Lighting programs

PART 2

H&N TECHNICAL TIPS

Lighting programs have been used in the egg production industry for decades to avoid the seasonality of egg production. It also allows synchronization and directs hens towards egg production adapted to the needs 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:

Brooding	Rearing	Stimulation	Production
4-5 weeks	2-16 weeks	16-20 weeks	20 weeks until the end

In this technical tip, we will be covering the 4th point.

Lighting programs in production

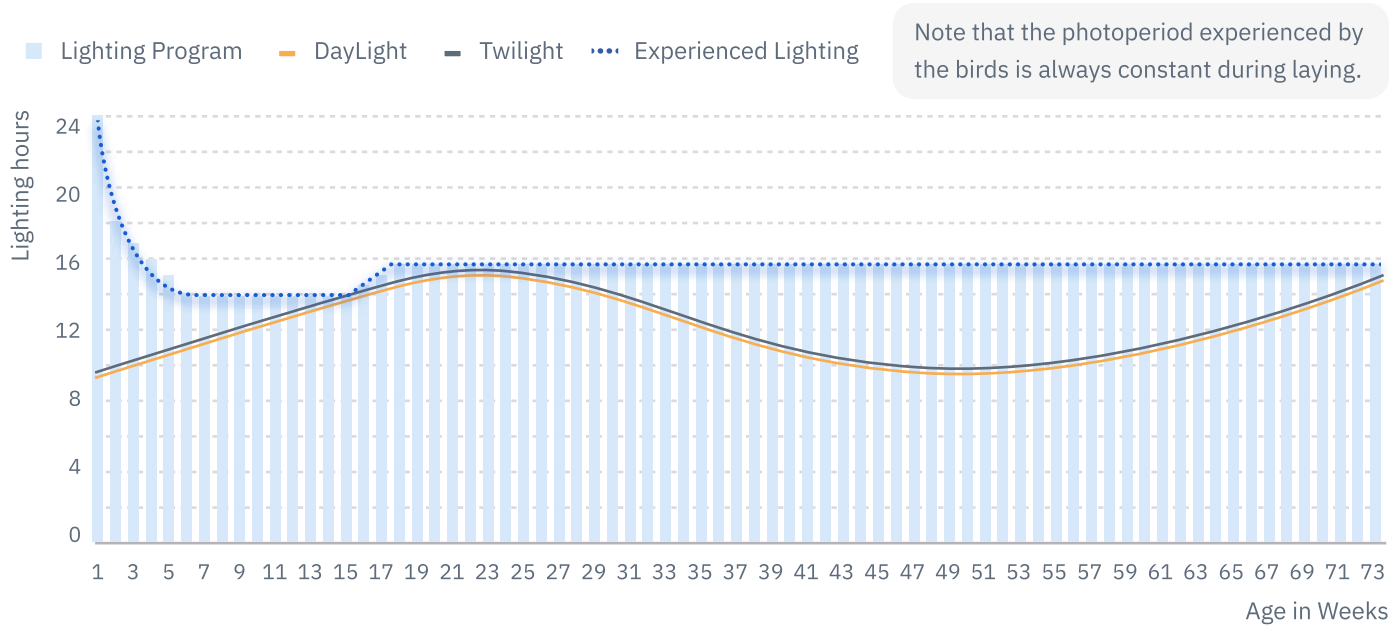
OBJECTIVE

To maintain birds in lay and improve egg production with correct lighting

Due to the light increase during the stimulation program, the birds have started laying. Once this has been achieved, the lighting program should ensure that the birds keep in production and do not receive any light signal to cease laying.

So, the key point of any production lighting program is to never expose birds to decreasing photoperiods.

Graph 1. Lighting program for rearing and laying of a flock located in Valencia, Spain.



