Layer Management: Egg Size Control

Introduction

The end users of table eggs today are looking for the best buy for their money. When it comes to groceries and a food staple like eggs, it's Grade A Large Eggs that fit this scenario most of the time. To further drive this trend in Nova Scotia retail figures from last year show that for all size eggs sold Grade A Large Eggs had the lowest average retail price per dozen. The total nutritional value of a carton of Grade A Large Eggs (56-62 gm/egg) may be increased when the carton is supplemented with eggs that are Extra Large in size (63-69 gm/egg), which is allowable under egg regulations. This type of marketing using cost and nutritional value further drives up the demand for the Grade A Large Egg.

Unless there is a special market, producing bigger size eggs is not economical for the table egg producer. It takes more nutrients to produce bigger size eggs, which increases the amount of feed eaten to produce the egg and therefore the cost per egg increases. The difference in feed usage to produce eggs and the associated feed cost increases are compared in Table 1 and are accentuated as layer numbers increase.

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Table 1: Comparing Feed Usage and Cost for Producing Different Size Eggs

Based on an average of 300 eggs produced per hen per year. XLarge average weight = **65 g** Large average weight = **60g**	**Kg of eggs produced**	**Feed Used Kg** FCR=2.2:1	**Feed Cost/T** **$400**	 **$450**
XLarge - Kg Eggs/Hen/Yr	19.5	42.9	17.82	19.31
Large - Kg Eggs/Hen/Yr	18	39.6	15.84	17.16
Increase for XLarge eggs over Large eggs	**1.5**	**3.3**	**$1.98**	**$2.15**
XLarge - **Kg Eggs/1000 Hens/Yr**	19,500	42,900	17,820	19,310
Large - Kg Eggs/1000 Hens/Yr	18,000	39,600	15,840	17,160
Increase for XLarge eggs over Large eggs	**1,500**	**3,300**	**$1,980**	**$2,150**
XL - Kg Eggs/10,000 Hens/Yr	195,000	429,000	178,200	193,100
Large - Kg Eggs/10,000 Hens/Yr	180,000	396,000	158,400	171,600
Increase for XLarge eggs over Large eggs	**15,000**	**33,000**	**$19,800**	**$21,500**

FCR = Feed Conversion Ratio

How Does An Egg Laying Hen Reach and Maintain a Large Egg Size?

With proper management and husbandry skills along with nutritional know how egg producers can influence the size of eggs produced by the modern, very efficient laying hen. Basic information essential for the egg producer to know to make proper decisions concerning pullets and layers are:

- Body weight
- Flock uniformity
- Feed intake
- The level of energy, protein and calcium in the feed
- Light period & intensity
- Pen/barn temperature

The egg producer cannot make a fully informed decision about egg production for the layer flock when any of this information is missing.

There are some other basic factors the egg producer needs to know concerning egg size:

- Egg yolk size released from the ovary dictates egg size
- Genetic make-up determines bird size
- Bigger birds eat more and lay bigger eggs
- Nutrition can have some influence on egg size
- For the table egg market, egg size is key compared to the breaker market where the criteria is total egg mass

Remember: A Proper Start = A Proper Finish

When the replacement pullet flock has developed properly, the egg producer has the opportunity to optimize the birds' performance in the laying barn. The egg producer may use husbandry and nutritional skills to manipulate the pullet flock so the proper egg product is produced.

Influencing Target Mature Body Weight

1. Light Stimulation

When the layer pullet reaches the mature target body weight it is time to light stimulate the flock to sexual maturity. Light stimulate the flock by increasing the daily light hours by one hour at mature body weight, then add half an hour per week afterwards until the target light period is reached. When sexual maturity is delayed one week, the mean egg weight of the flock will increase by at least one gram for the duration of the flock. Egg weight can be affected by as much as 1-3 g/egg when changes in sexual maturity occur with flocks not at mature target weight. The number of eggs per hen from such a flock would decrease by 3-4 eggs for each week delay in start of lay. Lost egg production in the early peak lay cycle is never fully recovered.

Use a light period of 14-15 hours throughout the lay cycle. More hours of light will increase activity time, feeding time and feed consumption and therefore increase body and egg size with decreased feed efficiency.

Delaying light stimulation by half to one week for non-uniform flocks with variable body weights may allow a number of smaller birds to reach target body weight and reduce production of smaller eggs. These non-uniform weight flocks will produce variable egg sizes.

2. Nutrition

The egg laying hen needs nutrients for:

1. body maintenance,
2. early in the lay cycle growth, and
3. egg production.

