

Lighting programs

Lighting programs have been used in the egg production industry for decades to avoid the seasonality of egg production. It also allows to synchronize the start of production of the whole flock and to do it at the right time according to the egg size requirements of each local market. **A lighting program for laying hens can be divided into different parts depending on the objective of the program during the different periods in the life of the bird:**



In this technical tip we cover the first 3 topics (brooding, rearing and first light stimulations).

Lighting programs during brooding

Main objective

Provide the environment for day-old chicks to adapt to the rearing farm and to minimize mortality due to non-starter chicks.

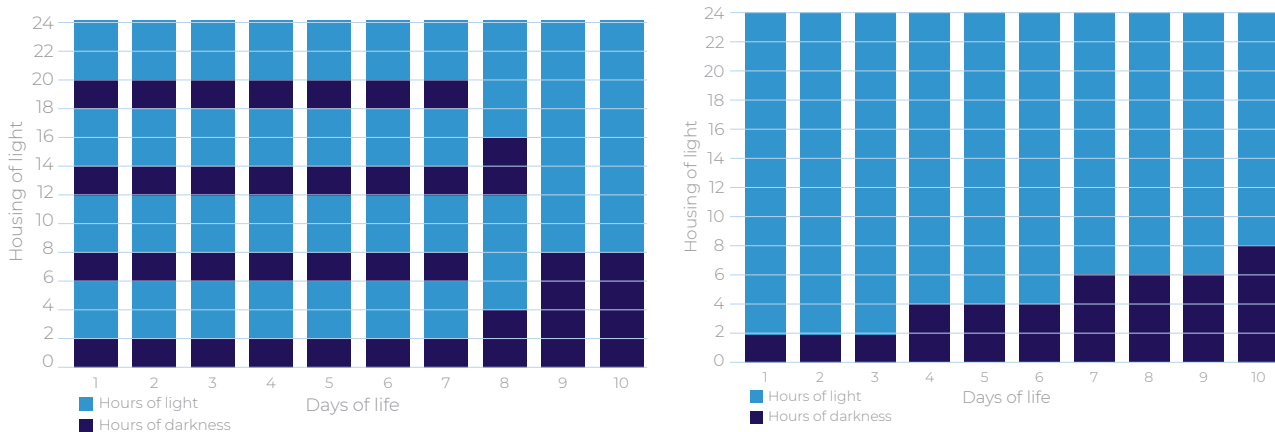
This is the lighting program that is applied during the first days of life. Birds are not very reactive to photoperiod at this age, but lighting program plays a crucial role for making chicks to adapt to the rearing house. In practice, there are two types of programs that can be used during this period: Non-intermittent and intermittent. They are described in:

Table 1. It is recommended to use intermittent lighting programs if it is possible.

Table 1. Different lighting programs for the first week					
		Description	Advantage	Disadvantage	Recommended for
	Non-intermittent programs	A long photoperiod of light (22h) for the first few days and gradually reducing it during the first week	Longer period for bird's activity	It is difficult to assess the status of the flock as bird's activity is not synchronized	Open houses
	Intermittent programs	Four repetitions of a cycle of 4 hours of light and 2 hours of darkness during the first 7-10 days	Synchronization of the bird's activity Reduced early mortality Improved uniformity	Only suitable in lightproof houses. Breaks during house service by darkness	Dark houses

It is crucial to reach a light intensity between 30 – 50 lux during the first week. This should be measured at drinker level. Light should be spread uniformly throughout the entire cage. It is important to avoid shady and dark areas.

Graph 1. Examples of different lighting programs for the first days after chick arrival



A) Example of an intermittent program for 7 days followed by a transition day to the standard lighting program.

B) Example of a non-intermittent program. Note that every day there is a period of darkness.

Rearing lighting program

Main objective



The correct growth of the birds by avoiding light stimulation that may cause early and unwanted sexual development.

