# Breeder Management Guide

breeder

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# INTRODUCTION

The Cobb commitment to genetic improvement of our family of products continues to increase the performance potential in all areas of broiler and broiler breeder production. However, to attain both genetic potential and consistent flock production, it is important that the flock manager has a good management program in place. The success of the Cobb broiler breeder worldwide has provided considerable experience of the breed in a wide range of situations, such as hot and cold climates, controlled environment and open housing. This Breeder Management Guide is designed to assist you in building your management program around the Cobb products.

Management must not only meet the basic needs of the stock but must also be finely tuned to benefit fully from the breed's potential. Some of the guidelines may need to be adapted locally according to your own experience or infrastructure. Cobb's local technical service and world tech support teams will assist with adapting the recommendations for your operation.

The Cobb Breeder Management guide highlights critical factors that are most likely to influence flock performance and is part of our technical information service, which include the Cobb Hatchery and Broiler Management Guides, Technical Bulletins and a full range of performance charts. Our recommendations are based on current scientific knowledge and practical experience from around the world. You should be aware of local legislation, which may influence the management practice that you choose to adopt.

This Cobb Breeder Management Guide is intended as a reference and supplement to your own flock management skills so that you can apply your knowledge and judgement to obtain consistently good results with the Cobb family of products.

# COBB Breeder Management Guide

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# 1. CHICK MANAGEMENT

## 1.1 PREPARING FOR CHICK ARRIVAL

The key to successful rearing lies in an effective management program starting well before the chicks arrive on site.

- When importing day-old poultry breeding stock from another country it is advised that you have trained personnel, who know the local customs, regulations, and necessary documentation procedures required, to ensure clearance from customs as quickly as possible.
- Chick transportation from the airport must be in clean, sanitized, properly ventilated, temperature controlled vehicles. Every effort must be made to coordinate transportation schedules so that upon arrival, day old chicks are cleared through customs and transported to the farm, and placed into the houses as soon as possible.
- Brood chicks on a single age farm. Ensure brooding farms are well isolated from older birds. Brood chicks on an all-in, all-out program with a good house biosecurity program. The stockman should work only on the brooding farm.
- The rearing facilities must be clean and pathogen free, including water line sanitation, before the chicks arrive. Detailed cleaning and hygiene procedures are described later in this guide. Remember that site biosecurity must be maintained at all times and that biosecurity regulations apply 365 days of the year, including periods when the farm is empty.
- Parent farms must be secure. Vehicles entering the farm should first carry out approved cleaning procedures. Only authorized visitors and personnel should enter the premises and they should be required to follow the correct biosecurity procedures, including showering and wearing the protective clothing provided. The poultry house doors should be kept closed and locked when not in use.

## 1.2 PLANNING FOR CHICK PLACEMENT

Stocking density should take into consideration environmental or local climatic conditions. Remember that males will be significantly heavier than the females and should be given extra floor space to help ensure they achieve target body weight.

- Flock size may vary for each placement. Before laying out a site for a placement of day-old chicks, confirm chick numbers with the supplier.
- Cover the whole floor with litter to prevent heat loss. Level shavings by raking and compressing firmly. Uneven litter creates uneven floor temperatures, causing groups of chicks to huddle in pockets or under equipment. This could restrict access to feed and water at this critical time of development.
- Ventilate the house to ensure all waste gases from disinfection and heating are removed before the chicks arrive. Formaldehyde gas can create immediate uniformity problems and inhibit early growth rate and result in more mortality.

- Start pre-heating the buildings before the chicks arrive, depending on climatic and housing conditions. This will ensure the floor is warm and the air temperature is correct when the chicks are placed. Make regular checks to ensure that all brooders are working correctly.
- Ensure that minimum ventilation rates are applied from the day before the chicks arrive. Never sacrifice fresh air quality for heat. In the first week, $CO_2$ levels should not exceed 3000ppm. Thereafter, the maximum $CO_2$ level should not exceed 2000ppm.
- Provide 2 supplementary drinkers for every 100 chicks and position them near the feed.
- Feeding equipment should not be placed directly under or too close to the brooders and feed should be distributed just prior to the chicks' arrival.
- Provide one feeder tray for every 75 chicks at day old. Ensure that supplementary feed remains fresh. Do not allow chicks to consume stale feed. Another option used today is to place a total of 40 g (8.8 lb/100) of feed on paper in 50% of the placement area, for the first 3 days. Depending upon the material used, this can last longer. We do not recommend used newspaper or other kinds of re-used paper because of bio-security related risks and material quality.
- If the area of placement is decreased from full house to half house, or even smaller, the maximum stocking density for chicks in a surrounded brooding area should be 70 chicks/m² (0.15 chicks/ft²). Many operations with partial brooding, house 40 chicks/m² (0.27 chicks/ft²) in the first days and then increase to full house brooding at 7 to 14 days of age. How fast the chicks are being opened up depends on environmental conditions in the house.

The table below is an example of how to manage density of chicks with partial brooding as they advance in age.

| Age (days) | Chicks/m² |
|---|---|
| 1-3 | 50-70 |
| 4-6 | 40-60 |
| 7-9 | 30-50 |
| 10-12 | 20-40 |
| 13-15 | 10-30 |
| 16-19 | 20 |
| >20 | 10 |

*Typical reception of parent stock on 100% paper with feed troughs and nipple drinkers. Drip plates under nipples are pre-filled with water to encourage water consumption upon arrival.*

- Where possible, construct pens so that chicks from donor flocks of the same age can be reared together. This will improve subsequent flock uniformity.
- Provide attraction lighting so that the chicks remain close to the heat source. Provide an intensity of 25 to 60 lux (2.5-6 ft candles) the first week to help chicks find feed and water more easily.

## 1.3 LIGHTING

Lighting should be continuous for the first 48 hours following chick placement. The light intensity should be the maximum possible in a house, but a minimum of 25 lux (2.5 ft candles), to ensure that the chicks find feed and water. If you have LED lights it is best to use LED lux meters to get accurate lux readings.

All parent rearing houses should be light proof. For details of the lighting program refer to Section 4. Lighting Program Management.

## 1.4 BEAK CONDITIONING

Beak conditioning can be done in the hatchery at day of age or between 4 and 5 days of age in the field. Conditioning at 4-5 days is preferred but requires more labor.

A bird's beak will continue to grow as the bird ages and must be kept in good condition so that the bird can eat and drink normally. Therefore, if allowed by law, it may be necessary to lightly treat the tip of the chicken's beak. This procedure is usually performed in the hatchery with specially designed equipment by properly trained personnel, and is monitored regularly for quality control. At various stages during the bird's life, technical managers should assess the health of the birds and the shape of the beak. For example, hawk beaks can result in problems with the bird's ability to drink and can also negatively impact the mating efficiency of the males. If needed, the tip of the beak of an individual bird can be trimmed to correct any irregularities and to promote an ideal beak shape for the adult breeder chicken.

Additionally, beak treatment has a net welfare benefit to prevent aggressive pecking. Pecking is a normal part of bird behavior and may be used in a flock to establish hierarchy. Gentle feather pecking and pecking at objects in the environment is considered to be normal avian behavior. However, severe or aggressive feather pecking can lead to skin trauma and may lead to cannibalism and death. Beak treatment can be beneficial to prevent injurious pecking in a flock, especially if the birds are raised in open-sided houses or situations where light intensity cannot be controlled. If cannibalistic behavior is seen more frequently in your flocks check your management and the protein level in the feed. An inadequate amount of protein increases aggressive bird behavior considerably.

**Females**

Check the females' beaks closely at 16 to 18 weeks of age to be sure that they have not grown out to the extent that they may cause injury to their flock mates. Birds with overgrown beaks, spoon beaks, parrot beaks or other beak deformities that may prevent them from eating or drinking properly should be reconditioned. The best moment to do this is during the individual vaccination from 16 to 18 weeks of age. In the situation where there is an excessive amount of beak deformities, re-conditioning of the beaks may be performed at 16 weeks of age, giving the birds more time to recover in conformation up to 20 weeks of age.

**Males**

It is essential that male beak conditioning be carried out with precision to maintain uniformity and maximize fertility.

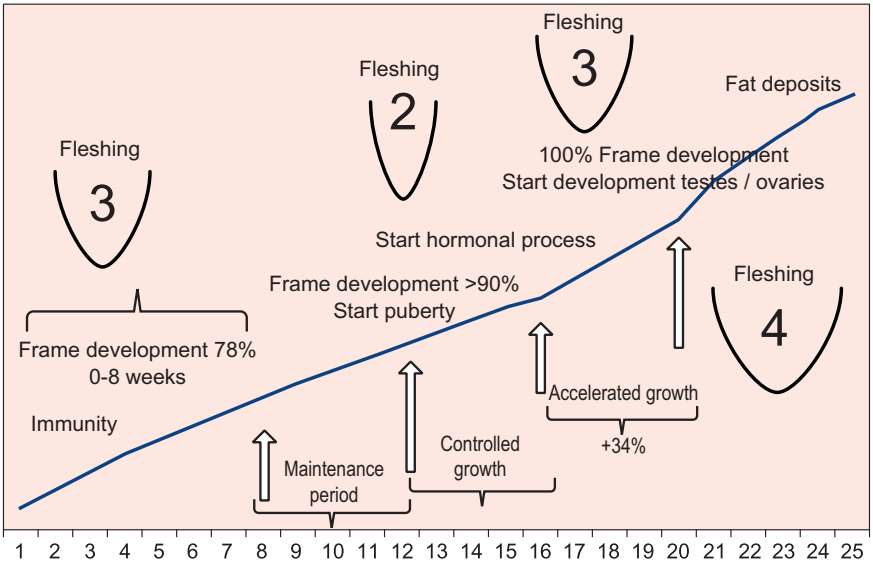
Remove only the keratinized tip of the beak.

Check the male's beaks closely at 16-18 weeks of age and recondition the birds that show beak overgrowth or any beak deformity.

Beak conditioning males also reduces the risk of damage to the females during mating in the hen house and helps the male mate more effectively.

# 2. GROWTH PHASES

**Physiological development Curve Cobb female**




It is very important to understand the body weight curve in the rearing period which can be divided into 4 phases. The first one is from 0-8 weeks, in which critical frame size and uniformity are determined for most of the flock's life. The second phase is from 8 to 12 weeks of age during which the birds should be maintained under a carefully controlled feeding program designed to prevent them from becoming overweight and overfleshed. The third phase is from 12 to 16 weeks of age when puberty begins. The flock should start to slowly increase fleshing and overall conditioning. The fourth phase is from 16 to 20 weeks of age when the flock needs to accelerate growth rate considerably to prepare for sexual development and achieve proper uniformity and fleshing. Towards 20 weeks of age, abdominal fat reserves should be developing independent of body weight.

## 2.1 START OR BROODING PHASE (1-14 DAYS)

The first 14 days are one of the most important times of a bird's life. Remember the four basics: Feed, Water, Temperature and Air Quality. The importance of the brooding period cannot be over emphasized. The first 14 days of a chick's life sets the precedent for good performance. Efforts spent at the start of the brooding phase will be rewarded in the final performance of the flock.

- Fresh feed and water should be made available to chicks on arrival in the rearing house. Water temperature should be between 15°C to 25°C (59°F to 77°F).
- Flushing of the water lines should be completed a few hours before the chicks arrive so that they have fresh water. In the first week, regular flushing can be implemented to increase water and feed intake and to limit biofilm buildup.

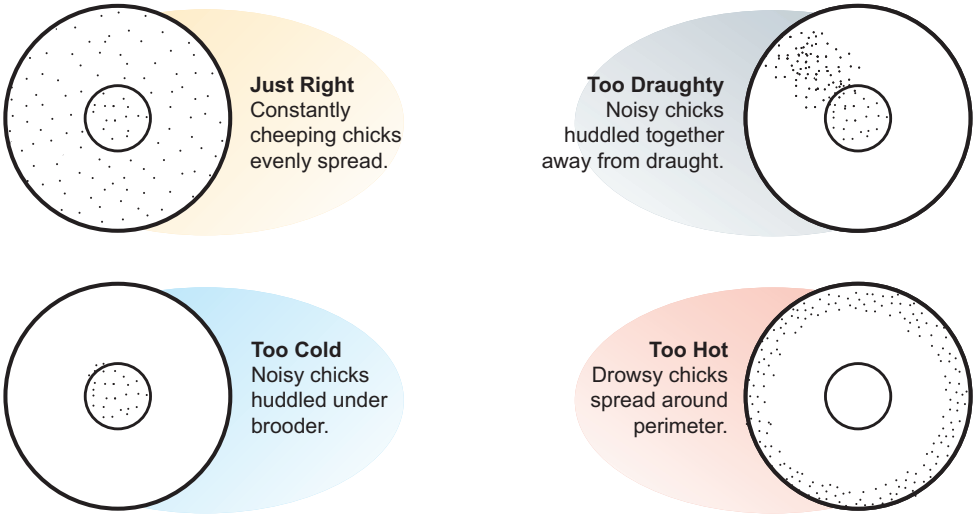
- Brooders and heaters should be checked regularly to ensure that they are working correctly. Also check for the proper angle of the infrared heater to ensure the heat is going where you want it to go.
- Supplemental drinkers are recommended from day old up to 3 to 5 days of age. Use mini drinkers or chick founts, not open trays. This will help to avoid problems with foot infections and water quality. Do not place drinkers directly under brooders.
- All chick boxes should be placed in the house with the appropriate number of boxes aligned with each brooder prior to releasing chicks. Strive for even chick distribution throughout the brood area. Do not stack full boxes inside the house or place full boxes inside the brooding area. Keeping chicks inside the boxes in a properly preheated house will result in heat stress. Remove the chicks from the boxes as soon as possible after delivery to the house. Seven day weights are an excellent overall indicator of how successful brooding management has been. The effects of early stress may not be seen until much later (wing feather growth) and may negatively affect the subsequent reproductive performance of the flock. The main reason for insufficient early weight gain is low feed consumption. Presentation of feed in the form of a good quality small crumble or even a micro pellet can be necessary to get the proper feed intake in the first week. Insufficient feed amount and/or feeder space will affect feed intake, weights and bird uniformity. It is also important to mention that early protein intake will especially affect four-week weights, flock uniformity, and ultimately egg production. It is again important to mention that good water intake can be the main driver to good feed intake. Water is a very important nutrient and often overlooked.
- Check chicks two hours after placement. Ensure they are comfortable with the temperature and are drinking and eating.
- Crop assessment is a useful tool to judge how effectively chicks have found feed and water. Randomly select 100 chicks and gently palpate the crop 6 to 8 hours following placement, or the next morning if the delivery is later in the day. The crop should be soft and pliable. If the crop is hard, it is an indication the chicks have not found adequate amounts of water. If the crops are swollen and distended with water, the chicks have not found enough feed. A minimum of 95% of the birds' crops should be full and pliable upon examination.
- For more information go to our technical booklet on Optimum Brooding development.

## Brooders

- Place no more than 70 chicks/m² (0.15 ft²/bird).
- Brooders should be operating for 24 to 48 hours before chicks arrive, maintaining a temperature of 29 to 32°C (85 to 90°F) 5 cm (2 in) into the litter at the brooder edge. In colder climates, and with no floor insulation, there could be a need to increase the pre-heating period to between 48 and 72 hours. It all depends upon the concrete floor temperature. Observe chicks and adjust for their comfort, but be careful not to over heat. Heat transfer is strongly affected by the relative humidity of the air. If air is dry with low RH % the transfer is low and higher dry bulb temperatures should be used as illustrated in the below table.

| % RH | 80 | 70 | 60 | 50 | 40 | 30 |
|---|---|---|---|---|---|---|
| Temp. °C | 30 | 31 | 32 | 33 | 34 | 35 |
| Temp. °F | 86 | 88 | 90 | 91 | 93 | 95 |

- The diagrams below illustrate how to observe chicks and correct for the brooding temperature.



### Types of heating systems

Most heating systems use infrared heating technology to heat surfaces or objects (chicks).

**Brooding stoves** – most traditional, also known as pancake brooders

**Infrared brooders** – many different sizes in the industry

**Infrared tube heaters** – normally placed high under ceiling covering most of floor area with infrared radiation type heat

**Space heaters** – Generate heat from gas fired units located about 4-6 per house and used preferably in combination with stir fans

**Temperature of environment and local placement based on 60% RH @ day old in the house**

| Age (days) | Temperature °C (°F) |
|---|---|
| 1-3 | 32 (90) |
| 4-7 | 30 (86) |
| 8-15 | 29 (84) |
| 16-18 | 28 (82) |
| 19-21 | 28-26 (79) |
| 22-24 | 26-24 (75) |
| 25-27 | 24-22 (72) |
| >28 | 21-20 (68) |

Temperatures without any airdrafts

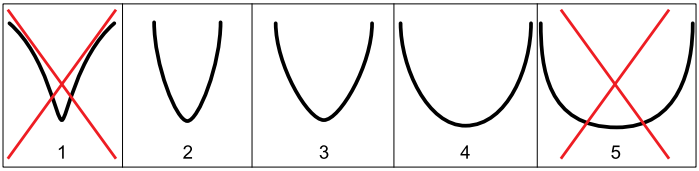
## 2.2 MAINTENANCE PHASE

The main objective in the maintenance phase of the bird's life is weight and fleshing control. It is important that the birds be handled as often as possible and their fleshing scored throughout this phase. The more birds handled at different ages, the better the condition of the birds will be understood. Bird condition at first light stimulation is critical, and the only way to achieve the desired results is with proper weight control and fleshing palpation.

