Lighting programs

PART 1

H&N TECHNICAL TIPS

Light programs have been used in the egg production industry to synchronize the start of production across the entire 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:

Brooding
4-5 weeks

›

Rearing
2-16 weeks

›

Stimulation
16-20 weeks

›

Production
20 weeks
until the end

In this technical tip, we cover the first three 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 the lighting program plays a crucial role to help chicks adapt to the rearing house. In practice, there are two types of programs that can be used during this period: semi-intermittent and intermittent. They are described in Table 1. It is recommended to use intermittent lighting programs whenever possible.

Table 1. Different lighting programs for the first week

	Semi-intermittent programs	Intermittent programs
Description	During the first week, there are two cycles of 4 hours of light and 2 hours of darkness at night, and full light during the day. During the second week, there are 20 hours of light.	During the first week, four repetitions of a cycle of 4 hours of light and 2 hours of darkness. During the second week, a cycle of 8 hours of light and 2 hours of darkness followed by a cycle of 8 hours of light and 6 hours of darkness.
Advantage	- Synchronization of the birds' activity - Reduced early mortality - Improved uniformity	- Synchronization of the birds' activity - Reduced early mortality - Improved uniformity
Disadvantage	The advantages are fewer than in the intermittent program, as there are fewer cycles per day.	- Only suitable in lightproof houses - Breaks during house service by darkness
Recommended for	Open houses	Dark houses

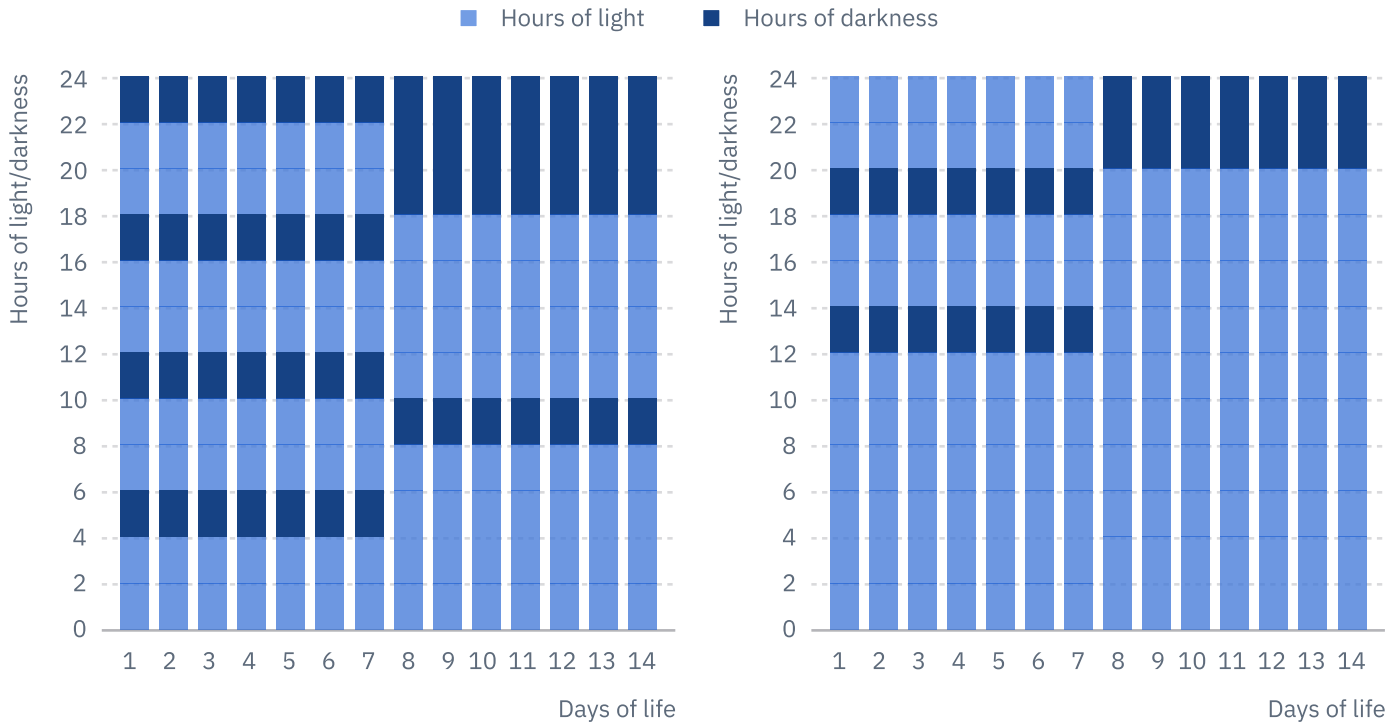
Technical TIP

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.

30–50 lux

first week light intensity

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



A Example of an **intermittent program** for 7 days, followed directly by the standard lighting program.

B Example of a **semi-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.