As mentioned above, an increasing photoperiod during rearing can produce a premature onset of laying, even if it occurs at an early age. The result would be a bird that begins production without the right body weight development and an insufficient reserve of calcium in the medullary bones. **Therefore, never increase the photoperiod (hours of light) during rearing.**

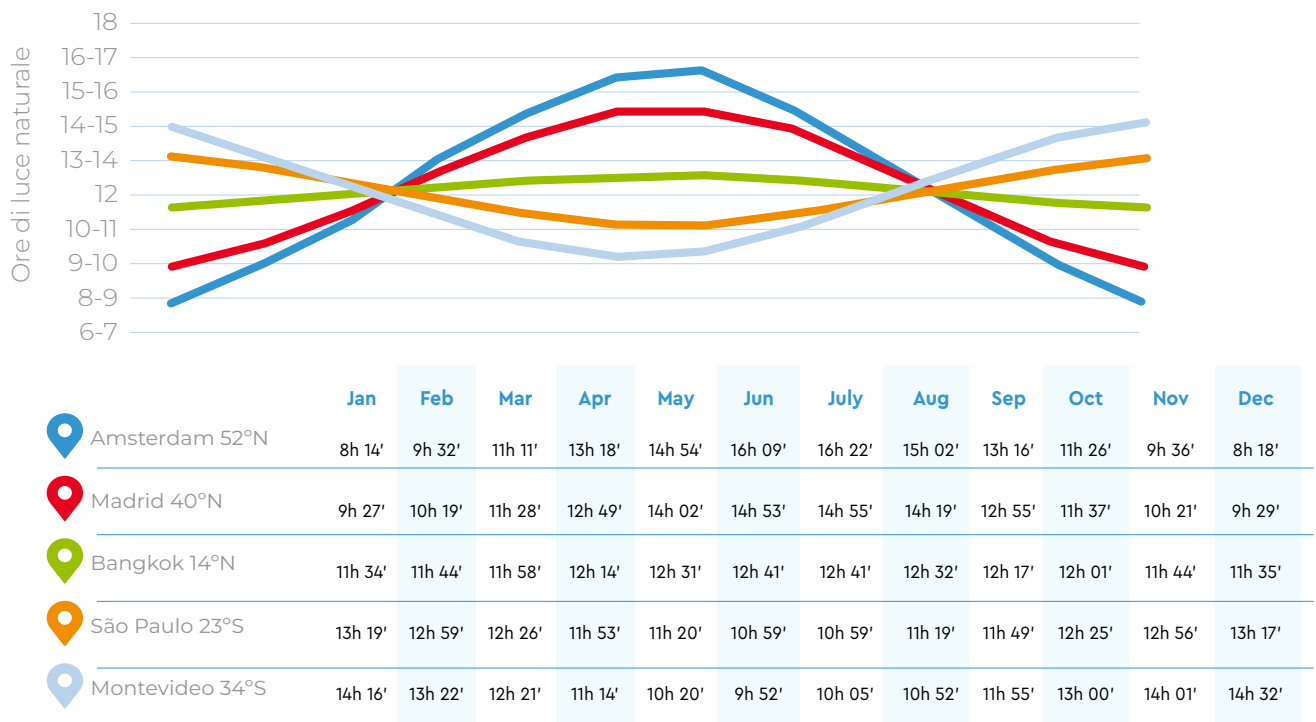
*Unfortunately, in open houses natural light can interfere with the established lighting program. Thus, it can even have an undesirable stimulation effect if the birds are exposed to naturally increasing photoperiods. Natural light can also have a delaying effect on the onset of lay if it interferes with the timing of light stimulation. **To avoid these issues and to make use of all the zootechnical possibilities of the rearing program, natural light should be taken into account in the design of the lighting program. Follow these 5 simple steps:***

Step 1

Be aware of the natural daylength during the rearing period.

The length of the natural day can vary significantly depending on the season and the latitude of the farm location. It is important to know if the photoperiod during rearing will be increasing or decreasing as well as the natural day length at the planned first stimulation.

Graph 2. Natural day length in different locations. The only ones having same hours through the whole year are at 0° latitude (Ecuador, Malaysia...)





