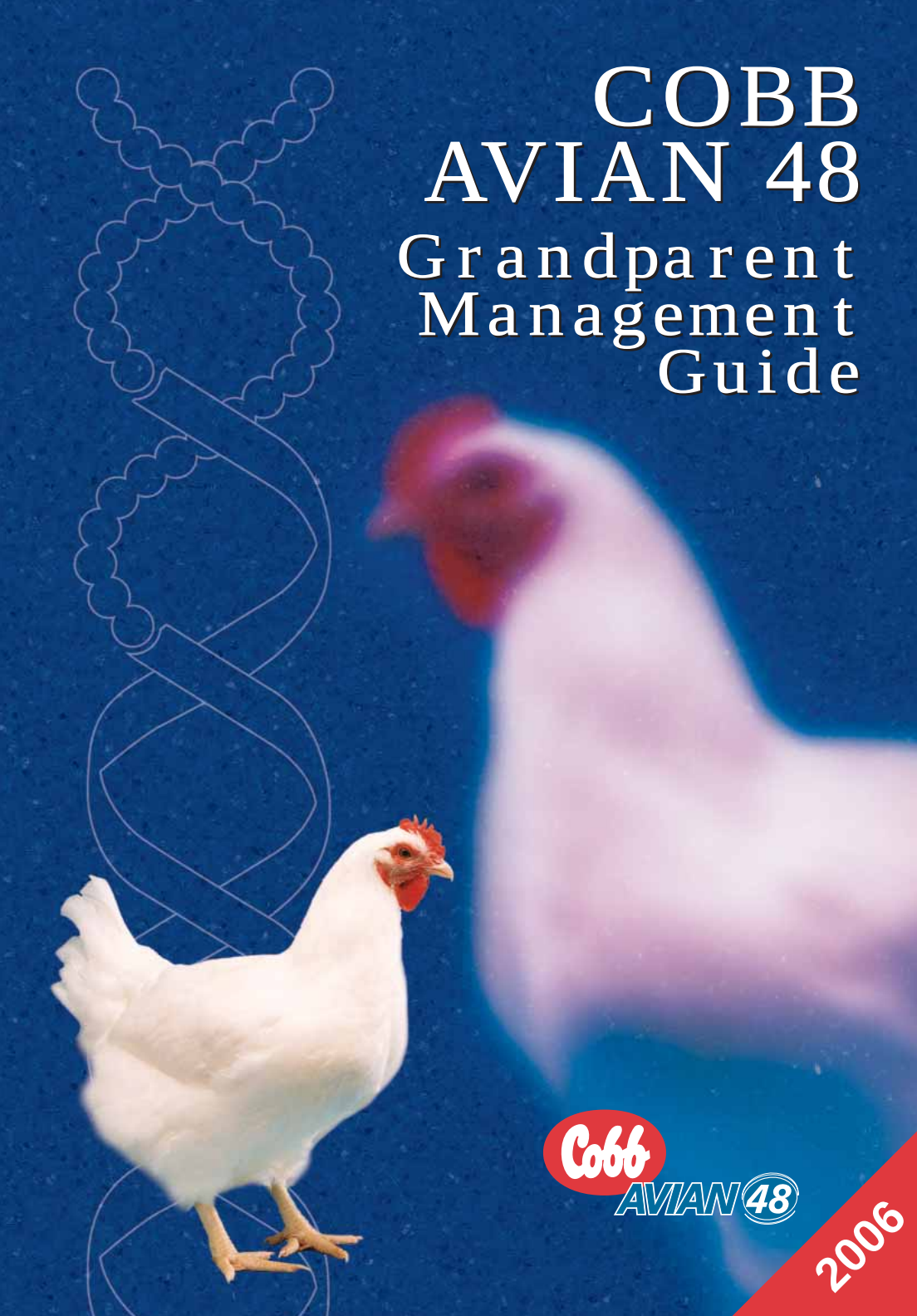
COBB AVIAN 48

Grandparent Management Guide



2006

Cobb Avian 48 Grandparent Management Guide

Introduction

The Cobb commitment to genetic improvement of the Cobb Avian 48 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 Avian 48 broiler breeder worldwide has provided considerable experience of the breed in a wide range of situations: hot and cold climates, controlled environment and open housing. This Cobb Avian 48 Grandparent Management Guide is designed to assist you in building your management program.

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, and our technical teams will assist with this.

The Cobb Avian 48 Grandparent Management guide highlights critical factors that are most likely to influence flock performance and is part of our technical information service, which includes 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 around the world. You should be aware of local legislation, which may influence the management practice that you choose to adopt.

The Cobb Avian 48 Grandparent 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 Avian 48.

Revised 2006

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Contents

1. Chick Management

1.1 Preparing for Chick Arrival

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

- The brooding farm must be a single age farm. Isolate the brooding farm from older birds. Brood chicks on an all-in, all-out program. Have a good brooder house security program. The stockman should work only on the brooding farm.
- The rearing facilities must be clean and pathogen free 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.
- It is advised that you have trained and experienced people who know the local customs regulations and the necessary documentation procedures required, ensuring clearance from customs as quickly as possible.
- It is essential that transport for chicks from the airport be carried out in clean, sanitized, properly ventilated, temperature controlled chick vans. Every effort must be made to co-ordinate transportation schedules so that upon arrival, day old chicks are cleared through customs and transported to the GPS farm and placed under brooders as soon as possible.
- Grandparent farms must be secure. The poultry house doors must be kept closed and vehicles entering the farm must first carry out approved wheel-cleaning procedures. Only authorized visitors and personnel should enter the premises (after showering) and they must wear clean protective uniforms provided on the farm.

1.2 Planning for Chick Placement

Take time to plan stocking rates to suit environmental or local climactic conditions, and remember that males will be significantly heavier than the females at selection. Extra floor space is needed for the males to ensure the best potential from the stock.

- Assignment numbers may vary at each intake. Before laying out a site for a placement of day-old chicks, be sure that you have received confirmation of chick numbers.
- 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 that all residues of formaldehyde are removed before the chicks arrive. Formaldehyde gas can inhibit early growth rate and create immediate uniformity problems.
- Start pre-heating the buildings 24 to 36 hours before the chicks arrive, depending on climactic 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.
- Provide 2 supplementary drinkers for every 100 chicks and position them near to the feed.
- Feeding equipment should not be placed directly under or too close to the brooders, and feed should be distributed as near to the chicks' arrival as possible.
- Provide one feeder tray for every 75 chicks at day old. Ensure that supplementary feed remains fresh; do not allow chicks to consume contaminated feed.
- Brooder surround guards (cardboard or metal) should be no more than 460 mm (18 in) high. The maximum stocking density for chicks in a surrounded brooding area should be 30 chicks/m_ (0.36 ft_/bird).
- Where possible construct pens so that chicks from supply flocks of the same age can be reared together. This will improve subsequent flock uniformity.
- Provide brooding light so that the chicks remain close to heat source.

Never grow different lines together in the same pen.

1.3 Chick Placement

- Fresh feed and water must be made available to chicks on arrival in the rearing house.
- Brooders and heaters must be checked regularly to ensure that they are working correctly.
- Supplementary drinkers are recommended for the first 2 to 3 days. Use mini drinkers or chick founts, not open trays. This will help to avoid problems with foot infections. Do not place drinkers directly under brooders.
- All chick boxes should be unloaded into the house with the appropriate number of boxes adjacent to each brooder for even chick distribution. Do not stack full boxes inside the house or place full boxes inside the brooding area.

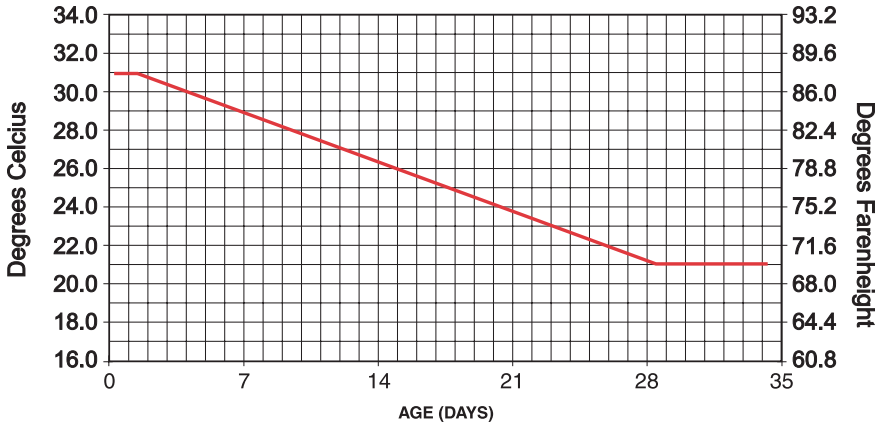
If chicks are grouping at the sides of the brooding area: (See diagram on page 3.)

- Check that the temperatures are not too high.
- Check that the temperatures are not too low.
- Check that they are not being attracted to brighter light or noise.
- Check for draughts.

Make necessary improvements and disperse the chicks.

1.4 Brooding Methods

Brooding temperature profile for Cobb Avian 48 grandparent breeders



Place no more than 500 chicks per individual brooder or as recommended by brooder manufacturer.

Brooders should be operating for at least 24 hours before the chicks arrive, maintaining a temperature at chick level of 29°C -32°C (84°F - 90°F) at the edge of the brooder for the day-old.

House temperature should be reduced until it reaches between 21°C (70°F) and 22°C (72°F) at 28 days of age, subject to bird behavior. Observe the chicks and adjust the temperature for their comfort, but be careful not to over-heat. The diagrams on page 6 illustrate how to interpret chick behavior.

Thereafter maximum and minimum house temperatures should be 24°C (75°F) and 19°C (66°F).

The brooding area should be gradually increased from day 3 to assist in temperature reduction and provide more space.

1.5 Lighting

Lighting should be continuous for the first 48 hours following chick placement. The light intensity should be at the achievable maximum, or at least 60 lux (6.0 Ft. Candles), to ensure that the chicks find feed and water.

All GP rearing houses should be light proof. For details of the lighting program refer to pages 28-31.

1.6 Beak Trimming

Beak trimming is not usually necessary for Cobb Avian 48 grand parents kept in fully controlled lighting. Beak trimming may be necessary to control aggressive pecking in open sided houses or situations in which light intensity cannot be controlled.

If required, precision beak trimming should take place for the females between 7 to 10 days. Do not beak trim the males until after selection, typically between 35 and 42 days of age. Increase the feed level in the feeders for 2 to 3 days after trimming to reduce stress and maintain uniformity.

Females

Remove approximately one third of the upper and lower beaks using the hot blade method. When properly trimmed the upper beak will be slightly longer than the lower beak.