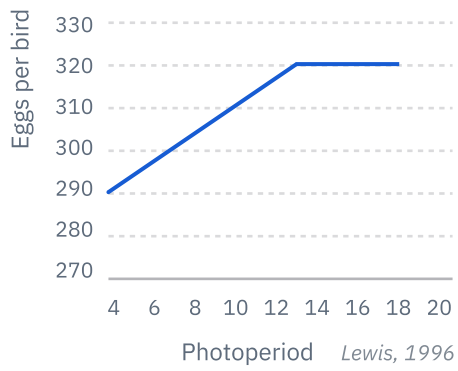
Although existing commercial birds have great laying persistency, they can be affected by changes in the photoperiod and may adversely affect the laying.

It is usually enough to keep them on a stable photoperiod of 14-16 hours to maintain birds in production.

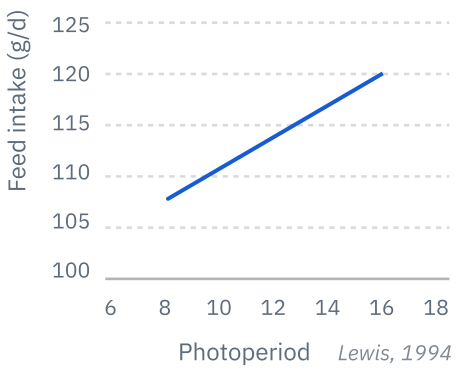
Nevertheless, birds use more energy for maintenance during the hours of light than during the hours of darkness. Longer photoperiods tend to result in higher feed intake and egg size, but there is also increased mortality, thinner eggshells and a slightly higher percentage of deformed eggs.

Graph 2. Effect of day length during the laying period on:

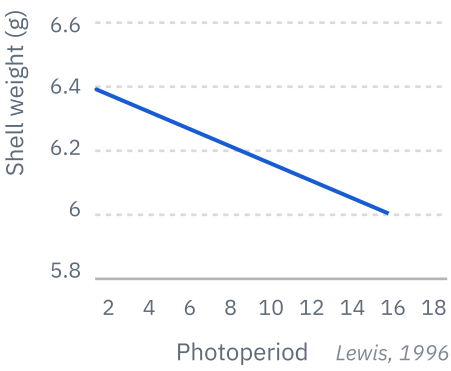
A) Eggs per bird in brown laying hens



B) Mean daily feed intake of brown and white laying hens



C) Eggshell weight



Therefore, short photoperiods would seem to have more advantages for almost all production scenarios. **However, it can be difficult to use them in many cases due to daylight interference, light schedule applied in rearing or in hot weather.**

Night lighting

A commonly used practice is to turn the lights on for 1–2 extra hours in the middle of the dark period. This allows the birds to refill their crop at a key time as they are in the process of making the eggshell for the next day egg.

In hot climates the birds will be restricted in their feed intake by the temperature.

So, it is beneficial to allow the birds to have another feeding period at night when the temperature usually drops. The advantages of this type of program are an improvement of the eggshell, an improvement of the birds' bone calcification status and an increase in feed intake of around 2-4 grams.

Technical TIP

30–40%

of eggshell calcium is drawn from the hen's reserves.

Calcium of the eggshell is supplied 30-40% of the total calcium of the egg by the reserves available in the hen. It is therefore essential that most of the calcium in the eggshell is not of skeletal origin but of dietary origin. Thus, this practice is in the interest of the birds as it will allow them to better manage their calcium balance and protect their bone integrity.

IMPLEMENTATION IS RELATIVELY SIMPLE:

01

Applicable at any stage

It can be implemented at any time in the bird's life. In fact, it can also be used in the rearing period to improve feed intake.

02

Adjustable night-light duration

The length of the light period during the night should be chosen. Normally 1-1.5 hours is enough if the aim is to improve dietary-derived calcium levels. On the other hand, if the objective is to allow supplementary feed intake, it is better to give 2 full hours.

03

Maintain proper dark intervals

In any case, at least 3 hours of darkness before and after the night-light period should be respected. This ensures that all birds will interpret the same lights-off timing.