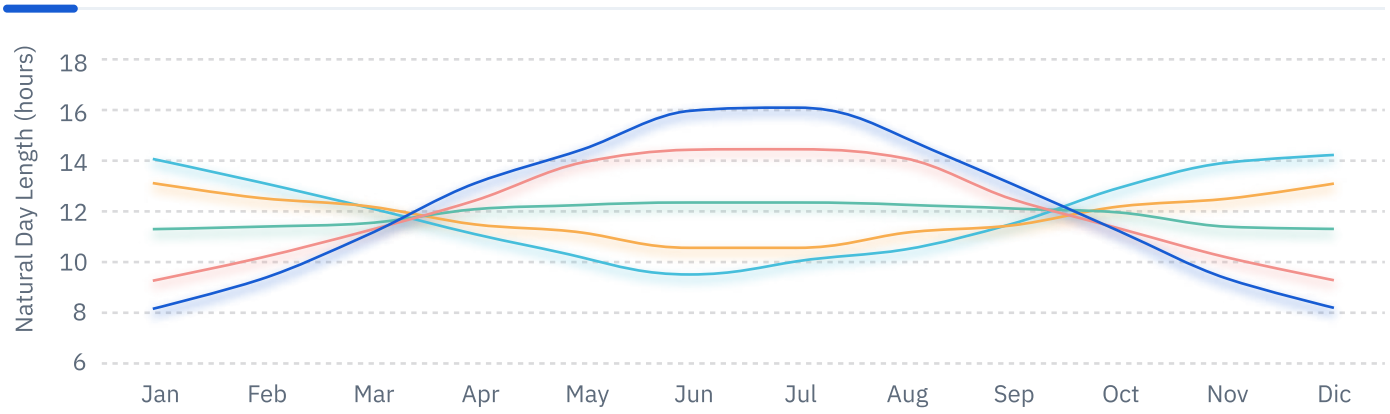
As mentioned above, an increasing photoperiod during rearing can produce a premature onset of laying, even if it occurs at an early age. The result would be a bird that begins production without the right body weight development and an insufficient reserve of calcium in the medullary bones. **Therefore, 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:

01 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...)



	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Amsterdam 52°N	8h 14'	9h 32'	11h 11'	13h 18'	14h 54'	16h 09'	16h 22'	15h 02'	13h 16'	11h 26'	9h 36'	8h 18'
Madrid 40°N	9h 27'	10h 19'	11h 28'	12h 49'	14h 02'	14h 53'	14h 55'	14h 19'	12h 55'	11h 37'	10h 21'	9h 29'
Bangkok 14°N	11h 34'	11h 44'	11h 58'	12h 14'	12h 31'	12h 41'	12h 41'	12h 32'	12h 17'	12h 01'	11h 44'	11h 35'
São Paulo 23°S	13h 19'	12h 59'	12h 26'	11h 53'	11h 20'	10h 59'	10h 59'	11h 19'	11h 49'	12h 25'	12h 56'	13h 17'
Montevideo 34°S	14h 16'	13h 22'	12h 21'	11h 14'	10h 20'	9h 52'	10h 05'	10h 52'	11h 55'	13h 00'	14h 01'	14h 32'

