



## Female Persistency Post-Peak - *Managing Fertility and Production*

Michael Longley, Global Technical Transfer Manager

### Summary

#### INTRODUCTION

Chick numbers are most often reduced during the period between 40 to 60 weeks of age because of poor persistency in both egg production and hatchability. It is important to understand the main reasons why broiler breeder flocks exhibit poor persistency post-peak and how to overcome them.

#### WHAT ARE THE MAIN REASONS FOR POOR PERSISTENCY IN BROILER BREEDER FLOCKS?

- 1. Environment - temperature, ventilation, and lighting:** Feed allocation must be adjusted appropriately for environmental temperature. Altering feed intake in response to changes in temperature must also take into account egg production levels, egg weight, egg mass, and body weight. Ventilation must be appropriate for bird biomass and external environmental conditions. Wherever possible, do not provide in excess of 14 hours of light in lay as this will advance the onset of adult photorefractoriness and reduce persistency of egg production.
- 2. Feather cover - feed management:** Female feather cover plays an essential role in post-peak flock management for egg production and hatchability performance. Flocks with poorer than expected feather cover need to be properly managed if drops in hatchability and egg production are to be avoided. Close attention must be paid to feed level, house temperature, and mating ratio, the latter particularly where over-aggressive and/or too many males are present.

- 3. Body weight and egg weight:** Body weight and egg weight must be monitored closely during the post-peak production period. Changes to feed levels made without consideration of body weight may lead to reduced persistency. For example, reducing feed too aggressively or without allowing or compensating for an overweight flock will cause a drop in persistency. Increasing feed too quickly to bring a flock back to target when it is underweight will push birds over weight too quickly, thus reducing egg production. A change in trend of egg weight increase often occurs before a drop in production is seen and so can be the first indication of a potential problem. A flock with higher or lower than expected increases in daily egg weight, away from the standard, should have feed allocation altered accordingly to avoid a fall in persistency.
- 4. Conditions in the production house:** Nest box space, feeder space and feed distribution, drinker space, floor space, and litter quality must be appropriate for the flock and maintained within recommended levels.

#### CONCLUSION

Measuring and monitoring changes in feather cover, environmental temperature, flock condition, body weight and egg weight profile compared to standard, and housing conditions and external challenges is necessary to be able to react efficiently and effectively to how the flock is performing. Reacting efficiently and effectively to these key management points is what will make the difference between a top or bottom quartile performing flock.

The remainder of this article provides more detail on the points summarized on page one.

## Introduction

Managing for fertility is an important aspect of achieving good bird production and welfare. However, maintaining persistent egg output and high chick numbers remains a challenge for today's production manager. Poor persistency in egg production and hatchability are still the main reason for loss of chick numbers during the period between 40 to 60 weeks of age.

This article looks at the main reasons why broiler breeder flocks exhibit poor persistency of egg production and hatchability post-peak, and aims to provide advice on how to overcome them.

## What is a good performing broiler breeder flock?

During rear, a good performing flock will have:

- A weight gain profile that closely follows the breed standard body-weight targets throughout rear and achieves female target body weight at 20 weeks.
- Appropriate fleshing and body conformation for age.
- Good sustained female and male uniformity throughout rear, with a CV of <10% at the end of rear.
- Excellent feather cover.

The rearing period forms the foundation on which the future performance of the flock is based. Without detailed management of all aspects of the rearing period, from brooding through to mating-up, and in particular grading the flock into correct rearing groups, future egg production performance will be compromised. A poorly reared flock is less predictable, with a quicker decline in persistency post-peak, and therefore a lower hatching egg and chick output compared to a well reared flock.

During production, a good performing flock will have:

- A predictable and uniform onset of egg production in response to light stimulation.
- Pin bone spacing of at least 2 fingers for more than 80% of the females prior to first light stimulation.
- A steady, regular increase in daily egg production from first egg.
- A peak hen-housed egg production level of greater than 87%.
- Cumulative hatchability of greater than 86% to 64 weeks of age.
- Good feather cover for age.

All of the traits given above play an important role in producing optimum hen-housed chick numbers of more than 150 chicks per hen to 64 weeks.

## What are the main reasons for poor persistency in broiler breeder flocks?

Many managers not reaching the levels of performance identified in the previous section see poor post-peak persistency as the main reason for this.

Monitoring of the following Key Management Points must form part of a daily management routine if issues of post-peak persistency are to be resolved.