Check the pullets' beaks closely at 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 further trimmed or culled.

Males

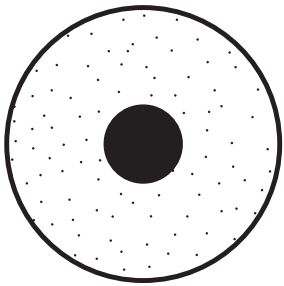
It is essential that male beak trimming, undertaken post-selection (between 35 and 42 days of age), be carried out with precision to maintain uniformity and maximize fertility. To reduce the variation between birds one qualified person should do the work.

Remove only the keratinized tip of the beak.

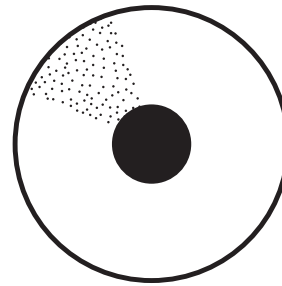
Check the males' beaks closely at 18 weeks of age and re-trim or cull any birds that show beak over-growth or any beak deformity.

Beak trimming males also reduces the risk of damage to females during mating in the hen house.

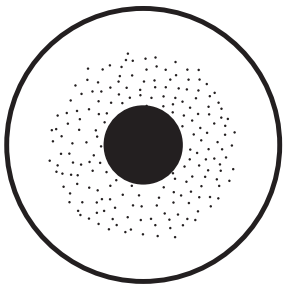
Chick Surrounds



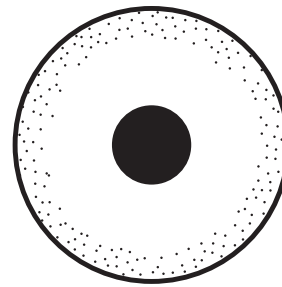
Just right - *Constantly cheeping chicks evenly spread*



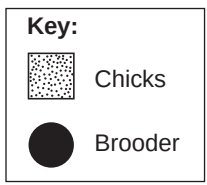
Too draughty - *Noisy chicks huddled together away from draught*

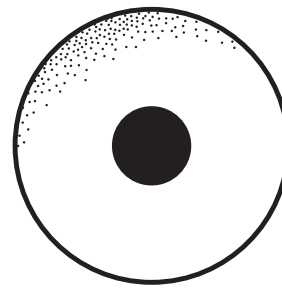


Too cold - *Noisy chicks huddled under brooder*



Too hot or too cold - *Drowsy chicks spread around perimeter*





Influence of bright light, draft or noise

2. Selection

The purpose of grandparent male selection is to improve the growth rate, feed conversion, liveability and meat yield of the broiler generation while also choosing birds which have good feathering, are free of ascites and have straight backs, legs and toes. Male and female line males are fed for maximum growth so that those with the best broiler characteristics can be selected and used for breeding.

Grandparent males are grown as broiler chickens until they reach selection age (see appropriate sections concerning nutrition and lighting). Selection should take place when the birds reach a bodyweight that is appropriate for the local broiler market. This is typically between 35 and 42 days of age.

Grandparent females are not selected, but it is important to remove any obvious culls, sexing errors, small birds, cripples or birds with any other kind of deformity. As a guide approximately 5% of the females are normally removed during the first weeks of rearing.

2.1 Male Selection Procedures

1. Calculate the number of males to be selected. For Female Line males keep the best 25% and for Male Line males keep the best 12.5%. These proportions are calculated to provide the appropriate mating ratios at point-of-lay.
2. Weigh a sample (minimum 100 birds) of the males and record their individual weights on a Selection Worksheet.
3. List the individual weights in descending order. The minimum selection weight for the Female Line males falls at the lowest weight in the top 27% of the sample, and the minimum selection weight for the Male Line males falls at the lowest weight in the top 12% of the sample. 2% points have been added to the selection pressures to allow the removal of birds with any kind of defect or disease.

For example: Male Line males – select 10.5% + 2% for defects = 12.5% of the sample

Count down the list of individual bodyweight from the heaviest bird, noting the weight of the twelfth bird on the list. The weight of the twelfth bird is the minimum selection weight.

4. Assemble 2 pens, 1 for selected males, 1 for males 20g-40g below male minimum selection weight. These birds will be used at the end of the selection if the required number of birds cannot be found at, or above the selection weight.
5. Weigh each bird individually. Every bird that is at or above the selection weight must then be evaluated by hand to ensure that it is in good condition, well fleshed, healthy and free from defects. These defects should include but are not limited to defects including poor fleshing, poor feathering, colored feathers, crooked beaks, crooked backs, crooked legs or toes, poor walking ability, crooked keels, breast blisters, green or black legs and dermatitis of the skin or foot pads.
6. Examine the legs of each bird at or above the selection weight. The birds' legs should be held at the hock joint so that the hock can move freely. Hold the legs at the natural width for the frame size of each individual animal. Holding the legs either too far apart or too close together will make them appear crooked. Select only birds that have straight legs and toes. Birds with leg defects will not be able to mate effectively. Other leg defects that are unacceptable include discolored shanks, feathers on the shanks or toes, and short shanks. Do not select birds that show any of these defects.

7. Examine the breast of every bird that is free of leg defects. The birds must be well fleshed with a straight keel. Breast defects that are unacceptable include breast blisters and protruding keel bones.

Summary table of chicks placed, selection percentages, and resulting Point of Lays.

Line Descriptions	Line Code	No. at day old	Mortality % Culls	Birds After Selection	% Rearing Mortality	Point of lay
Female Line Females	B	1,000		100%	10.0%	900
Female Line Males	O	442	10%	25%	10.0%	90
Male Line Females	R	380		100%	15.0%	323
Male Line Males	G	380	10%	12.5%	20.0%	34
Totals		2,202				1,347

*POL reflects the numbers of birds at 24 weeks. Male ratios at POL for both female and male lines should be approximately 10%, but can be more based on local experience.

2.2 Selection of Females and Males at 19 to 22 Weeks of Age

Females

Remove obvious culls and sexing errors.

Males

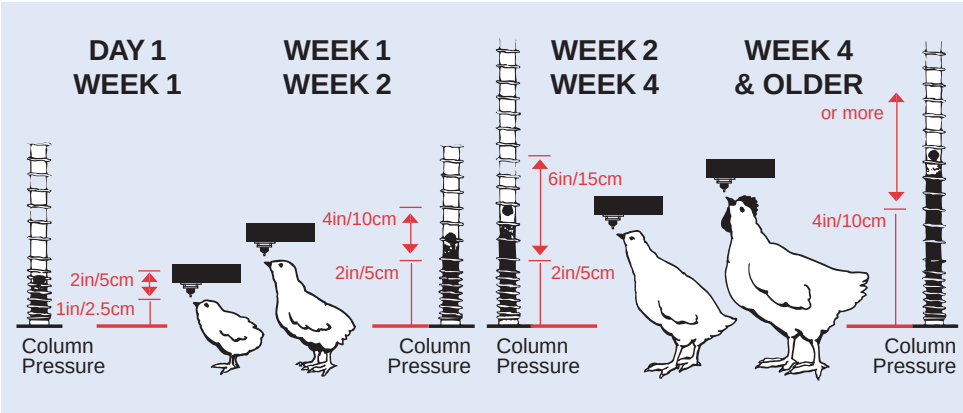
Handle every male and select the best males for mating. Maintain a mating ratio of 10% males/females. Selected males will have the following characteristics:

- Good conformation and fleshing
- Strong straight legs
- Clean foot pads without any visible lesions
- Clean and tidy feathering
- Active and mobile
- Free from any deformities

3. 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 walk more than 3m (9.8 ft.) for a drink.
- Supplementary drinkers should be provided at the rate of 2 per 100 chicks 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 manufacture 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.
- 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 spoiling of litter.

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 1.6 – 2.0 times their feed intake on a daily basis. This applies to both *ad libitum* and control fed flocks. Water consumption of more than 2.0 times the feed can occur in excessively high temperatures (above 30°C or 86°F). High consumption may also indicate errors in the feed formulation or leaking drinker systems. These errors must be investigated before restricting water availability, which should never normally be practiced.

Example Water Consumption Calculation: At 60g of feed a day per bird, water consumption is approximately 1.8 x 60 = 108 g. As 1 kg water = 1 litre, 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.birds. As 1 gallon of water = 8.33 pounds, this is 2.86 gallons of water per 100 birds.

4. Feed Management

4.1 Rearing Period

Grandparent males are fed ad-libitum until they reach selection weight, at approximately 35 days of age, whereas grandparent females are fed using a conventional controlled feeding program. Recommended feed nutrient densities for both programs are given on page 20-22.

- Provide one feeder tray per 75 chicks at day old. Ensure that supplementary feed remains fresh; do not allow the birds to consume contaminated feed.
- For males, during the ad lib feeding period allow 40 mm (1.5 in) of trough space or 45 birds per pan. During the rearing period while on controlled feeding, a minimum trough space of 150 mm (6 in) per bird must be provided for both males and females. If pans are used allow for 8 birds per pan (4.5 in per bird).
- Feed must be distributed to all birds throughout the house in less than 3 minutes.
- Feed increases every week should be based on bodyweight targets.

4.2 Alternative Feeding Methods

Birds should be fed every day; however, there are situations in which it may be necessary to adopt alternative feeding programs.

Skip-A-Day Feeding

This program uses the same feed amounts as the growers' feeding program. From 21 to 28 days, however, until the birds are a maximum of 140 days of age, feed two days' mash or crumbs as one feed on one day with no feed or a scratch feed on the next day and so on.

Example: week 8 - 9 (female line programs)

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
Sunday	No feed/Scratch feed

Female daily feed allowance
= 53 g/bird/day

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
Sunday	No feed/Scratch feed

Female daily feed allowance
= 11.68 lbs/100/birds

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 within 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.

Example: week 8 - 9 (female line programs)

Female daily feed allowance = 53 g

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

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

The program should start at 28 days and finish by 140 days.

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

The program should start at 28 days and finish by 140 days.