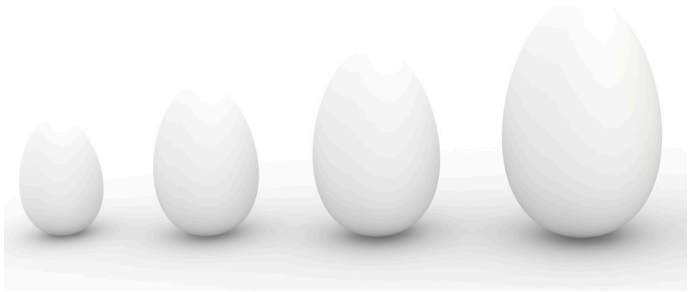
An overabundance of nutrients will lead to increased bird growth along with increased egg size. The amount of nutrients the layer receives is dependent on:

1. the level of nutrients in the feed (% protein, % specific amino acids, Metabolizable Energy (kcal/kg), % calcium, % oil/fat, etc.), and
2. the amount of feed intake

A 100 g/bird/day feed consumption of a ration with 19% protein, .45% methionine, 2850 ME kcal/kg and 4 % calcium means the birds are getting daily the 19 g protein, .45g methionine, 285 kcal and 4 g calcium needed for production of a large size egg.

Optimum Egg Size Control

1. Pullet at mature target body weight (varies with pullet strains)
2. Pullet flock uniformity of 85%+
3. Pullets moved to lay barn prior to first egg (in lay barn body weights taken every six weeks)
4. Pullets on layer type diet 7-10 days prior to first egg to build calcium reserves
5. Pullets light stimulated at mature target body weight with quick step up to 14-15 hours light
6. Feed layers to get egg size first – most hens reach large egg size (60g) by 30 weeks of age
7. Temper feed intake using management tools – pen temperature, feeding frequency, etc.
8. Maintain the flock with a uniform feather cover
9. Temper ration to control bird weight and egg size without effecting egg production
10. Ration changes are based on egg size or mass not percent production



Manipulating Feed Intake for Optimum Daily Nutrient Intake

Through the Well Formulated and Manufactured Ration

1. Maintain body size: provide enough nutrients for egg production and body maintenance.

2. A well balanced ration will allow also for some growth. Excessive bird growth in the laying barn may be from increased overall nutrient intake due to a poorly formulated ration.

3. The ration formulation must reflect the daily feed intake level of the laying hen.

4. Adjust feed texture where coarse texture increases feed consumption and fines decreases feed intake. This relates to palatability where fines have less of the better tasting grain. Barley has a tendency to produce more fines so should not be used in the early layer production diets when trying to increase daily feed consumption. Barley could be incorporated in layer diets later in the production cycle.

5. Oil/fat added to the ration improves feed palatability and stimulates appetite.

Through Feeding

1. Layers should be allowed to clean out the feed trough at least once/day to ensure they get the complete ration every day and there is not a build-up of fines from the feed.

2. To reduce feed intake adjust and minimize the frequency of feeding times to reduce stimulating birds to eat when the feeder runs.

3. To stimulate feed intake run feeders more often.

4. Adjust feed height in the feed trough to minimize waste and over-consumption by some birds.

Through Layers Metabolic Activity and Body Maintenance Needs

1. Adjust pen temperature: For every 1° C change in pen temperature feed intake will be affected by 1 g/bird/day. Birds eat 5 g/bird/day less at 25°C than at 20°C. For a 20,000 hen flock that's 100 kg/day less feed.
2. House birds in properly designed cages and

space that allows for the maintenance of a good uniform feather cover on the laying hens. When birds lose feather cover, body heat/energy loss increases and more energy and feed is required for body temperature maintenance. Husbandry practices should prevent feather loss whether mechanical, lack of nutrients or change in the pen environment (light).

3. Adjust bird activity level by optimizing day length for the layer. More hours in the day means more time for birds to be active and eat more feed.

4. Adjust light intensity to reduce bird activity and movement.

5. To ensure all layers are being treated equally there should be uniform light intensity throughout the pen: floor to ceiling and front to back of the pen. Layers in the top cage level in pens with lights on the ceiling are exposed to higher light intensity than the layers in lower cage levels and therefore are more active requiring more feed to meet metabolism levels. The birds in the lowest cage level tend to be less active and get bigger requiring more feed for maintenance of the bigger body.