### KEY MANAGEMENT POINTS

1. Environment – temperature, air quality, ventilation, and lighting.
2. Feather cover – feed management.
3. Body weight and egg weight – compared to standard and weekly trends (gains).
4. Conditions in the production house – nest box space, feeder space and feed distribution, drinker space, floor space, litter quality.
5. Feed management – nutrient intake and feeding management.
6. Challenges – disease, temperature variation, mating ratios, parasites.

Reacting efficiently and effectively to these Key Management Points is what will make the difference between a top or bottom quartile result. Each area is discussed in more detail below.

#### Environment – Temperature

The relationship between temperature and the effect it has on bird performance is often overlooked, especially when considering feed allocation and nutrient intake. Many managers feed the same feed amount for age throughout the year, regardless of environmental temperature.

Flocks peaking during the hotter months of the year would normally be allocated a lower peak feed amount and possibly have feed withdrawn more quickly after peak. However, feed amounts must be reviewed if there is a fall in temperature. Feed may need to be increased or held at a higher or more static level as production progresses through the winter or colder months. This will improve persistency without the occurrence of excess increases in female body weight.

A winter peaking flock will generally need a higher peak feed amount, but it will be possible to withdraw feed post-peak more quickly during the summer or hotter periods of the year. This reduces the potential for a flock to become overweight, while also maintaining persistency.

When managed in closed-type housing, total cumulative post-peak feed withdrawal amounts from peak to end of lay can typically range from 10-11% for a winter peaking flock and 8-10% for a summer peaking flock (based on body weight, egg production and feed levels given in the Indian River® Global Performance Objectives).

In addition, it is important that feed intake is altered as operating temperature differs from 20°C (68°F). Energy intakes must be altered to account for changes in temperature. A basic rule is that:

**For every 1°C (2°F) change from 20°C (68°F) between 15°C and 25°C (59 to 77°F) females will need an increase in energy of approximately 1% per day per degree change.**

For example, for a **reduction** in temperature from 20 to 15°C (68 to 59°F), females will require a 5% **increase** in feed or an extra 25-30 kcal of energy (9-10 g / 0.3-0.4 oz extra feed) per bird per day based on a 2800 kcal ME/kg diet. For an **increase** in daily average temperature from 20 to 25°C (68 to 77°F), females will require approximately a 25-30 kcal **reduction** in daily energy intake (9-10 g / 0.3-0.4 oz less feed) based on a 2800 kcal ME/kg diet.

It is essential that the changing energy requirements of the bird caused by changing environmental temperatures are taken into account. However, altering feed intake in response to changes in temperature is not straight forward and feed allocation, egg production levels, egg weight, egg mass, and body weight must also be considered before any changes are made.

### Environment – Lighting and Persistency

In order to dissipate juvenile photorefractoriness, birds must experience at least 18 weeks of short daylengths (8 hours) during rear. Birds can then be given, and will be able to respond to, an increase in daylength (light stimulation), thus initiating production. However, after prolonged exposure to long daylengths (>11 hours), birds become adult photorefractory. This means that they are no longer able to respond to a long stimulatory daylength and production begins to decline with age (the normal egg production curve). It is recommended that in lay, a daylength of 13-14 hours of light is provided. Providing more than 14 hours of light to a flock during lay will generally lead to that flock exhibiting poorer persistency because the onset of adult photorefractoriness will be advanced and production will decline more rapidly.

In situations where open-sided production houses are used, daylength should preferably be kept to 13-14 hours by use of blackout curtains at the beginning and end of each day.

### KEY MANAGEMENT POINTS

- Standard objectives for feed allocation are based on house temperature of 20°C (68°F).
- Correction in feed allocation is needed for house temperatures differing from 20°C (68°F).
- For a winter peaking flock, aim to reduce feed levels by 10-11% from peak to end of lay.
- For a summer peaking flock, aim to reduce feed levels by 8-10% from peak to end of lay.
- Manage rearing daylength to be a maximum of 8 hours per day for at least 18 weeks.
- Production daylength should be a maximum of 13-14 hours to help delay adult photorefractoriness.
- **Production traits (% eggs, egg weight, egg mass, body weight) after any feed change must be monitored closely.**

### Environment - Ventilation

Ventilation is a key part of the management system and should be monitored as closely as possible for the life of the flock. It is essential to highlight the importance of ventilation and the link it has with persistency. Inappropriate or inadequate ventilation can lead to poor persistency, and ventilation must be accurately matched to bird biomass, feather cover, and external environmental conditions. Exact ventilation principles will not be discussed further in this article. For more information on the principles of broiler breeder ventilation please refer to the following Aviagen® articles: Environmental Management in the Broiler Breeder Rearing House and Environmental Management in the Broiler Breeder Laying House.