04

Temporary shift in laying time

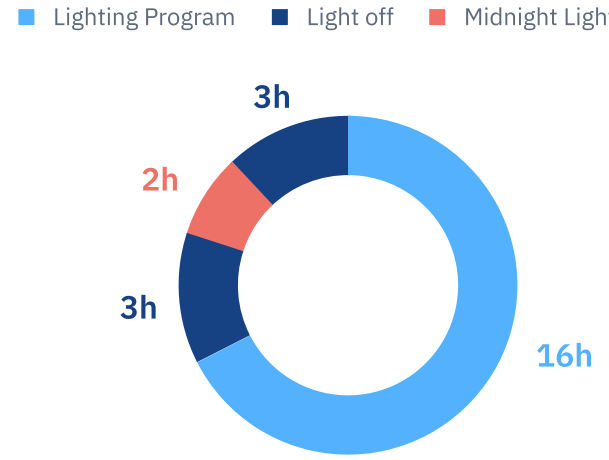
Egg production may be delayed in the day, but the birds will keep laying. This may result in some carry-over of collected eggs in the days following implementation.

05

Gradual removal recommended

It is possible to remove the night lighting period at any time. However, it is advisable to do this gradually.

Graph 3. Example of a light program with night light



Note that 3 hours of darkness are observed before and after the night light period.

It is crucial that feed is available in the feeders, as well as water, for the birds. Consequently, a feed distribution should be done prior to switching on the lights. In case this is not possible, an extra feed distribution can be made during the late evening hours so that feed will be available during the night lighting period.

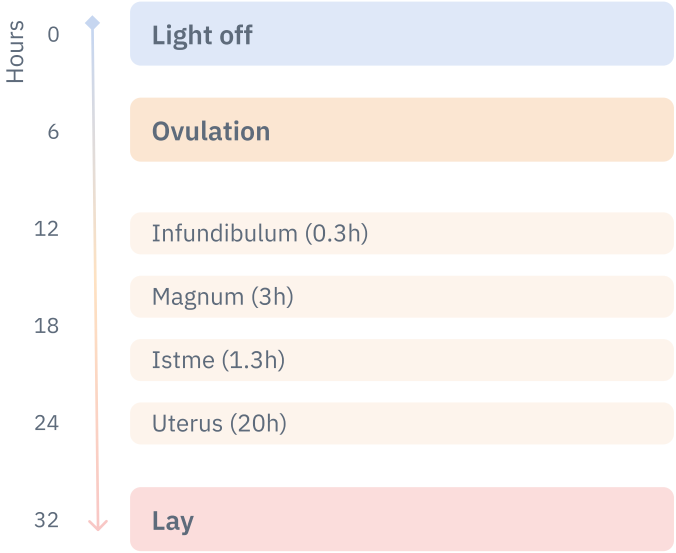
Please ensure that this program complies with your local regulations before using it.

Effect of the light-off on laying

It is important to emphasize the importance of the light off timing (no matter if this is natural or by artificial lighting) as it will play the role of a "trigger" for ovulation. This will take place about 6 hours after lights out and then the process in the oviduct will last close to 24 hours.

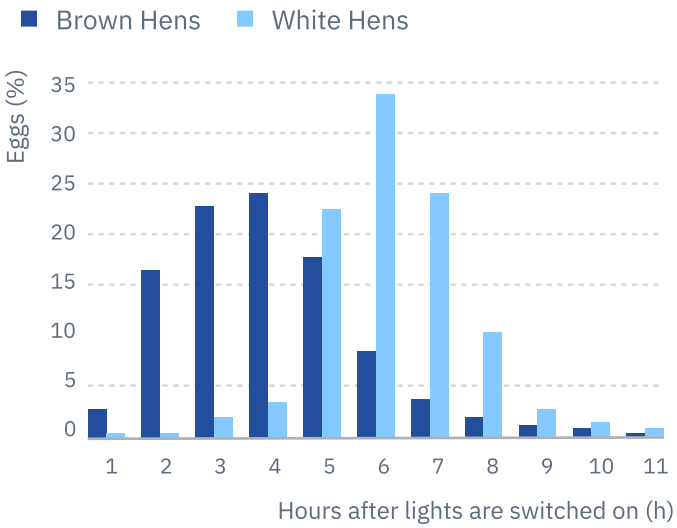
So, the time between lights-off and 50% of laying always remains the same as this acts as a trigger. Still, the time elapsed is different for white and brown birds and the distribution of the laying day is also different.