6. The metabolic heat from nutrient digestion varies for different nutrients. For the laying hen body heat production is greater for digesting carbohydrate than for oils/fats. By adjusting the carbohydrate level in the diet, metabolic energy needs for body temperature control can be reduced. Adjust feed ingredient/nutrient levels to affect energy used in the digestion of the diet. Protein digestion produces even more body heat but it is not economical to adjust protein levels for this purpose.

7. Improve amino acid balance in the diet by the addition of specific limiting amino acids like methionine, lysine, threonine, etc. and reduce energy required to digest poorer quality excess protein in feeds.

Controlling Egg Size Through the Diet

Work on egg size before it becomes a problem by following a proper program for pullet development, reproductive maturity and maintenance of egg production. Egg size control is about maintaining egg size where trying to decrease egg size will inevitably lead to production losses. To get any significant effect from the diet in maintaining egg size, a number of nutrients need to be adjusted at the same time.

Phase feeding layer programs are based on these types of principles.

1. Protein: Need 18-19 grams of protein/bird/day for large egg production. Decreasing protein level by too much will decrease egg numbers as well. Supplementing with artificial amino acids allows room to lower protein and improve amino acid balance closer to the laying hens' nutritional requirements.

2. Amino Acids: Lowering the methionine level and Total Sulfur Amino Acids (TSAA) level in the diet will aid in decreasing egg size.

3. Energy: Birds eat for energy so ensure feed/energy intake meets the need of 280-310 kcal/bird/day for large egg production. Maintaining caloric intake at levels needed for egg production and body maintenance with little excess will ensure the bird doesn't over consume energy and put on excessive weight. Birds on the floor require 5-10% more energy depending on pen temperature and flock activity level. Heat stress will decrease feed and energy intake along with egg size and egg numbers.

4. Oils/Fats: Decreasing unsaturated fatty acids (like linoleic acid) and total oil/fat levels in the diet will affect yolk size and therefore egg size. Excess oils/fats like linoleic acid are deposited in the yolk, increasing yolk size and egg weight. Most vegetable oils (soybean, canola) are higher in unsaturated fatty acids than fats from animal sources. Adjusting ration levels is difficult for many egg producers that produce eggs from diets with no animal bi-products. A saturated fatty acid like palmitic acid does not have the same effect on egg parameters. Digestion of oils/fats produces less body heat so a higher percent of energy from oils/fats should be considered in warmer weather.

5. Decrease daily feed intake: Adjust the ration, the pen environment and management practices.

6. Increase egg production: Feed mainly used for egg production and body maintenance. Birds that come into production early tend to lay more eggs but of a smaller size.

7. Minerals: Four (4) grams of calcium/bird/day are needed for large egg production. As the egg size increases the amount of egg shell laid down on the egg does not necessarily increase. Like a balloon, as the egg size gets bigger the egg shell

gets thinner. With a Phase Feeding Program ration calcium levels should increase as the layer ages while phosphorus levels are decreased.

Feed formulations should be related to feed consumption levels and stage of the production cycle. When a pullet flock starts egg production the feed consumption/bird/day is around 75-80 g/bird. The first few eggs are usually smaller in size so nutrient requirements aren't as high. The feed consumption target is to get the daily feed consumption to a level that supports large egg production (56-63 g/egg weight) usually at about 100-105 g/bird/day and before 30 weeks of age. The challenge is to get the hens eating at the proper level and achieving the large egg size, then trying to maintain these levels of feed consumption and egg size throughout the lay cycle.

Checking bird body weight every six weeks allows the egg producers to know if the ration is well balanced and meeting the body maintenance and egg production requirements. Too much increase in body size may be pointing to an imbalanced ration with excess nutrients being consumed.

The phase feeding program for layers should be based on egg size or egg mass not percent production. Minerals in the layer diet like calcium and phosphorus must be adjusted as the laying hen ages, to compensate for the decreases in calcium utilization in aging birds especially after 40 weeks of age. As the egg size reaches or significantly exceeds the target weight switch to rations with lower oils, methionine/TSAA and phosphorus, and increased calcium. When aging layers continue to produce eggs that are at the target egg weight and production level, the ration only needs adjustments in the calcium and phosphorus levels; so egg shell quality can be maintained.

With proper monitoring of flock performance and egg product condition, the egg producer has the tools to efficiently produce the egg product the consumer wants with optimum returns. It's just common sense that less feed and more eggs at a lower cost should stimulate egg producers to improve their husbandry and nutritional skills to benefit from the ever improving layer hen available today.

References:

ISA, A Hendrix Genetics Company, www.isapoultry.com

Lohman Tierzucht, www.ltz.de

Commercial Poultry Nutrition 3rd Edition, Leeson & Summers

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