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

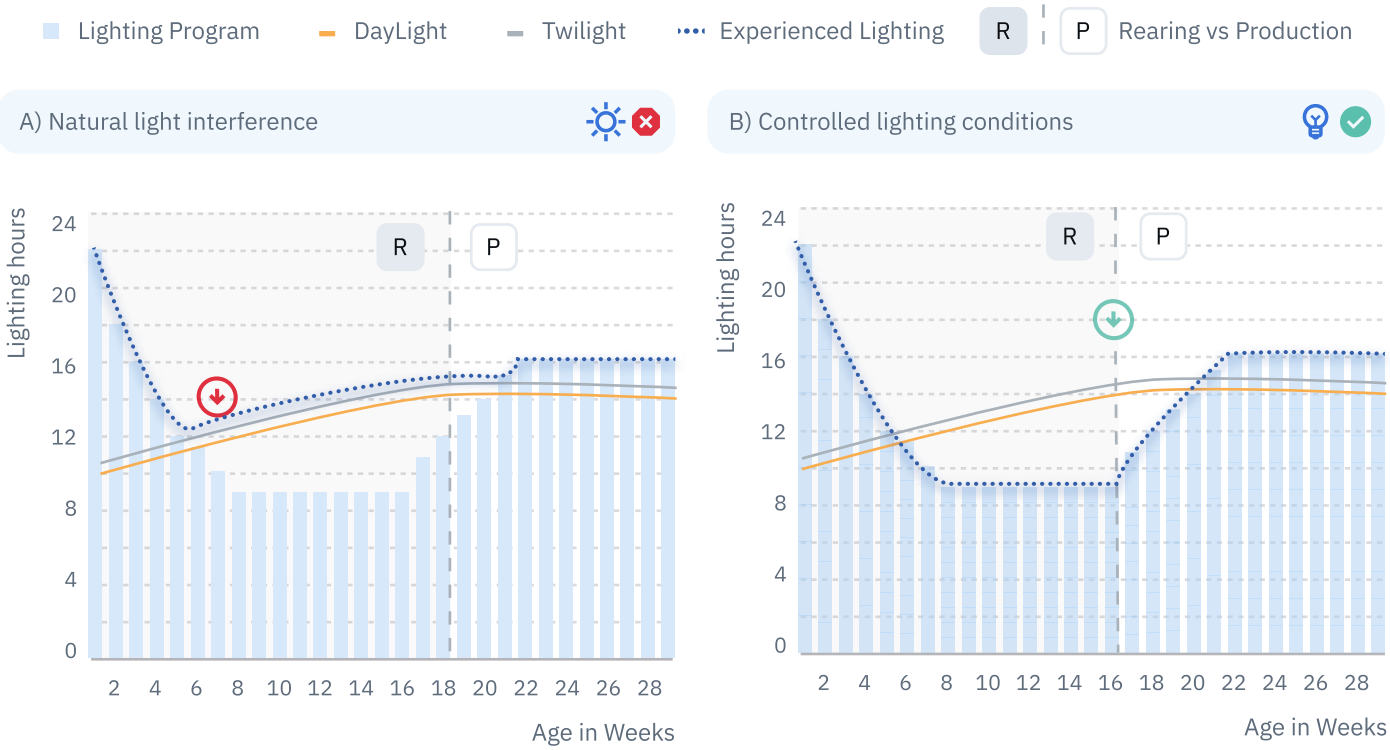
There are houses that completely avoid the entry of external light and therefore the interference of natural light. They usually have dynamic ventilation systems and are equipped with light traps in the air inlets as well as in the ventilators. **A truly lightproof building should have less than 3 lux 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 for the lighting program. Depending on the type of rearing and production houses three different limitations can be established:

Table 2. Lighting program limitations by house type

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

Graph 3. 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 reach the correct body weight. A correction due to the type of housing should be considered.