5. Bodyweight Targets and Feeding Guide - Day Old to 30 Weeks of Age

5.1 Cobb Avian 48 Slow Feather Female Line Grandparents - Females

Age		Body Weight		Body Weight Gain	Feed Feed amounts are only a guide		Feed Type
days	weeks	g	lb	%	g	lb per 100	
	0-1				ad lib ad lib to max 40 g/bird/day (8.8 lb/100 birds/day)		Starter- 19.0% C.P.
7	1-2	125	0.28				
14	2-3	250	0.55	100			
21	3-4	400	0.88	60	43	9.5	1300 kcal/lb
28	4-5	550	1.21	38	45	9.9	2860 kcal/kg
35	5-6	660	1.45	20	47	10.4	11.97 MJ/kg
42	6-7	750	1.65	14	48	10.6	
49	7-8	840	1.85	12	50	11.0	Feeding Pattern For advice concerning everyday feeding, skip-a-day feeding and alternative programs refer to pages 9-10.
56	8-9	930	2.05	11	51	11.2	
63	9-10	1025	2.26	10	53	11.7	
70	10-11	1115	2.46	9	54	11.9	
77	11-12	1215	2.68	9	55	12.1	
84	12-13	1315	2.90	8	62*	13.7	
91	13-14	1415	3.12	8	65	14.3	Grower- 15.0% C.P
98	14-15	1530	3.37	8	69	15.2	
105	15-16	1645	3.62	8	74	16.3	1250 kcal/lb
112	16-17	1760	3.88	7	78	17.2	2750 kcal/kg
119	17-18	1880	4.14	7	81	17.8	11.51 MJ/kg
126	18-19	2010	4.43	7	88	19.4	Pre-breeder- 16.0% C.P
133	19-20	2140	4.71	6	98	21.6	1300 kcal/lb
140	20-21	2270	5.00	6	105	23.1	2860 kcal/kg
147	21-22	2405	5.30	6			11.97 MJ/kg
154	22-23	2540	5.59	6			
161**	23-24	2805	6.18	10			
168	24-25	2945	6.49	5			Breeder 1- 16.0% C.P
175	25-26	3085	6.80	5			
182	26-27	3245	7.15				1300 kcal/lb
189	27-28	3405	7.50				2860 kcal/kg
196	28-29	3450	7.60				11.97 MJ/kg
203	29-30	3495	7.70				
210	30-31	3540	7.80				

The feed amounts given above are only a guide. Actual feed allowances will depend on bodyweight, feed specification and local climate.
Breeder 2 may be given week 40 onwards but do not change until you have discussed it with your Cobb technical advisor.
For advice on feeding contact your Cobb technical services representative.

*From 11 to 12 weeks of age a one time stronger feed increase is given to avoid the Avian female from dropping below the BW target. This increase could be done earlier and depends also on the vaccination program (stress condition).

**At 23 weeks of age the BW is taken in the afternoon, between 1300 and 1600 hours. For this reason a large weekly BW increase is noted. If BW's are taken in the afternoon (after feeding) at an earlier age the BW standard needs to be adjusted upwards with +140 grams.

5.2 Avian FLM Body Weights in Rearing

Recommended Body Weights* and Weekly Gain All Season and Dark out Housing			
Age in Weeks	**BW Grams At 1st day 40 grams**	**Weekly Gain Grams**	**BW Lbs**
1	160	120	0.35
2*	486	326	1.07
3	953	467	2.10
4	1497	544	3.29
5	2087	590	4.59
39-42 days	**2390 g average BW after selection	303	5.26
7		****30	
8	**Recalculate after selection the new body weight standard curve by adding every week the indicated BW increase shown in this table**	35	
9		40	
10		40	
11		45	
12		50	
13		55	
14		60	
15		65	
16		70	
17		75	
18		80	
19		85	
20		90	
21		95	
22	3405	100	7.48
23* **	**3685**	**280**	8.10
24	3785	100	8.32

*Vaccinating against coccidiosis in the hatchery or in the first week could slow down the growth rate in the 2nd or 3rd week.

**The average BW of the female line males (FLM) before selection should be 2270 grams (5 lbs). After selection the average BW of the selected birds is around 120 grams higher. If the BW of the broilers for the country is below 2.0 kg and no export of PS is permitted or possible, the selection BW of the males can be reduced. The target BW of the selected males after selection should then be around 2.0-2.1 kg.

As of selection (5th week) the BW standard for the males needs to be projected till transfer (21-22 weeks of age normally). Males should grow on the minimum weekly BW increase as indicated in the above table so that testicular development is not impaired. Higher growth rates can be used based on local experience. If the average BW of the males is around 2.0-2.1 kg before selection the BW increase can be larger and good experience has been obtained with 80 grams average increase per week. Split the males in 2 groups after selection when the uniformity drops below 80% in order to maintain proper development. This is the best way to guarantee quality males at housing and maximum fertility rates.

***Indicates afternoon weights taken between 1400 and 1600 hrs.

****Minimum weekly BW increase to maintain uniformity each week after selection.

5.3 Cobb Avian 48 Male Line Grandparents -Females

Age		Body Weight		Body Weight Gain	Feed Feed amounts are only a guide		Feed Type
days	weeks	g	lb	%	g	lb per 100	
	0-1				ad lib		Starter - 19.0% C.P. 1300 kcal/lb 2860 kcal/kg 11.97 MJ/kg
7	1-2	140	0.31	-	ad lib to max 40 g/bird/day (8.8 lb/100 birds/day)		
14	2-3	302	0.67	116			
21	3-4	451	0.99	49	40	8.92	
28	4-5	585	1.29	30	45	9.81	
35	5-6	706	1.56	21	47	10.46	
42	6-7	818	1.80	16	49	10.88	
49	7-8	922	2.03	13	51	11.26	Feeding Pattern For advice concerning everyday feeding, skip-a-day feeding and alternative programs refer to pages 9-10. Grower - 15.0% C.P. 1250 kcal/lb 2750 kcal/kg 11.51 MJ/kg
56	8-9	1021	2.25	11	53	11.62	
63	9-10	1117	2.46	9	54	11.99	
70	10-11	1212	2.67	9	56	12.35	
77	11-12	1308	2.88	8	58	12.72	
84	12-13	1406	3.10	7	59	13.10	
91	13-14	1507	3.32	7	61	13.51	
98	14-15	1613	3.56	7	63	13.96	
105	15-16	1724	3.80	7	66	14.51	
112	16-17	1842	4.06	7	69	15.12	
119	17-18	1967	4.34	7	74	16.30	
126	18-19	2099	4.63	7	78	17.29	Pre-breeder - 16.0% C.P. 1300 kcal/lb 2860 kcal/kg 11.97 MJ/kg
133	19-20	2239	4.94	7	89	19.59	
140	20-21	2387	5.26	7	98	21.62	
147	21-22	2542	5.60	7			
154	22-23	2705	5.96	6	See Section 13.2 on page 38 for further recommendations on feeding.		Breeder 1 - 16.0% C.P. 1300 kcal/lb 2860 kcal/kg 11.97 MJ/kg
161	23-24	2874	6.34	6			
168	24-25	3050	6.72	6			
175	25-26	3230	7.12	6			
182	26-27	3430	7.56				
189	27-28	3580	7.89				
196	28-29	3700	8.16				
203	29-30	3760	8.29				
210	30-31	3820	8.42				

The feed amounts given above are only a guide. Actual feed allowances will depend on bodyweight, feed specification and local climate.
Breeder 2 may be given week 40 onwards but do not change until you have discussed it with your Cobb technical advisor.
For advice on feeding contact your Cobb technical services representative.

5.4 Avian MLM Body Weights in Rearing

Recommended Body Weights* and Weekly Gain All Season and Dark out Housing			
Age in Weeks	**BW Grams At 1st day 40 grams**	**Weekly Gain Grams**	**BW Lbs**
1	160	120	0.35
2*	486	326	1.07
3	975	489	2.14
4	1542	567	3.39
5	2177	635	4.79
39-42 days	**2420 g average BW after selection	245	5.33
7		****30	
8	**Recalculate after selection the new body weight standard curve by adding every week the indicated BW increase shown in this table**	35	
9		40	
10		40	
11		45	
12		50	
13		55	
14		60	
15		65	
16		70	
17		75	
18		80	
19		85	
20		90	
21		95	
22	3435	100	7.55
23* **	**3735**	**300**	8.21
24	3835	100	8.43

*Vaccinating against coccidiosis in the hatchery or in the first week could slow down the growth rate in the 2nd or 3rd week.

**The average BW of the male line males (MLM) before selection should be 2270 grams (5 lbs). After selection the average BW of the selected birds is around 150 grams higher. If the BW of the broilers for the country is below 2.0 kg and no export of PS is permitted or possible, the selection BW of the males can be reduced. The target BW of the selected males after selection should then be around 2.0-2.1 kg.

As of selection (5th week) the BW standard for the males needs to be projected till transfer (21-22 weeks of age normally). Males should grow the minimum weekly BW increase as indicated in the above table so that testicular development is not impaired. Higher growth rates can be used based on local experience. If the average BW of the males is around 2.0-2.1 kg before selection the BW increase can be larger and good experience has been obtained with 100 grams average increase per week. Split the males in 2 groups after selection when the uniformity drops below 80% in order to maintain proper development. This is the best way to guarantee quality males at housing and maximum fertility rates.

***Indicates afternoon weights taken between 1400 and 1600 hrs.

****Minimum weekly BW increase to maintain uniformity each week after selection.

6. Growth Program - 20 to 60 Weeks of Age

6.1 Avian FLF and FLM Body Weights in Production

	FLF BW's		FLM BW's		
Age in Weeks	BW Grams	BW Lbs	BW Grams	BW Lbs	Male/Female BW Ratio
24	2945	6.49	3785	8.34	129%
25	3085	6.80	3885	8.56	126%
26	3245	7.15	3985	8.78	123%
27	3405	7.50	4085	9.00	120%
28	3450	7.60	4185	9.22	121%
29	3495	7.70	4265	9.39	122%
30	3540	7.80	4325	9.53	122%
31	3585	7.90	4365	9.61	122%
32	3630	8.00	4395	9.68	121%
33	3675	8.09	4425	9.75	120%
34	3700	8.15	4455	9.81	120%
35	3720	8.19	4475	9.86	120%
40	3765	8.29	4550	10.02	121%
45	3810	8.39	4625	10.19	121%
50	3860	8.50	4700	10.35	122%
55	3900	8.59	4775	10.52	122%
60	3945	8.69	4850	10.68	123%

The average body weight in production is only a guide. According to the body weight development in rearing the weights will have to be adapted in production.

In production the average weight of the males should be determined by the fleshing condition and the activity. Due to the high selection weights in the males they will express a large frame. The regular process of weighing and palpating birds should give the management insight on the male condition. If a better conditioned male is needed, more feed should be given (+5 to +10 grams). The uniformity in production should be maintained above 80%.

Grill size in female feeders: To prevent males from accessing the female feeders and control their BW's, use a grill that is 60 mm in height and 45 mm in width.

Once again check at 25 weeks of age if any sex-slips remain in the flock.

Do not drop below 8% males over females after 45 weeks of age in order to maintain maximum fertility.