### Fleshing Scores from 1 to 5:

1. Substantially under-desired level of fleshing and very thin birds.
2. Ideal breast shape at 12 weeks of age and the lowest fleshing condition of the birds in their entire life.
3. Breast fleshing shape during early preparation for lay (16 to 25 weeks).
4. Breast fleshing shape during preparation for lay (19 to 25 weeks).
5. Oversized breast muscle.

**Fleshing and Pelvic fat guidelines for first light stimulation at 147 days of age**




| OBJECTIVES for Fleshing and Pelvic Fat | | | | |
|---|---|---|---|---|
| Week | Fleshing (1 to 5) | | | Pelvic Fat |
| | 2 | 3 | 4 | |
| 12 | 70% | 30% | - | - |
| 16 | 40% | 60% | 0% | 0% |
| 19 | <10% | 60% | 30% | >65% |
| 20 | <5% | 60% | 35% | >85% |
| 21 | - | 60% | 40% | >90% |

**Note:** There is also a table with the parameters for flocks that are light stimulated at 22 weeks of age (154 days) or later. If you need these guide lines ask your Cobb technical representative.

The above table shows the objectives that should be achieved by fleshing the females at different ages starting at 12 weeks of age. As of 12 weeks of age the puberty starts and females need to be on fleshing target to hit the fleshing objective at 16 and then at 19 to 20, and 21 weeks of age. The table is only a guide, but indicates the importance of starting early (12 weeks) to evaluate the pullets and determine if the flock is on target from the beginning. The fleshing evaluations can be done in combination with the weighing of the birds at these specific ages. Another option is to do the fleshing separately and quickly with the technical management group fleshing pullets at different ages together so that everybody is on the same page around expectations for fleshing and pelvic fat (fat vein).

In the table above, the majority of the females at 12 weeks of age have a fleshing score of 2. This % is constantly reduced after this age and should be zero at the moment of light stimulation (ideal). A female with a fleshing score of 2 does not normally exhibit pelvic fat or fat vein deposition. It would be ideal if at the moment of light stimulation 100% of the females show a fleshing score of 3 with pelvic fat. That is however difficult to achieve. If we have too many females in the fleshing score 3 category we will still have females in the fleshing score 2 category, and that is not a good thing. For that reason part of the females after 16 weeks of age move gradually from fleshing #3 to #4. Normally at the start of light stimulation the ratio is around 60% #3's and 40% #4's. Later on in production the tendency is to have 50% #3's and 50% #4's. In case of evaluating fleshing condition in peak production and having more than 60% of the females with a fleshing score of 4, it normally indicates an overweight condition in the females due to over feeding going into peak production or having simply too much feed at that age.

**Observation:** When birds are penned for evaluation/vaccination/selection/etc., the density in the pen should be adequate to allow for 'only a single layer of birds' so that stress is minimized and no birds are injured during the process. The open wire mesh will allow for good airflow to the birds.

Hitting the early fleshing targets (12 and 16 weeks of age) will make it easier to obtain appropriate levels of pelvic (vein) fat or abdominal fat deposition that is needed at the time of first light stimulation.
This body fat is a key component at first light stimulation to obtain:

- Good sexual synchronization of the females
- High peak production and persistency
- High early hatchability, and good chick quality and vitality
- Reduced mortality in females going to peak production

At Cobb we thus prepare the pullet before light stimulation, and avoid doing this after light stimulation when many physiological problems can occur.

The rules for determining readiness for first light stimulation:

- Females need a body weight between 2300 and 2500 g (5.07-5.50 lbs).
- >95% of hens should have a fleshing score of either #3 or #4.
- >90% of hens with appropriate pelvic fat (You need to feel the pelvic bones rounding-off and the outside bone depression being filled in with fat tissue. One could also use the fat vein to determine the fat deposition for sub-cutaneous fat. However this is more often used after 25 weeks of age when the birds enter the production period and the pelvic bones do not reflect very well how much fat is being deposited in the abdominal cavity).
- First light stimulation should be between 147 and 154 days of age.
- After first light stimulation, go slow with the feed (+2 to +3 g (0.44 to 0.66 lbs/100)/week) up to the start of production.

*Elevated fat vein that indicates good body fat reserves for first light stimulation*

## 2.3 PREPARATION FOR LAY PHASE

This is the phase in the bird's life when consistent weight gains are needed. The objective is to provide enough fleshing and fat reserves to carry the bird throughout the rest of its life. It is very important to understand the following:

- Placing correct emphasis on regular feed increases
- Ensuring correct age and condition at light stimulation
- Maintaining consistent frame size
- Building adequate fleshing and fat reserve
- Preventing stalls or drops in weight gain

Remember it is better to delay light stimulation if you feel the birds are not in the correct condition (physical composition). The best way to achieve good breeder flock egg production is to develop feed and weight programs that prepare the pullets for a uniform response to light stimulation. The response of the hens to light stimulation is based on the condition (physical composition) and body weight of the bird. It is important not to stimulate the flock if it still contains underweight birds. To determine the average body weight at which to begin light stimulation, refer to the relevant breeder management supplement. A minimum of 70% of the flock (70% flock uniformity) should fall within +/-10% of the average body weight. The birds should achieve the appropriate breed specific average body weight to ensure the proper response to initial light stimulation. If either the average body weight or uniformity are below the breed specific recommendations, consider a delay in initial light stimulation.

*Adequate fat covering on pelvic bones prior to move*

*No fat reserve on the outer tips of the pelvic bones prior to light stimulation*

## 2.4 FEMALE BODY WEIGHT GAIN FROM 16-20 WEEKS

It is essential that the female parent achieves sufficient body weight gain between 16 and 20 weeks of age to maximize peak egg production and maintain post peak persistency.

The female's body composition at lighting is as important as the bird's body weight. This means that the hen must have adequate fat reserve and fleshing at this point. Birds normally lay down fleshing quite easily between 16 and 20 weeks of age, however this is not the case with building fat reserve.

In order to build an adequate amount of fat deposition the females must have sufficient weight gain in this critical 16 to 20 week period. A good management tool is to have a 34% increase in female bodyweight during the period from 16 weeks (112 days) of age to 20 weeks (140 days). This increase in body weight is to enhance female preparation for first light stimulation. In some situations where females are delayed in conditioning, (fleshing and pelvic fat deposition) it could be possible to increase the body weight gain to 38%, and even 40%. These situations need to be discussed with your technical Cobb representative.

As a general conclusion it is evident in the Cobb product lines that first light stimulation is not age dependent, but is determined by 4 parameters: Age, Body Weight, % fleshing condition and birds with presence of pelvic (vein) fat. Uniformity of frame, fleshing, pelvic fat and body weight determines, in a large part, the sexual uniformity of the flock, and hence the peak production performance and its persistency over 80% and 70% production.

# 3. FEED MANAGEMENT

## 3.1 REARING PERIOD

Females are fed ad libitum for the first week and then their intake is controlled to ensure they do not exceed the target weight at 4 weeks of age. Parent females and males need to achieve the body weight standard each week for the first 4 weeks to obtain uniformity and to have proper frame development. Feed is presented ad libitum (usually 22 to 25 g average daily intake (5.5 lbs/100)) for the first week and then is controlled so the females and males do not exceed the target at 4 weeks of age. If the males do not achieve target body weight during the first 4 weeks, a stronger feed stimulation is recommended. Males should be grown separately from the females up to 20 to 21 weeks of age for best results.

- Provide one feeder tray per 75 chicks at day old. Ensure that supplementary feed remains fresh. Do not allow the birds to consume stale feed.
- For males and females, during the first week feeding period allow 4.0 cm (1.5 in) of trough space or 45 birds per pan. Feed space increase should be gradual during rearing and is based on the age of the birds and the amount of feed being distributed, so that the feed will cover the whole feed track. In a house with 4 chain feeder loops, 2 loops will be used till 5 weeks of age, 3 loops till 11 weeks of age and the 4th one from 12 to 20 weeks of age. After 12 weeks of age the minimum trough space is 15.0 cm (6 in) per female and 20 to 22 cm (7.9 to 8.7 in) per male. If pans are used, allow for 11.5 cm (4.5 in) per bird or calculate the number of entrance points to the pan feeder and then subtract 2 entrances. Example: 16 entrances on an oval pan feeder are normally calculated for 14 birds.
- Feed should be distributed to all birds throughout the house in less than 3 minutes. Inexpensive methods of improving feed delivery should be considered. For example, slave or dummy hoppers could be added to the system to increase points of feed distribution. Another option is the use of additional lines of feeders (chain loops or another line of pans), which will add more space so all of the birds can eat at the same time. Other methods of feeding could also be considered; either providing the first feed distribution in the dark, or using “signal light” feeding. Either of these methods will keep the flock calmer, give better feed distribution, maintain bird distribution throughout the house, resulting in less piling and better flock uniformity. Turning off the lights just before and during feed distribution will also train the birds to expect feeding after this signal. As a result, entering the house with the lights on will not trigger a lot of movement of the birds and will keep the flock at ease, and reduce stress.
- Weekly feed increases should be based on body weight targets, and at later stages in rearing, the bird’s condition should also affect feed amounts.

## 3.2 ALTERNATIVE FEEDING METHODS

Birds should be fed every day. However, there may be situations in which it is better to adopt an alternative feeding program, especially if good feed distribution is difficult to achieve with daily feeding and with fast feed cleanup times. There are 4 alternative feeding programs that are typically used:

1. 6/1 - means 6 days with feed and 1 without.
2. 5/2 - means 5 feed days and 2 days with no feed. For 3 days birds are fed and then 1 non-feed day follows; then you have 2 days of feeding followed by 1 non-feed day to complete the 7 day week.
3. 4/3 - means 4 days per week with feed and 3 days with no feed.
4. Skip a day - means the birds are fed every other day (below more on this).

### Skip-A-Day Feeding

This program uses the same weekly feed amounts as the daily recommendations. However, from 21 or 28 days until the birds are 140 days of age, feed the equivalent of 2 days feed on a single day, providing only a scratch feed the next day. Skip-a-day feeding may be advantageous when feeding low amounts of a high density feed, or when feeding space is limited. It provides feed over a longer period of time and allows timid birds at the lower end of the pecking order to feed properly.

**Example:** week 8 - 9 (female line programs)

**Female daily feed allowance = 53 g/bird/day**

| | |
|---|---|
| Sunday | 106 g/bird |
| Monday | No feed/Scratch feed |
| Tuesday | 106 g/bird |
| Wednesday | No feed/Scratch feed |
| Thursday | 106 g/bird |
| Friday | No feed/Scratch feed |
| Saturday | 106 g/bird |

**Female daily feed allowance = 11.68 lbs/100/birds**

| | |
|---|---|
| Sunday | 23.36 lbs/100 bird |
| Monday | No feed/Scratch feed |
| Tuesday | 23.36 lbs/100 bird |
| Wednesday | No feed/Scratch feed |
| Thursday | 23.36 lbs/100 bird |
| Friday | No feed/Scratch feed |
| Saturday | 23.36 lbs/100 bird |

A good rule of thumb when using a skip-a-day feed program is to never exceed the anticipated “peak feed amount” at any time. For example, if the skip-a-day amount approaches 34 lbs/100 = 154 g/bird (17 lbs/100 = 77 g/bird) the flock should be carefully monitored for signs of “feed impaction” and a switch to a 4-3 or 5-2 feed program should be considered.

**Five Days / Week Feeding (5-2 Feeding)**
This program is a compromise between everyday and skip-a-day programs so that birds are fed on the same days each week throughout the rearing period. This program significantly reduces the maximum feed amounts presented to the birds on a single day compared to skip-a-day. Typically this program is used during the later part of the growing period, particularly if "feed impaction" has become a problem on feed days.

**Example:** week 8 - 9

**Female daily feed allowance = 53 g**
**Female weekly feed allowance**
**= 53 g x 7 = 371 g ÷ 5 feeds = 74 g / bird.**

| | |
|---|---|
| Sunday | 74 g/bird |
| Monday | 74 g/bird |
| Tuesday | 74 g/bird |
| Wednesday | No feed/Scratch feed |
| Thursday | 74 g/bird |
| Friday | 74 g/bird |
| Saturday | No feed/Scratch feed |

**Female daily feed allowance**
**= 11.68 lbs/100 birds**
**Female weekly feed allowance**
**= 11.68 lbs x 7 = 81.76 lbs ÷ 5 feeds**
**= 16.35 lbs/100 birds.**

| | |
|---|---|
| Sunday | 16.35 lbs/100 birds |
| Monday | 16.35 lbs/100 birds |
| Tuesday | 16.35 lbs/100 birds |
| Wednesday | No feed/Scratch feed |
| Thursday | 16.35 lbs/100 birds |
| Friday | 16.35 lbs/100 birds |
| Saturday | No feed/Scratch feed |

Observation on the feeding program: Many companies worldwide use daily feeding until the feed cleanup time gets under 4 hours (21 days of age), when 6/1 is introduced for a 1 week period and after 4 weeks of age the 5/2 program till around 18-19 weeks of age. After 19 weeks the birds go to daily feeding. It is possible to continue with a 5/2 or 6/1 feeding program till the week of light stimulation when feed amounts are very low or the feed presentation in pellets reduces the feed cleanup time below 30 minutes. These low consumption times will hurt uniformity and make the birds more nervous. A crop check immediately after feed cleanup time can give a clear indication if there is a good uniform feed intake. A maximum of 2% of the birds can show a low amount of feed in the crop.

When 5/2, 4/3 or skip a day feeding programs are used, change over from a higher feed amount program to a lower volume feed amount on the day of feeding if feed impaction or feed chock occurs (birds over eating and showing extended and very hard crops and having problems with respiration). Giving water 15 to 30 minutes before feed distribution can help to reduce this problem; however the light program needs to be adjusted for the birds to drink properly. It is often best to simply move from a skip a day program to a 4/3 or 5/2 program when feed chock occurs and check if the feed distribution process is OK.

# 4. LIGHTING PROGRAM MANAGEMENT

The response of chickens to light is a complex subject. The following paragraphs provide basic advice on lighting programs that are proven for Cobb product lines. Local conditions and housing types may necessitate the use of modified lighting programs, which should be discussed with your Cobb Technical Service representative.

Broiler breeder hens come into lay in response to increases in the day length or in light intensity when made at the appropriate time. The response of the hens to light stimulation is based on their condition, body weight and age. In light controlled housing, delay light stimulation if the flock still contains significant numbers of underdeveloped birds. Depending on the body weight profile used, this age at first light stimulation could be between 21 and 23 weeks of age. When transferring birds from dark-out rearing to open sided laying houses (transparent curtain tunnel houses), the weight and body condition (fleshing and fat) must be correct at time of transfer.

The following recommendations for lighting programs are given for 3 situations:

- Dark-out rearing to dark-out production.
- Dark-out rearing to natural daylight production.
- Natural daylight rearing to natural daylight production.

## 4.1 DARK-OUT REARING HOUSES

Parents should be reared in lightproof housing. This means that the house should be pitch dark when the lights are off. This will avoid birds perceiving the different times of the year and better sexual uniformity will be obtained at the start of production.

Open houses can be converted to dark out rearing by eliminating all areas that allow light leakage using effective blackout curtains. Provision must then be made for sufficient fan capacity to allow correct ventilation. Fans and air inlets must also be covered with adequate light traps, and of course the house should be well sealed so that minimum, transition and tunnel ventilation will work well.

## 4.2 DARK-OUT REARING TO DARK-OUT PRODUCTION

Dark-out houses should provide total light control.

- Start chicks on 24 hours of light reducing to eight hours by two to three weeks of age. The age at which 8 hours day length is reached will depend on feed consumption time and BW development achieving the target weights. Generally, the 8 hour day length can be started when the birds consume their every-day restricted amount of feed in 4 hours or less.
- The day length remains at 8 hours until 21 to 22 weeks (147-154 days) of age when the step-up light stimulation should be followed.

Modifications can be discussed with your Cobb technical services representative. It is important not to stimulate the flock if it still contains significant numbers of underweight birds.

## Recommended lighting program for flocks going from dark-out rearing to dark-out production housing

| Age (weeks) | Age (days) | Light (hours) | Light intensity (lux) | Light intensity (foot candles) |
|---|---|---|---|---|
| 2-21 | up to 146 | 8 | 5 to 7 | 0.5 to 0.7 |
| 21 | 147 | 12 | >50 <100 | >5 <10 |
| 22 | 154 | 13 | >50 <100 | >5 <10 |
| 23 | 161 | 14 | >50 <100 | >5 <10 |
| 25 | 175 | >14 | >50 <100 | >5 <10 |

**Observations:**

1. The light program should start at minimum 147 days of age with 154 days often the most recommended age, especially for the slow feathering Cobb females. Some companies could even go to 161 days of age but that is often done when females are not in proper fleshing and pelvic fat condition.
2. Our present day female seems to perform better when light stimulated at 147 days of age or later. If light stimulation is too early, problems occur with cannibalism, prolapse, double yolks, egg peritonitis and lower peak production and persistency. Feathering is also negatively affected by premature light stimulation.
3. Maximum light duration depends on local conditions.
4. Many flocks today do very well with only 14 hours of total light during the production period.

## Recommended lighting program in first 3 weeks for flocks reared in dark-out housing

| Age (weeks) | Age (days) | Light (hours) | Light intensity (lux) | Light intensity (foot candles) |
|---|---|---|---|---|
| 1-3 | Day-old to 21 | Decreasing from 24 hours at day 1 to 8 hours by 14-21 days | Days 0-2 maximum light (>20 lux) reducing to 20 lux by day 7 | Days 0-2 maximum light (>2 fc) reducing to 2.0 fc by day 7 |

## 4.3 DARK-OUT REARING TO NATURAL DAYLIGHT PRODUCTION

Start chicks on 24 hours of light reducing to eight hours by two to three weeks of age. The age at which 8 hours day length is reached will depend on feed consumption time. Generally, the 8 or 9 hour day length can be started when the birds consume their every-day restricted amount of feed in 4 hours or less.