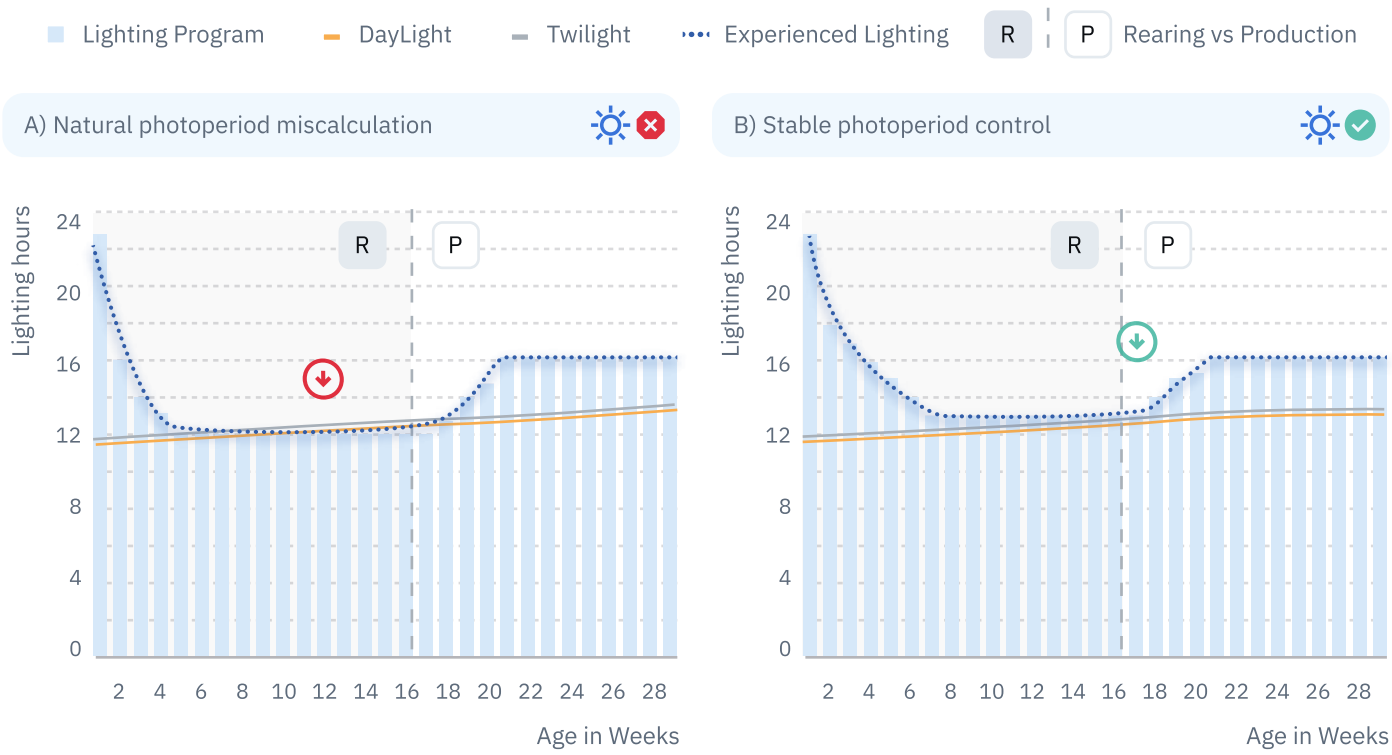
Location: Montevideo

Hatch Date: 05 July

Housing: Lightproof 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 and in production

Egg size: On Standard

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 hens will therefore be earlier in their onset of production.

Location: Bangkok

Hatch Date: 14 Dec

Housing: Open house in rearing and in production

Egg size: On Standard

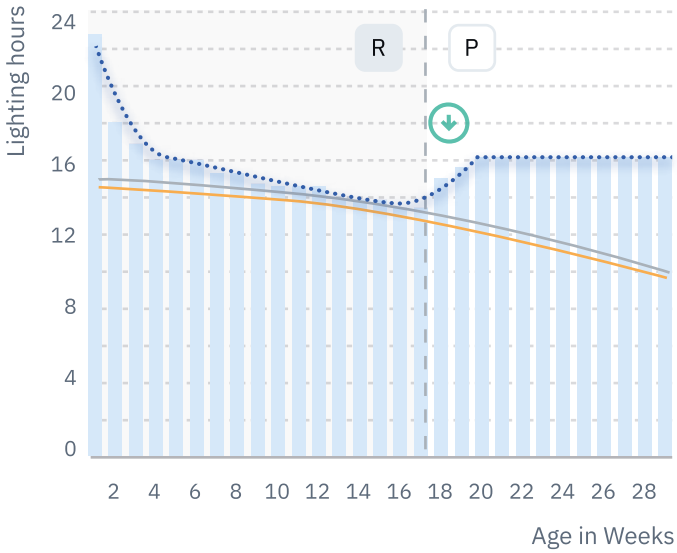
Right lighting program.

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 a standard, it has been shifted to a slow step-down program to promote flock growth in warm weather conditions.

Accounting for natural photoperiod variability and maintaining a stable lighting program prevents premature stimulation, ensuring birds reach the correct body weight before the intended production onset.

Lighting Program DayLight Twilight Experienced Lighting R P Rearing vs Production

A) Limited adaptation to egg size target



Location: Indianapolis

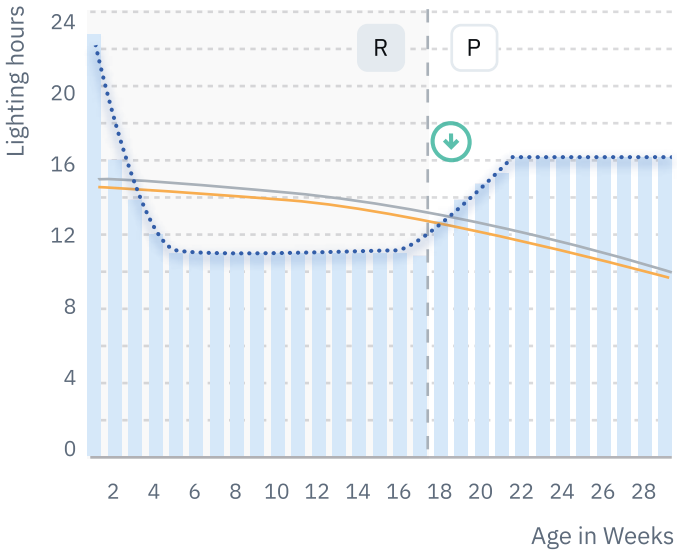
Hatch Date: 31 May

Housing: Open house in rearing and 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.