6.2 Avian MLF and MLM Body Weights in Production

	MLF BW's		MLM BW's		
Age in Weeks	BW Grams	BW Lbs	BW Grams	BW Lbs	Male/Female BW Ratio
24	3050	6.72	3835	8.45	126%
25	3230	7.11	3935	8.67	122%
26	3430	7.56	4035	8.89	118%
27	3580	7.89	4135	9.11	116%
28	3700	8.15	4210	9.27	114%
29	3760	8.28	4270	9.41	114%
30	3820	8.41	4325	9.53	113%
31	3870	8.52	4375	9.64	113%
32	3920	8.63	4415	9.72	113%
33	3970	8.74	4450	9.80	112%
34	4010	8.83	4480	9.87	112%
35	4050	8.92	4510	9.93	111%
40	4210	9.27	4660	10.26	111%
45	4320	9.52	4810	10.59	111%
50	4420	9.74	4960	10.93	112%
55	4495	9.90	5110	11.26	114%
60	4570	10.07	5260	11.59	115%

The average body weight in production is only a guide. According to the body weight development in rearing the weights will have to be adapted in production.

In production the average weight of the males should be determined by the fleshing condition and the activity. Due to the high selection weights in the males they will express a large frame. The regular process of weighing and palpating birds should give the management insight on the male condition . If a better conditioned male is needed, more feed should be given (+5 to +10 grams). The uniformity in production should be maintained above 80%.

Grill size in female feeders: To prevent males from accessing the female feeders and control their BW's, use a grill that is 60 mm in height and 45 mm in width.

Once again check at 25 weeks of age if any sex-slips remain in the flock.

Do not drop below 8% males over females after 45 weeks of age in order to maintain maximum fertility.

7. Recommended Nutrient Levels

Two separate systems of feeding apply on grandparent farms, according to the lines involved:

- Grandparent males are fed ad libitum until they reach selection weight, approximately 35-42 days. After selection they are fed controlled amounts in a conventional manner.
- Grandparent females are fed controlled amounts throughout rearing and production.

7.1 Grandparent Males - Day-old to Selection

Nutrient	Broiler Starter	Broiler Finisher
Age (days)	**0 - 20**	**21 - selection**
Protein %	21.50	19.50
ME kcal/kg (MJ/kg) kcal/lb	3011 (12.60) 1367	3107 (13.00) 1411
Lysine %	1.28	1.10
Methionine %	0.56	0.53
M + C %	0.95	0.90
Calcium %	0.90	0.90
Available Phosphorus %	0.45	0.45
Sodium %	0.20	0.17
Linoleic acid %	1.25	1.25

Nutrient Levels in the table above are representative of a typical broiler diet. Actual nutrient levels should be that of the local market in which the broilers will be grown.

7.2 Recommended Nutrient Levels for Cobb Avian Grandparent Flocks

Nutrient	Units	Starter 0 - 42 days	Grower 43 - 119 days	Pre-breeder 120 - 154 days	Breeder 1 155 - 280 days	Breeder 2* 281 days onwards
Protein	%	19	15	16	16	15
Metabolizable Energy	kcal/lb	1300	1250	1300	1300	1300
Metabolizable Energy	kcal/kg	2860	2750	2860	2860	2860
Metabolizable Energy	MJ/kg	11.97	11.51	11.97	11.97	11.97
Fat	%	3-4	3-4	3-4	3-4	3-4
Linoleic Acid	%	1.25	1.50	1.25	1.50	1.00
Fiber	%	3-4	3-4	3-4	3-4	3-4
Lysine	%	1.00	0.60	0.74	0.75	0.73
Digestible Lysine	%	0.88	0.50	0.63	0.66	0.64
Methionine	%	0.45	0.26	0.32	0.35	0.34
Digestible Methionine	%	0.40	0.22	0.28	0.32	0.31
Methionine + Cystine	%	0.77	0.51	0.62	0.64	0.62
Threonine	%	0.75	0.50	0.55	0.57	0.57
Tryptophan	%	0.22	0.15	0.17	0.19	0.19
Leucine	%	1.20	0.80	1.00	0.98	0.95
Isoleucine	%	0.72	0.50	0.74	0.57	0.53
Calcium	%	0.95	1.10	1.50	3.00	3.20
Available Phosphorus	%	0.45	0.45	0.45	0.45	0.40
Sodium	%	0.21	0.21	0.21	0.21	0.21
Chloride	%	0.18	0.18	0.17	0.17	0.17
Potassium	%	0.60	0.65	0.65	0.65	0.60

* Breeder 2 may be given week 40 onwards but do not change until you have discussed it with your Cobb technical advisor.

7.3 Vitamin and Trace Elements Specifications

Vitamin/ Trace Element	Units per tonne	Starter 0-42 days	Grower 43-119 days	Breeder 120 days onward
Vit A	MIU	10	10	12
Vit D_3 (Cholecalciferol)	MIU	3	3	3
Vit E (Tocopherol)	KIU	75	45	50
Vit K (Menadione)	g	3	3	6
Vit B_1 (Thiamine)	g	2	2	2.5
Vit B_2 (Riboflavin)	g	8	7	10
Vit B_3 (Pantothenic acid)	g	12	10	25
Vit B_5 (Niacin)	g	40	35	40
Vit B_6 (Pyridoxine)	g	3	3	6
Vit B_{10} (Folic acid)	g	1.5	1	4
Vit B_{12} (Cyanocobalamin)	mg	25	20	35
Vit H (Biotin)	mg	250	200	300
Vit C (Ascorbic acid)	g	25	25	50
Choline	g	350	300	250
Manganese	g	100	100	120
Zinc	g	100	120	110
Iron	g	20	20	40
Copper	g	10	10	10
Iodine	g	1.5	0.5	2.0
Selenium	g	0.30	0.30	0.30

8. Bodyweight Control

The objective of bodyweight control is to rear all of the birds to the target weight for age with good uniformity. Bodyweight targets are achieved by controlling feed allowances. Feed amounts during rearing are based on bodyweight 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 bodyweight is accurately measured every week.

To measure bodyweight weigh between 60 - 100 birds per pen each week. At 7 and 14 days weigh a bulk sample of birds. Thereafter weigh birds individually at the same time on the same day of every week.

Follow these simple procedures to ensure accuracy:

1. The scales used to measure bodyweight must have a capacity of 5 kg (11.02 lbs.) and be accurate to +/- 20 g (.04 lbs.). Check regularly that the scales are properly calibrated—it is an advantage to have electronic balances with a printout facility.
2. Gather approximately 100 birds in a catching pen.
3. Weigh **every** bird in the catching pen, including small birds (culling sexing errors during the operation).
4. Record bodyweight using the chart below.
5. Calculate the average weight, of all birds weighed.
6. Plot the average bodyweight on the appropriate chart.
7. Only then decide on the feed amount for the following days.
8. During rearing feed amounts must only ever be maintained or increased, never decrease the feed amount.
9. After peak egg production feed amounts are normally reduced to control mature bodyweight and ensure persistency of egg production and fertility.

8.1 Analysis of Bird Weights

The following is an example of a completed bodyweight recording chart.

Example Bodyweight 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
➡	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																						

Select ➡ '00 closest to expected average weight and mark the card accordingly.

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

Bodyweight 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 lbs.

Average weight per bird = 595 g or 1.31 lbs.

Uniformity

Mark the chart at bodyweights of 10% either side of the average bodyweight. Count the number of birds that fall into this band. Calculate the percentage of the sample that this number represents.

Coefficient of Variation (CV)

Variation can be expressed in terms of the average bird weight, the standard deviation of bodyweight and the coefficient of variation in bodyweight. In a normal flock approximately 95% of the individual birds will fall in a band +/- two standard deviations either side of the average bodyweight. 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.

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

The following table allows the conversion of flock uniformity (%within +/- 10%) into CV (%).

% Uniformity	CV (%)
95.4	5
90.4	6
84.7	7
78.8	8
73.3	9
68.3	10
63.7	11
58.2	12
55.8	13
52.0	14
49.5	15
46.8	16

9. Maintaining Good Uniformity

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

9.1 Common Factors Leading to Bodyweight Uniformity Problems

- Presence of formaldehyde gas at chick placement
- Mixing of parent age sources at day old
- Beak trimming if not carried out to an exceptionally high standard
- Extreme temperatures
- Poor feed distribution
- Incorrect feed amounts
- Incorrectly ground food or variable pellet size
- Over stocking
- Insufficient water supply
- Low or too high energy feeds
- Insufficient light at feeding time
- Feeder trough set too high
- Irregular feeding times
- Mixing different lines in the same pen after selection
- Incorrect bird numbers or pen drift
- Disease or parasitic infection

9.2 Grading

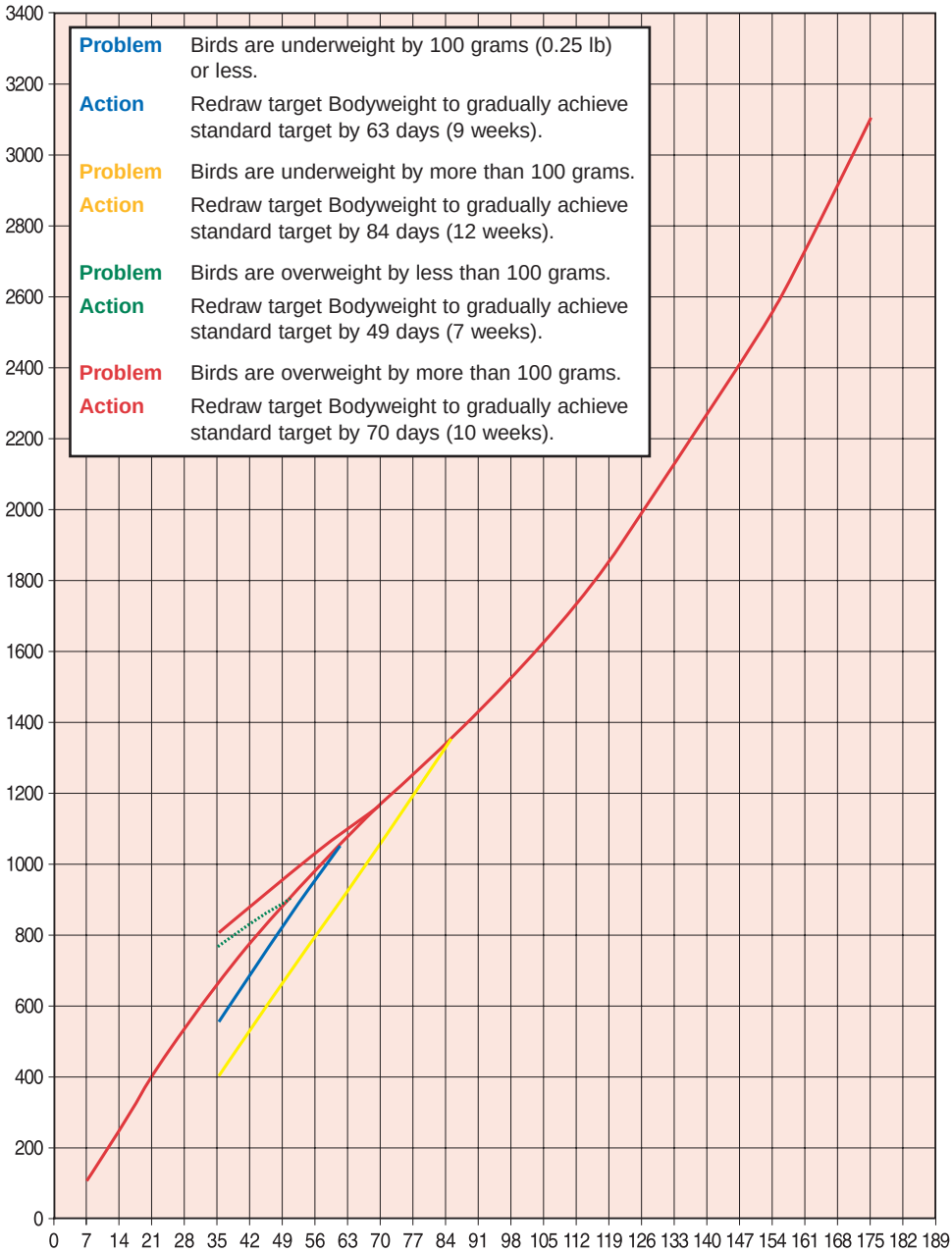
Size grading helps to maintain flock uniformity if it is done correctly. Females should be graded between 28 and 35 days; there is no need to grade males. Remove 20 - 25% of the lightest birds and place them in a separate pen, where they can be fed according to their needs.

