.1	41.1	2.0
70	64.1	5.3	52.6	40.1	2.0
72	64.2	5.5	53.2	39.3	2.0
74	64.3	5.7	53.3	38.9	2.0
76	64.4	6.2	53.6	38.2	1.9
78	64.5	6.5	54.1	37.5	1.9
80	64.6	7.0	54.3	36.9	1.9

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Table 23 | Hy-Line Brown egg size distribution - Alternative systems

Egg Size Distribution - E.U. Standards					
Age in Weeks	Average Egg Weight (g)	Very Large Over 73g	Large 63-73g	Medium 53-63g	Small 43-53g
20	51.2	0.0	0.5	34.3	65.2
22	54.4	0.0	3.7	57.8	38.5
24	56.6	0.1	10.4	65.5	24.0
26	58.5	0.3	19.5	65.2	15.0
28	58.9	0.4	21.6	64.8	13.3
30	60.2	0.7	28.8	62.2	8.3
32	61.4	1.0	36.4	57.9	4.7
34	62.0	1.2	40.7	54.8	3.3
36	62.4	1.5	43.6	52.1	2.8
38	62.8	1.5	46.8	49.8	1.9
40	63.1	2.0	48.9	47.4	1.8
42	63.3	2.2	50.3	45.9	1.6
44	63.5	2.6	51.4	44.3	1.6
46	63.7	2.9	52.8	42.9	1.5
48	63.9	3.4	53.7	41.4	1.5
50	64.1	3.8	55.0	40.0	1.3
52	64.3	4.4	55.7	38.6	1.3
54	64.5	4.8	56.8	37.2	1.2
56	64.7	5.5	57.3	36.0	1.2
58	64.9	6.0	58.3	34.6	1.1
60	65.1	6.8	58.7	33.5	1.1
62	65.3	7.3	59.5	32.2	1.0
64	65.5	7.9	60.0	31.1	1.0
66	65.7	8.8	60.3	29.9	0.9
68	65.9	9.4	60.9	28.7	0.9
70	66.1	10.5	61.1	27.7	0.8
72	66.3	11.2	61.4	26.7	0.8
74	66.5	11.9	61.6	25.7	0.8
76	66.7	13.0	61.7	24.6	0.7
78	66.9	13.8	61.9	23.7	0.7
80	67.0	14.6	62.1	22.6	0.7

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