Step 2

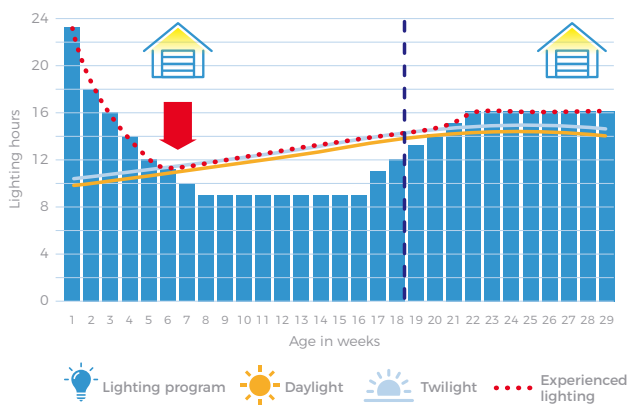
Determine the type of rearing house (open or lightproof house).

There are houses that completely avoid the entry of external light and therefore the interference of natural light. They usually have dynamic ventilation systems and are equipped with light traps in the air inlets as well as in the ventilators. **A truly lightproof building should have less than 3 lux inside if the artificial lighting system is turned off even with the ventilation system working at full power.** If there is residual light in any part of the building, it should be considered as open house.

The type of housing has some implications to the lighting program. Depending on the type of rearing and production houses three different limitations can be established:

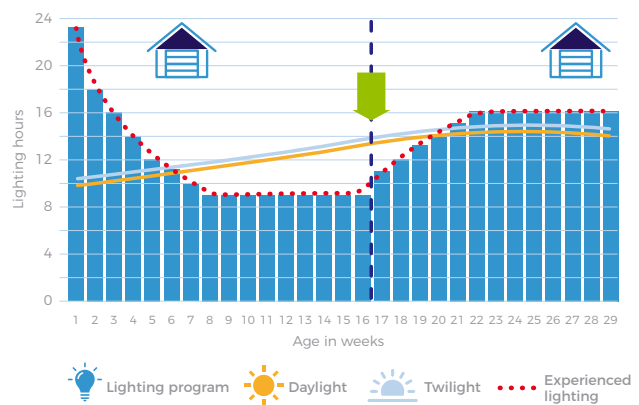
 Rearing house		 Production house		Limitation
Open	Open	Open	Open	Minimum length of the lighting program should be equal or superior to natural daylength on the programmed stimulation day
Open	Lightproof	Open	Lightproof	
Lightproof	Open	Open	Open	Lighting program must consider that it will match natural daylength after transfer to the production house.
Lightproof	Lightproof	Lightproof	Lightproof	No limitation

Examples of lighting programs - natural light vs experienced lighting



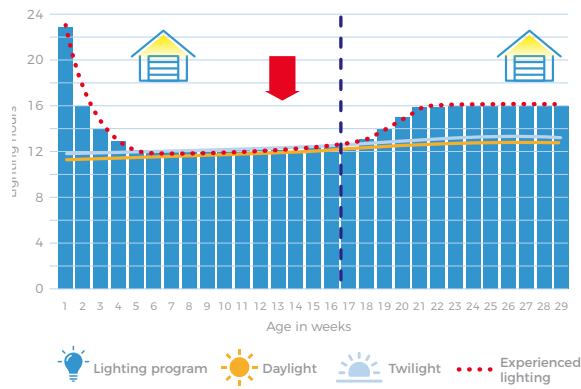
- Location:** Montevideo
- Hatch date:** 05-july
- Housing:** Open house
- Egg size:** on standard

Wrong lighting program. Birds will be stimulated by week 7 (red arrow) by the increasing natural daylength. As consequence Production onset will start before birds will reach the correct body weight. A correction due to the type of housing should be considered.



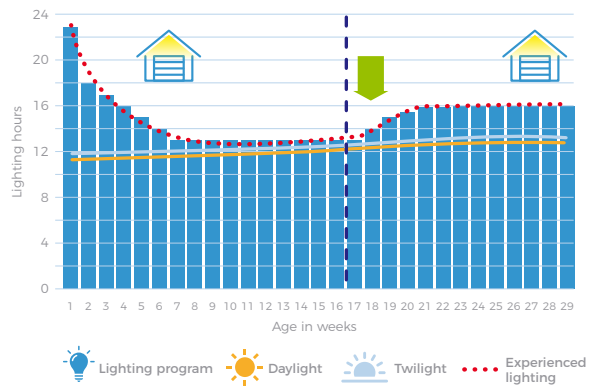
- Location:** Montevideo
- Hatch date:** 05-july
- Housing:** Light-proof house
- Egg size:** on standard

Right lighting program. Birds will be stimulated by week 17 (green arrow) as natural daylength is not interfering due to the house type.