The day length remains at 8 to 9 hours until the age of 21 or 22 weeks (147-154 days) when the step-up programs should be followed. (9 hours of light in rearing is used when birds are being transferred to open sided production houses in the summer months when the natural light duration is higher than 13 hours). Another option is to light stimulate the hens in the rearing house between 147 and 154 days of age from 8 hours to 12 hours on artificial light, and then transfer at 154 days of age to natural light. This will avoid over stimulation. It is not always possible to apply this program based on the down time between flocks.

Light intensity during the production period must be between a minimum of 50, and a maximum of 100 lux (5-10 ft candles). This relates to the additional artificial light. Light should be uniform throughout the house with a maximum of 20% variation compared to the light intensity below the lamps.

**Recommended lighting program for flocks going from dark-out rearing to open-sided or transparent curtain production housing**

| Age (weeks) | Age (days) | Light (hours) | Light intensity (lux) | Light intensity (foot candles) |
|---|---|---|---|---|
| 2-21 | up to 146 | 8 | 5 to 7 | 0.5 to 0.7 |
| 21 | 147 | 12 | >50 <100 | >5 <10 |
| 23 | 161 | 13 | >50 <100 | >5 <10 |
| 25 | 175 | 14 | >50 <100 | >5 <10 |
| 27 | 189 | >14 | >50 <100 | >5 <10 |

**Maximum light duration depends on latitude conditions that determines the maximum hours of natural light. Flocks being transferred in autumn can probably receive a maximum of 14 hours of total light, but flocks going into the summer will need to adjust the maximum light to the maximum hours of natural light. Females should never experience a decrease in natural light duration during the production period.**

## 4.4 NATURAL DAYLIGHT REARING TO NATURAL DAYLIGHT PRODUCTION

It is recommended that parents not be reared in natural daylight houses. However, it is recognized that this production system is used in certain parts of the world and works well if the variation in natural day length is small. For this reason there are still a lot of operations around the equator that manage this type of rearing quite successfully.

In open-sided and windowed houses, local day length conditions require that a specific program be adopted for each flock as agreed with the technical service representative. The following guidelines apply to all such programs.

During the rearing period birds can remain on natural light in all seasons until an artificial light stimulus is given. The program to be applied is determined by the natural day length at 140 days. When extending the day length, provide extra light at both the beginning and end of the natural day light period to be certain that the intended day length is achieved.

Additional light during this period must be 80 to 100 lux (8-10 ft candles) to ensure that the birds are stimulated sufficiently.

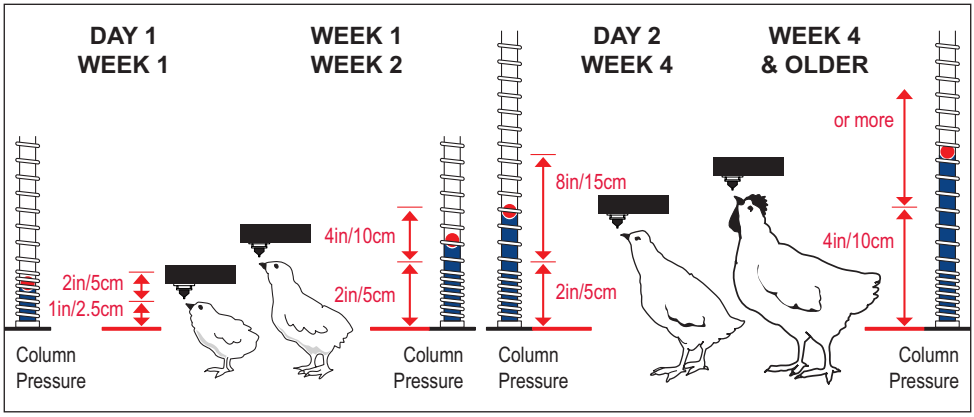
**Recommended program for open-sided housing according to natural day length at 140 days (20 weeks) of age**

| Natural day length hours at 140 days | Light program | | |
|---|---|---|---|
| | 147 days | 154 days | 161 days |
| 15 | 15 | 17 | 17 |
| 14 | 16 | 17 | 17 |
| 13 | 13 | 15 | 15 |
| 12 | 14 | 14 | 16 |
| 11 | 14 | 14 | 16 |
| 10 | 13 | 14 | 15 |
| 9 | 12 | 13 | 14 |

## 5. WATER MANAGEMENT

It is essential to provide easy access to fresh, clean water so that feed intake and growth are maintained.

- The main drinking system may be bell drinkers or nipple drinkers. Bell drinkers should be installed at the rate of one per 80 birds. Nipple drinkers should be installed at the rate of 8-10 birds per nipple. Birds should not have to travel more than 3 m (10 ft) to access water.
- Supplementary drinkers should be provided at the rate of 2 per 100 chicks from day old to 7 days. Ensure that the birds have access to the main drinking system from day-old.
- Nipple drinkers are a more hygienic water delivery system. Nipple drinkers should be adjusted as per manufacturer's recommendations.
- Bell drinkers must be thoroughly washed at least every other day. Buckets and brushes used for cleaning should be disinfected with chlorine or quaternary ammonium sanitizer.
- Flush the water lines several times a day in the first few days (week) to have cool and fresh water available for stimulating more feed intake.
- Use a disinfectant, like chlorine, in the water to be sure that there is no bacterial load in the drinking water. The high house temperatures will heat up the water and promote fast bacterial growth.
- Header tanks must have lids to avoid contamination from airborne bacteria etc.
- From 4 weeks onwards, the bell drinker height should be adjusted to bird back height. Adjustments should be made frequently to prevent spillage and wet litter.
- Additionally, it is important to remember that birds will consume more water in the 2-3 hours after eating. If the water usage is not observed during this time, it is possible that the water lines are restricted, preventing birds from receiving an adequate amount.



**Nipple flow rates in the first 4 weeks, and later**

| Age | Nipple capacity per minute |
|---|---|
| 0-7 days | 30 ml |
| 7-14 days | 42 ml |
| 14-21 days | 49 ml |
| 21-28 days | 56 ml |
| >28 days | 60 ml |

Daily water consumption (taken from meter readings before feeding - the only precise time to record) can give early warning of nutritional, disease or house temperature problems in time to take corrective action. Chickens normally drink between 1.8 and 2.0 times their feed intake on a daily basis at 21°C (70°F) in closed house conditions. In open house, or transparent curtain conditions this is often between 2 and 2.5 times their feed intake especially during production. Water consumption of more than 2.0 times the feed can occur in excessively high temperatures (above 30°C (86°F)). High consumption may also indicate errors in the feed formulation, leaking drinker systems, or intoxications such as high salt levels.

**Example Water Consumption Calculation:** At 60 g of feed a day per bird, water consumption is approximately 1.8 x 60 = 108 g. As 1 kg water = 1 liter, this is 0.108 liters per bird.

**Example Water Consumption Calculation:** At 13.2 lbs feed/100 birds per day, water consumption is approximately 1.8 x 13.2 lb/100 = 23.8 lbs of water per 100 birds. As 1 gallon of water = 8.33 pounds, this is 2.86 gallons of water per 100 birds.

# 6. BIRD WEIGHING AND BODY WEIGHT CONTROL

The objective of body weight control is to rear all of the birds to the target weight for age with good uniformity. Body weight targets are achieved by controlling feed allowances. Feed amounts during rearing are based on body weight and maintenance, whereas in lay they are based on these two factors plus egg production and egg weight.

Feed amounts can only be determined if the body weight is measured accurately every week.

To measure body weight, weigh between 60 and 100 birds per pen each week or 1% to 2% with a minimum of 50 birds to have a representative sample of the population. At 7 and 14 days weigh a bulk sample of birds, or 10 birds weighed together in a bucket. Thereafter, weigh birds individually at the same time on the same day of every week. Be sure the bird weights are taken on an “off day” or before feeding if everyday feeding is used.

Follow these simple procedures to ensure accuracy:

1. The scales used to measure body weight must have a capacity of 5 kg (11.02 lb) and be accurate to +/- 20 g (.04 lb). Check regularly that the scales are properly calibrated. It is an advantage to have electronic balances with a printout facility.
2. Gather a good sample of birds in a catching pen and with preference take the sample in the middle of the house. If a large sample is taken use 3 spots in the house (front, middle and back of the house).
3. Weigh **every** bird in the catching pen, including small birds (cull sexing errors during this operation). Record body weights using the following chart.
4. Calculate the average weight of all birds weighed.
5. Plot the average body weight on the appropriate chart.
6. Decide on the feed amount for the following days.
7. During rearing, feed amounts should be maintained or increased. Only emergency situations require a decrease in the feed amount.
8. After peak egg production feed amounts are normally reduced to control mature body weight and ensure persistency of egg production and fertility. The precise method of feed reduction could vary from flock to flock, and should be discussed with your Cobb Technical Service representative.

## 6.1 ANALYSIS OF BIRD WEIGHTS

The following is an example of a completed body weight recording chart.

**Example Body Weight Recording Chart**

| | g | lb | | | | | | | | | | | | | | | | | | | | | | No. of Birds |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 460 | 1.01 | | | | | | | | | | | | | | | | | | | | | | |
| | 480 | 1.06 | | | | | | | | | | | | | | | | | | | | | | |
| | 500 | 1.10 | x | | | | | | | | | | | | | | | | | | | | | 1 |
| | 520 | 1.15 | x | x | x | | | | | | | | | | | | | | | | | | | 3 |
| -10%-> | 540 | 1.19 | x | x | x | x | x | | | | | | | | | | | | | | | | | 5 |
| | 560 | 1.23 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | | | | | | | 15 |
| Av.-> | 580 | 1.28 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | | 20 |
| Target ➡ | 600 | 1.32 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | 23 |
| | 620 | 1.37 | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | | | | | | 17 |
| +10%-> | 640 | 1.41 | x | x | x | x | x | x | x | x | x | | | | | | | | | | | | | 10 |
| | 660 | 1.46 | x | x | x | x | | | | | | | | | | | | | | | | | | 4 |
| | 680 | 1.50 | x | x | | | | | | | | | | | | | | | | | | | | 2 |
| | 700 | 1.54 | | | | | | | | | | | | | | | | | | | | | | |
| | 720 | 1.59 | | | | | | | | | | | | | | | | | | | | | | |

| | |
|---|---|
| Date | __/__/__ |
| Age | 35 days |
| House / Pen reference | - |
| Number of birds / Pen | - |
| Number sampled | 100 |
| Target weight (g) (lb) | (600) (1.32) |
| Average weight (g) (lb) | (595) (1.31) |
| Coefficient of variation (CV) | 6.0 |
| Percentage within +/- 10% of average weight | 90% |

Body weight should be analyzed in the following way

**Average Weight of Birds Sampled**
Using the chart above:

Total weight of 100 birds = 59,500 g or 131 lb

Average weight per bird = 595 g or 1.31 lb

## Coefficient of Variation (CV)

Variation can be expressed in terms of the average bird weight, the standard deviation of body weight and the coefficient of variation in body weight. In a normal flock approximately 95% of the individual birds will fall in a band +/- two standard deviations either side of the average body weight. The coefficient of variation is a comparative measure of variation that allows the change in variation during the growth of the flock to be monitored. The coefficient of variation is the standard deviation expressed as a percentage of the mean.

The standard deviation is a measure of how widely values are dispersed around the average value (the mean).

**(Standard deviation (g)/average body weight (g))*100 = CV (%)**

The following table gives an approximation of flock uniformity (% within +/- 10%) into CV (%).

| Uniformity % | CV (%) |
|---|---|
| 95 | 5 |
| 90 | 6 |
| 85 | 7 |
| 79 | 8 |
| 73 | 9 |
| 68 | 10 |
| 64 | 11 |
| 58 | 12 |
| 56 | 13 |
| 52 | 14 |
| 50 | 15 |
| 47 | 16 |

# 7. MAINTAINING GOOD UNIFORMITY

A uniform Parent breeder flock will be easier to manage and will produce more chicks per hen housed than an uneven flock. Good uniformity results from careful attention to detail.

## 7.1 COMMON FACTORS LEADING TO BODY WEIGHT UNIFORMITY PROBLEMS

- Presence of formaldehyde gas at chick placement
- Mixing of parent age sources at day old
- Beak conditioning, if not carried out to a high standard
- Extreme temperatures
- Poor feed distribution
- Incorrect feed amounts
- Incorrect feed specs
- Incorrect or variable pellet size
- Over stocking
- Insufficient water supply
- Too high or too low energy feeds
- Insufficient light at feeding time
- Incorrect feeder height
- Irregular feeding times
- Incorrect bird numbers or pen drift
- Disease or parasitic infections
- Fast feed cleanup time (less than 30 minutes)
- Incorrect feeding space

## 7.2 GRADING

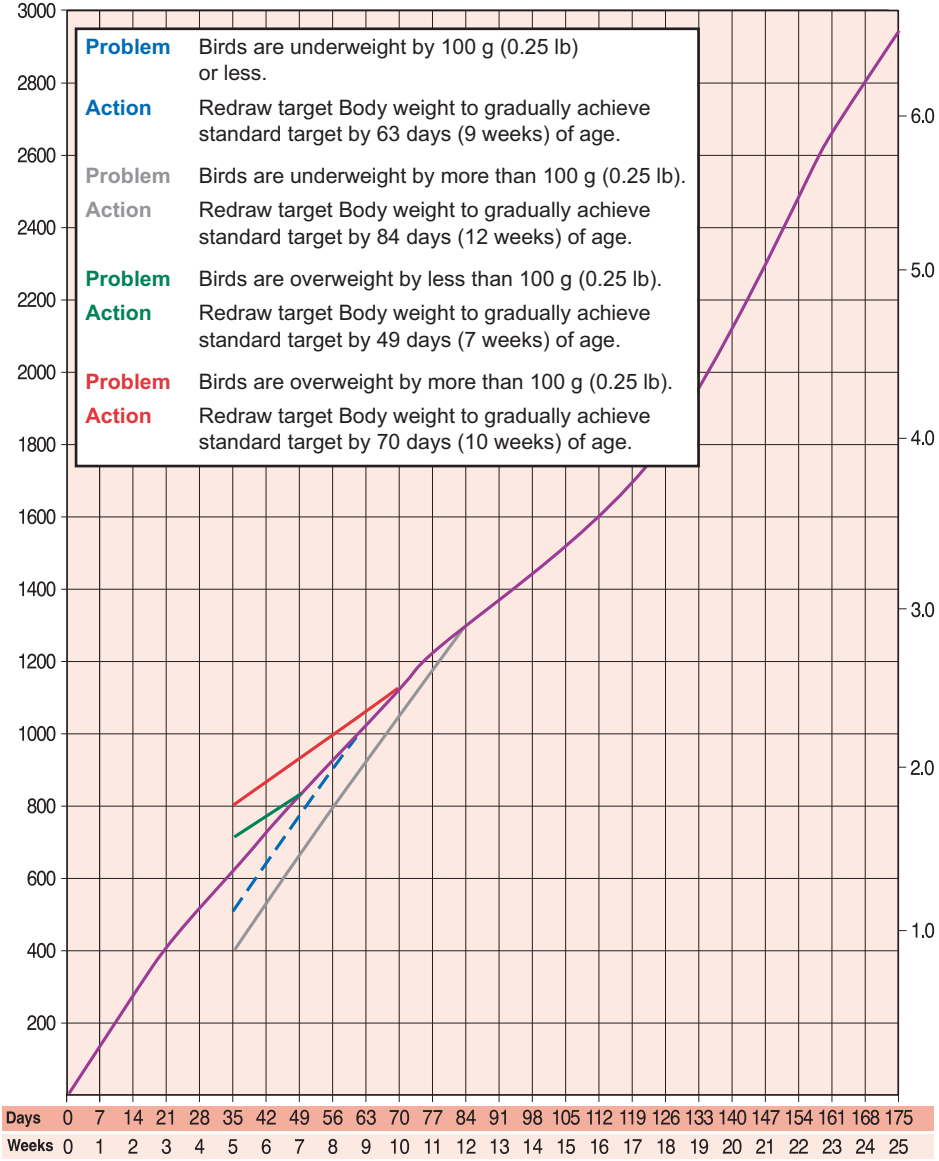
Bodyweight grading helps to maintain flock uniformity if it is done correctly. Females can be graded at different ages. When enough labor is available, doing the first grading at 7 to 10 days of age is very effective in obtaining good flock uniformity early. Grading can be done again at 4, 8 and 16 weeks of age. Certain markets, like Latin America, frequently grade because the uniformity objectives are very high (>85%). Other markets, like those in North America, and Europe, have no manpower to do multiple gradings because of the cost of labor. In these markets, no or limited grading is often being practiced in parent stock. If only 1 grading can be done, the best age is between 23 and 28 days of age. Remove 20 - 25% of the lightest birds and place them in a separate pen, where they can be fed according to their needs. In markets where few gradings can be done, it is very important to have the basic management criteria right. These are: enough feeder space, fast feed distribution (in the dark), good bird distribution over the whole house, and enough drinking water availability with the correct water pressures just to mention the most important ones. Males follow the same grading concept as females.