B) Full adaptation to egg size target



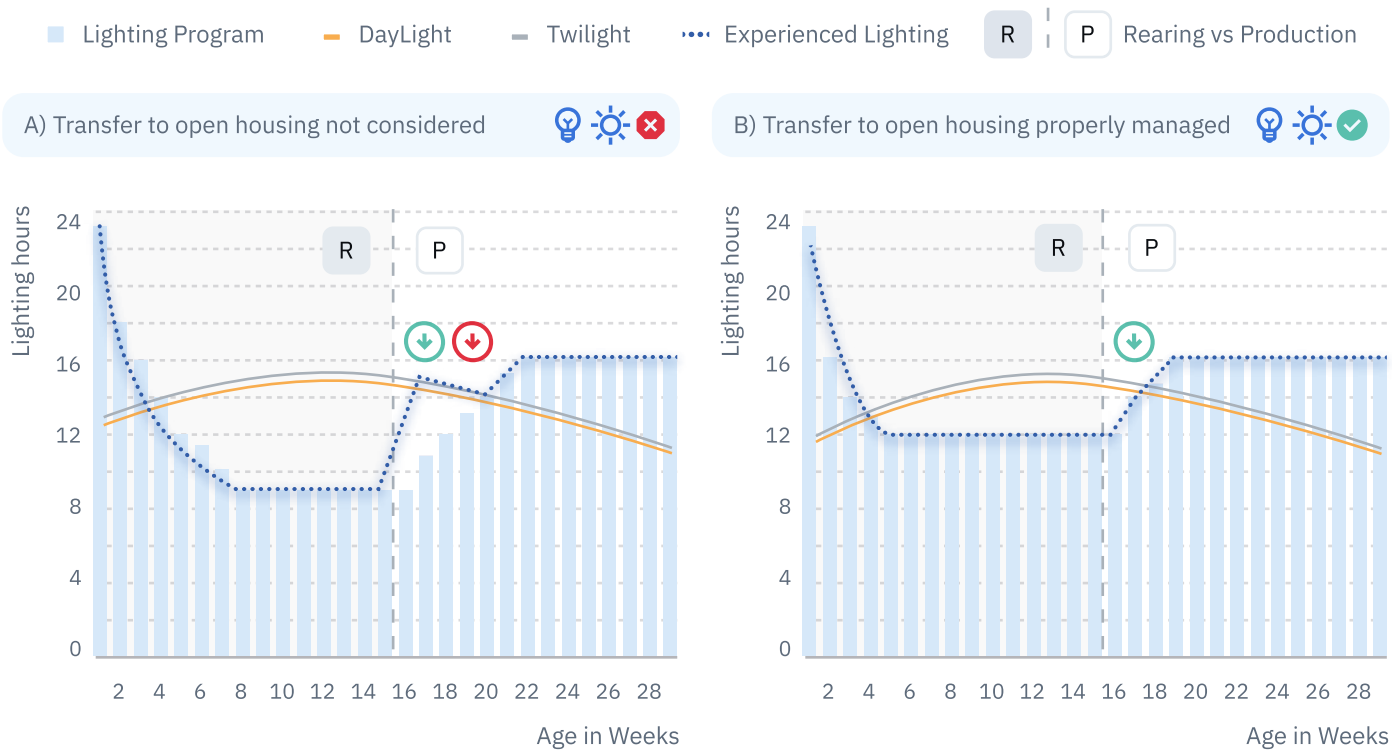
Location: Indianapolis

Hatch Date: 31 May

Housing:
Lightproof 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:
Lightproof 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 arrow) and will therefore be delayed in their onset of production.

Location: Algeria

Hatch Date: 31 March

Housing:
Lightproof house in rearing, open in production

Egg size: On Standard

Right lighting program.
Light program has 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).

03 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:

3.1. 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.

3.2 Long day length program (12-14 hours)

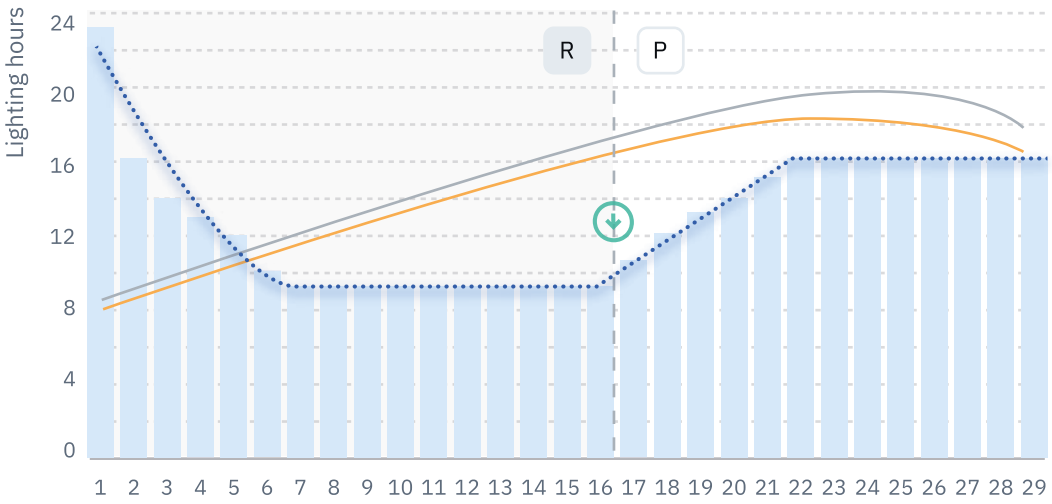
Allows for longer feed consumption time. This can be advantageous in hot climate countries where feed consumption will be restricted by high temperature during the rearing period.