### Feather Cover

Female feather cover plays an essential role in post-peak flock management for egg production and hatchability performance. Flocks with poorer than expected feather cover, if not managed correctly, do show clear drops in hatchability and egg production that in many cases will not recover. Pay close attention to feed level, house temperature, and mating ratio, particularly mating ratio where over-aggressive and/or too many males are present.

Feather cover of broiler breeder females can be scored throughout the life of the flock using a 0 to 5 scale (0 relating to females being fully feathered and 5 relating to females with no or little feather cover). A sample of females should ideally be inspected for feather cover on a weekly basis. Each bird in the sample should be given a feather score so that an overall idea of flock feathering condition can be determined. This can be done in detail when handling the birds during weighing times and/or when walking through the flock during a general house inspection.

Examples of management areas that affect feather cover are provided in **Table 1**. More information can be obtained from a local Technical Service Manager.

**Table 1:** Examples of management factors that influence feather cover during the production period.

Influence	Causal Factor	Remedial Action
Higher stocking densities	More than 5.5 birds per m <sup>2</sup> (less than 2.0 ft <sup>2</sup> per bird)	Reduce to recommended level (3.5-5.5 birds per m <sup>2</sup> or 2.0-3.1 ft <sup>2</sup> per bird)
Inadequate female feed space	Lower than recommended feeder space	15 cm or 6 in per bird - track 10 cm or 4 in per bird - pan
Poor feeder maintenance		Ensure correct feeder maintenance
Incorrect distance between feeder lines	Birds are too close to one another	Maintain minimum distance of 100 cm (3.3 ft) between feeder lines
Inadequate drinker space	Lower than recommended drinker space	6-10 birds/nipple 2.5 cm or 1.0 in per bird round/trough drinkers 15-20 birds/cup
Incorrect drinker and feeder height	Too low or too high	Adjust to ensure 75-85° drinking angle for adult birds using nipples Adjust to correct height where using bell drinkers
	Females unable to clearly pass under feeders	Feeder height should allow for easy passage of birds below the feeders
Poor feed distribution time	Slower than 3 minutes to fill feeder system completely	Decrease feed distribution time and/or distribute feed without lights turned on
Sexual synchronization	Males too mature for females causing feather damage early in production cycle	Ensure males and females are equally mature before mating Reduce male ratio
Mating ratios	Too many males mixed with females	Reduce male ratio to follow recommendations
Litter quality	Caked/non-friable litter - birds cannot bathe	Ensure adequate/correct ventilation to keep litter quality dry and friable

Feather Cover and Nutrition

The influence of nutrient specifications, particularly in relation to methionine and cystine levels, should not be overlooked when considering feather condition. Indian River nutrition specifications are designed to ensure optimal feather development throughout the life of the flock and should be followed as closely as possible to ensure best possible performance.

Feather Cover - Temperature and Feed Levels

The relationship between environmental temperature, feed level, and feather cover of females plays a particularly important role in post-peak production persistency. Many flocks experiencing lower than expected weekly egg production levels post-peak also exhibit feather cover that is much poorer than normal for age.

For flocks with poor feather cover, feed levels must be adjusted to allow for increased energy requirements. The relationship between feed level and environmental temperature discussed previously is based on changes required in feed allocation when house temperature varies from 20°C (68°F), and assumes a good feather cover. However, where feather cover is poor at lower temperatures, an additional increase in feed allocation (above the levels mentioned earlier) is essential to maintain production traits. The difference between a well-feathered flock in the summer and a poorly feathered flock in the winter may be as much as 25 g (or 0.9 oz) of feed per bird per day.

Feather Cover and Fertility

The focus up to this point has been on maintaining persistent egg production levels post-peak, but poor feather cover also has a direct impact on fertility levels, reducing the number of chicks per female, particularly after 40 weeks of age. This is not because the female becomes any less fertile as such, but because a poorly feathered female becomes less receptive to male mating activity. Normal mating behavior does not occur if a female does not have the protection of a layer of feathers. The very process of mating will have an impact on feather cover of females throughout the production cycle so it is important to monitor and understand the normal pattern of feather loss for a flock and react appropriately to natural changes in feather cover or if feather loss becomes excessive.