9.3 Troubleshooting Bodyweight Control

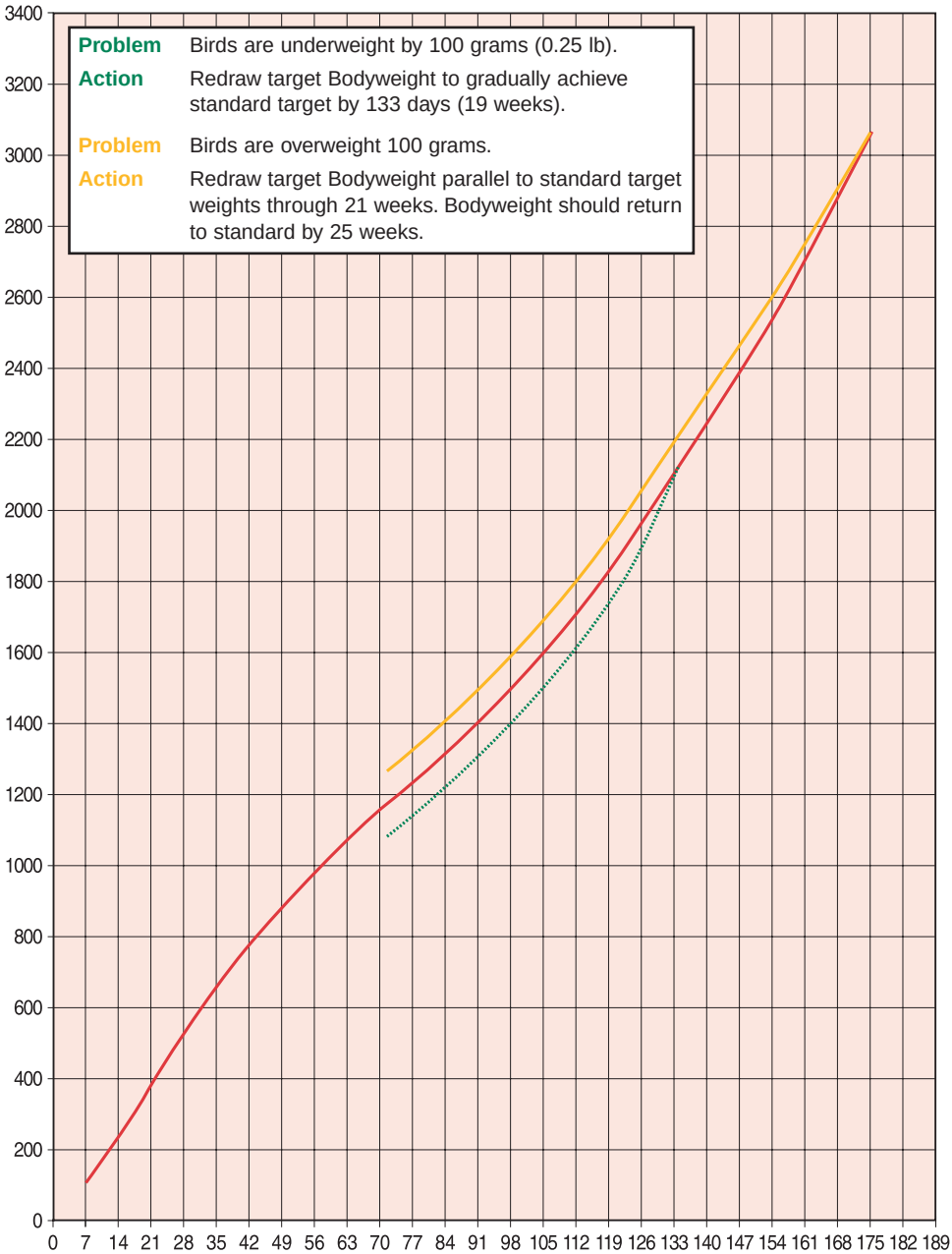
There will always be occasions when flocks are not on the bodyweight target. Any corrective action taken on these flocks should be done with long term rather than short-term goals. Adjustments to the growth rate of the flock must ensure that the pullets will still achieve the necessary body condition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