Table 3. Recommendation for the minimum photoperiod duration 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.*

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

Lighting program adaptation at high latitudes



Location: Helsinki **Hatch Date:** 31 March **Egg size:** On Standard

Housing: Lightproof house in rearing and in production

Right lighting program.
Note the difficulty of implementing a lighting program in open houses at this latitude for both rearing and production. Especially if there are restrictions on maximum artificial lighting hours in the animal welfare legislation.

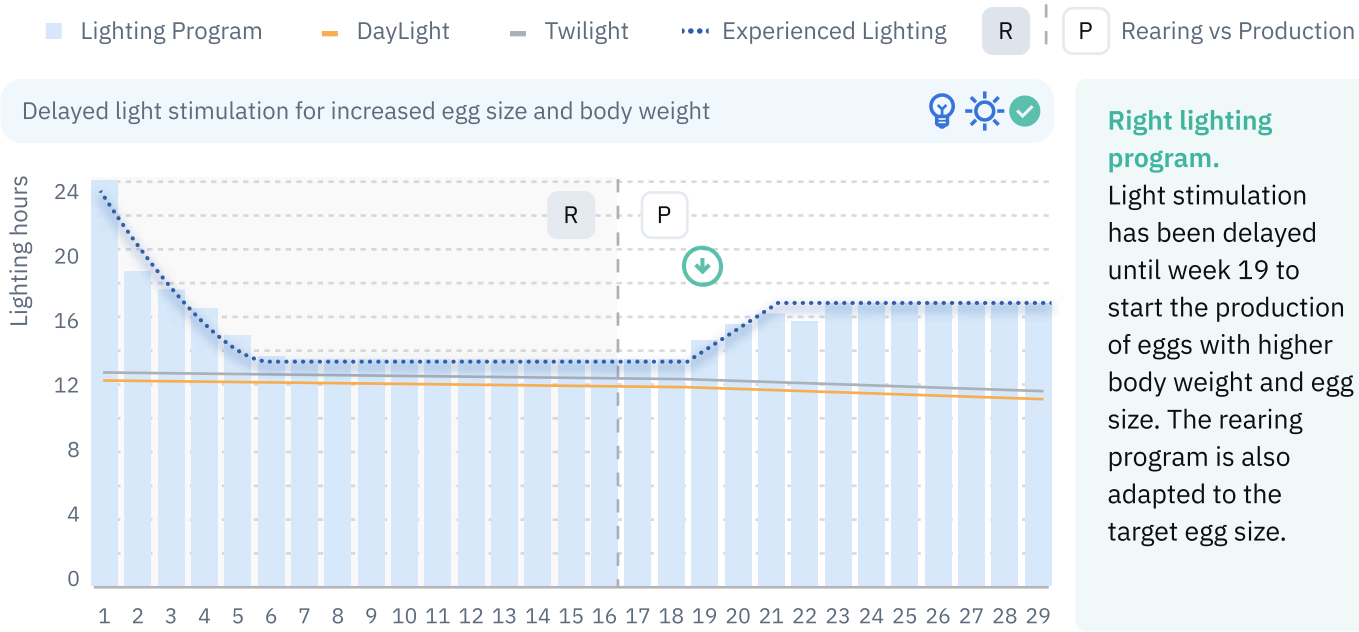
04 Determine the step down to the minimum duration of the lighting program.

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:

Table 4. Lighting program step-down options by production target

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.



Right lighting 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.

Location: Manila **Hatch Date:** 31 May **Egg size:** Above standard

Housing: Lightproof house in rearing, open in production

05 Determine light intensity during rearing.

As mentioned 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 birds' 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 during rearing should never 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.

DIFFERENT TYPES OF FILTERS:

01

Stimulate based on target body weight. See table below.

02

The start of light stimulation is between 17-19 weeks of age.