Over-Mating

In many cases where flocks exhibit lower fertility levels through peak and drops in fertility, particularly post-peak, mating ratios are above those recommended (**Table 2**).

**Table 2:** Recommended mating ratios.

Age of Flock	Recommended Number of Males / 100 Females
22-24 weeks (154-168 days)	9.50-10.00
24-30 weeks (168-210 days)	9.00-10.00
30-35 weeks (210-245 days)	8.50-9.75
35-40 weeks (245-280 days)	8.00-9.50
40-50 weeks (280-350 days)	7.50-9.25
50 weeks – depletion (350 days to depletion)	7.00-9.00

Initial mating ratios (25 to 35 weeks) are often higher than recommended due to the incorrect belief that this will improve early and peak hatch. Male numbers may also remain higher than recommended when:

- There is no means of disposing of males.
- Male levels are simply not reduced.
- Inappropriate male management reduces mating ratios such that fertility becomes poor and then mating ratios are held (or increased) in an attempt to help fertility.

Avoid having high male numbers as this will lead to over-mating, feather damage, non-receptive females (due to poor feather cover and bullying) and poorer persistency (fertility) post-peak.

**KEY MANAGEMENT POINTS**

- Use a feather scoring system to help you MEASURE – MONITOR - REACT to your flock on a weekly basis.
- Adjust feed levels according to environmental temperature and feather cover of females.
- High mating ratios at the start of production do not necessarily improve early and peak fertility levels.
- High mating ratios will have a negative impact on feather cover of females, and later fertility and production levels.
- Adjust mating ratios to recommended levels to prevent over-mating, feather damage, and non-receptive females.

Body Weight and Persistency

Body-weight control is key in day-to-day management practices, but in many cases feed allocation simply follows a set “company” profile from one flock to the next. With feed prices contributing to 70-80% of the cost of production, adjusting feed levels according to set “company” guidelines in order to stay within budgetary constraints may not allow for what a flock requires when it is over or under standard weight.

Body weight, persistency, and feed levels must be managed quantitatively:

- Reducing feed too aggressively or without allowing or compensating for an overweight flock will cause a drop in persistency, altering the balance of weight gain, egg production, and maintenance.
- Increasing feed too quickly to bring a flock back to target when it is underweight generally pushes birds overweight too quickly and reduces egg production.

When making any adjustments in feed level, it is essential to consider the impact that this has on total nutrient intake rather than just grams of feed per bird per day. Changes in daily energy and protein intake will affect body weight, egg weight, egg production, and egg mass.

If a flock is overweight for example, this weight difference from standard must be maintained if persistent production levels are also to be maintained. Giving more feed over the life of the flock, but ensuring correct total nutrient intake, will maintain egg production as a reward.

**Figure 1:** Relationship between body weight control, feed amount and production.

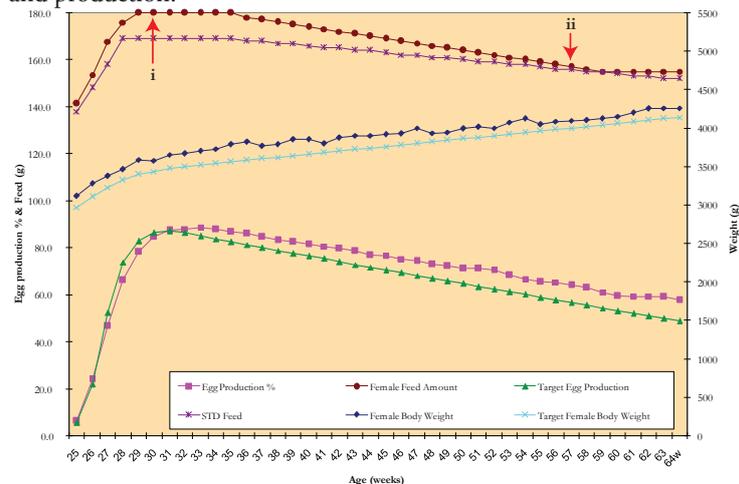


Figure 1 shows a high peaking flock with a peak feed amount of 180 g (6.3 oz) per bird (i). The flock remains on this feed level until 35 weeks and feed withdrawal is 13% from peak to 58 weeks (ii). Persistency is good even though body weight is still very high compared to standard. The increased feed level and appropriate feed withdrawal allowed this flock to maintain body weight without compromising production.