## 7.3 TROUBLESHOOTING BODY WEIGHT CONTROL

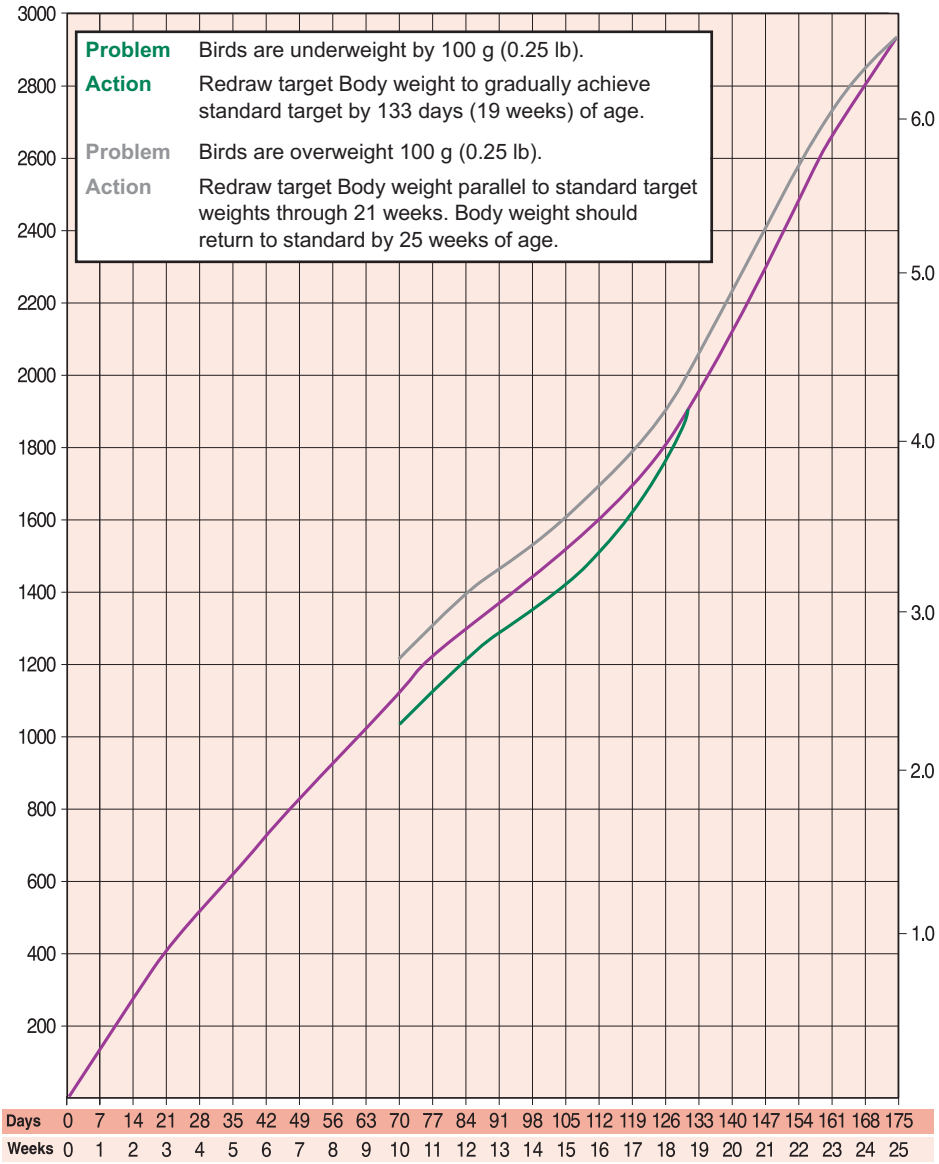
There will be occasions when flocks are not on the body weight target. Any corrective action taken on these flocks should be carried out with long term rather than short-term goals. Adjustments to the growth rate of the flock must ensure that the females will still achieve the necessary body condition and weight gains to allow them to reach sexual maturity.

The following examples illustrate the way in which corrective action should be taken in four different situations:

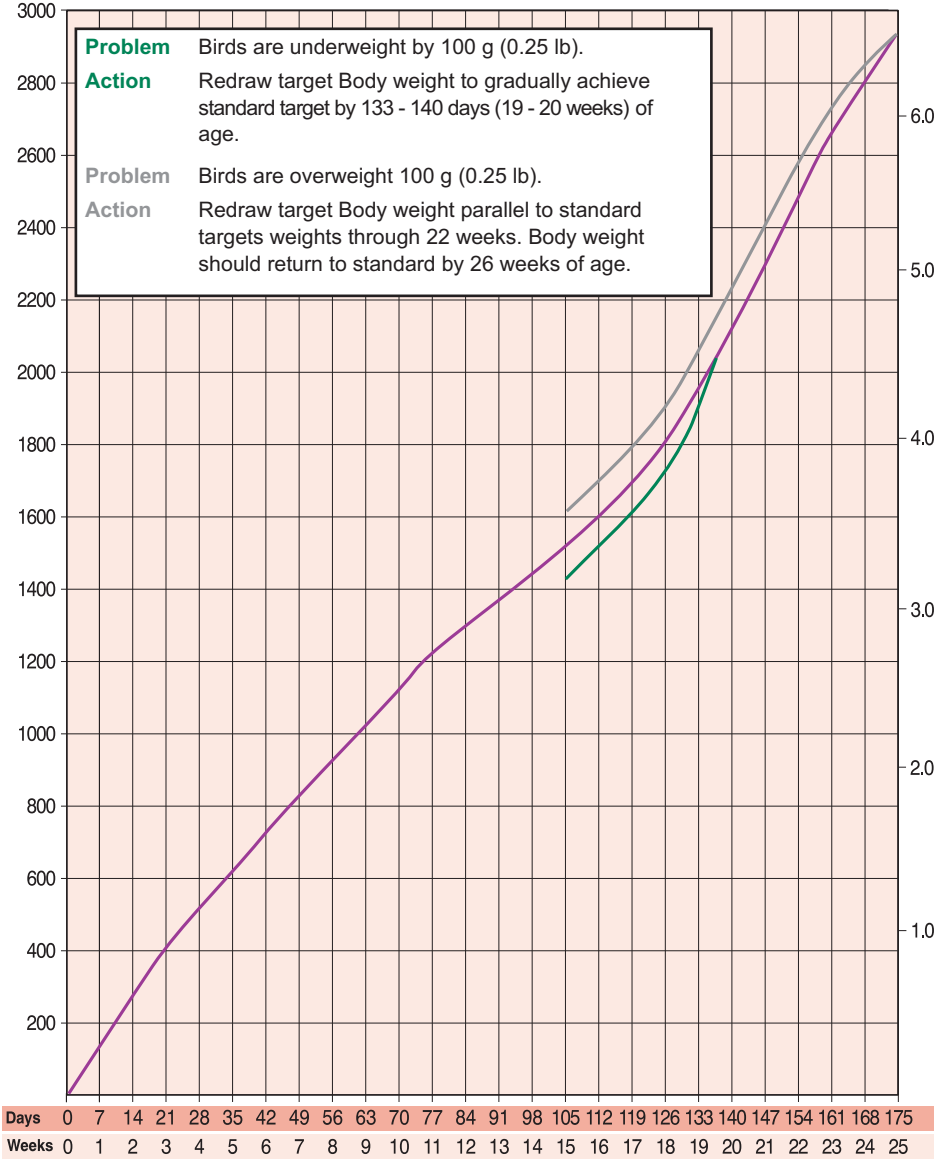
## Flock weight off target at 5 weeks



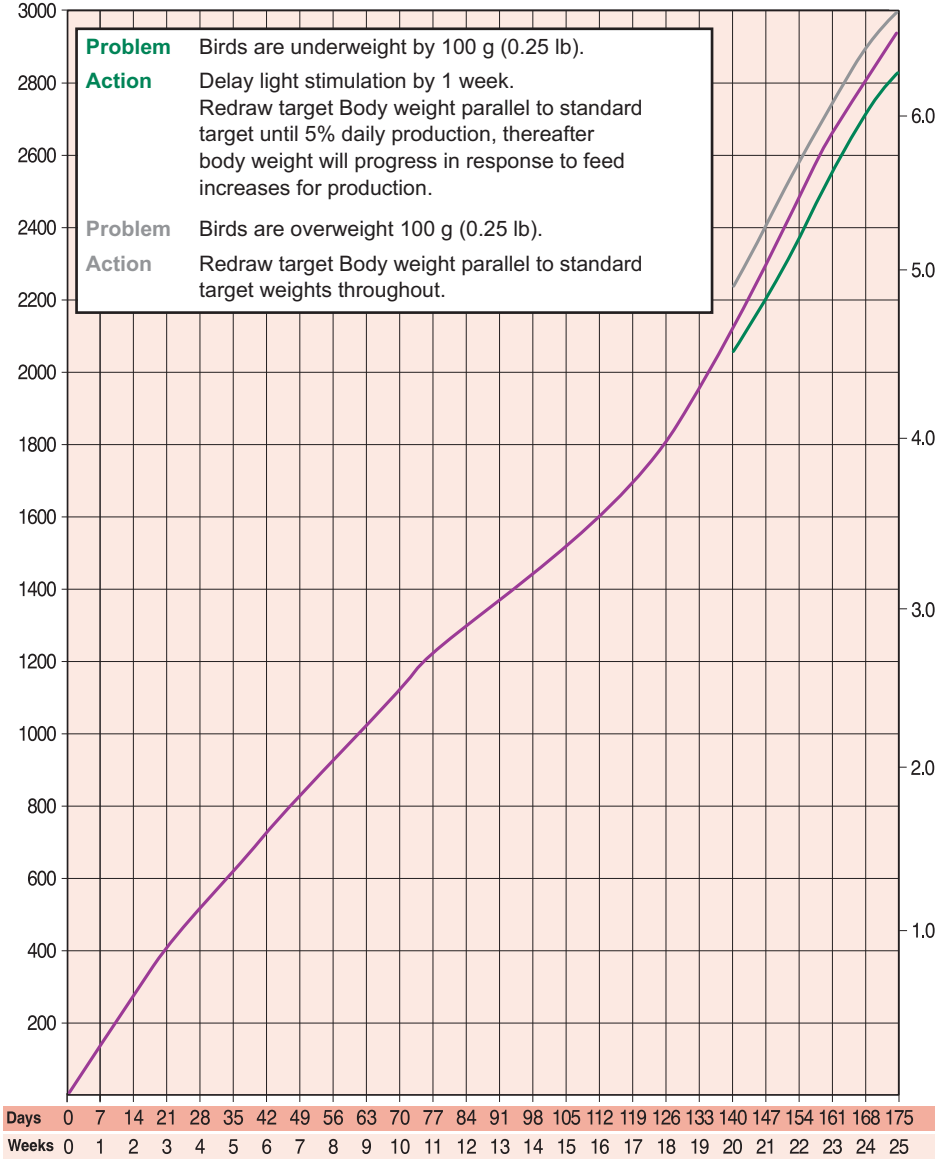
## Flock weight off target at 10 weeks



## Flock weight off target at 15 weeks



## Flock weight off target at 20 weeks



## 8. TRANSFERRING STOCK FROM REARING TO PRODUCTION FARMS

Age for transferring stock to the production farms is determined mainly by the facilities available, body weight and the lighting program. The transfer can be a very stressful time for the birds and every effort should be taken to ensure that it is carried out smoothly. Plan the work in detail and handle the birds carefully.

Prior to transfer, the rearing and laying managers should meet to discuss the flock. A copy of the rearing records should be transferred with the flock to the laying farm. These should include details of disease challenges, body weights, fleshing and pelvic (vein) fat scorings, lighting program, intensity of light, feed amounts, time of feeding, medication, vaccination program, transfer bird numbers, water consumption and any other relevant information to assist the production farm manager during the settling in period.

Sometimes it may be necessary to give additional feed several days before and/or after the birds have been moved. The amount of extra feed and the time when it is given will depend on the season and the distance travelled. On the day of moving be sure the birds are empty (no feed) with the goal of eliminating Dead-On-Arrivals and limiting dirty crates. This also reduces stress. It is important to ensure that the birds do not lose weight, condition or uniformity as a result of transfer. They must find feed and water quickly when they reach the laying house.

The following points must be considered when planning the transfer procedure:

- The laying house must be ready to receive the flock, with the feeders, drinkers, and nest boxes fully operational, one week before the planned transfer date.
- Ensure that there are enough clean crates to move the whole flock at the start of each day.
- The final selection and transfer of the males should be carried out 2 to 3 days before the transfer of the females.
- The females should be carefully observed and obvious defects removed before moving to laying house.
- Move the birds at night or in the early morning.
- When taking birds out of the crates or coops place them directly on the slats.
- After transfer observe the birds closely, handling their crops, to make sure that they are all able to find feed and water.

Walk through the house frequently to encourage birds to use the slatted area. The recommended slat height is 45 cm (approximately 18 inches) at the step-up from litter to slats.

# 9. PRODUCTION PERIOD

## 9.1 HOUSING AND EQUIPMENT REQUIREMENTS

- The ventilation system must be capable of achieving desired temperatures in a wide variety of climatic conditions. In cooler climates, there should be a minimum ventilation fan volume of at least one air exchange every 8 minutes, and the exhaust fans should run 1 minute out of every 5 minutes, or 2 minutes out of every 10 minutes. If the temperature in the house exceeds the temperature set point, then the maximum ventilation system should provide fan volume equal to one air exchange every 5 minutes until the temperature falls below the set point.
- When birds are eating, they will produce more metabolic heat and therefore will require more cooling. Increasing cooling during feeding times will result in improved livability and feed intake.
- Provide a minimum of 15 cm (6 inches) of feeding space per female for chain feeders and 12 females per round pan and 14 females per oval pan to ensure that feed can be distributed in less than 3 minutes.
- Nipple drinkers are preferred for parents and should be installed at the rate of 8 to 10 birds/nipple. Bell drinkers should be installed at the rate of 60 to 70 birds per drinker. Drinker lines should be positioned fairly close to the nesting system to encourage use of the nests.
- Manual nesting systems should provide for 4 birds per nest. Allow 5 birds per nest hole in individual bird rollaway mechanical nests.

**House set up with the mechanical community nest:**
World wide there is a tendency to mechanize egg gathering. The egg collection in the house can be automated with individual or community nests. The individual mechanical nest system is more common with the U.S. house setup of 2/3 slats with 1/3 scratch area in the center of the house. In this setup there is 1 line of mechanical nests on each of the slats, giving a total of 2 lines of nests per house. The advantage of this concept is a low % of floor or slat eggs. However, the female density is limited to a maximum of 5.5 females/m².

The community nest system is another option for mechanical collection of eggs. In this design, there is only 1 line of automatic nests placed in the central part of the house with slats extending out from either side of the nests. There are, however, very important issues in the house setup that need to be addressed to avoid problems with floor eggs. Floor eggs are the weak spot for this nesting system, but higher female densities can be kept to reduce hatching egg costs and pay for the higher investment costs.

Conditions for proper house community nest setup:

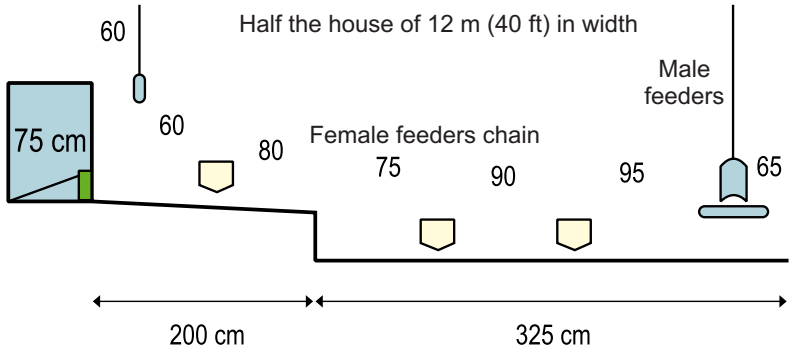
- A ratio of 60% floor area to 40% slat area.
    - With a 12 m (40 ft) wide house, slats need to extend approximately 2 m (6.5 ft) from the front of the nest on each side.
    - With a 13 or 14 m (44-46 ft) wide house, slats need to extend approximately 2.5 m (8.1 ft) from the front of the nest on each side.

- Apply a slat slope of 7 degrees with wooden slats and 8 degrees with plastic slats
    - One of the female feeder lines needs to be on the slats.
    - When you have slats extending 2 m (6.5 ft), place the waterline in front of the nest and then install 1 female feeding line further out on the slats. The distance from the slat step-up to the first feeder should be a minimum of 50 cm (20 in).
    - When using 2.5 m (8.2 ft) of extended slats, it is possible to have two female feeding lines on the slats (complete loop) in case a 14-15 m (46-49 ft) wide house is used.
- Never put water lines in the scratch area. Recommended distances from the nest are: nest to water line, 60-70 cm (2 ft); water line to feeder line, 60-70 cm (2 ft).
- Lights should be placed just outside the slat area (above the scratch area) so that they do not give a shadow of the slats in the scratch area.
    - The scratch area should have enough light intensity (min. 50 to max. 100 lux), with uniform light distribution.
    - The lights should be located to allow 2 to 4 lux to reach the back of the nest.
    - No extra lights inside or directly above the nest are needed.
    - Ventilation: No air should go through the nest and cause draft (important when using cross ventilation).
    - In tropical or hot climates a good cooling system is needed to avoid excessively high temperatures in the nests. If this occurs, the females will lay the eggs outside the nest system.