Graph 4. A simplified model for sequence from light off to lay



Keep in mind that lighting programs, breed differences or other factors can modify the timing.

Graph 5. Laying window in brown and white hens



Brown hens lay earlier but spread out over the day, while white hens lay later in the day but concentrate the lay in a few hours.

In lightproof houses, it is possible to use this physiological effect to shift the distribution of laying throughout the day by moving the light period and thus the time of ovulation of the hens. This can be useful for better egg collection setup.

In brown birds, a part of the birds will lay in the dark if given a photoperiod of less than 16 hours. **This has no practical effect on birds housed in conventional cages but may increase the number of floor eggs in birds housed in alternative systems or broken eggs in enriched cages.**

The hens sleep in these systems in the perches and the percentage of “nocturnal layers” will not have the possibility to move to the nest to lay eggs. Eggs laid under these conditions will be knocked to the ground and will obviously not be laid in the nest.

Corrective measures (opening of illuminated nest boxes before the main lights are switched on, stimulation program with fast increases) are necessary to avoid this inconvenience.

Light intensity in production

Once the birds are laying, it is not necessary to expose them to a high light intensity to keep them in production. In fact, an increase in intensity correlates negatively with feed intake and egg size. Similarly, high light intensity can encourage undesirable behaviours such as feather pecking and cannibalism.

Therefore, it is usually recommended to dim the intensity to around 10 lux at the feeder level after the peak of production. This should be done progressively and always checking that feed and water consumption, and egg production, remain unchanged. It should be remembered that the intensity is not homogeneous in a house, so the area with the lowest intensity should always be considered as the limit.

In open houses, these levels of light intensity cannot be obtained as sunlight is much more intense even on a cloudy day. **In this case, the aim will still remain the same: keep the birds at the lowest possible light intensity. In addition, it is especially important in this case to avoid direct light rays entering the house as they will easily trigger pecking and cannibalism episodes.** Therefore, the use of shades that partially darken the house is recommended.

A) Light traps for fans

B) Shading system with black screen

Both are useful to darken the houses but both also affect the ventilation of the houses and this effect should be considered and corrected.

Once a low intensity level has been reached, it should be maintained. It is a common mistake to raise the intensity during daily farming activities. These intensity peaks are highly stressful for the hens and should be avoided. It is best to equip the workers with torches or other lighting systems so that they can see properly.

It is a good idea to turn the light on and off **gradually by increasing or decreasing the light intensity** at production house or even rearing. This mimics sunrise or sunset in nature has a positive effect on the birds. Additionally, in cage-free systems, sectored on/off programs are used to help the birds distribute themselves better in the aviary system and to encourage them to spend the night in the aviary rather than on the floor.

Light quality during the production period

The first point to bear in mind when dealing with the quality of light in egg production is that the vision of laying hens differs greatly from that of humans:

01

Expanded light spectrum perception

They can see a much wider and different light spectrum than humans. This means that birds can perceive light waves in the ultraviolet and infrared spectrum that humans don't. Consequently, the type of light spectrum emitted by light bulbs (i.e. their colour) must be adapted to the birds' perception.

02

Higher visual processing sensitivity

Their ability to process images per second is greater than ours. While a human can discern 24-30 images per second, birds can discern 150-200. This has a negative side effect as they are much more sensitive to the flickering effect from light sources.