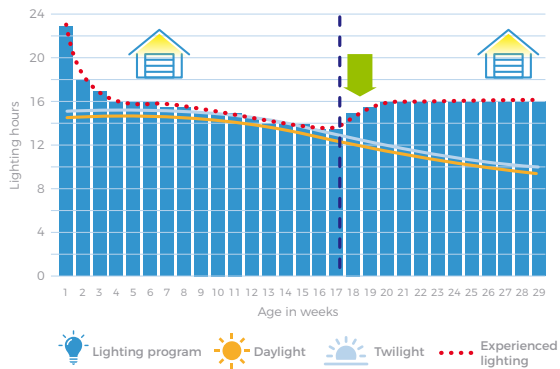
- Location:** Bangkok
- Hatch date:** 14-dec
- Housing:** Open house in rearing, open house in production
- Egg size:** on standard

Wrong lighting program. Wrong lighting program. A common mistake in areas close to the equator is to think that the natural daylight hours will be twelve hours consistently and therefore there will be no stimulation effect without artificial light. The reality is that there are variations in the natural photoperiod as we move away from the equator, and this can affect the hens. In the example, stimulation will occur from week 12 (red arrow) onwards and therefore hens will be earlier in their onset of production.



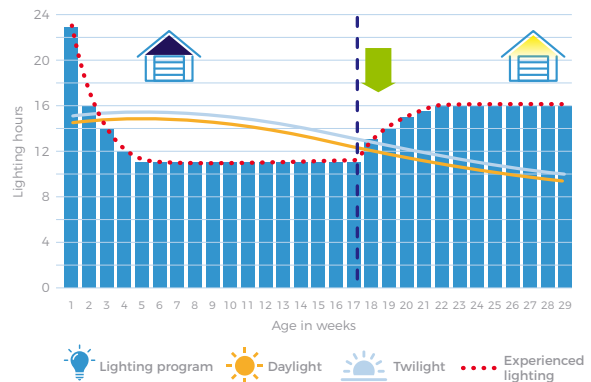
- Location:** Bangkok
- Hatch date:** 14-dec
- Housing:** Open house in rearing, open house in production
- Egg size:** on standard

Right lighting program. If the effect of natural light is considered, it is logical to keep the photoperiod stable at 12 hours. This will prevent the birds from being exposed to increasing photoperiods until stimulation in week 17 (green arrow). In addition, although the target egg size is at standard, it has been shifted to a slow stepdown program to promote flock growth in warm weather conditions.



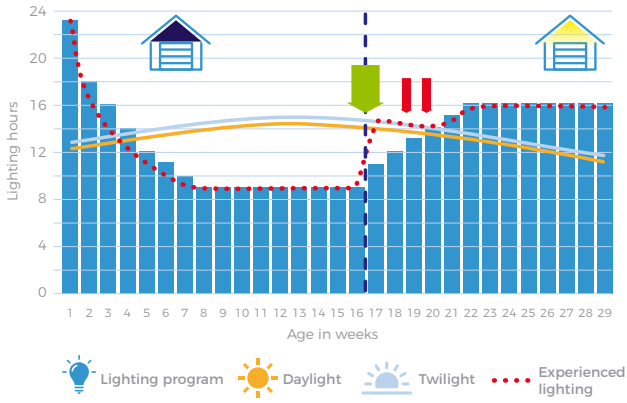
- Location:** Indianapolis
- Hatch date:** 31-may
- Housing:** Open house in rearing, open in production
- Egg size:** on standard

Right lighting program. Photoperiod step down in the lighting program has been adapted to the decrease in natural light. Note that due to the open house restrictions, the program is not fully adapted to the egg size goal.