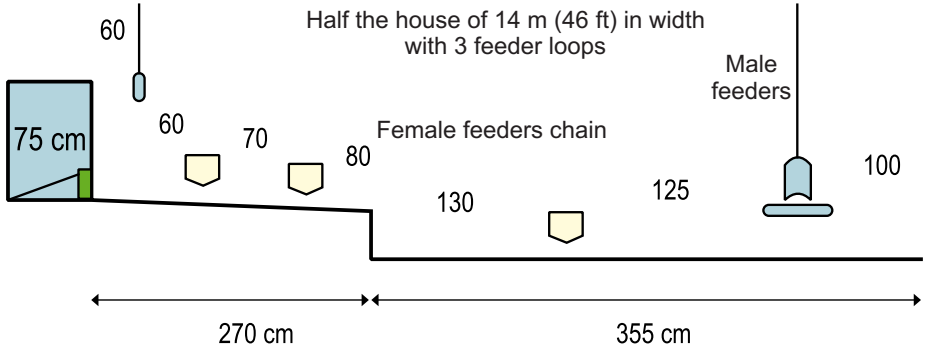
When using the mechanical community nest, the following guidelines are recommended: There are 2 nest types in general use; 40 to 41 cm (16 in) deep, or 45 to 46 cm (18 in) deep, by 240 cm (94.5 in) long. Each nest unit has 4 entrance holes, 2 on each side. Use the recommendations on birds per nest hole from the manufacturer, or use the numbers below as a general guide. Be sure to buy a nest system that gives the lowest % of floor or slat eggs. Always use the larger nest dimensions and stay away from the smaller nest types. In below comments we only discuss the 45 to 46 cm (18 in) horizontal deep nests.

- With the 45 to 46 cm (18 in) horizontal deep nest calculate ± 200 females per nest unit (4 holes), or 50 females per hole, or 83 females per m (3.3 ft) house length (41 females on each side of the nest per 1 m (3.3 ft) house length). This deeper nest system can be used with wider houses. The calculation above is conservative and based on the type of nest chosen, there may be different recommendations. Under good conditions and having the right nest type, up to 240 hens per nest unit have been used with good results.
- Important observation: Discuss with your Cobb representative what is the best indicated bird density for your situation and how best to manage the feeding and nesting systems. One of the complications that happen too often with new house constructions is that the integration listens to the sales persons of certain equipment producers and put in a new system without ever asking or consulting the broiler breeder supplier. If you are placing Cobb birds in new facilities consider having our opinion on your house setup. In the end Cobb knows what works best for our hens in rearing and production.

**House and nest set up with the community nest:**




Configuration with only 1 feeder line on the slats. There are 3 loops of chain feeders or 6 lines giving a potential density of 6.7 females/m² (1.60 ft²/bird) with 15 cm feeder space. Nipples are spaced at 20 cm (7.87 in) distance.




Comments: Step up to slat 40 to maximum 45 cm (18 in).
Slope of 7-8° on the slats.
Preferably use wooden slats when a wider slat area is used.
This configuration will give space for 5.7 ♀♀/m² (1.89 ft²/bird) with 15 cm feeder space.
With 14 cm feeder space the density can increase to 6.1 ♀♀/m² (1.76 ft²/bird).

There are other setup configurations including one with 4 feeder loops in a 14 m (46 ft) wide house that allows one to house more females/m. Ask your Cobb technical representative for more information in case you are interested. Higher densities are only recommended in cooler (temperate) climates and/or with good environmental controlled conditions.

## 9.2 FEMALE FEED MANAGEMENT FROM LIGHT STIMULATION TO PEAK PRODUCTION

From the moment of light stimulation (MOL) to peak production is one of the most critical periods in the life of a breeder flock in terms of nutrition. After light stimulation the female will partition the available nutrients between maintenance, growth and the development of the reproductive system. A well designed management program can influence how this partitioning takes place.

From light stimulation to onset of production feed according to body weight. When the birds are light stimulated with the right body condition, this period usually requires small feed increases (2 to 3 g/bird/week or 0.44 to 0.66 lb/100 birds/week).

Conservative feeding programs from light stimulation to onset of production will also reduce:

- The % of double yolks.
- Low peak production problems by 2 to 4%.
- Floor eggs, especially with community nest systems.
- Egg peritonitis going into peak production (and also spiking mortality due to prolapse, SDS, heart attacks, and fatty liver).
- Cull birds from 22 to 30 weeks of age.
- Production persistency related issues.
- Flocks being more difficult to feed in the production period, and to take feed away after peak.
- Number of less efficient flocks.

### Weekly Mortality Trends

Weekly mortality trend comparisons of aggressive and conservative feeding programs, after light stimulation, indicate that greater mortality is seen when aggressive feeding programs, such as those in the table below are used.

| Production period | Conservative | | Aggressive | |
|---|---|---|---|---|
| | Grams per bird/day | Pounds per 100 birds/day | Grams per bird/day | Pounds per 100 birds/day |
| Light stimulation (at 21 weeks) | 105 | 23.1 | 105 | 23.1 |
| At 5% daily production | 115 | 25.4 | 125 | 27.6 |
| At peak production | 160 | 35.3 | 165 | 36.4 |
| At peak production kcal intake | 445 - 465 kcal | | 455-475 kcal | |

Observe and handle the birds, checking their crops to ensure that they are eating and drinking. Check their fleshing to monitor their condition. Weigh the females every week, taking a sample of between 60 and 100 birds per house or 1% to 2% of the population. Calculate the mean body weight and flock uniformity.

Continue feeding for body weight until 5% production, thereafter, feed increases should be according to hen day egg production. When the flock reaches 5% daily production, a program to lead production with feed should be developed. In the following information it will be explained how the feed can be partitioned between start and peak production.

Peak feed intake should be reached by 75% hen day egg production. The maximum feed amount will depend on the energy value and form of the feed, but for all practical purposes will be between 435 and 470 kcal. Here are 3 examples that demonstrate when to use certain maximum amounts of kcal based on housing conditions and feed density (kcal level).

- Example 1) Use 435 to 445 kcal with pelleted, or crumbled feed, and with environmentally controlled houses.
- Example 2) Use 445 to 455 kcal with mash feed with environmental controlled houses.
- Example 3) Use 460 to 470 kcal in open sided houses, based upon the time of the year.

Be sure to have quality feed ingredients being used for flocks going into peak production to be sure that you have the required energy and protein levels. Birds going into peak are more susceptible to stress. Good quality ingredients are essential to give support to the birds, and for obtaining quality off-spring.

Some companies give peak feed at 65% while others do this at >80% daily production. It is important for each company to evaluate the body weight increases to peak to see if over feeding is happening. Giving at 65% maximum feed can work very well if body weight is controlled to peak and after peak.

The birds should be capable of sustaining peak production on 24 to 25 g of protein per day, 1000 mg of available lysine, and 900 mg of available methionine + cysteine. Variation in house temperature has an effect on the amount of feed that the birds require. House temperatures should ideally be held between 21°C (70°F) and 22°C (72°F). Feed allowances may need to be adjusted to suit temperatures outside this range.

The table below is an example on how feeding needs to be done from the start of production to peak production, giving the maximum feed amount at 75% daily production.

| Production % | Feed in g based on mash feed and at 21-22°C (70-72°F) house temperature | | | | Feed Increase | Increase Kcal/ day/♀ |
|---|---|---|---|---|---|---|
| | 2900 Kcal/kg | 2800 Kcal/kg | 2700 Kcal/kg | 2650 Kcal/kg | | |
| 5 | 111 | 115 | 119 | 122 | 3 | 322 |
| 15 | 114 | 118 | 122 | 125 | 3 | 330 |
| 25 | 117 | 121 | 125 | 128 | 3 | 339 |
| 35 | 123 | 127 | 132 | 134 | 6 | 356 |
| 45 | 130 | 135 | 140 | 143 | 8 | 378 |
| 55 | 140 | 145 | 150 | 153 | 10 | 406 |
| 65 | 150 | 155 | 161 | 164 | 10 | 434 |
| 75 | 157 | 163 | 169 | 172 | to Max. | 455 |

This table is an average of the conditions that we see worldwide and is based on mash feed and with a temperature range in the thermal neutral zone for the chickens (temperatures between 21°C and 22°C (70-72°F)). Observe:

1) That the feed amount at 5% daily production depends on the kcal level in the feed.
2) On average most companies worldwide work with an energy level close to 2800 kcal in production feed. For this reason the average feed amount at the start of production (5%) is around 115 g (25.3 lb/100) worldwide.
3) With 2800 kcal at an average of 45% daily production the average feed amount needs to be in the 135 g (29.7 lb/100) range and never in the 145 g (31.9 lb/100) range which would result in over feeding the females and being considerably overweight at peak production in most cases.
4) To avoid over feeding the females to peak production the feed increase is done every 3 days and never on a daily basis which would result in birds being overweight at peak production and beyond.
5) At higher house temperatures (tropical countries) the maximum feed amounts are lower and in the 435 to 445 kcal range.
6) In mountain areas where temperatures are lower, the kcal demand for good production can be higher than 470 kcal, especially in open-sided curtain houses.
7) As can be seen, there are many different conditions and it is impossible to express the energy needs in just a simple table. For that reason discuss maximum feed amounts with your Cobb technical representative.

Another way to feed from 5% to peak production is by using an MS Excel template and by using the feed increases in the table above, based upon the daily production. If interested, request this table from a Cobb technical representative. On the next page is an example with 115 g (25.3 lb/100) at 5% daily production and demonstrates how the feed increases are changed based upon production level.

## Feed per hen based upon % production

| Prod % | g of feed | Prod % | g of feed | Prod % | g of feed | Prod % | g of feed | Prod % | g of feed |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 115 | 21 | 118 | 37 | 127 | 53 | 135 | 69 | 155 |
| 6 | 115 | 22 | 118 | 38 | 127 | 54 | 135 | 70 | 155 |
| 7 | 115 | 23 | 118 | 39 | 127 | 55 | 145 | 71 | 155 |
| 8 | 115 | 24 | 118 | 40 | 127 | 56 | 145 | 72 | 155 |
| 9 | 115 | 25 | 121 | 41 | 127 | 57 | 145 | 73 | 155 |
| 10 | 115 | 26 | 121 | 42 | 127 | 58 | 145 | 74 | 155 |
| 11 | 115 | 27 | 121 | 43 | 127 | 59 | 145 | 75 | 163 |
| 12 | 115 | 28 | 121 | 44 | 127 | 60 | 145 | 76 | 163 |
| 13 | 115 | 29 | 121 | 45 | 135 | 61 | 145 | 77 | 163 |
| 14 | 115 | 30 | 121 | 46 | 135 | 62 | 145 | 78 | 163 |
| 15 | 118 | 31 | 121 | 47 | 135 | 63 | 145 | 79 | 163 |
| 16 | 118 | 32 | 121 | 48 | 135 | 64 | 145 | 80 | 163 |
| 17 | 118 | 33 | 121 | 49 | 135 | 65 | 155 | 81 | 163 |
| 18 | 118 | 34 | 121 | 50 | 135 | 66 | 155 | 82 | 163 |
| 19 | 118 | 35 | 127 | 51 | 135 | 67 | 155 | 83 | 163 |
| 20 | 118 | 36 | 127 | 52 | 135 | 68 | 155 | 84 | 163 |

**How to work with this table:**

1) Fill in the amount of feed that the flock is consuming at 5% daily production. The table will then automatically adjust the whole feeding program based on daily production until peak feed at 75% daily production.
2) The table indicates 163 g of maximum feed but if the feed amount given in peak is higher or lower for your operation, just plug your maximum feed amount in the cell behind 75%. Then the table is good to go.
3) Feed increases are done every 3 days.
4) 3 days after a feed increase look at the % daily production and what the table indicates to be the appropriate amount of feed.
5) That particular feed amount indicated by the table should be used for the following 3 days.
6) At 75% daily production the maximum feed amount is given.
7) Delaying maximum feed amount will not necessarily hurt peak production, but can affect the quality of the chicks in the first 4 to 6 hatches due to under feeding the females, with less nutrients being stored in the first hatching eggs. For this reason protein levels cannot be too low in the production phase-1 feed.

- Please consult your technical services representative for more information on peak feeding, feed reduction and related issues.
- To ensure consistent performance, avoid changes in feed formulation. Check the quality of each feed delivery and report any problems immediately. Samples of feed (1 to 2 kg) (2-4 lb), as fed should be retained on the farm to allow testing in the event of production problems. Samples must be stored in a cool, dark place.
- An accurate method of weighing feed is essential. Weighing systems must be checked weekly and should be calibrated on a regular basis.
- Calculate the feed amounts based on the actual number of birds, not the number of birds housed.
- The time taken by the flock to consume the whole feed allowance should normally be 2.5 to 3 hours in peak production with mash feed and 1.5 to 2 hours with pelleted or coarse crumbled feed. If the time taken to eat the feed changes suddenly, it may be an indication of a problem requiring immediate investigation.
- A pelleted feed in production is not recommended for Cobb breeders. Feed cleanup times will be so fast that proper feed distribution becomes a challenge and can affect hen performance. Hens become more nervous and scratching, opening up the thighs can become an issue also. If feed is pelleted, make a small crumble for the production period.
- It is strongly recommended that you use the Cobb nutritional specs that have been especially designed for the Cobb females and males.
- Second stage breeder feed containing lower essential fatty acids and higher calcium levels may be beneficial at around 40 weeks of age.
- A scratch feed or small pellet form may be beneficial to maintain fertility. It should be fed late in the afternoon at the maximum rate of 0.5kg (1 lb) per 100 birds and this amount can be deducted from the feed amount given in the morning.
- Prevent feed wastage. Check for worn feeder troughs and spillage at the return to the feeder bins. The feed level in the troughs should be set to one-third depth. Check slide gates daily for correct height. One option is to use chain feeders with deep corners that permit a higher feed level in the trough. The hopper inlet and outlet opening for the feed needs to be increased as well.
- Feeding can be run automatically without people being present, but the equipment needs to be in good shape with relatively few problems. Feed only when staff are present and in one continuous period if equipment is old and if problems with feed distribution are happening more often. The best remedy is to replace the old equipment. Do not split feed other than scratch feed. Continue to run the feeding system until the entire day's feed allowance has been distributed with the chain feeder. With pan feeders you may use the same concept based on how fast the birds eat the feed, which can be very quickly with the use of crumbles or pellets. Pan feeder systems work in general better with pelleted and/or crumbled feeds.
- Bulk bins should be emptied between feed types and at least once a month during production to maintain good feed quality.

## 9.3 REQUIRED BODY WEIGHT INCREASE FROM START TO PEAK PRODUCTION

This parameter is important to evaluate to ensure that the feeding program has been correct from start to peak production. Overfeeding or underfeeding will affect peak production or production persistency and for that reason this period should be micro managed.

The peak production is determined by the uniformity, the body weight and the feeding program in the rearing period. A good benchmark is to measure the weight gain of females from the onset of lay to the age at peak egg production. Onset of lay can be defined as the weekly weight taken between 0.5% and 3.0% average production. There should be a 16 to 18% increase in female bodyweight from this weighing to the flock weight at peak. For FF flocks think more along the lines of a 16% increase and for SF flocks more towards an 18% increase. Less than 16% weight gain may necessitate leaving peak feed amounts on the flock a bit longer. Weight gains of over 18% to 20% indicates that the hens are getting more nutrients than they need to sustain production, and feed reduction can begin immediately.

This rule of 16 to 18% body weight increase is used when the body weight of the females is between 2800 and 3100 g (6.2 and 6.8 lb) with a 0.5% to 3% average weekly production. If the production in the first week surpasses 3%, an average body weight can be calculated with the week before. If the flock starts production with a body weight lower than 2800 g (6.2 lb), the birds need more than 18% body weight increase to peak in order to have enough fat reserves to maintain production persistency. If the flock begins production with a body weight higher than 3100 g (6.8 lb) then the flock can perform well with a body weight increase lower than 18% simply because the females have already accumulated an adequate amount of fat reserves.

**Analysis of 3 flock situations:**

| | Flock 1 | | | Flock 2 | Flock 3 |
|---|---|---|---|---|---|
| **Age** | **BW increase of 18%** | **Feed (g) (lb)** | **Prod %** | **BW increase is not enough** | **BW increase is too high** |
| 24 | 2900 | 115 | 2 | 2900 | 2900 |
| 25 | 3000 (+100) | 118 | 20 | 2950 (+50) | 3100 (+200) |
| 26 | 3100 (+100) | 128 | 44 | 3010 (+60) | 3300 (+200) |
| 27 | 3200 (+100) | 140 | 65 | *Feed must be increased faster to give more kcal support* | *Excess feed has been given 2-3 wks earlier. Adjust in younger flocks* |
| 28 | 3300 (+100) | 152 | 79 | | |
| 29 | 3380 (+17%) | 160 | 86 | | |
| 30 | 3440 | 160 | 86 | | |
| 31 | 3480 | 159 | 86 | | |
| | *Normal flock behavior* | | | | |

As can be seen from the table above the most important data needed to follow flock performance is age, body weight, feed amount and % production in combination with the timing of the first light increase. The standards published are only a guide. A poultry technician can calculate from the start of production what the body weight should be at peak production and then add another 300 to 400 g (0.66 to 0.88 lb) to get the target final body weight of the females at 65 weeks of age. In this case the poultry technician could make the standard body weight for each flock for the production period if needed. Optimum weighing programs of females and males will obtain weekly weights until 35 weeks of age, and then every 2 weeks between 35 and 50 weeks of age, and then every 4 weeks until the end of the flock.

## 9.4 POST PEAK FEEDING/FEED REDUCTION

The hen carries some of the genes for excellent broiler performance that are seen in her progeny. The female can easily become overweight and overfleshed, causing problems with persistency of lay and fertility in the later stages of her life, and potentially resulting in increased floor eggs due to difficulty in accessing the nest boxes. Therefore, one must be careful in feeding the flock after peak production has been reached. Generally, peak production is defined as the point that the average production percent of the 5 most recent hen-days begins to decrease. At this time, reduction of the daily amount fed is important in order to keep the hens performing adequately.

There are 2 situations that one encounters in the field:

- **Over feeding** in peak, drop 5 g (1.1 lb/100 birds) in a 2 week period and then go slow with 1 g (0.22 lb/100)/week till 40 weeks of age, then go even slower (1 g (0.22 lb/100) every 2 to 3 weeks).
  – Total drop in feed = 10-15%.
- **Correct energy** feeding in peak, drop with 1 g (0.22 lb/100) per week after maintaining feed for 2 to 3 weeks at max level. Drop feed 1 g (0.22 lb/100)/week until 40 weeks and then go slower (1 g (0.22 lb/100) every 2 to 3 weeks).
  – Total drop in feed = 7 to 10% (but can go lower).