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

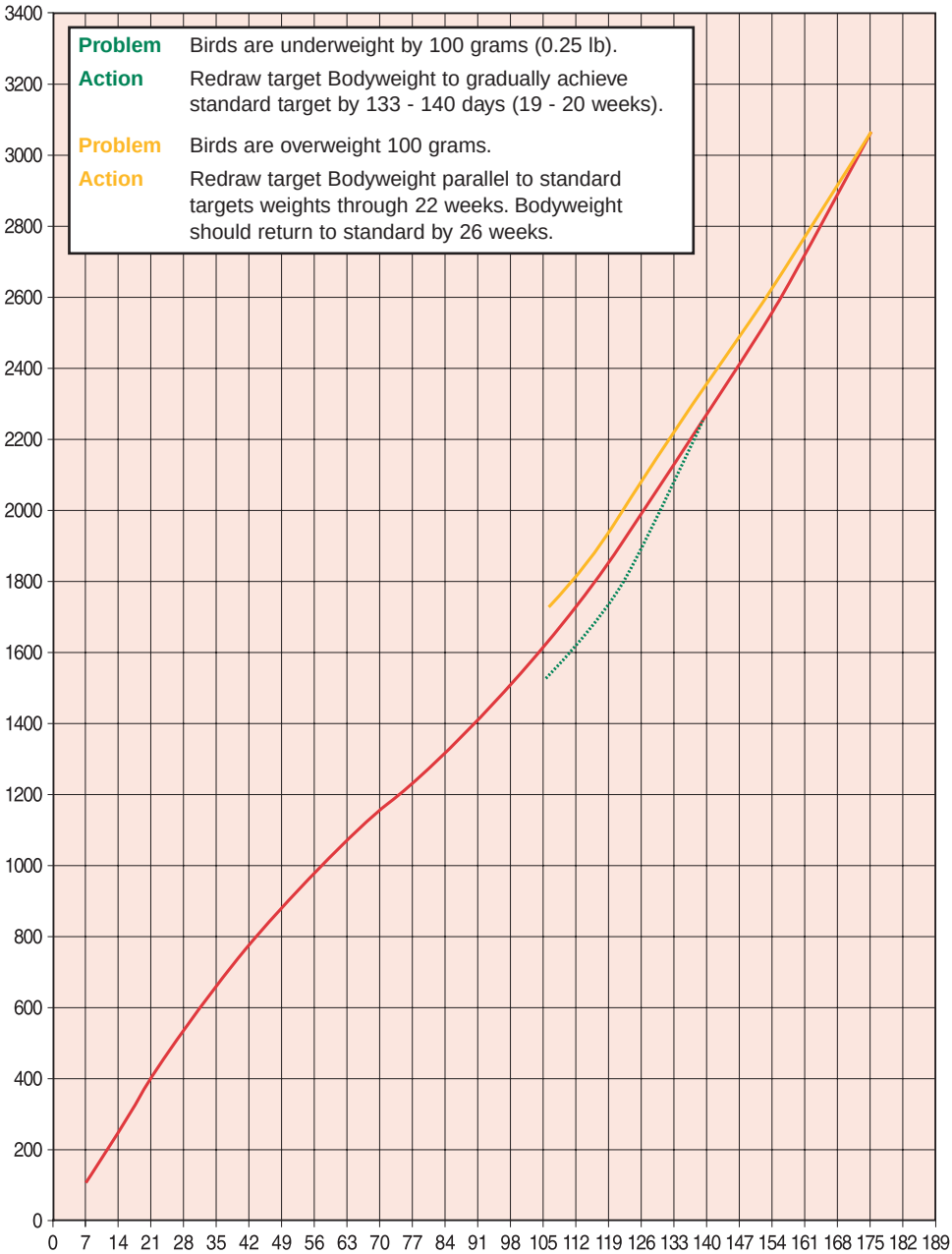
Flock weight off target at 5 weeks



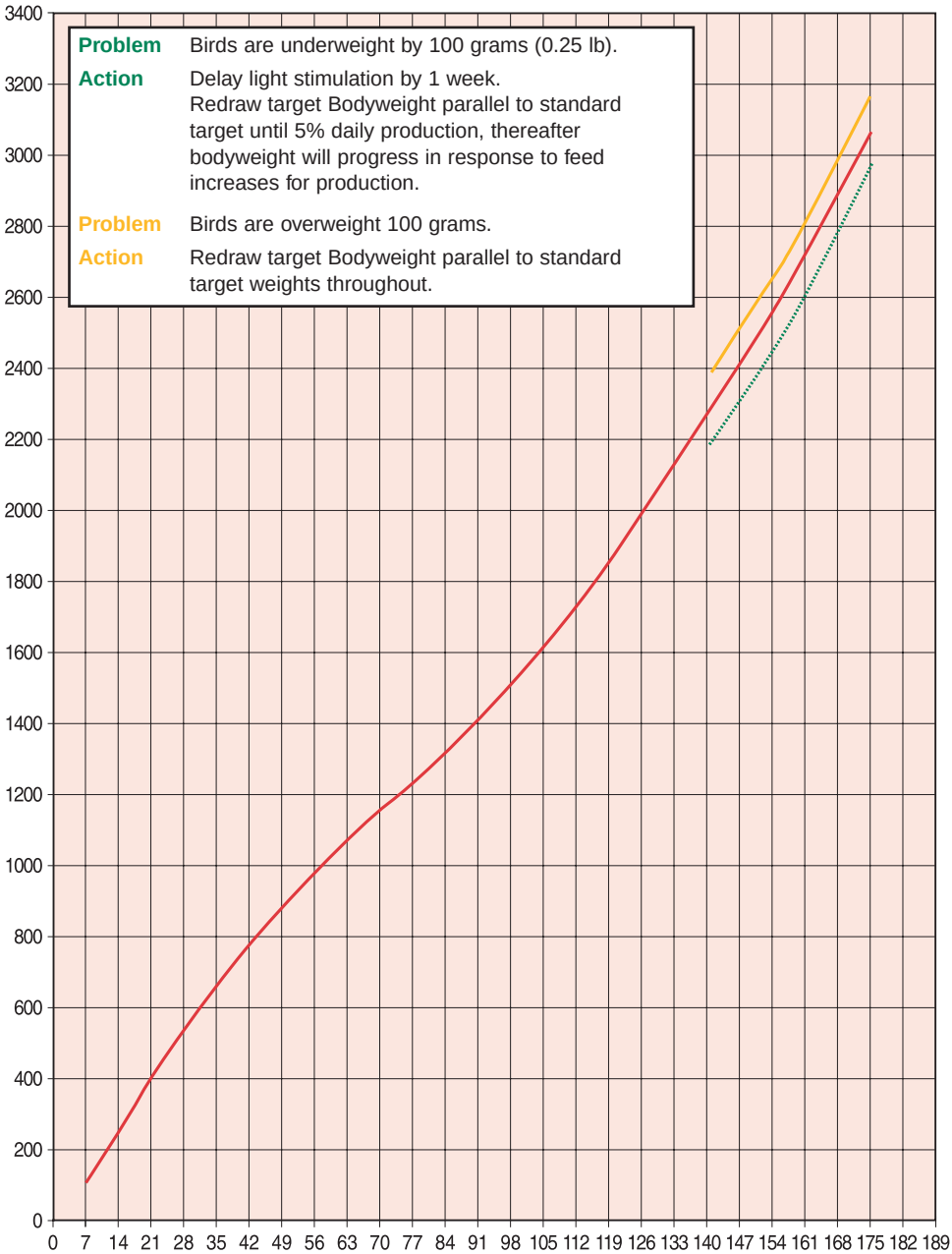
Flock weight off target at 10 weeks



Flock weight off target at 15 weeks



Flock weight off target at 20 weeks



10. 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 Avian 48 Grandparents. Local conditions and housing types may necessitate the use of modified lighting programs, which should be discussed with your Cobb Technical Service representative.

The response of the hens to light stimulation is based on their condition, bodyweight and age. In light controlled housing delay light stimulation if the flock still contains underweight birds. As a guide, 95% of the birds in the flock should have reached a weight of 2100 g (4.63 lb) before light increases are made. When transferring birds from dark-out rearing to open sided laying house the weight and body condition must be correct at time of transfer

Broiler breeder hens come into lay in response to increases in the day length - when these are made at the appropriate time. Increase the day length by adding hours to the early morning; for example, if the day length is 8 hours and the lights come on at 07:00, after a day length increase of 3 hours is given the lights should come on at 04:00.

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.

10.1 Dark-out Rearing Houses

Cobb Avian 48 grandparents must be reared in lightproof housing. The light intensity in such houses must be less than 0.5 lux when the lights are switched off.

Open houses can be converted to dark out rearing by eliminating all areas that allow for light leakage using effective blackout curtains. Provision must then be made for sufficient fan capacity to allow for correct ventilation. Fans and air inlets must also be covered with adequate light traps.

10.2 Dark-out Rearing to Dark-out Production

Dark-out houses should provide total light control and hence one rearing program can be used for all flock placements.

- The chicks start 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 the growth rate.
- The day length remains at 8 hours to 20 weeks (140 days) of age when the step-up programs 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 underweight birds.

Recommended lighting program for females reared in dark-out housing.

Recommended lighting program for females reared in dark-out housing.

Age in weeks	Age in days	Light (hours)	Light Intensity* (lux)
1 - 3	1 - 21	Decreasing from 24 hours at day 1 to 8 hours by 14 to 21 days	Days 0-2 maximum light (>60 lux) reducing to 20 lux by day 7
3 - 20	21 -140	8	5 - 7
20 - 21	140 - 147	11	40 - 60
21 - 22	147 - 154	12	40 - 60
22 - 23	154 - 161	13	40 - 60
23 - 24	161 - 168	14	40 - 60
24 - 25	168 - 175	15	40 - 60

*Flourescent light or incandescent light bulbs.

Recommended lighting program for males reared in dark-out housing.

Age (weeks)	Age (days)	Day length (hours)	Light Intensity (lux and foot candles)
0 - 1	0 - 7	23	Days 0-2 maximum light (>60 lux or 6.0 fc reducing to 10 lux or 1.0 fc by day 7
1 to selection	7 to selection	16	10 lux or 1.0 fc
After selection reduce day length to 8 hours and then follow the female lighting program.			

10.3 Dark-Out Rearing to Natural Daylight Production

The chicks start 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 the growth rate.

The day length remains at 8 hours to 20 weeks (140 days) of age when the step-up programs should be followed.

Light intensity during the production period must be 80-100 lux (8-10 ft candles) this includes additional artificial light (high pressure sodium lamps).

Light should be uniform throughout house.

Recommended program in open-sided production housing for flocks reared in dark-out housing.

Age in days	Light Hours	Light Intensity (lux)*
1 - 21	Decreasing from 24 hours at day 1 to 8 hours by 14 to 21 days	Decreasing from 24 hours at day 1 to 8 hours by 14 to 21 days
21 - 147	8	5 - 7
147 - 154	Natural (minimum 11 hours)	Natural
154 - 161	12	80 - 100
161 - 168	13	80 - 100
168 - 175	14	80 - 100
175 - 182	15	80 - 100

*High pressure sodium lamps. If flourescent or incandescent lamps are used the light intensity can be reduced to 40-60 lux range.

10.4 Natural Daylight Rearing to Natural Daylight Production

It is not recommended that Cobb Avian 48 grandparents should 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.

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 Services 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 – 100 lux (8-10 ft candles) to ensure that the birds are stimulated.

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

Natural day length hours at 133 days	Lighting program				
	133 days	140 days	147 days	154 days	161 days
15	Natural	17	17	17	17
14	Natural	16	17	17	17
13	Natural	15	16	17	17
12	Natural	14	15	16	17
11	Natural	14	15	16	17
10	Natural	13	14	15	16
9	Natural	12	13	14	15

First light stimulation should start when more than 90% of the females are in the proper physical condition. This will assure that a maximum number of birds will use the first light simulation to bloom in sexual development. It will give the best sexual synchronization between the females and will enhance peak production and production persistency. The moment of light stimulation depends on how the females are grown in the rearing period, in particular between 15 and 20-21 weeks of age. If the proper development is not present the light program should be delayed for one week (and sometimes even more). Contact the Cobb technical service person to receive more information on the management aspect.

11. Transferring Stock from Rearing to Production Farms

Age for transferring stock to the production farms is determined mainly by the facilities available 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 manager and laying manager should meet to discuss the flock. A copy set of the rearing records must be transferred with the stock on arrival at the farm. These should include details of disease challenges, bodyweights, lighting program and intensity of light, feed amounts and time of feeding, medication and vaccination program transfer bird numbers, bodyweights and uniformity, feed amounts and time of feeding, light program and intensity, water consumption, vaccination program and medication, disease challenges and any other relevant information to assist the production farm manager during the settling in period.

It is good practice to give additional feed before and 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. 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 feeders and drinkers in the laying house should be the same as those in the rearing house. Do not, for example, rear birds on bell drinkers then transfer them to a laying house equipped with nipple drinkers.

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 must be carefully culled before they are moved to the laying house.
- Move the birds at night or in the early morning.
- After transfer observe the birds closely, handling their crops, to make sure that they are all able to find feed and water.
- Remember to ensure line security.

In slatted houses the birds may be encouraged to use the slatted area by walking through the house frequently. Slats must not be higher than 45 cm (approximately 18 inches).

12. Records

Keeping full and accurate records is an essential part of managing Cobb grandparent stock. For example, feeding during production is based on the rate-of-lay, egg weight and bodyweight 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	**Weekly**
Total mortality	Bodyweight
Culls	Uniformity
Feed	
Temperature	
Water consumption	
Feed clean-up time	

PRODUCTION

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

The following Cobb farm record cards are available on request:

- Mortality and Feed Consumption
- Test Weigh
- Bodyweight
- Weekly Production
- Egg Production

13. Production Period

13.1 Housing and Equipment Requirements

- Minimum ventilation is a must to assure a good start of the flock in the first 2 weeks and from 2-4 weeks transtion ventilation is the recommended system before tunnel ventilation can be implemented as of 4 weeks of age. In the rearing period the maximum airspeed 350 fpm can normally handle the ventilation needs of the birds after 4 weeks of age. In the production period the maximum airspeed should be around 500 fpm. Because the ventilation concept is complex contact your Cobb technical service representative to receive additional information. Remember that before any update ventilation work is done to your existing houses or for new houses, let the calculations be double checked by the Cobb ventilatin specialists. This will insure that the ventilation system will work properly and the Avian birds will give the expected results.
- Provide a minimum of 15 cm (6 inches) of feeding space per female and ensure that feed can be distributed in less than 3 minutes.
- Nipple drinkers are preferred for Cobb Avian 48 grandparents. Nipple drinkers should be installed at the rate of 6 to 8 birds/nipple. Bell drinkers should be installed at the rate of 80 to 100 birds per drinker. Drinker lines should be positioned approximately 1 m (36 inches) in front of the nesting system to encourage use of the nests.
- Manual nesting systems should provide for 4 birds per nest. Communal mechanical nests should provide for 50 birds/community nest entrance of nest floor area. Allow 6 birds per nest hole in single bird rollaway nests.
- In windowless laying houses the light intensity should be 40 to 60 lux (4 to 6 Ft. Candles). In natural daylight housing, artificial light should be provided to give 80 - 100 lux (8 to 10 Ft. Candles) when the natural light reduces at dusk. The distribution of light intensity should be uniform in all housing styles.
- Male lines and female lines must have adequate secure separation to prevent lines mixing. If both lines are placed in the same house use double doors to avoid line mix ups. In the last vaccination at 18 weeks of age, check if the identication of the toes is correct.