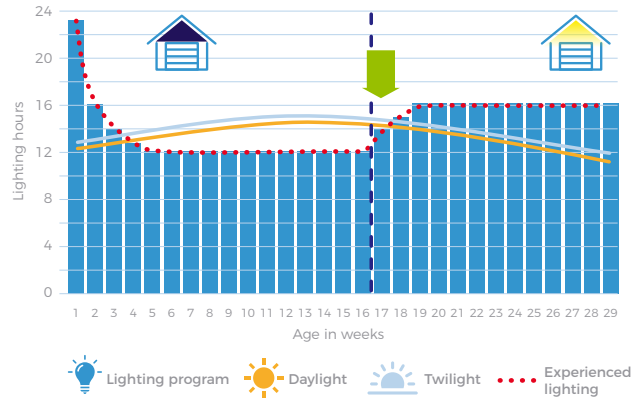
- Location:** Indianapolis
- Hatch date:** 31-may
- Housing:** Open house in rearing, open in production
- Egg size:** on standard

Right lighting program. It has been possible to adapt to the egg-size target using a lightproof house. At high latitudes, even during the period of decreasing daylight, this housing type has great advantages.



- Location:** Algeria
- Hatch date:** 31-march
- Housing:** Light-proof house in rearing, open in production
- Egg size:** on standard

Wrong lighting program. It was not considered that the transfer was to open houses. Therefore, although the birds are first stimulated at 17 weeks of life (green arrow), they are subsequently exposed to a decreasing photoperiod (red arrows) and will therefore be delayed in their onset of production.



- Location:** Algeria
- Hatch date:** 31-march
- Housing:** Light-proof house in rearing, open in production
- Egg size:** on standard

Right lighting program. Light program have been set considering that birds will be exposed to a decreasing photoperiod after transfer. To avoid this, a more aggressive light increasing has been set. Light stimulation in this example is at 17 weeks (green arrow).

Step 3

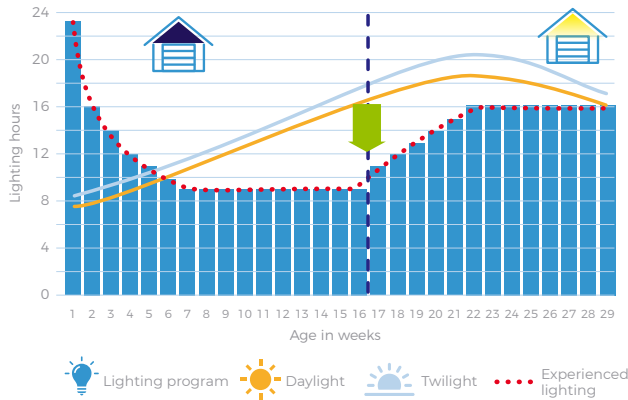
Determine the minimum length of the lighting program during rearing.

This is to determine how many hours the birds will have during the stable period of the program. The limitations imposed in the previous step must be considered. However, if there is freedom to choose the minimum duration of the light program, there are mainly two options:

- 1 Short day length program (9–11 hours).** Birds will be more receptive to light stimulation at the end of rearing and they will have lower cumulative feed consumption.
- 2 Long day length program (12–14 hours).** Allows for longer feed consumption time. This can be advantageous in hot climate countries where feed consumption will be restricted by high temperature during the rearing period.

Ending rearing	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Bangkok	12	12	12	13	13	13	13	13	13	12	12	12
São Paulo	13h30'	13	12h30'	12	12	12	12	12	12	12h30'	13	13h30'
Montevideo	15	15	14h30'	13	12	11	11	11	12	13	14	15
Mexico	11	11h30'	12	12h30'	13	13h30'	13h30'	13	12h30'	12	11h30'	11
Madrid	11	11	12	13	14	15*	15*	14h30'	13	12	11	11
Amsterdam	10	10	11h30'	13h30'	15*	16*	16h30*	15*	13h30'	11h30'	10	10

Table 2. Recommendation for minimum duration photoperiod in open house rearing depending on the month in which light stimulation is planned. Note that in some cases (*) will not allow enough time for a stimulation program.
 * Note: in some cases, time for stimulation is limited.



- Location:** Helsinki
- Hatch date:** 31-march
- Housing:** Light-proof house in rearing and in production
- Egg size:** on standard
- Right program.** Note the difficulty of making light program in open houses at this latitude for both rearing and production. Especially if there are restrictions on the maximum hours of artificial lighting in the animal welfare legislation.