**Observation:** Flocks perform very well (87 to 91% peak production) these days and it is recommended to keep peak feed for 1 or 2 weeks longer, or for each 2% production above 87%, add 1 g (0.22 lb/100) of feed to help sustain the high production performance. Normally these flocks do not tend to become overweight because the females are converting feed into high egg mass output.

**CAUTION!**
**Several items should be considered when determining the schedule for feed withdrawal:**

Periodic handling of the hens, along with weighing, is necessary to determine subtle changes in body composition, condition and body reserves of the hens.

- **Egg Mass.** Egg mass is determined by multiplying the daily production in percentage, times the average weight of the eggs. (See Section 12, Egg Weighing). Even though the flock may be past peak production, the egg size may be increasing, and the hens will require the proper nutrients to sustain production.
- **Cleanup time.** A feed cleanup time from 1.5 (crumble) to 3 hours (mash) is considered normal. A flock that consumes the daily ration in less than that time may not be receiving the nutrients needed, and may be hungry. Feed withdrawal could adversely affect production in such a flock. On the other hand, if the birds are receiving too much feed, the feed consumption time could go past 3.5 to 4.0 hours. The birds could become overweight and uneven. More rapid withdrawal would be needed in this case. Extended clean up time can lead to selective eating, birds picking up coarse particles and leaving the fines in the pans or feed trough, consequently females will not only lose uniformity but also performance (egg numbers & female fertility).

**NOTE:** Many things can affect feed cleanup time, including:

1. Feed physical form (pellets/crumble/mash)
2. Feed raw materials
3. Hot/Cold and high temperature fluctuations
4. Watering system (nipples or open trough)
5. Feeding system and speed of feed delivery
6. Possible disease considerations

## 9.5 FEATHERING OF THE FEMALES DURING PRODUCTION

Having good feather quality and covering of the females in production is very important for maintaining production persistency and high fertility levels. Below you will find some of the main reasons why females would lose feather pack more quickly:

1. Females coming out of rearing with insufficient feathering due to management issues or having the protein (amino acid) specs too low for the pullet grower feed.
2. Not enough feeder space between 20 and 27 weeks of age when feed cleanup time is very fast.
3. Poor or uneven bird distribution throughout the house at feeding time. Overcrowding of females in part of the house normally close to hoppers, which could also results in some thigh damage.
4. Not enough condition (fat reserves) at the moment of light stimulation. Females can show more wear on the feathers as early as peak production.
5. To tight feed restriction grill (<45 mm) that affect the heavier females after 40 weeks of age. These females cannot eat properly anymore, drop out of production and often molt. The ears will swell up and should not be confused with swollen head syndrome or pneumovirus.
6. Over mating by the males without inducing higher mortality in the females.
7. Any feed passage, flushing or diarrhoea reducing the absorption of nutrients.
8. Chronic enteritis in the duodenum that cannot be seen with the eye.

# 10. MALE MANAGEMENT

The key to obtaining good hatchability from today's broiler breeders is to develop feeding and management programs that allow a correct development of the male's reproductive system while controlling their growth potential and capacity to deposit breast muscle.

The male growth profile is the single most important factor that correlates with flock fertility. Males should be weighed at least weekly from one to 30 weeks of age and at least every other week thereafter.

## 10.1 REARING

A good start in rearing males is crucial for weight uniformity as well as good organ and skeletal development, which are correlated with future male fertility. It is important that the males achieve body weight targets according to the standard. For best results, the males should be reared separately from the females until housing at around 20 weeks of age. In brown out or dark out houses, enough light intensity (minimum of 25 lux) and duration must be available to ensure that the proper amount of feed is consumed during the first 4-week period.

The body weight development in the first 8 to 12 weeks determines most of the frame size later in life. The heavier males will develop the largest frame size, so the male weights need to be kept very close to the standard body weight from 4 thru 16 weeks of age. One way to do this is to separate the heaviest males at 3 to 4 weeks of age, by visual grading, and then controlling the male body weight in the growing period and getting the males back on standard BW by 8 weeks of age.

8 week Standards Test – Handle all males and remove obvious males with visual (phenotypic) faults; i.e., crooked and bent toes, spinal abnormalities, eye and beak abnormalities.

| **Situations in the Field that give positive results** | | |
|---|---|---|
| Compact male with strict body weight control<br><br>Grill size 46 mm wide x 60 mm (1.81 x 2.36 in) in height<br><br>Result:<br>Good high persistent fertility | Larger male with good control of body weight in production<br><br>Grill size 46 mm wide x 60 mm (1.81 x 2.36 in) in height<br><br>Result:<br>Good high persistent fertility | Larger male and no good control of body weight in production<br><br>Use male feed with 12-13% protein to have "V" shaped breast muscle<br><br>Result:<br>Acceptable fertility with persistency |

Uniformity is more and more important with the conformation of males today, not only to have a uniform distribution of the female numbers per male in production, but also to control the size of the male. With slats in production, a compact male, close to the Cobb standard weight, will produce fewer leg problems and result in good overall fertility. With floor operations a somewhat larger male can be used as long as the breast muscle is not oversized, which can create stability and fertility problems.

After 16 weeks of age, stimulate the males constantly with feed to maintain body weight and testes development. Any severe stress or drop in body weight, or even stagnation of growth from 16 to 22 weeks of age, will result in underdeveloped and less uniform testes in the males and lower initial hatches. This can also result in low fertility throughout the production period.

When transferring from rearing to production houses consider the following:

- In controlled environment houses it is a good practice to transfer males to the production house 2 to 3 days earlier than the females. This will help train the males to their feeder system, resulting in less feed stealing and better body weight control.
- Select your males to leave at transfer a male/female ratio of 7% to 9% in closed houses, and 9% to 10% in open sided houses, depending on sexual synchronization, type of males being used and housing conditions. Select only healthy males with no obvious skeletal defects.
- Aim to keep the middleweight population by culling out underweight males but also extremely heavy ones. (The heavy ones would be ideal for spiking if needed).
- The recommendation is to have a mating ratio of 7.5% to 9% (with slatted houses, where males tend to be more territorial and can express some aggressiveness) to 10% (in floor operations) by 23 weeks. Culling of poorly conditioned, extremely big, or males with beak, skeletal or leg problems should be practiced regularly. The feed allocation of males in poor condition will be eaten by other males that will, in turn, get overweight.
- Aim to match heavier groups of males with heavier females and light males with light females. It is important to ensure a proper synchronization between male and female sexual maturity and a proper body weight differential. This helps with hen receptivity and mating efficiency.

**What does the difference in BW mean?**

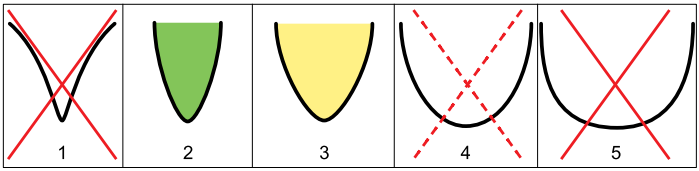
| Weeks | BW Females | BW Males | % Diff. | | % Fert. | % Hatch |
|---|---|---|---|---|---|---|
| 20 | 2250 | 2725 | 21% | | | |
| 25 | 3105 | 3485 | 12% | | 90% | 80% |
| 30 | 3570 | 3970 | 11% | | 96% | 88% |
| 40 | 3770 | 4240 | 12% | | 97% | 90% |
| 50 | 3915 | 4460 | 14% | | 96% | 89% |
| 60 | 4015 | 4685 | 17% | | 92% | 80% |

Over the last 10 years, the body weight of the males has come down considerably, enhancing fertility and hatchability levels. The table above is an example, at different ages, of what the ideal body weight differential should be between males and females. The table also includes estimates for fertility and hatchability rates when these values are achieved.

Having the primary males 11%-12% heavier than the females gives a lot of advantages like:

- Less mortality and culling due to leg, toe or bumblefeet problems.
- Fast and easier mating that will allow the females to maintain better feather cover on their backs.
- Females are more prone to permit mating, resulting in higher fertility rates.
- Easier to spike, then there is less body weight differential between the primary males and the spiking males.

**Fleshing Score in Cobb-Males**




Minimum fleshing needed in males
**(>95% with wing resistance)**
4 weeks fleshing 3-4
12 weeks fleshing 2
16 weeks fleshing 2-3
20 weeks fleshing 2.5-3
25-60 weeks fleshing 2.5-3

It is best to keep the males in production between a fleshing 2.5 and 3 and only at the end have some males with fleshing 4. Males with fleshing 2 should have good wing resistance. If they are not showing good wing resistance, the males are under conditioned and should receive more feed and obtain a fleshing #3. It is a good practice to combine weekly weighing with fleshing the males, and evaluate if the males are maintaining, losing or enhancing condition.

The left picture is a good example of what a fleshing score 2.5 to 3 looks like during the production period (the keel is still visible and this male is not overfleshed). The reddish lower part of the breast indicates a male with good libido and a very active mating pattern.
The picture on the right gives a good idea of how the color of the comb, wattles and around the eyes should look when a male is sexually active. This is one of the first signs we like to see when entering the hen house.

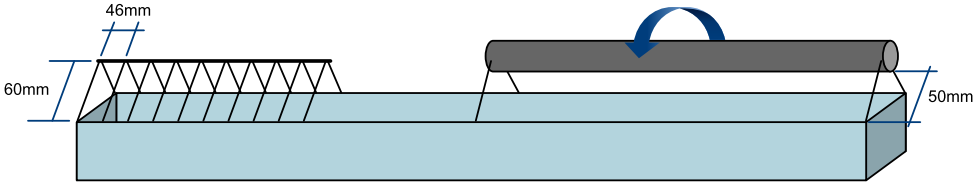
## 10.2 MALE FEEDING AND WEIGHT TRENDS DURING PRODUCTION

One challenge for the farm manager and the feeding system selected is to distribute a small amount of feed per male as uniformly as possible and keep all males with a uniform growth and activity level.

Use 20 cm (7.8 in) of feeder space with a track system, 8 males per round feeder and 10 males with an oval pan feeder. The height of the feeder system is important for all the males to eat comfortably. Normally apply a height that is close to the upper crop height of the males. A stick that is fixed to the male feeder line can help to drop, each day, the feeder line to the correct height so that all males can access the pan feeders without female interference. There are many other tools, such as switches that are activated when the feeder line drops, to keep the correct height for feeding the males.

It is highly recommended to use Separate Sex Feeding (SSF) in production. True SSF implies that males should not have access to the female feed and vice versa. A normal set up would include a male exclusion system placed on the female feeder (grill, roller bar, plank or wooden board) and a line of pans, trough or tube feeders for the males. The exclusion grill should create both a vertical (60 mm) (2.36 in) and horizontal (46 mm) (1.81 in) restriction (see Female Track Feeder on the following page). In systems with a plank or roller bar restriction the vertical restriction should be 50-55 mm (1.96 - 2.16 in).

**Different exclusion methods on a female track feeder.**
**A grill on the left and a roller bar on the right.**




It is equally important to keep the females from eating from the male feeder. Keep the male feeder at a height that makes the males stretch slightly to eat and prevents the females from reaching. A male feeder should always be stable and not be allowed to swing. The height needs to be frequently adjusted by observing feeding behavior at least once a week up to 30 weeks of age.

It is highly recommended not to dub males. A complete comb or one partially dubbed comb, helps restrict the males earlier in production. However, full exclusion does not start until the combs are completely developed (26-27 weeks of age). It is very important to take this into account.

Training is key to the success of Sex Separate Feeding. The males need to quickly identify and use their specific feeders. The best option is to have the same type of male feeder in rearing and production. Other options include:

- Use decoy feeders in the rearing house. For example, if the males are fed on a chain and they will be faced with pans in production, place a few pans in the rearing house and manually add some feed. The males will then learn to identify the pans as feeders.
- Transfer the males a few days earlier (2-5 days) so they are specifically trained to eat from their new feeders before the females arrive to the production house.
- Start the male feeders first.

For the males, it is best to give small feed increases (3 to 4 g/week or 0.66 to 0.88 lb/100/week) from transfer (20 weeks of age) to adult weight (30 weeks). The key is to monitor weights weekly and adjust feed accordingly. It is possible that feed has to remain constant for some weeks while stealing from the female feeder takes place. If the male is fed too much after transfer, the result will be continued male body weight growth producing heavier males that will need more energy for body weight maintenance and could be strongly over weight by 50 weeks of age.

The adult male (35-50 wks of age) can be kept very active and in good condition with 370-380 Kcal/male day and 17-18 g crude protein/male/day (With crumbled feed calculate about 5 g (1.1 lb/100) less feed than with mash feed). Males that are active sexually will not easily become overweight.

After 30 weeks feed allocations should be modified according to weight trends. Ideally small amounts of feed should be given by 28-30 weeks to allow slight body weight increases throughout the production period to maintain the proper weight gains and keep the males stimulated and active (1-2 g/week or 0.22-0.44lb/100/week every 3-4 weeks). This feed increase is particularly important in slat operations, especially after 40 weeks of age.

Ensure that good positive growth takes place during the first 4 weeks after light stimulation, when testis development takes place.

The Cobb standard for male body weights is designed to keep the male light early in production (not more than 4 kg (8.8 lb) at 30 weeks) and have a consistent positive growth of a maximum of 25 g (0.06 lb) per week from 30 weeks to depletion (approx. 4.7 kg (10.3 lb) at 60 weeks).

Field data shows that the worst hatching flocks are those with males that:

- Grow too much to 30 weeks (4400 g) (9.7 lb) and not enough afterwards due to insufficient feed. In many of these flocks part of the males will be losing condition.
- Grow too much to 30 weeks of age and then continue to climb too much towards 5.0 kg (11 lb) at 50 weeks of age.
- Grow normal to 30 weeks of age and then do not receive enough feed resulting in many males losing condition and comb and wattle color.

- Males should never lose weight in production. **A SLIGHT LOSS IN BODY WEIGHT WILL RESULT IN AN IMMEDIATE REDUCTION IN SPERM QUALITY.**
- Males should not weigh more than 4.7 kg (10.3 lbs) or mating efficiency starts to go down, as they are not able to complete their mating's. As males get too heavy they become more unbalanced and more inefficient mating is the result.
- Evaluating male breast shape by hand is a good way of estimating body condition. Aim to keep a V-shaped breast for as long as possible. The breast muscle and skin should be tight in consistency.
- Separate sex feeding (SSF) allows the use of special male rations. Male diets are widely used in the industry, and this is supported by research and field results that confirm that these male diets improved fertility. With lowering protein levels down to 12-13% with a 2700 kcal energy level and 0.42% available lysine, the males body weight and breast muscle growth is controlled but enough energy is given to the males to maintain activity and high fertility rates. With specific male rations it is even more important that the SSF system prevents the females from eating out of the male feeder.
- When not spiking, the value of the existing primary males increases considerably because no replacements will be used. During the production period consider weekly cullings in order to remove problem males that are not able to mate. This will maintain good quality primary males in the house or pens. The best results are being achieved when these selections are done at 25, 35, 45 and 55 weeks of age. Males that are obvious culls (injured birds with locomotion problems, etc.) should be eliminated daily.

## 10.3 SPIKING

Spiking is the addition of young broiler breeder males into an older flock to compensate for the decline in fertility that usually occurs after 45 weeks of age. As far as the primary males are concerned this can be due to a decline in mating interest (natural post 35-40 weeks of age), a reduction in sperm quality (natural post 55 weeks), lower mating efficiency (poor management leading to males in poor physical condition such as weight, leg and foot disorders, etc.), and excess male mortality resulting in a reduced male to female ratio.
Important criteria:

- Extra males are moved to a separate house/farm at transfer and held until moved to a number of older flocks. Alternatively, the males are moved to another flock and held in a pen until used to spike that flock.
- Spike a minimum of 20% additional males to an existing flock. Providing that the primary males have previously been culled down to between 6.5 - 7%. This program is to prevent excessive male ratio and aggressive male behavior.
- Spiked males should be of good quality and free of physical defects. Males must be at least 25 weeks of age with a minimum weight of 4.0 kg (8.8 lb) and sexually mature.

- Regularly cull poor primary males to have only good quality primary males in the flock and get to the ideal male to female ratio. Spiking males are then added to increase the ratio to the original levels without need for massive culling.
- When an early addition of males is done (30 to 32 weeks of age) there is the opportunity to start with less males (6 to 7% at 21 to 22 weeks of age) and to add extra males as needed over time, to increase the numbers to 8.5 to 10% (based on local housing conditions and male “aggressive” behavior). This will improve female receptivity and mixing of the sexes.
- A slight feed increase just after spiking (2 to 3 g/bird/day) (0.44-0.66 lbs/100) could be beneficial since spiking significantly increases male’s mating activity (for at least 4 weeks the older primary males will be mating like a 30-week old male).
- Better results are obtained if spiking is done prior to 40 weeks. Have a program in place. Do not wait for fertility to decline.
- Spiking once in the life of the flock is normally enough. Flocks spiked twice on a 8 to 10 week interval also show good results, but it depends a lot on the quality of the primary males.
- Spiking is usually not economical beyond 55 weeks of age.

**How to spike:**

**Option 1** - Add to each house a minimum of 20% new young males that are at least 25 weeks of age, with around a 4.0 kg (8.8 lb) body weight.