The balance of production, egg weight, maintenance, and body weight becomes even more critical for an underweight flock. If a feed reduction is required, it is good practice to give 2 smaller feed changes over a 7 day period rather than a larger, single reduction once a week. This allows the flock to adjust more gradually, maintaining balance of production, body weight, and maintenance.

Egg Weight and Persistency

Along with body weight, monitor egg weight closely during the post-peak production period. Monitoring egg weights on a daily basis allows trends against standard to be plotted so that feed amounts can be adjusted appropriately. A change in trend of egg weight increase often occurs before a drop in egg production is seen and so can be the first indication of a potential problem.

A flock performing below standard for post-peak egg production and being overfed will show consistently (over a period of at least 4 days) higher than expected increases in daily egg weight away from the standard. Over-feeding a poor performing flock will have a negative impact, not only on production but also on overall hatchability due to a generally poorer egg shell quality in larger eggs. In this case, further feed removal will be required.

If feed is withdrawn too quickly or at too high a level for the egg output of the flock, a reduction in egg weight will precede a drop in production. If a consistent drop in egg weight (over a period of at least 4 days) occurs, feed should be given back to the flock.

**KEY MANAGEMENT POINTS**

- Monitor body weight and egg weight as part of the daily and weekly management schedule.
- If birds are over standard body weight, maintain the difference between standard and actual body weight throughout the production period.
- If birds are under standard body weight post-peak, remove feed in small amounts split over a 7 day period.
- Adjust feed levels to maintain a regular and small weekly increase in body weight and egg weight.
- Adjust feed levels to maintain body-weight gain, maintenance, and egg production.

Housing Conditions Related to Persistency

Broiler breeder flocks may be challenged to varying degrees on a daily basis, however only the effects of larger challenges may be noticeable and seen as sudden or dramatic changes in physical flock performance.

It is much more difficult to identify the ongoing, lesser challenges that may only be observed as a gradual change in flock persistency or reported fertility, particularly during the later stages of production. Housing conditions (see **Table 3**) should be monitored on a regular basis and adjustments made where possible.

**Table 3:** Housing conditions affecting broiler breeder persistency.

Housing Condition	Observation	Remedial Action
Nest box space	Increased floor egg levels, broodiness	Increase nest boxes to allow 1 box per 3.5-4 birds manual nests
	Reduced production, increased misshapen eggs	40 birds per linear meter or 12 birds per linear foot mechanical (communal) nests
Feeder/feeding management	Increased feed clean-up times, reduced egg production, increased flock CV%, increased floor egg levels	Maintain recommended feeding space
Drinker/drinking management	Reduced egg production, dehydrated birds, increased floor eggs	Maintain recommended drinking space
		Improve water availability
Parasites – worms, red mites	Reduced egg production, increased water consumption, change in face color	Treat flock with approved medicine
Stocking densities	Reduced egg production, more floor eggs, increased CV%, issues with feed clean-up times, dehydrated birds	Reduce birds per square meter and/or increase available feeder, drinker, and nest box space
Incorrect ventilation	Increased floor eggs, reduced egg production, reduced daily livability	Ensure correct ventilation techniques and practices are used
	Ocular discharge	
	Reduced fertility	

**Summary**

Broiler breeders have been changing rapidly over the years. With primary breeding companies selecting for both improved broiler traits and improved reproductive performance, it has become even more essential to provide detailed management practices for the day-to-day running of facilities and broiler breeder flocks.

### KEY MANAGEMENT POINTS

#### Maintaining Persistency of Both Egg Production and Fertility of Females

- A flock is affected by environmental temperature and feed levels should be adjusted accordingly.
- Measure and monitor flock feather cover and react by adjusting feed amounts where necessary, especially where environmental temperatures are variable.
- High mating ratios will have a negative impact on feather cover and fertility levels, and should be controlled proactively.
- Female body weight and egg weight must be monitored closely, remembering that an overweight flock must remain above and parallel to standard in order to maintain persistent production levels.
- Correct nutrition specifications must be adhered to.

Measuring and monitoring changes in feather cover, environmental temperature, flock condition, body weight, and egg weight profile compared to standard, as well as housing conditions and external challenges is necessary to be able to react efficiently and effectively to how the flock is performing.

Adjusting feed levels correctly, decreasing or reacting to incorrect mating ratios, and minimizing challenges within the flock allows post-peak persistency in both egg production and fertility to be improved and maintained.