Step 4

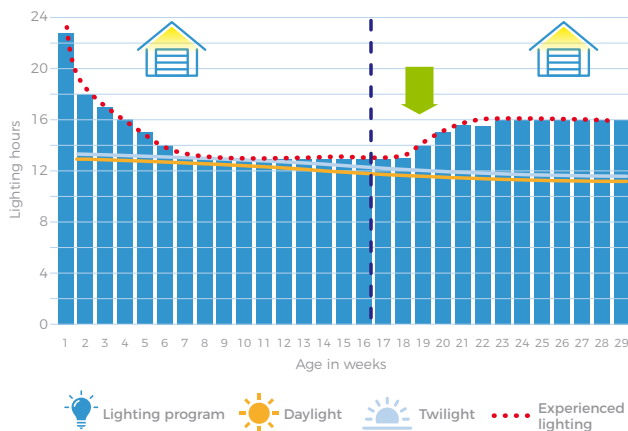
Determine the step down to the minimum duration of the lighting program.

This is to determine reduction of the day length until the stable period of the program. They are usually used with three types of program:

Type	Target in production	How
Fast	More eggs than standard but smaller than standard	3 hours per week until the minimum
Standard	Eggs and size at the standard	2 hours per week until the minimum
Slow	Bigger egg size than standard but less eggs	1 hour per week until the minimum



In countries with HOT CLIMATE and/or farms NOT ACHIEVING BODY WEIGHT, it is recommended to slow down the step down if the correct body weight is not achieved.



- Location:** Manila
- Hatch date:** 31-may
- Housing:** Light-proof house in rearing, open in production
- Egg size:** above standard
- Correct program.** Light stimulation has been delayed until week 19 to start the production of eggs with higher body weight and egg size. The rearing program is also adapted to the target egg size.

Step 5

Determine light intensity during rearing.

As mention above, it is critical to have at least 40 lux at the level of the drinker nipples during the first week to activate the birds. It will encourage bird's activity and allow them to find water and feed. After the brooding period, light intensity should be decreased to 5–6 lux to calm the birds and prevent pecking and cannibalism. **Once the light intensity has been reduced, it should not be increased until the time of light stimulation.**



On the other hand, light intensity in rearing never should be much lower than what will be expected in the production house. This is to avoid any sharp increase of light intensity after transfer. It may therefore be justified to keep these flocks at a higher light intensity in order to reduce the light intensity jump between the rearing and production houses.

Stimulation program

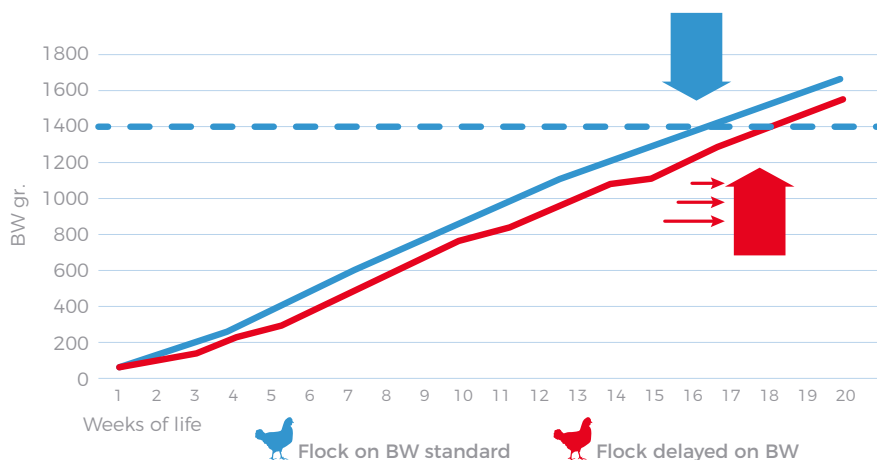
Main objective



To induce the appropriate start of laying when the birds are well-developed and at the right time according to the production objectives.