**Option 2** - Take out of one house, or compartment, all the good primary males and interspike with the other houses/compartments on the farm. The house with no males will receive the spiking males. This procedure will induce no competition between primary and spiked males and is a very effective way to preserve and utilize the spiking males to their full extent (recommended method).

**Option 3** - A third program relates to the use of the heavier males in a young PS flock. The heavier males are pulled out of the flock at 26 weeks of age. They know where to eat and drink and how to mate. Placing these males in a flock with primary males or in a house where primary males have been pulled out normally works very well. This program is in particular popular in farms that have 100% floor operation, and where a higher % of males can be kept to 26 weeks of age (10%-11%) without getting into aggressive male behavior.

**Expected Results:**

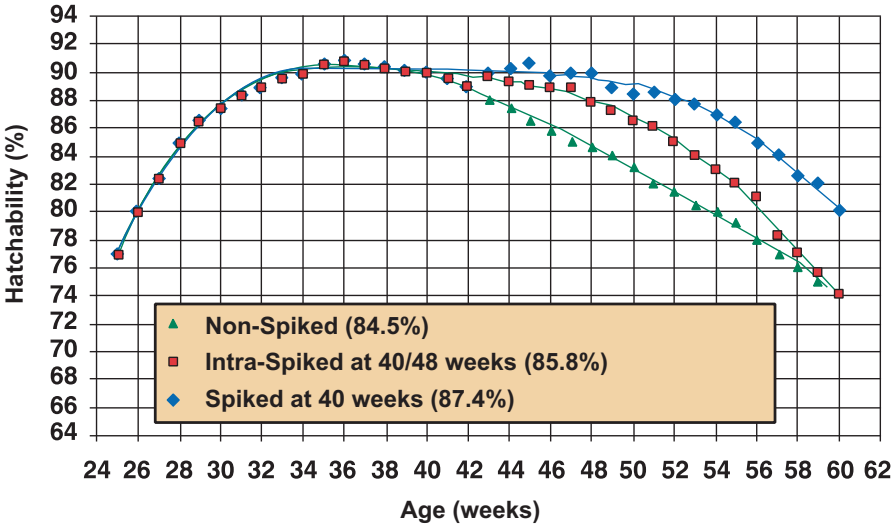
- Peak fertility response is reached approximately 2-3 weeks post-spiking. Generally, spiking results in a 2-3% increase in overall hatchability.
- Spiking stimulates mating activity significantly in the primary males. This stimulation lasts about 6 to 8 weeks.
- Male aggression and mating interference usually increase for 2 weeks after introducing young males. Male mortality can increase slightly but not dramatically if the males were ready to compete when added.
- Spiking does not solve pre-existing problems (overweight primary males, poor mixing, etc.)
- There is the danger of not taking proper care of primary males, which are the most important ones.
- To keep males in reserve in good condition is difficult. The longer they are without females post 23 weeks, the worse their condition normally is. Make sure that the male pen is stocked lightly (3 males/m² (3.5 ft²/male)), and has plenty of drinkers, feeders and hiding places.
- Keeping the full amount of started males with the young hen flock until spiking happens can create severe female receptivity problems, as the flock will have too many males just when the mating activity is highest. You have to know what is possible under your local conditions.
- Biosecurity risk is the main reason some choose not to spike.

## Spiking the Biosecure Way

- Males should come from a single source flock.
- The source flock should be serologically tested, 5 to 7 days before moving.
- Test for Mycoplasma and other diseases as appropriate: AI, TRT and environmental Salmonella. Also check for external parasites (worms, mites…) and any overt signs of disease (fowl cholera).
- Any positive or suspect results should put the move on hold.
- Plan the time and pathway of the move to minimize contact with other poultry. Use an enclosed vehicle when possible.

## 10.4 INTRA-SPIKING

- Intra-spiking simply means exchanging 25-30% of primary males between houses from the same farm, without importing any young males, to create a similar stimulus to mating activity as the one created by spiking.
- Like spiking, intra-spiking gives better results when done earlier in life (<45 weeks). Intra-spikings at 40 and 48 weeks of age can produce even better results.
- Mating activity increases significantly after intra-spiking. The effects may last between 6 and 8 weeks. One advantage is that with intra-spiking the males exchanged are already trained in mating and usually have similar weight and maturity as the existing males, improving their chances to compete successfully.
- Intra-spiking increases male aggression for two weeks after mixing. There are usually no problems with male or female mortality.
- Hatchability does not go up dramatically after intra-spiking. However, the persistency of hatchability is improved and with a double intra-spiking procedure one can expect an increase between 1 and 1.5% in the overall hatchability of the flock.
- Intra-spiking is inexpensive, easy-to-practice and, most importantly, rarely presents a biosecurity risk.




**Intra-Spiking**
Possible hatch trends based on non-spiked flocks, spiked at 40 weeks, or Intra-spiked at 40 & 48 weeks of age. (Shows the cumulative hatchability to 60 weeks of age in each case).

# 11. RECORDS

Keeping complete and accurate records is an essential part of managing Cobb parent stock. For example, feeding during production is based on the rate-of-lay, egg weight and body weight of the flock. These records must be accurate and up to date in order to make correct management decisions and to achieve good production.

Everyday management decisions are based on the following list of key records.

**REARING**

**Daily**
Total mortality
Culls
Feed
Temperature
Water consumption
Feed clean-up time

**Weekly**
Body weight
Uniformity

**PRODUCTION**

**Daily**
Total mortality
Culls
Feed
Temperature
Water consumption
Feed clean-up time
Total egg number
Egg weight
Hatching egg number
Floor eggs
Fertility

**Weekly**
Body weight
Uniformity

Please contact your Cobb Technical Service Representative for copies of charts to assist in collecting and keeping data.

# 12. EGG WEIGHING

There are considerable advantages in weighing a sample of eggs each day to establish the trend in egg weight. The analysis of this trend is a useful guide to flock performance and will give an early indication of problems.

The egg weight shown in the table should be expected from normal parent flocks where our recommendations for body weight, feed levels and feed specifications have been followed.

Weigh at least 90 eggs immediately after the second egg collection, which usually occurs around mid-morning. Make sure to exclude double-yolks, misshapen, very small and cracked eggs. Daily egg weights, when plotted on a graph, will give an indication of potential problems that should be investigated immediately.

**Underweight eggs**

- Underfeeding
- Low levels of energy or protein feeds
- Inadequate water supply
- Disease
- Extreme house temperatures
- Underweight birds
- High production performance

**Overweight eggs**

- Overfeeding
- High levels of energy or protein feeds
- Overweight birds
- Low production performance

Egg size is partly determined by the body weight of the females at photostimulation, the development between 21 and 25 weeks of age, and the extent to which females become overweight after peak production. Delayed lighting will give larger eggs initially and throughout the life of the flock. Try to maintain an average egg weight below 70 g (2.47 ounces) as long as possible. Eggs over 70 g (2.47 ounces) tend to hatch worse and can affect the average hatchability of the flock considerably. This is likely the reason for a more rapid decline in hatch after 50 weeks of age.

Please refer to the Breeder Management Supplement for each products egg weight standard (Cobb 500, Cobb-Avian 48 and Cobb 700).

# 13. EGG HANDLING

## 13.1 EGG COLLECTION

Maximum hatchability and chick quality can only be achieved when the egg is held under optimum conditions between laying and setting in the incubator. Remember that a fertile egg contains many living cells (40,000-50,000). Once laid, its hatching potential can at best be maintained, not improved. If mishandled, hatching potential will quickly deteriorate.

- Manual nests should be kept well maintained with clean shavings. Any droppings, broken eggs and any soiled material must be removed promptly from the nests and replaced with clean fresh nest material. In the early stages the females will tend to scratch the shavings out, but they will soon lose the habit if the nests are not being overfilled.
- Frequent walking through the point of lay flock is a good management technique to minimize floor eggs.
- Walking the flock will disturb birds that are looking for nesting sites on the litter or in the corners of the house and encourage them to use the nest boxes.
- Collect eggs at least four times daily and during peak production periods six collections are recommended.
- Egg temperatures within the nest, particularly during hot weather, may be similar to those in an incubator. Therefore eggs must be regularly collected and cooled down to storage temperatures to prevent pre-incubation and embryo development. This will reduce the number of early dead germs and improve hatchability.
- Egg collection from mechanical nests should be timed to avoid the risk of pre incubation. Most of the time, the morning is used to gather most of the hatching eggs, and the afternoon is spent handling house and bird management, as well as repairs/maintenance.
- Use of floor eggs depresses hatchability and is a hygiene risk. Under no circumstances put floor eggs into the nest boxes. They should be collected and packed separately from nest eggs and clearly identified. If floor eggs are to be incubated, it is recommended that they be set and hatched in separate machines.
- Wash hands before and after each egg collection, and before and after handling floor eggs.
- Prevent hair line cracks by handling eggs carefully at all times. Eggs should be collected in plastic or fiber trays. Egg trays should be stacked and carried 3 tiers high. Do not use baskets or buckets as they result in more eggs becoming cracked and contaminated.
- Eggs collected using mechanical belt systems must not be allowed to pile up on the collection tables. Operate the system at a speed that allows the egg collectors to work comfortably.
- In manual nests, when you are picking up eggs many times throughout the day, close the lower nests before the last round of egg collection and leave the upper nests open. At the last collection, close the upper nest and this will help maintain cleaner nest conditions. With the automatic community nest, open the nests 1 hour before the lights come on and close the nest 1 hour before the lights go off.

## 13.2 EGG GRADING

Egg grading should be carried out with care to prevent damage to hatching eggs.
Remove and discard eggs unsuitable for hatching. These are:

- Dirty as defined by company policy
- Cracked
- Small - depending on hatchery policy
- Very large or double yolk
- Poor shells
- Grossly misshapen

Rejected eggs should be stored well away from hatching eggs.

It is essential to place hatching eggs carefully into the setter or transport tray with the small (pointed) end facing down.

The egg handling room must be kept clean and tidy.

Nest pads in automatic nests should be kept clean especially with older flocks. It is a good practice to clean the nest pads at 40 weeks of age. It is very important that individual and community nests be closed at night so that birds will not sleep in the nest and dirty the nest pads.

Maintain good vermin control in the egg store. The egg handling room is the first stage of egg cooling and it is an advantage to keep it cool – cooler than the laying house, but warmer than the egg store.

## 13.3 EGG HYGIENE

Eggs that are picked up clean from the nest or belt have all the potential to produce good quality chicks, especially coming from a community nest system. Under certain conditions, it may be beneficial to sanitize hatching eggs. Formaldehyde or paraformaldehyde are the most commonly used products, however, there are alternative products such as peracetic acid. Avoid wetting the hatching eggs by liquid sanitizers. Only under low humidity conditions will this procedure be an acceptable tool to reduce contamination.

No product will be effective unless the correct chemical concentration, temperature and humidity are maintained. Remember that dirty eggs will reduce the effectiveness of the sanitation more quickly than clean eggs.

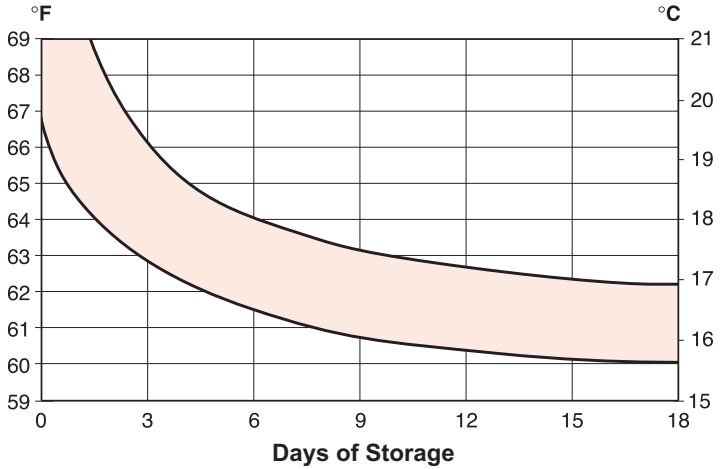
## 13.4 EGG STORAGE

Eggs should be allowed to cool down gradually to the farm egg store temperature (refer to the following Optimum Temperature Range for Egg Storage chart) before putting them into the egg store. Store the eggs in a separate room that can be maintained at all times according to the chart. A Relative Humidity of 75% should be maintained at all times.
For long-term egg storage, refer to Cobb Hatchery Management Guide.

Keep a record of the maximum and minimum temperatures and the relative humidity in the egg store. Read the thermometers three times a day, in the morning, mid-day and in the evening, at the same times every day and write down the data on a chart.

Condensation will form when cold eggs are taken into a warmer high humidity environment. This is often overlooked when eggs are being transported from the farm to the hatchery and can be prevented by using temperature controlled egg vehicles to transport eggs from farm to hatchery.

**Optimum Temperature Range for Egg Storage**




## Key Points on Egg Storage

Eggs should be collected from the farms and transported to the hatchery at least twice a week. There are three storage areas: farm egg room, transport, and hatchery egg room. It is important to match the conditions in each of these situations as closely as possible to avoid sharp changes in temperature and humidity, which can lead to condensation (sweating) on eggs, or eggs becoming chilled or over-heated. Recent research shows that the eggs should be gradually cooled from the point of lay to the hatchery egg storage room, which should be the coolest point for the egg. From that point, the eggs should be warmed to incubation temperature by pre warming before setting in the incubator. These temperature changes should happen in a steady pattern down from lay to the coolest point, then in a steady pattern up from the egg storage to the incubator. **Temperature fluctuations during egg storage time will cause a higher early embryonic mortality and poorer quality chicks.**

# 14. BIOSECURITY ON THE FARM

Good biosecurity must encompass all the operations carried out by a caretaker of breeding stock. Procedures to prevent the introduction and spread of disease or contamination must be put in place for feed production, farm operations, hatchery, general maintenance and personnel. A breakdown in any single area will endanger the whole biosecurity program.

The following paragraphs outline the biosecurity measures that must be implemented at farm level.

- All personnel must understand the importance of following the biosecurity program.
- Choose an isolated site when developing new parent farm facilities.
- Farms should contain flocks of a single age. As a general rule, the distance between flocks of different ages should be no less than 600m (2000 ft). When single age placement is not possible, and caretakers must enter flocks of different ages, always work in the youngest birds first.
- Each farm must have a perimeter fence to prevent unauthorized entry of people, vehicles and animals. Only essential personnel should enter the farm.
- All houses must have concrete floors.
- Feed delivery vehicles should not enter the farm, but should fill feed bins from outside the perimeter fence. Any vehicle that must enter the farm must be washed and disinfected at the gate and inside of the cabin needs to be fogged with a disinfectant.
- All farm workers and any other personnel who need to enter the farm must shower and change into a clean uniform and farm boots. Since shower facilities can be a biosecurity risk, it is important that they are kept clean and disinfected and are designed with a separation between “clean” and “dirty” zones.
- Boots, uniforms and work clothing should be color coded to help control personnel movement within the farm or age groups.
- No other poultry, livestock or domestic pets of any kind should be allowed on parent farms.
- All buildings must be vermin and wild bird proof.
- A vermin control program should be practiced at all times. It is important to maintain a clean, rubbish free environment. Rotate brands of bait regularly to prevent vermin developing resistance. Any spilled feed should be cleaned up immediately. (Please see section 14.8).
- It is recommended that dead birds be disposed of by incinerating the carcasses on farm.
- Keep a record of all visitors.

## 14.1 BREEDER FARM DISINFECTION SCHEDULE

- All removable equipment and fittings should be taken out of the building and soaked in clean water in a tank or pit. After a thorough soaking they should be cleaned with a pressure washer. Once all dirt has been removed, they should be soaked in a disinfectant solution at the correct dilution as recommended by the manufacturer. Use an officially approved disinfectant.
- After equipment removal, brush or blow off dust.
- Remove the litter from the site in covered transport.
- Pressure-wash the surfaces of the house with detergent, paying particular attention to air inlets, fan shafts and concrete floors.
- Use the pressure washer on the outside of the fan shafts and air inlets. It is advisable to wash off the dust that accumulates on the roof and in the gutters.
- At the end of each flock, bag off any surplus feed in the bulk bins and remove from the site. The bins should then be thoroughly cleaned out and fumigated by the most appropriate method, according to the age and design of the bins. Ensure that the feed bins are completely dry before refilling.
- When the interior is clean, add disinfectant to the water and pressure wash the entire house. Again, it is advisable to disinfect the areas of the roof surrounding the fan shafts and the gutters.
- Drain the entire water system of the house and flush pipes out several times to remove any debris that might block valves. Finally, flush the whole system out with a sanitizing solution. Make sure that any trace of disinfectant is removed as it can impair the future use of live vaccines.
- When the floor is dry, spray the floor and the sidewalls with an approved disinfectant. It is advisable to spray an area of 6 m (20 ft) around the house with the disinfectant solution.
- When the house interior is dry, put in the litter and set up the equipment. Then close and warm the house to 21°C (70°F) and fumigate/fog with formaldehyde gas (see details on fumigation shown on pages 60-61). This procedure should be carried out at least 48 hours before restocking.
- After 24 hours, neutralize the gas and then open the house inlets and fully ventilate.
- Include the egg room, feed store and changing room in the cleaning and disinfecting procedures.
- In some cases it may be necessary to treat the house with an insecticide. Follow the manufacturer's instructions and introduce the application into the disinfection schedule as recommended.

**Remember**

- Hygiene is your insurance policy.
- No disinfectant is sufficient in itself. All waste matter must be removed before applying the disinfectant.
- It is impossible to sterilize a house but it is possible to reduce the number of pathogens to an insignificant level.
- Maintain a rigorous vermin control policy.
- Keep the doors shut at all times to prevent re-introduction of vermin and other contaminants.

