novogen

novogen White

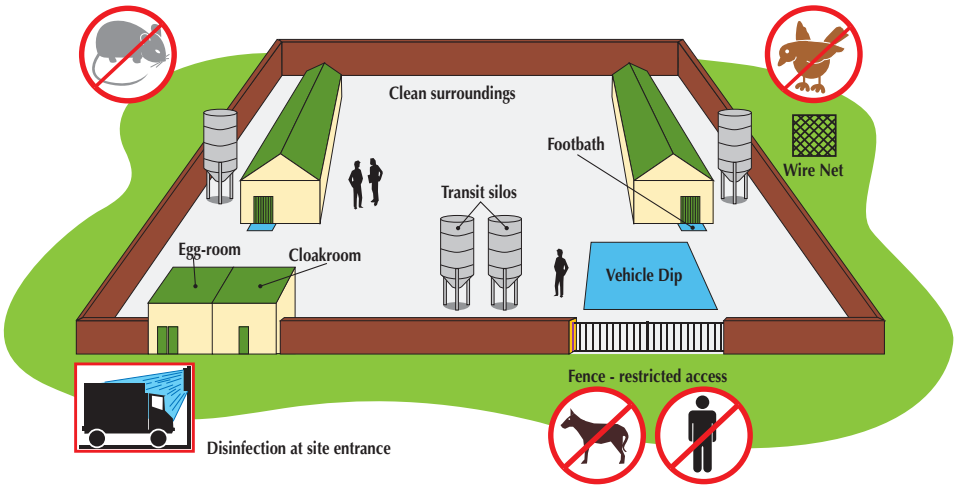
Management Guide

Commercial layers

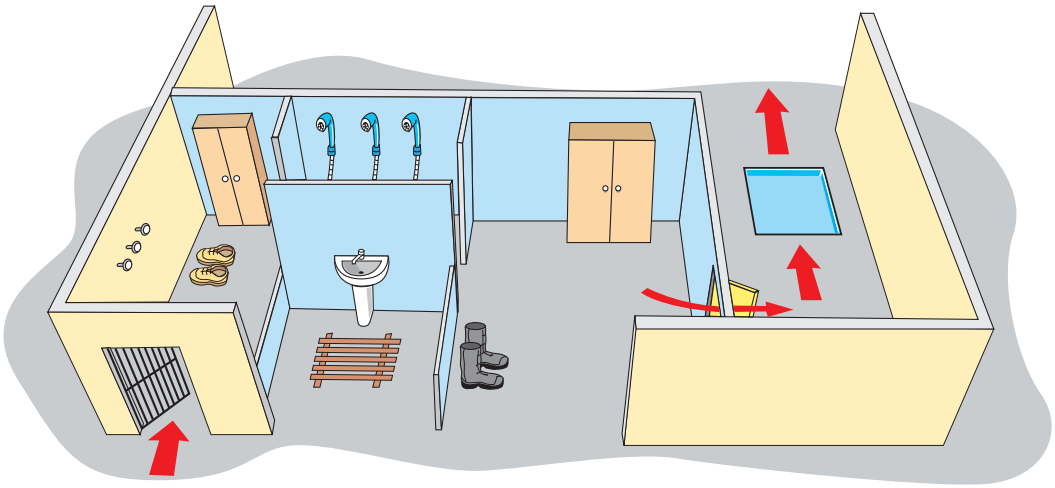
> GENERAL RULES

The golden rule of management is to have one age and one breed per site to ensure the "all-in, all-out" principle is followed at all times.

The choice of the site for the farm, including the layout of the houses, must prioritise the elimination of all possible sources of contamination. Biosecurity protection is reinforced by hygiene controls.



A changing room should be made available at the entrance of the site. It must be used by everybody entering the farm (incorporating both a shower and a change of clothes).



When the old flock is removed and before the arrival of the new flock, all houses and equipment must be thoroughly cleaned and disinfected according to strict procedures and protocols. This should be followed by a rest period of at least 10 days.

Between each flock, cleaning and disinfection of the houses, their annexes, surroundings and access ways are essential to ensure the optimal health conditions required for the incoming flock to maximise its profitability.

> CLEANING AND DISINFECTION OF POULTRY HOUSES

Insect control

Depending on local regulations, the first application of an organophosphorus-type insecticide is made immediately after the old breeders have been removed, while the house is still warm. The insecticide is sprayed over the pits, the litter and the lower part of the walls up to a height of 1 metre. Leave the insecticide to work for 24 hours.