13.2 Feeding - Production Period

- If you consider using pre-breeder feed it should be given from 120 to 147 days (17 to 21 weeks) of age, followed by breeder feed, according to the nutrient specifications given in earlier chapters. Do not give breeder feed before 147 days (21 weeks) of age. Consult you Cobb Technical representative for recommendations on using pre-breeder.
- Feed at the same time every day. Do not alter feeding time as the lighting program changes.
- Observe and handle the birds, checking their crops to ensure that they are eating and drinking and their fleshing to monitor their condition. Weigh the females every week, taking a sample of between 60 and 150 birds per house. Another way is to weigh 1% of the flock with a minimum of 50 birds per pen. Calculate the mean bodyweight and flock uniformity.
- Continue feeding for bodyweight 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. The program can be built by deducting actual feed at 5% from peak feed. Calculate an amount to increase for each 10% increase in egg production.

- Peak feed intake should be reached by 60-70% hen day egg production. Pelleted feed is not recommended and only used under special circumstances. This maximum figure will depend on the energy value and form of the feed, but for all practical purposes will be around 168 g/bird/day (37 lb/100 birds/day) using mash feed or 162 g/bird/day (35.7 lb/100 birds/day) to provide 465 kcal /bird/ day when crumbled feed is used. The birds should be capable of sustaining peak production on 24-26 grams of protein per day. Variation in house temperature has an effect on the amount of feed that the birds require. House temperatures should ideally be held between 15 °C (59 °F), and 25 °C (77 °F). Feed allowances may need to be adjusted to suit temperatures outside this range.
- Under normal circumstances feed can be reduced by a minimum of 1 g/week (.22 lb/100 birds/week) after peak production. This reduction should be made each week until the peak feed amount has been reduced by 10 to 14%. The feed reduction rate may be made faster or slower based on daily records of rate-of-lay, egg weight, temperature and bodyweight trends.
- Please consult your Technical Services representative for more information on peak feeding, feed reduction and related issues.
- Feed quality must be maintained 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 - 2 kg), 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.

Calculating Production Feeding

	Grams per Bird	Pounds per 100
Feed at % Daily Production:	130	28.6
Peak Food Amount:	166	36.6
Amount to Increase:	36	8.0
Number of Increases:	6	6
Amount of Feed to Increase per 10%	6	1.3

	Standard		Alternative*	
Egg Prod. HD	Grams per Bird	Pounds per 100	Grams per Bird	Pounds per 100
5%	130	28.6	130	28.6
15%	136	30.0	133	29.3
25%	142	31.3	136	30.0
35%	148	32.6	142	31.3
45%	154	33.9	150	33.0
55%	160	35.2	160	35.2
65%	166	36.6	166	36.6

* The Alternative is a “Progressive” Program

The alternative program increases the feed amount slower in the first 2-3 weeks of the production period and then catches up when more birds are entering production (3rd-4th week). It is used to avoid overweight females and reduce mortality (known as spiking mortality or SDS).

- An accurate method of weighing feed is essential. Weighing systems must be checked weekly.
- 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 is normally 2.5 to 3 hours. If the time taken to eat the feed changes suddenly this may be an indication of a problem requiring immediate investigation.
- Second stage breeder feed containing lower essential fatty acids and higher calcium levels may be beneficial.
- A scratch feed may be beneficial to maintain fertility. It should be fed late in the afternoon at the maximum rate of 0.5 kg per 100 birds. Half the amount given in grams can be deducted from the total 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 trough should be set to one-third depth.
- Feed only when staff are present and in one continuous period. Do not split feed other than scratch feed. Continue to run the feeding system until the whole of the day's feed allowance has been distributed.
- Bulk bins should be emptied between feed types and at least once a month during production to maintain good feed quality.

13.3 Separate Sex Feeding

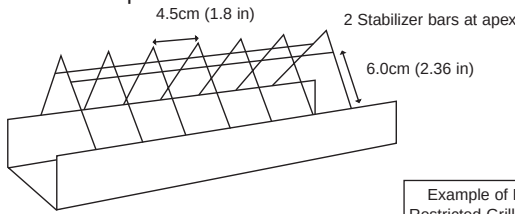
Effective feed restriction systems are an absolute must. The provision of separate female and male feeders maximizes fertility because the bodyweight of both sexes can be independently controlled during the production period.

Female Feeders

The basic principle of separate sex feeding is to exclude the males from the female feed track and provide a separate male feeding system. The normal method of exclusion is a grill placed on top of the track that controls access by the horizontal distance of 4.5 cm between the bars. Alternative methods use a solid cover for the track that restricts access vertically.

Male Feeders

Male feeders are ideally an automatic pan or ballasted tube system suspended 45 cm (18 in) from the floor making it inaccessible to the females. The male feeding system should be installed at the rate of 8 to 10 males per tube/pan. To allow the system to be raised or lowered quickly it must be suspended from a winch.



Example of Female Feeder-Restricted Grill to exclude males.

14. Male Management

- REMEMBER there is NO unimportant stage in the rearing of males.
- Uniformity is as important in males as females.
- Capability of sperm production starts developing in the pullet house not the hen house. Damage done during the first 12 weeks of life may be irreversible. Avoid stress related situations that inhibit the development of the male. The maximum potential for sperm production is established during the first 8-10 weeks of age.
- MUST have good weight gains from 18 to 23 weeks of age to support adequate testes development. The greatest period of testes growth occurs 2-3 weeks after light stimulation. Increased feed restriction during 18-23 weeks of age can cause complete shut down of testes function and has been shown to permanently impact sperm production and thus fertility.
- Transfer males to laying house 1 or 2 days before females.
- In floor operations, mate between 10-11.5% males at housing and try to keep the male ratio above 8% at the end of production period. In slat operation, mate between 9-10% in the FLM and 10-11% in the MLM and also try to finish above 8% good males at 65 weeks of age.
- It is important to remove cull males regularly to maintain the health and condition of the male population.
- Males must be weighed every week to ensure that the correct amount of feed is given. Adjust feed levels every week to ensure that the bodyweight targets are achieved.
- Separate male feed may be of some advantage, but for all practical purposes the males can be given the same feed as the females.
- Males must never be allowed to lose weight during the rearing or production period.
- Feed males as necessary not as to maintain weight standards but better said to maintain condition. Be present in the house and “feel” the males.
- Reduce feed at 30 weeks according to condition of the male to control weight increase and maintain fertility persistency and male livability.

15. Breeder Performance

15.1 Cobb Avian 48 Slow Feather Grandparent Female Line

Age (Weeks)	Eggs (% HW)	Mortality (%)	Cum HE/TE	Cum Eggs (HH)	Cum H. Eggs (HH)	Weekly % Salable Hatch	Accum Salable Chicks	#PP Chicks (HH)	%PP/ Hatching Egg Set
25	3	0.21	0						
26	17	0.56	40.0%	1.2	0.5	70	0.3	0.2	34%
27	36	0.91	60.0%	3.7	2.0	75	1.5	0.7	35%
28	52	1.26	80.0%	7.3	4.9	77	3.7	1.8	36%
29	68	1.56	89.0%	12.0	9.0	77	6.9	3.3	36%
30	74	1.86	93.0%	17.1	13.8	78	10.6	5.0	37%
31	77	2.16	96.0%	22.4	18.8	79	14.6	7.0	37%
32	77	2.46	96.0%	27.6	23.9	79	18.6	8.9	37%
33	76	2.76	96.0%	32.8	28.9	79	22.5	10.7	37%
34	75	3.06	96.0%	37.9	33.8	80	26.4	12.6	37%
35	74	3.36	96.0%	42.9	38.6	80	30.3	14.4	37%
36	73	3.66	96.0%	47.8	43.3	80	34.1	16.2	37%
37	72	3.96	96.0%	52.7	48.0	81	37.8	18.0	38%
38	71	4.26	96.0%	57.5	52.5	81	41.5	19.8	38%
39	70	4.56	96.0%	62.1	57.0	81	45.2	21.5	38%
40	69	4.86	96.0%	66.7	61.5	81	48.8	23.2	38%
41	68	5.16	96.0%	71.3	65.8	81	52.3	24.9	38%
42	67	5.46	96.0%	75.7	70.1	81	55.7	26.5	38%
43	66	5.76	96.0%	80.0	74.2	81	59.1	28.2	38%
44	65	6.06	96.0%	84.3	78.4	81	62.5	29.7	38%
45	64	6.36	96.0%	88.5	82.4	80	65.7	31.3	38%
46	63	6.66	96.0%	92.7	86.3	80	68.8	32.8	38%
47	62	6.96	96.0%	96.7	90.2	80	72.0	34.3	38%
48	61	8.26	96.0%	100.7	94.0	80	75.0	35.7	38%
49	60	7.56	96.0%	104.6	97.8	80	78.0	37.1	38%
50	59	7.86	96.0%	108.4	101.4	80	80.9	38.5	38%
51	58	8.16	96.0%	112.1	105.0	80	83.8	39.9	38%
52	57	8.46	96.0%	115.8	108.5	80	86.6	41.2	38%
53	56	8.76	96.0%	119.4	112.0	79	89.3	42.5	38%
54	55	9.06	96.0%	122.9	115.3	79	92.0	43.8	38%
55	54	9.36	95.0%	126.3	118.6	78	94.5	45.0	38%
56	53	9.66	95.0%	129.7	121.8	78	97.0	46.2	38%
57	52	9.96	95.0%	132.9	124.9	78	99.4	47.3	38%
58	51	10.26	95.0%	126.1	127.9	78	101.8	48.5	38%
59	50	10.56	95.0%	139.1	130.9	77	104.1	49.6	38%
60	49	10.86	95.0%	142.3	133.8	76	106.3	50.6	38%
61	48	11.16	94.0%	145.3	136.6	75	108.4	51.6	38%
62	47	11.46	94.0%	148.3	139.4	74	110.4	52.6	38%
63	46	11.76	94.0%	151.1	142.1	73	112.4	53.5	38%
64	45	12.06	94.0%	153.9	144.7	72	114.3	54.4	38%
65	44	12.36	94.0%	156.6	147.2	71	116.1	55.3	38%

These data are based on actual performances of the top 25% of GP flocks and should be adjusted to local expected performance.