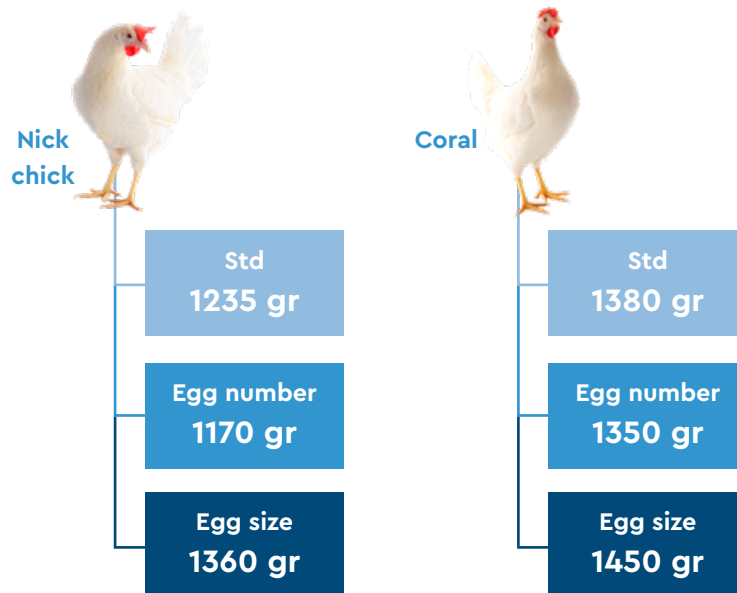
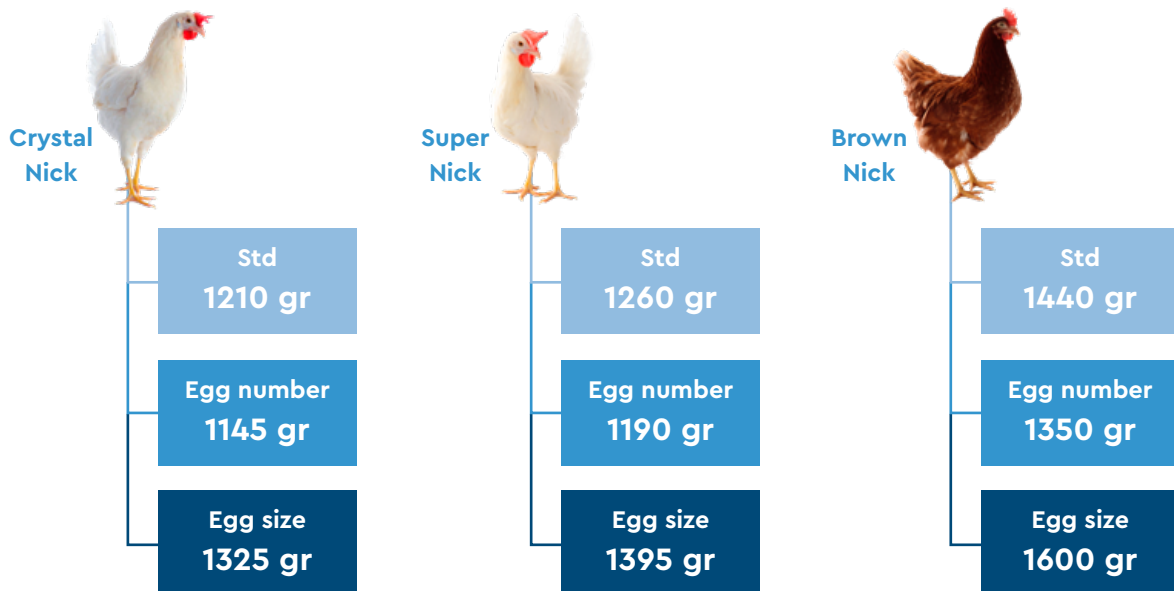
RULES on WHEN to stimulate a layer flock

- 1 Stimulate base on a target body weight. See table below.
- 2 The start of light stimulation is between 15–19 weeks of age.
- 3 If you have not achieved the target body weight, delay the stimulation until you get the body weight. *See chart below.*
- 4 If there is no light stimulation, the birds will eventually enter lay when they reach adult body weight.





Example: target BW is 1.4 kg at 16 weeks, however as it hasn't been achieved, the light stimulation is delayed to 18 weeks as it is the time that the 1.4 kg body weight is achieved.