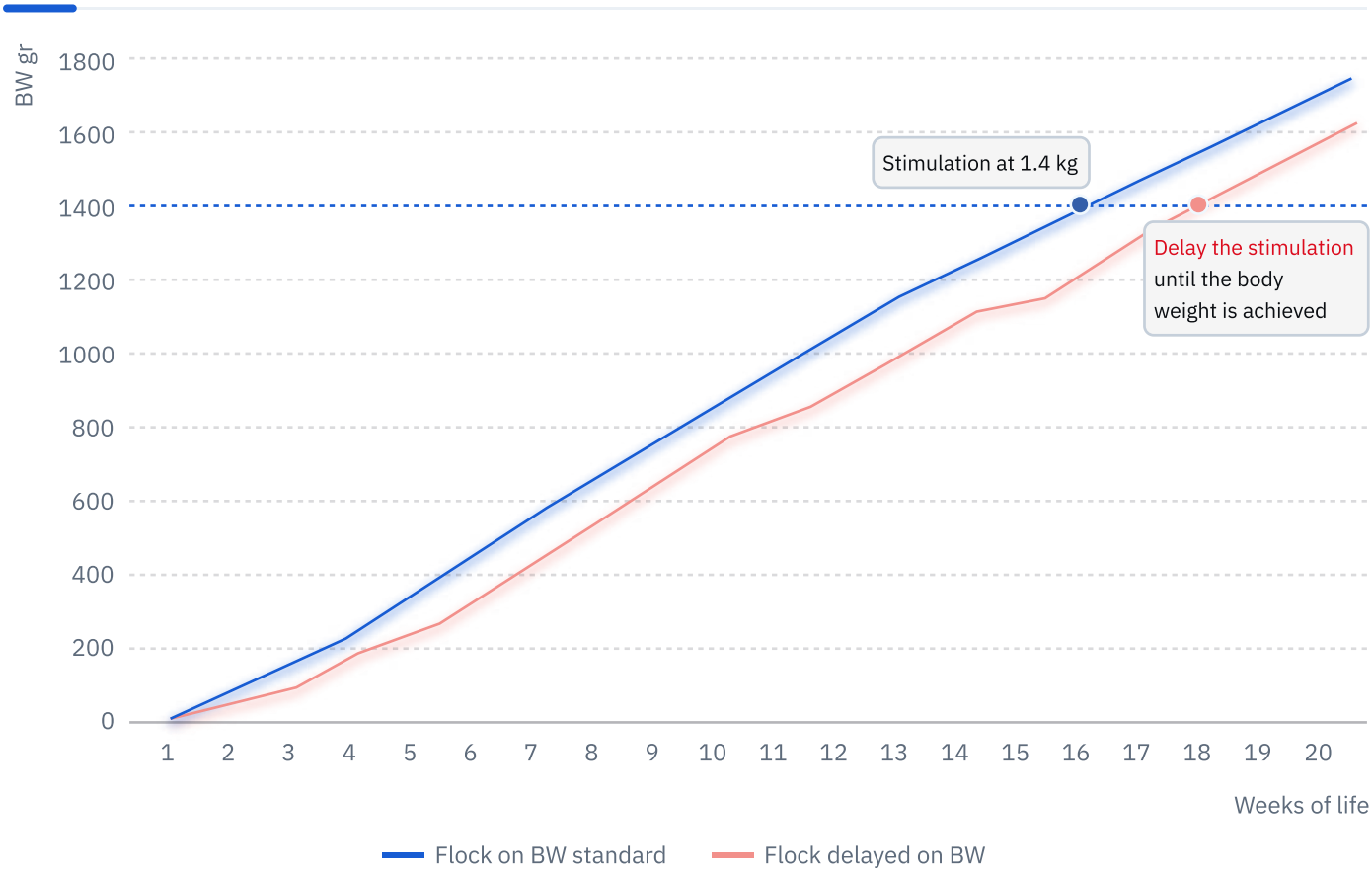
03

If you have not achieved the target body weight, delay the stimulation until you get the body weight. See chart below.

04

If there is no light stimulation, the birds will eventually enter lay when they reach adult body weight.

Graph 4. Light stimulation adjustment based on target body weight (BW)



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.

Graph 5. 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)

Crystal Nick

Standard
1210 gr

Egg number
1145 gr

Egg size
1325 gr

Super Nick

Standard
1260 gr

Egg number
1190 gr

Egg size
1395 gr

Brown Nick

Standard
1440 gr

Egg number
1350 gr

Egg size
1600 gr

Nick Chick

Standard
1235 gr

Egg number
1170 gr

Egg size
1360 gr

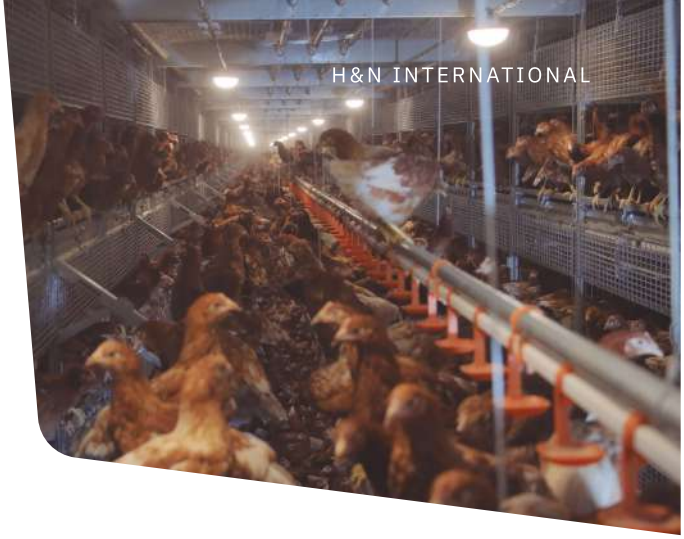
Coral

Standard
1380 gr

Egg number
1350 gr

Egg size
1450 gr

As explained above, a lighting program aimed at increasing the number of eggs will decrease egg size, while a program aimed at increasing egg size will decrease the number of eggs.