15.2 Cobb Avian 48 Grandparent Male Line

Age (Weeks)	Total Eggs (%HW)	Hatching Eggs (%HW)	Mortality (%)	Cum. Total Eggs (HH)	Cum. Hatching Eggs (HH)	Weekly (%) Hatch	No. of Chicks (HH)	#PP Chicks (HH)
25	11.0	0.7	0.30					
26	28.0	7.1	0.70	3	1	62	0	0.45
27	43.0	19.2	1.25	6	2	64	1	1.4
28	55.0	35.1	1.80	9	4	67	3	2.3
29	62.0	49.4	2.30	14	8	69	5	3.6
30	64.0	55.6	2.75	18	11	71	8	5.0
31	65.0	59.5	3.15	23	16	73	11	6.3
32	64.0	59.9	3.50	27	20	74	14	7.7
33	64.0	61.1	3.85	31	24	75	17	9.0
34	63.0	60.2	4.20	35	28	76	20	10.4
35	62.0	59.3	4.55	40	32	76	23	11.7
36	60.0	57.4	4.90	44	36	76	26	13.1
37	58.0	55.4	5.25	47	39	76	29	14.6
38	57.0	54.4	5.60	51	43	76	31	15.3
39	56.0	53.4	5.95	55	46	75	34	16.7
40	54.0	51.5	6.30	58	50	74	37	17.6
41	52.0	49.6	6.65	62	53	73	39	18.5
42	50.0	47.7	7.00	65	56	72	41	19.4
43	48.0	45.8	7.35	68	59	71	43	20.3
44	46.0	43.8	7.70	71	62	70	45	21.2
45	44.0	41.9	8.05	74	65	69	47	22.1
46	42.0	40.0	8.40	77	67	68	49	23.0
47	40.0	38.0	8.70	79	70	67	51	23.4
48	38.0	36.1	9.00	82	72	66	52	24.3
49	36.0	34.2	9.30	84	74	65	54	24.8
50	34.0	32.2	9.60	86	76	63	55	25.2
51	32.0	30.4	9.90	88	78	62	56	25.7
52	30.0	28.5	10.20	90	80	60	57	26.1
53	29.0	27.4	10.50	92	82	59	58	26.6
54	28.0	26.5	10.80	94	83	57	59	27.0
55	27.0	25.6	11.10	95	85	56	60	27.5
56	26.0	24.5	11.40	97	86	54	61	27.9
57	25.0	23.6	11.70	98	88	53	62	27.9
58	24.0	22.6	12.00	**100**	**89**	52	62	28.4
59	24.0	22.6	12.30	101	91	51	63	28.8
60	23.0	21.7	12.30	103	92	50	64	28.8
61	23.0	21.7	12.60	104	93	48	64	28.8
62	22.0	20.7	12.90	106	95	47	65	29.3
63	22.0	20.7	13.20	107	96	45	65	29.3
64	21.0	19.8	13.50	108	97	44	66	29.7
65	21.0	19.7	13.80	109	98	42	67	30.2

16. 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 tables below should be expected from normal Cobb Avian 48 grandparent flocks where our recommendations for bodyweight, feed levels and feed specifications have been followed.

Weigh at least 90 eggs immediately following the mid-morning collection, excluding only double-yolk and cracked eggs. Daily egg weighing trend when plotted on a graph will give an indication of potential problems that should be investigated immediately.

Egg weights depend strongly on hen day production performance of the females. If production is above the standard, the egg weight tends to be lower than the standard and vise versa. When producion is below the standard, the average egg weight tends to be higher.

Underweight eggs

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

Overweight eggs

- Overfeeding
- High levels of energy or protein feeds
- Overweight birds

Average total egg weights (g) for Cobb Avian 48 grandparent lines

Age (weeks)	Female line	Male line
25	51.0	51.0
26	52.5	52.5
27	53.8	54.7
28	55.0	56.3
29	55.9	57.4
30	56.8	58.3
31	57.6	58.9
32	58.4	59.6
33	59.2	60.2
34	59.9	60.8
35	60.6	61.4
36	61.3	62.6
37	61.9	63.1
38	62.5	63.6
39	63.1	64.1
40	63.6	64.6
41	64.1	65.0
42	64.6	65.4
43	65.1	65.8
44	65.5	66.2
45	65.9	66.5
46	66.3	66.8
47	66.6	67.1
48	66.9	67.4
49	67.2	67.7
50	67.5	67.9
51	67.7	68.1
52	67.9	68.3
53	68.1	68.5
54	68.3	68.7
55	68.5	68.9
56	68.7	69.1
57	68.8	69.2
58	68.9	69.3
59	69.0	69.4
60	69.1	69.5

17. Egg Handling

17.1 Line Security

Male and female eggs must be kept separate. Ideally the flocks will be kept in separate houses. The following steps must be taken to ensure that there is no mixing of eggs.

- Collect eggs from the nests on to the appropriate colored trays.
- Never mix eggs of different lines onto the same tray.
- Use separate tables when sorting male and female line eggs.
- All male line eggs should be individually color marked and placed on trays of the same color.
- Female line eggs should be marked – it is usually sufficient to mark one egg on each tray - and placed on trays of a different color to male line eggs.
- Use the same color marking system for all GP flocks. Do not change the marking color between the collection of eggs and the dispatch of day-old PS chicks.
- Use a non toxic, water soluble felt marker pen or soft pencil to mark individual eggs.

17.2 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. 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. Do not overfill the manual nests with litter material. Females look for deep nests (vertically) and making a concave shape of the nest material will attract females to the nests.
- 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.
- Spend time walking through the flock at point-of-lay. This 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. 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 cracks by handling eggs carefully at all times. Eggs should be collected in plastic or fibre trays of the appropriate color per line. 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 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.

17.3 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:

- Dirties
- Small - depending on hatchery policy
- Poor shells
- Cracks
- Very large or double yolked
- 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 down wards.

The egg handling room must be kept clean and tidy.

17.4 Egg Hygiene

Sanitize all hatching eggs; it is recommended that fumigation with formaldehyde be used, but for alternative methods contact your Technical Service representative.

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

17.5 Egg Storage

Maintain good vermin control in the egg storage room and on the automatic nest belt system. 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 storage room.

Eggs should be allowed to cool down gradually over a 3 to 4 hour period at a temperature of 21 °C to 24 °C (70 °F to 75 °F) before putting them into the egg store.

Store the eggs in a separate room that can be maintained between 15 °C and 18 °C (60 °F to 65 °F). A relative humidity of 75% should be maintained. For long term egg storage, refer to Cobb Hatchery Manual.

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.

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

18. Biosecurity on the Farm

Good biosecurity must encompass all the operations carried out by a producer 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.

- Choose an isolated site when developing new Grandparent 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 300 meters (2000 ft).
- Each farm must have a perimeter fence to prevent unauthorized entry of people, vehicles and animals.
- 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.
- All farm workers and any other personnel who need to enter the farm must shower and change into a clean uniform. Shower facilities can be a biosecurity risk—they must be kept clean!
- Uniforms and work clothing should be color coded to help control personnel movement with in the farm or age groups.
- No other poultry, livestock or domestic pets of any kind may be allowed on Grandparent 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 frequently to prevent vermin developing resistance. Any spilled feed should be cleaned up immediately. (Please see section 18.8 on page number 50).
- Predominant wind direction should be taken into account when positioning the house units in relation to each other and also where to place the tunnel fans for summer and the side fans for minimum ventilation.

18.1 Breeder Farm Disinfection Schedule

1. 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.
2. Having stripped the house, brush the dust down so that it is removed with the litter, ideally using an industrial vacuum cleaner.
3. Remove the litter from the house on covered transport and away from the site.
4. Pressure wash suitable surfaces of the house with clean water, paying particular attention to air inlets, fan shafts and concrete floors.
5. 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 asbestos roof and in the gutters. If left, this is not only a source of contamination but will cause the asbestos to deteriorate.
6. 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.
7. 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.
8. 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 all trace of disinfectant is removed as it can impair the future use of live vaccines.
9. When the floor is dry, spray the floor and the sidewalls with a disinfectant of the cresylic acid type diluted in diesel oil or paraffin. It is advisable to spray an area of 6m around the house with the disinfectant solution.
10. 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 page 52). This procedure should be carried out at least 48 hours before restocking.
11. After 24 hours, neutralize the gas and then open the house inlets and fully ventilate.
12. Include the egg room, feed store and changing room in the cleaning and disinfecting procedures.
13. 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.
14. It is recommended that dead birds be disposed of by incinerating the carcasses on farm.
15. Keep a record of all visitors.

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 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 disease are present
- Fumigate with formaldehyde – active material
- Replace equipment, put down litter and preferably fumigate again before house is re-stocked

18.2 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.

18.3 Fumigation Methods

Formalin and potassium permanganate

This method produces a violent chemical reaction that generates considerable heat and releases formaldehyde gas. Use 1 litre per 25m^3 (40 fl oz / 1000 ft^3) formalin 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. 55m x 10m x 3.1m = 1705m^3 (60,210 ft^3)

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 300m^3 (1 lb of prills for 5000 ft^3). 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 25m^3 mixed with 28 ml of water, or 5 fl oz of formalin per 1000 ft^3 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

18.4 Salmonella and Mycoplasma Controls

All Cobb breeding stock is derived from flocks that have been 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 for 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 houses. 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 disinfectant foot dip and brush for cleaning footwear, wash hand basin, soap or sanitizer and paper towel must be provided at the entrance to each house.
- Keep all houses locked to prevent unauthorized entry.
- Since it is likely 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.

18.5 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 and provide immunity. The scheduling of a vaccination program should be such that it allows the infection 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.
- Keep vaccines refrigerated at the manufacturers recommended temperature, avoiding heat and exposure to direct sunlight.
- Do not use out-dated vaccines.
- Use the full dosage; 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 job.
- To determine the quality of the vaccine administration, the flock should be monitored at 10 to 14 days for neck sores, twisted heads and mortality or leg damage depending on the site of administration.
- Monitor the health and antibody status of the flock on a routine basis.

18.6 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.

18.7 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 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 monthly intervals, is good practice to determine the need for treatment. Chlorine will be most effective when water pH is between 6.5 and 7.0.

18.8 Rodent and Vector Control

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

- Eliminate 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 rat 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.

19. 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	=	100 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 oz	=	28.35 g
1 lb	=	0.4536 kg = 453.5924 g
1 long ton	=	1.016 ton = 1.016.05 kg
1 short ton	=	0.9072 ton = 907.185 kg
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		

20. Breeding Farm Contacts List

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

21. Notes

21. Notes

21. Notes

21. Notes

Technical Supplements

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