**Disinfection: Step by Step**

- Empty house of all poultry
- Clean out all organic matter and remove to far off site
- Remove all portable equipment for cleaning and disinfecting outside building
- Wash down all the inside surfaces with heavy-duty detergent, under pressure if possible
- Apply disinfectant with guaranteed activity against viruses and bacteria that can infect poultry
- Use an insecticide and rodenticide where these vectors of diseases are present
- Fumigate with formaldehyde – active material
- Replace equipment, put down litter and preferably fumigate again before house is re-stocked

## 14.2 FUMIGATION

Formaldehyde has been used for many years as an effective fumigant. The environment during fumigation is critical to its efficiency, and these are the points to follow:

1. Increase relative humidity to 70-80%.
2. Heat house to 21°C (70°F) as formaldehyde gas has a high temperature coefficient.
3. Wash down all surfaces or place pans of water in the house, so increasing the relative humidity and gaining maximum benefit from both the gaseous actions of formaldehyde and its condensation into a polymerized form.
4. The house should be sealed and left to cool for 24 hours after fumigation, thus promoting uniform condensation.

## 14.3 FUMIGATION METHODS

**Formalin and potassium permanganate**

This method produces a violent chemical reaction that generates considerable heat and releases formaldehyde gas. Use 1 liter formalin per 25m³ (40 fl oz / 1000 ft³) in the ratio of three parts formalin to two parts of potassium permanganate. Because of the violent chemical reaction, never use more than 1.2 liters (2 pints) of formalin in any one container. The container should have deep sides (at least 3 times the depth of the chemicals, with a diameter equal to the height) to prevent the mixture bubbling over. The formalin must be placed on concrete or metal, and not on shavings or any other inflammable material.

In practice, first calculate the cubic capacity of the house, e.g. 55 m x 10 m x 3.1 m = 1705 m³ (60,210 ft³)

This would require

- 68.2 liters (2400 fl oz or 120 pints) of formalin
- 60 containers
- 45.36 kg (100 lb) of potassium permanganate

Place 760 g (27 oz) of potassium permanganate into each container, preferably with two operators for safety. Start at the far end of the house placing as quickly as possible 1.2 liters (2 pints) of formalin into each container. Operators should wear a respirator throughout the entire procedure.

**Heating Solid Paraformaldehyde**

This is probably the most convenient method of producing formaldehyde gas. Paraformaldehyde prills are heated to a temperature of 218°C (425°F); generally 1 kg of prills will be sufficient for 300m³ (1 lb of prills for 5000 ft³). If the heating device is fitted with a time switch, this system can be fully automatic. Always follow the manufacturer's instructions.

**Formalin Vapor**

A mixture of equal parts of water and formalin dispersed as an aerosol is a very efficient method. Use 28 ml of formalin per 25 m³ mixed with 28 ml of water, or 5 fl oz of formalin per 1000 ft³ mixed with 5 fl oz of water. This should be generated as an aerosol using the necessary equipment. In each house it may be necessary to use more than one generator or employ some system of removing the generator and refilling. There are several companies providing such a service to the poultry industry.

**PRECAUTIONS – Formalin solution and formaldehyde gas both represent a hazard to human and animal life. Operators must be provided with and wear suitable protective clothing, respirators, eye shields and gloves and should be aware of current legislation affecting these products.**

## 14.4 SALMONELLA AND MYCOPLASMA CONTROLS

All Cobb breeding stock is derived from flocks that have consistently tested negative for M. gallisepticum, M. synoviae, S. gallinarum, S. pullorum, S. enteritidis, S. thyphimurium. To maintain negative status, the following rules are important:

- All houses must have concrete floors to ensure effective cleaning and disinfection.
- Only farm personnel should have regular access to the flocks. Farm personnel should only visit stock for which they are responsible and should not visit any other poultry outside of the farm, including any poultry show, fair or exhibition.
- All personnel should shower and change clothes between visits to different units within a farm. If a flock is found suspect or positive, that flock should be put under strict quarantine, and visited last. A different set of footwear must be worn in each house.
- A complete set of clean protective clothing and boots must be provided for flock supervisors and visitors.
- A wash hand basin, soap or sanitizer with paper towels, and disinfectant foot dip and brush for cleaning footwear must be provided at the entrance to each house.
- Keep all houses locked to prevent unauthorized entry.
- Since it is possible for humans to transmit some species of Salmonella to poultry, any person with an upset stomach should report this immediately to management before starting to work with poultry or poultry feed.

## 14.5 VACCINATION

The main purpose of a vaccination program is to prevent losses from a specific disease. The usual method is to provide immunity by exposure with a disease agent of less pathogenicity than the field strains of the disease. The scheduling of a vaccination program should be such that it allows any possible reaction to occur at an age in the flock's life that will cause the least economic loss. Vaccination is a necessary stress placed on the birds, therefore pay particular attention to these flocks to help reduce this stress.

It is not practical to recommend a specific vaccination program for poultry in all areas of the world. Consult your local poultry veterinarian for a program that meets the disease challenge and vaccine availability in your geographical area.

- Only vaccinate healthy birds.
- Minimize stress following vaccination by careful flock management.
- Read the label and follow the manufacturers' instructions for vaccine reconstitution, dilution and administration.
- Vaccine refrigerator should be located in clean and secure area.
- Do not use out-dated vaccines.
- Keep vaccines refrigerated at the manufacturers recommended temperature, avoiding heat and exposure to direct sunlight.
- Use the full dosage and do not dilute the vaccines.
- Do not save opened bottles for use at a later date.

- All used and open vaccine containers should be disposed of in a correct manner following each vaccination to prevent accidental spread of the virus.
- Shake the vaccine well prior to administration and regularly during the operation.
- Change needles every 500 doses to ensure that needles are kept sharp.
- One member of the vaccinating team should be responsible for supervising the procedure to check that the vaccine is administered correctly. Any birds that do not receive the full dose should be revaccinated.
- The number of doses administered at the end of the day should be checked against the number of doses taken to the farm.
- One qualified person should be responsible for cleaning and sterilizing the equipment at the end of each day's vaccinating.
- To determine the quality of the vaccine administration, the flock should be monitored post vaccination for neck sores, twisted heads and mortality or leg damage depending on the site of administration.
- Consider the use of inguinal vaccinations of bacterins and killed vaccines, especially in very full vaccination programs, to avoid the breast muscle of the birds and reduce stress. Inguinal vaccinations have also shown that the titers are higher and the CV lower due to a more efficient application of the vaccines.
- Monitor the health and antibody status of the flock on a routine basis.

## 14.6 MEDICATION

Prevention is by far the most economical and best method of disease control. Prevention is best achieved by the implementation of an effective biosecurity program, including appropriate vaccination. Diseases do, however, overcome these precautions and when they do, it is important to obtain qualified advice as quickly as possible.

Drugs and antibiotics are not only expensive, but they can confuse the characteristics of a disease, preventing the correct diagnosis. The use of the correct medication and the timing of treatment can be crucial in combating a disease problem.

The preferred choice of a drug or antibiotic for some diseases may be harmful if used for the treatment of others. For certain diseases there may not be an effective treatment or it may not be economically feasible to treat. Therefore, always submit 6 to 8 birds showing typical symptoms to a laboratory, so that sensitivity tests can be conducted to identify medication that will be effective against the disease agent involved.

## 14.7 WATER

Water should be kept clean, cool and free from pathogens. The total dissolved solids in the water should not exceed 3,000 ppm. It is recommended that calcium and magnesium salts (hardness) should be less than 20 ppm and salinity less than 1,000 ppm.

Chlorination may be used to sanitize a water supply. It helps to control bacteria and also helps to prevent slime and algae build-up in water lines. A chlorine level of 3-5 ppm is recommended at the drinker level. Water analysis, at three month intervals, is good practice to determine the need for treatment.

## 14.8 RODENT CONTROL

Rodents are known to spread diseases to humans and animals. They can be vectors for salmonella, cholera, and numerous other infectious agents. Additionally, they can damage insulation, curtains, hoses, and electrical wire, as well as inflict mortality and injury to poultry. Rodents may come in through almost any opening—holes in walls, openings around pipes, cracks in doors, etc. Mice can squeeze through spaces as small as 20 mm (about ¾ in) and rats can squeeze through a space as small as 35 mm (about 1 ½ in). If the head of the rodent gets through a hole the body will get through that hole.

An effective rodent control program involves several measures that restrict shelter, food and water. Actions that need to be taken are as follows:

- Minimize hiding places, by removing all the rubbish from around the buildings.
- All vegetation needs to be kept trimmed.
- Make the entrance to the buildings as rodent proof as possible.
- Dispose of dead birds properly and promptly.
- Keep feed spillage to a minimum. Clean up feed spills immediately.
- Keep feed storage areas clean and store feed properly. Keep feed bags on pallets off the floor.
- Maintain permanent bait stations with a fresh supply of rodenticides on a year round basis.
- Rotate the use of different baits on a regular program.
- Use traps where it is practical.
- Consider the installation of a rodent barrier of metal sheet around the houses or around the units to keep rodents from getting close to the houses.

# 15. GENERAL INFORMATION

| | | |
|---|---|---|
| 1 mm | = | 0.0394 in |
| 1 cm | = | 10 mm = 0.3937 in |
| 1 m | = | 100 cm = 1.0936 yd = 3.2808 ft |
| 1 km | = | 1000 m = 0.6215 miles |
| 1 in | = | 2.54 cm |
| 1 ft | = | 30.48 cm |
| 1 yd | = | 0.9144 m |
| 1 mile | = | 1.609 km |
| 1 g | = | 0.002205 lb = 0.0353 oz |
| 1 kg | = | 2.2046 lb |
| 1 ton | = | 1000 kg = 0.9842 long tons (British) = 1.1023 short tons (USA) |
| 1 long ton | = | 2240 lb = 0.9072 ton = 907.185 kg |
| 1 short ton | = | 2000 lb = 1.016 ton = 1016.05 kg |
| 1 oz | = | 28.35 g |
| 1 lb | = | 0.4536 kg = 453.5924 g |
| 1 $cm^2$ | = | 0.155 $in^2$ |
| 1 $m^2$ | = | 1.196 $yd^2$ |
| | = | 10.7639 $ft^2$ |
| 1 $in^2$ | = | 6.4516 $cm^2$ |
| 1 $ft^2$ | = | 0.0929 $m^2$ |
| 1 $yd^2$ | = | 0.8363 $m^2$ |
| 1 liter | = | 0.22 Imp gal |
| | = | 0.2624 US gal |
| 1 pt (Imp) | = | 0.5682 liter |
| 1 pt (USA) | = | 0.4732 liter |
| 1 qt (Imp) | = | 1.1365 liter |
| 1 qt (USA) | = | 0.9463 liter |
| 1 gal (Imp) | = | 4.54596 liter |
| 1 gal (USA) | = | 3.7853 liter |
| 1 $m^3$/kg/h | = | 16.016 $ft^3$/lb/h |
| 1 $ft^3$/lb/h | = | 0.0624 $m^3$/kg/h |
| 1 $m^3$/h | = | 0.5886 cfm |
| 1 m/sec | = | 196.85 ft/min |
| 1 kcal | = | 3.97 BTU |
| 1000 kcal | = | 4.184 MJ |
| 1 kcal/$m^3$ | = | 0.1123 BTU/$ft^3$ |
| 1 kcal/kg | = | 1.8 BTU/lb |
| 1 ft candle | = | 10 lux |

| | | |
|---|---|---|
| 3.5 birds/$m^2$ | = | 3.08 $ft^2$/bird |
| 4.0 birds/$m^2$ | = | 2.69 $ft^2$/bird |
| 4.5 birds/$m^2$ | = | 2.41 $ft^2$/bird |
| 5.0 birds/$m^2$ | = | 2.15 $ft^2$/bird |
| 5.5 birds/$m^2$ | = | 1.96 $ft^2$/bird |
| 6.0 birds/$m^2$ | = | 1.82 $ft^2$/bird |
| 6.5 birds/$m^2$ | = | 1.67 $ft^2$/bird |
| 7.0 birds/$m^2$ | = | 1.54 $ft^2$/bird |
| 7.5 birds/$m^2$ | = | 1.43 $ft^2$/bird |
| 8.0 birds/$m^2$ | = | 1.35 $ft^2$/bird |
| 8.5 birds/$m^2$ | = | 1.27 $ft^2$/bird |
| 9.0 birds/$m^2$ | = | 1.20 $ft^2$/bird |
| 9.5 birds/$m^2$ | = | 1.13 $ft^2$/bird |
| 10.0 birds/$m^2$ | = | 1.08 $ft^2$/bird |
| 10.5 birds/$m^2$ | = | 1.02 $ft^2$/bird |
| 11.0 birds/$m^2$ | = | 0.98 $ft^2$/bird |
| 11.5 birds/$m^2$ | = | 0.94 $ft^2$/bird |
| 12.0 birds/$m^2$ | = | 0.90 $ft^2$/bird |
| 12.5 birds/$m^2$ | = | 0.86 $ft^2$/bird |
| 13.0 birds/$m^2$ | = | 0.83 $ft^2$/bird |
| 13.5 birds/$m^2$ | = | 0.80 $ft^2$/bird |
| 14.0 birds/$m^2$ | = | 0.77 $ft^2$/bird |
| 14.5 birds/$m^2$ | = | 0.74 $ft^2$/bird |
| 15.0 birds/$m^2$ | = | 0.71 $ft^2$/bird |
| 15.5 birds/$m^2$ | = | 0.69 $ft^2$/bird |
| 16.0 birds/$m^2$ | = | 0.67 $ft^2$/bird |
| 16.5 birds/$m^2$ | = | 0.65 $ft^2$/bird |
| 17.0 birds/$m^2$ | = | 0.63 $ft^2$/bird |
| 17.5 birds/$m^2$ | = | 0.61 $ft^2$/bird |
| 18.0 birds/$m^2$ | = | 0.60 $ft^2$/bird |
| 18.5 birds/$m^2$ | = | 0.58 $ft^2$/bird |
| 19.0 birds/$m^2$ | = | 0.57 $ft^2$/bird |
| 19.5 birds/$m^2$ | = | 0.55 $ft^2$/bird |
| 20.0 birds/$m^2$ | = | 0.54 $ft^2$/bird |
| 20.5 birds/$m^2$ | = | 0.52 $ft^2$/bird |
| 21.0 birds/$m^2$ | = | 0.51 $ft^2$/bird |
| 21.5 birds/$m^2$ | = | 0.50 $ft^2$/bird |
| 22.0 birds/$m^2$ | = | 0.49 $ft^2$/bird |

| Temperature | |
|---|---|
| °C | °F |
| 35 | 95.00 |
| 34 | 93.20 |
| 33 | 91.40 |
| 32 | 89.60 |
| 31 | 87.80 |
| 30 | 86.00 |
| 29 | 84.20 |
| 28 | 82.40 |
| 27 | 80.60 |
| 26 | 78.80 |
| 25 | 77.00 |
| 24 | 75.20 |
| 23 | 73.40 |
| 22 | 71.60 |
| 21 | 69.80 |
| 20 | 68.00 |
| 19 | 66.20 |
| 18 | 64.40 |
| 17 | 62.60 |
| 16 | 60.80 |
| 15 | 59.00 |
| 14 | 57.20 |
| 13 | 55.40 |
| 12 | 53.60 |
| 11 | 51.80 |
| 10 | 50.00 |
| 9 | 48.20 |
| 8 | 46.40 |
| 7 | 44.60 |
| 6 | 42.80 |
| 5 | 41.00 |
| 4 | 39.20 |
| 3 | 37.40 |
| 2 | 35.60 |
| 1 | 33.80 |
| 0 | 32.00 |
| -1 | 30.20 |
| -2 | 28.40 |
| -3 | 26.60 |
| -4 | 24.80 |
| -5 | 23.00 |

| Days / Weeks conversion chart | | | |
|---|---|---|---|
| Days | Weeks | Days | Weeks |
| 0 | 0 | 231 | 33 |
| 7 | 1 | 238 | 34 |
| 14 | 2 | 245 | 35 |
| 21 | 3 | 252 | 36 |
| 28 | 4 | 259 | 37 |
| 35 | 5 | 266 | 38 |
| 42 | 6 | 273 | 39 |
| 49 | 7 | 280 | 40 |
| 56 | 8 | 287 | 41 |
| 63 | 9 | 294 | 42 |
| 70 | 10 | 301 | 43 |
| 77 | 11 | 308 | 44 |
| 84 | 12 | 315 | 45 |
| 91 | 13 | 322 | 46 |
| 98 | 14 | 329 | 47 |
| 105 | 15 | 336 | 48 |
| 112 | 16 | 343 | 49 |
| 119 | 17 | 350 | 50 |
| 126 | 18 | 357 | 51 |
| 133 | 19 | 364 | 52 |
| 140 | 20 | 371 | 53 |
| 147 | 21 | 378 | 54 |
| 154 | 22 | 385 | 55 |
| 161 | 23 | 392 | 56 |
| 168 | 24 | 399 | 57 |
| 175 | 25 | 406 | 58 |
| 182 | 26 | 413 | 59 |
| 189 | 27 | 420 | 60 |
| 196 | 28 | 427 | 61 |
| 203 | 29 | 434 | 62 |
| 210 | 30 | 441 | 63 |
| 217 | 31 | 448 | 64 |
| 224 | 32 | | |

# 16. BREEDING FARM CONTACTS

| | Name | Telephone Number |
|---|---|---|
| Breeder flock manager | | |
| Feed Mill | | |
| Hatchery manager | | |
| Veterinary service | | |
| Equipment supplier | | |
| Electricity services | | |
| Gas services | | |
| Water services | | |
| Cobb representative | | |
| | | |
| | | |
| | | |
| | | |
| | | |

# 17. NOTES

NOTES

**cobb-vantress.com**

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