Body weight at the first light stimulation based on targeted production (standard, more eggs with lower egg size or less eggs with higher egg size)



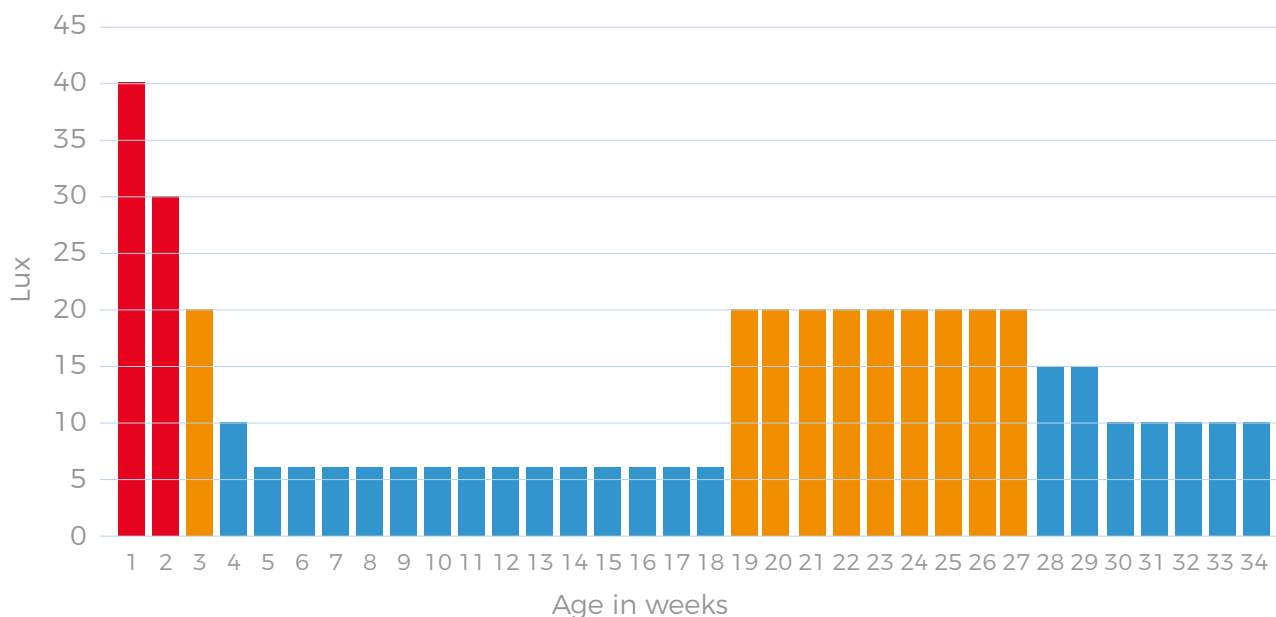
ATTENTION: As it was explained above, a lighting program for number of eggs will decrease the size and a program for increasing the egg size will decrease the number of eggs.

RULES on HOW stimulate a flock of layers

- 1 Make the first light increase in production towards dawn and later ones towards dusk.
- 2 Depending on the breed:
 -  **In white layers:** 1 hour for the first light stimulation* and then 1 hour per week until the limit of the maximum hours.
 -  **In brown layers:** 2 hours for the first light stimulation and then 1 hour per week until the limit of the maximum hours.
- 3 Light stimulations of more than 2 hours at once might produce stress for the birds and has no beneficial effect.
- 4 **Minimum stimulation of 30 minutes.**
- 5 Maximum light hours in production should be **longer than 14 hours to allow enough time for feed consumption during the production period. It is not advantageous to exceed 16 hours** of light because after this day length the birds do not increase their daily feed intake.

LIGHT INTENSITY during stimulation

- 1 **The light intensity influences sexual hormones production but mostly production onset is determined by photoperiod. Therefore, a moderate increase in light intensity is desired for stimulation (from 5–8 lux to 25–30 lux).**
- 2 **Sharp increase in light intensity is strongly discouraged as it might stress the birds and lead to pecking or cannibalism episodes.**
- 3 **In open houses, Light intensity is difficult to control. The use of shades or light traps is strongly recommended for reducing light intensity and to prevent direct sunlight from entering the house.**
- 4 **Good light distribution is crucial for uniform production onset. Dark spots can cause the birds not to be correctly stimulated in time because they do not receive the photoperiod change correctly due to the lack of light intensity. This is another reason to increase the light intensity slightly as it will make it easier for all birds to receive sufficient stimulation.**



Graph showing variations in light intensity during rearing and the onset of production. These recommendations are correct for houses without direct sunlight and for rearing in a cage system.