RULES on HOW TO stimulate a flock of layers

01

Make the first light increase in production towards dawn and later ones towards dusk.

02

In white and brown layers:

2 hours for the first light stimulation and then 1 hour per week until the limit of the maximum hours.

Precision in timing and duration of light stimulation is key to optimising production performance.

03

Minimum light increase of 1 hour per week.

04

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

01

The **light intensity** influences sexual hormone 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).**

02

A sharp increase in light intensity is strongly discouraged as it might stress the birds and lead to pecking or cannibalism episodes.

03

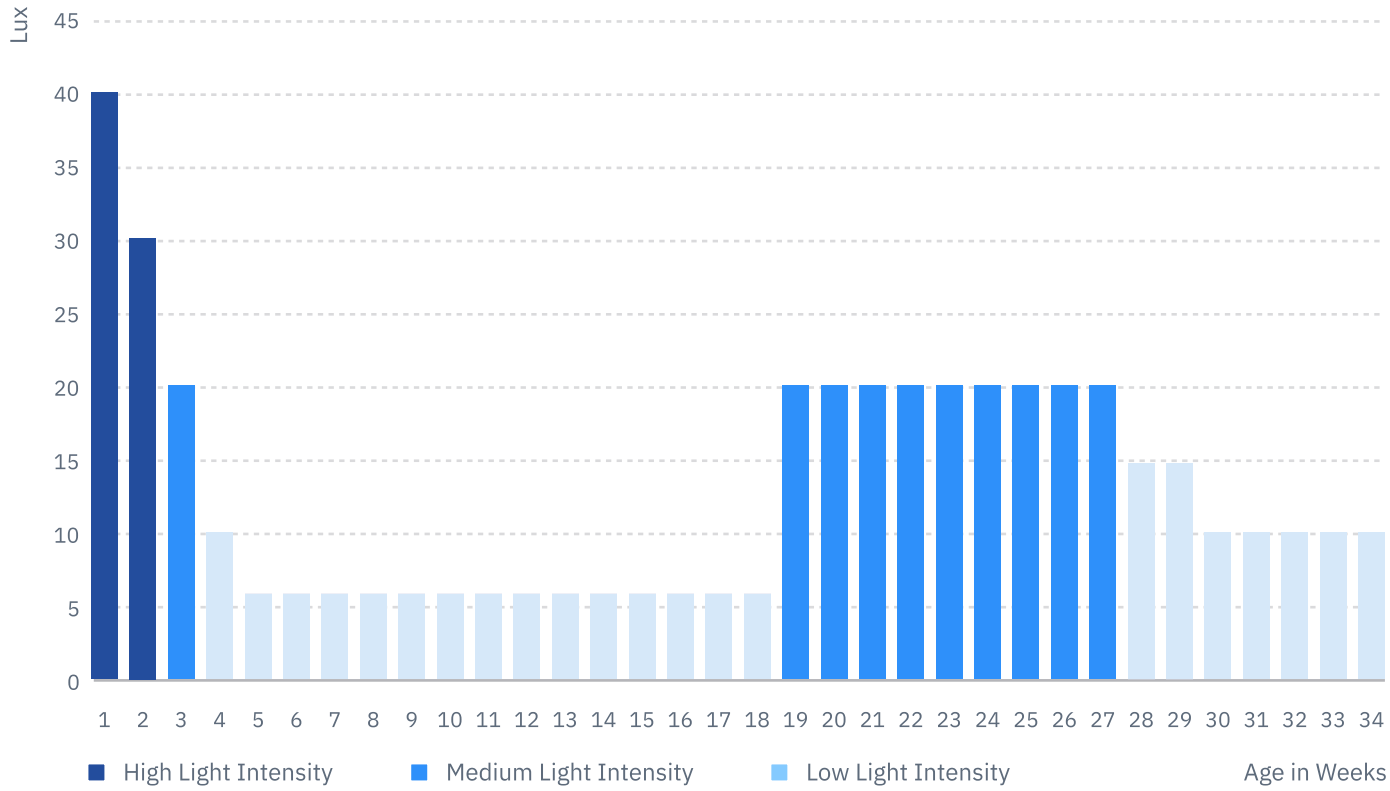
In open houses, light intensity is difficult to control. **The use of shades or light traps is strongly recommended** for reducing light intensity and to prevent direct sunlight from entering the house.

04

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.

Light intensity should increase moderately and uniformly to support stimulation while avoiding stress and behavioural issues.

Graph 6.



Lux Progression

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.

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