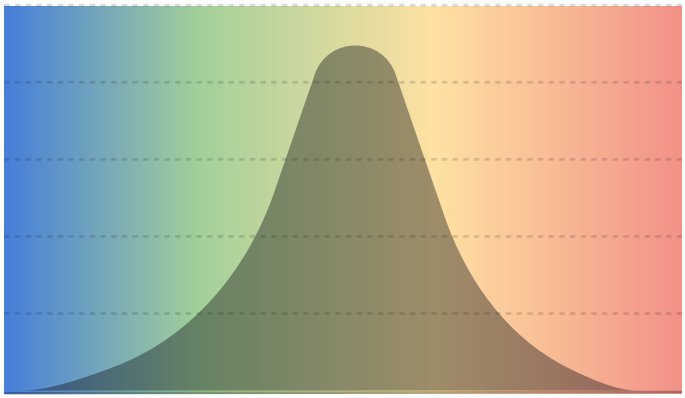
Wrong light colour and a flickering effect are factors that can promote behavioural problems in birds such as feather pecking or cannibalism.

Technical TIP

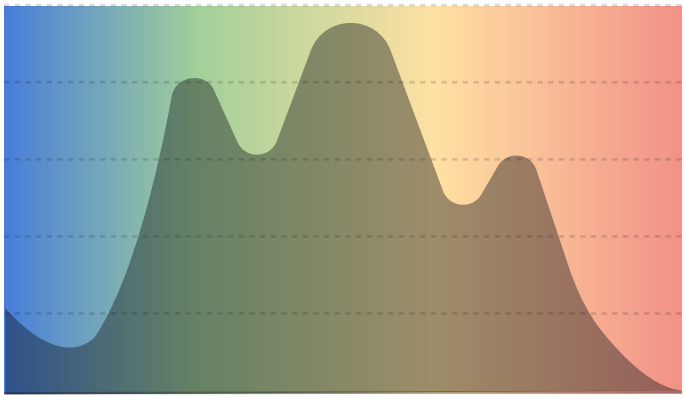
A basic recommendation is that colour temperature should be around 2800 K and with a frequency of at least 200 Hz.

Graph 6. Light spectrum for humans and poultry

A) For humans



B) For poultry

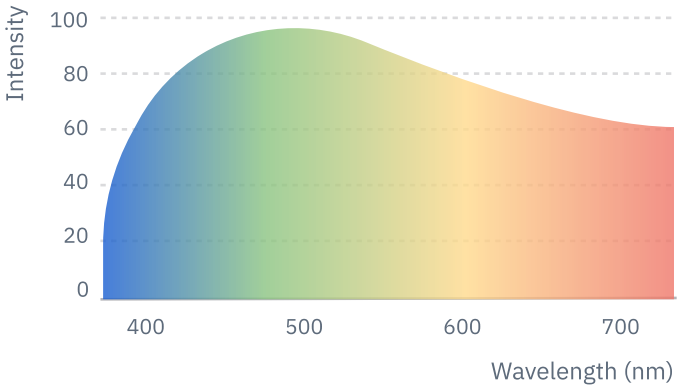


This is possible due to the fact that birds have 4 types of cone receptors in the retina instead of the 3 that humans have.

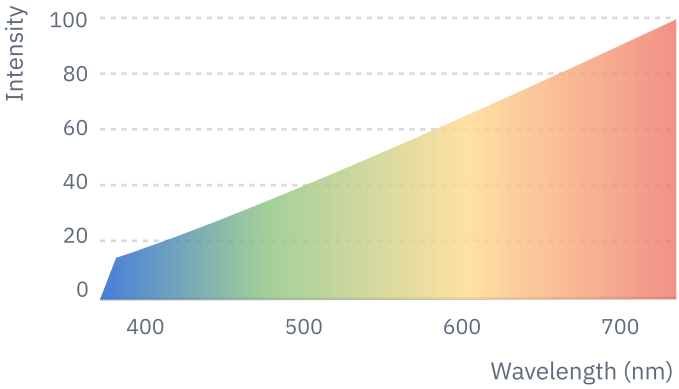
Graph 7. Different light sources and their emitted light spectrum

Note that in some cases (as in LED) it is possible to find in the market bulbs producing complete different light spectrum. Therefore, it is necessary to choose those adapted to poultry.

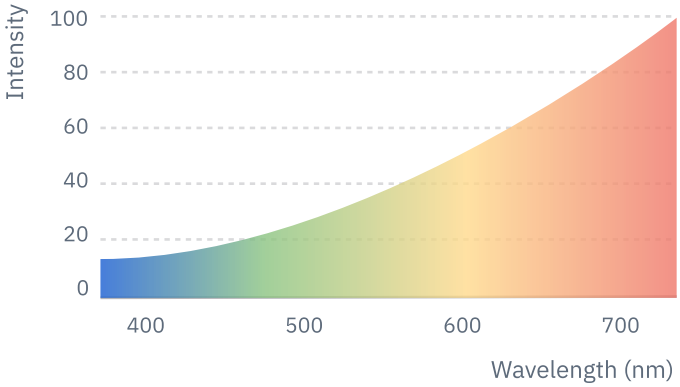
Sunlight Noon



Sunlight Sunset

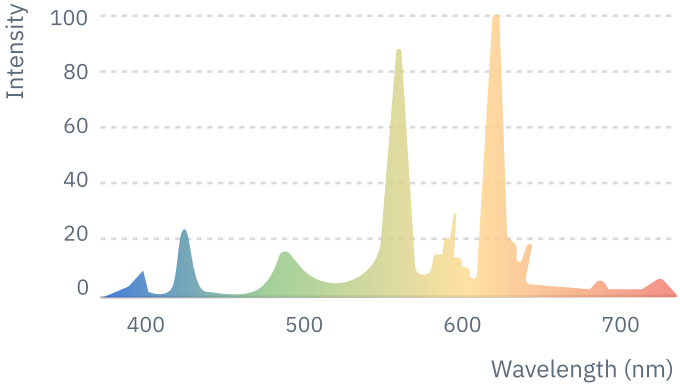


Incandescent

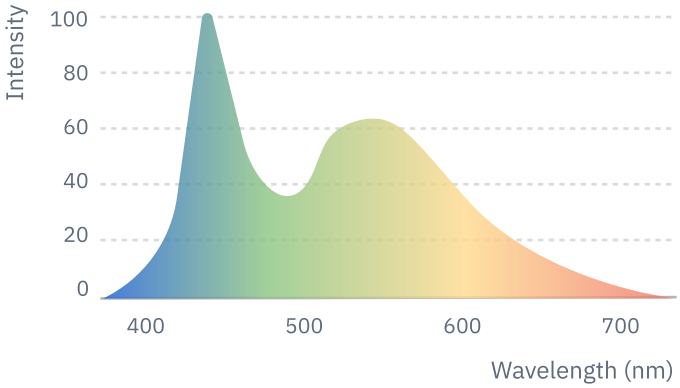


Choosing the right spectrum means **choosing better performance.**

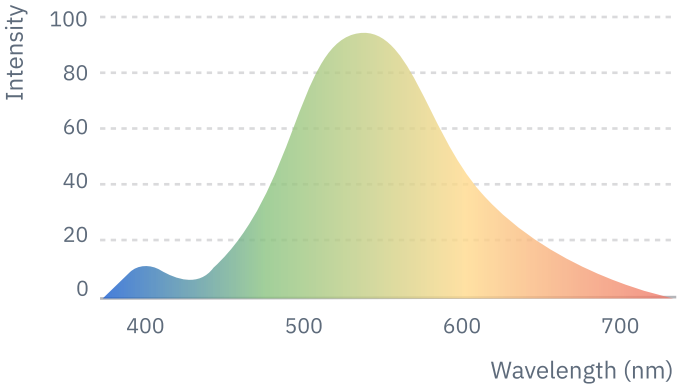
Fluorescent



LED Cool



LED Warm



Lighting technology has evolved very rapidly in recent years. Traditionally, incandescent bulbs have been used in poultry houses, but a few years ago they were replaced by energy-saving bulbs such as CFLs. Subsequently LED bulbs have been introduced and are the technology that seems to be predominant in the future.

It should be noted that different light sources can produce a different spectrum and frequency of light depending not only on the type of bulb, but also on the particular model. It is therefore necessary to check that the bulbs are suitable for poultry use or at least meet the requirements mentioned above.

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