Operations prior to cleaning

- Water tank, pipes and nipples:
  - empty the complete water system on the litter,
  - clean and de-scale the complete system with an acid solution and leave for 6 hours to soak,
  - rinse twice with clean water.
- All the equipment (nests, feeders, drinkers etc.) are removed and stored on a concrete area.
- The entire ventilation system (air inlets and outlets, fans, heating and ventilation ducts if they are present) and individual radiant or pancake type brooders are brushed and vacuum cleaned.
- Litter is removed.

Washing

When washing, ensure local regulations regarding wash down water are observed. As a general rule, always ensure that the dirty water is directed towards a pit or suitable internal drain and does not run outside to the house surroundings or access roads and pathways.

- House
  - Soak and remove the remaining organic matter.
  - Apply a foaming bactericidal detergent capable of dissolving fats using a machine capable of applying foam products.
  - Some hours after soaking, wash with a high pressure washer (>50 kg/cm^2) or with hot water, in the following order:
    - internal roof surfaces, from the top downwards
    - walls, from the top downwards
    - finally, pits and concrete floors.

- Equipment
  - Nests, drinkers and feeding equipment:
    - soak and remove all organic matter,
    - apply a foaming bactericidal detergent capable of dissolving fats using a machine capable of applying foam products
    - ensure every piece of equipment gets a thorough wash, followed by rinsing. Prior to the final rinsing,
    - immerse the removable parts of the nests perches and nest box bottoms for 24 hours in a disinfectant solution,
    - dry on a clean disinfected concrete area (different to that used for washing).

Placing equipment back into the house

The vehicles used for this operation must have been carefully washed and sprayed with disinfectant.

> CLEANING AND DISINFECTION OF POULTRY HOUSES

Disinfection

- Water pipes
  - Prepare a highly concentrated chlorine solution (200 ppm) in the water tank.
  - Open the tank to fill the pipes with this solution and leave for 24 hours. Afterwards, drain the water circuit. Do not forget to seal the water tank to protect it from dust.
- House
  - House and equipment disinfection is achieved using a homologous bactericidal, virucidal and fungicidal disinfectant, applied with a hand held or low pressure sprayer or a foam-producing machine.
  - The list of homologous approved disinfectants may vary from one country to another. We recommend that you consult the relevant local Authorities for a list of approved disinfectants and the required concentrations when used for poultry applications.
- Feed Storage Silos
  - Scrape, brush wash and after drying, fumigate using fungicidal candles following manufacturers guidelines.
- Heating and ventilation ducts (if they are present)
  - Disinfection using fungicidal, virucidal and bactericidal candles following manufacturers guidelines.
- House surroundings and road and path access ways
  - Spread a disinfecting product, such as:
    - caustic soda (50 to 100 kg/1000 m^2)
    - or quicklime (400 kg/1000 m^2).

Sanitary precautions

Place clean boots and overalls in the changing room. Replenish footbaths with an appropriate disinfectant.

Rodent control

Rodents may be vectors of numerous bacterial diseases such as salmonellosis.
Rodent control is often based on the use of toxic baits which generally contain anticoagulants. These are left in places frequented by the rodents following a site risk assessment. A poorly prepared rodent control programme may give variable or poor results. We therefore advise using a specialised rodent control service.

Assessing disinfection effectiveness

- Visual examination
  - Check for dirt stains in the house and on the equipment.
- Bacteriological analysis
  - Contact plates or swabs are applied to equipment and to different places in the house. These are rapidly forwarded to a laboratory for bacteriological assessment following an agreed protocol with the laboratory.

Resting period

This starts only when all the above operations have been achieved and lasts for at least 10 days, in order for the house to dry properly.

Before the new flock arrives

- 3 days before the new flock arrives, a residual insecticide is sprayed on all surfaces.
- Fresh litter is placed (never use mouldy material) and its surface sprayed with a larvicidal insecticide.
- Equipment is prepared in the brooding area.
- 24 hours before the new flock arrives, the final disinfection is performed by fogging.

> FLOCK MANAGEMENT DURING THE REARING PERIOD

Stocking density, drinker space and feeding space from day old to 2 weeks old

	FLOOR		CAGES	
	Temperate climate	*Hot climate*	*Temperate climate*	*Hot climate*
Stocking density	30 birds/m²	25 birds/m²	50 birds/m²	45 birds/m²
Starter drinkers	1 for 80 chicks	1 for 70 chicks	1 for 50 chicks	1 for 50 chicks
Hanging drinkers	1 for 150 birds	1 for 150 birds		
Nipple drinkers	1 for 12 birds	1 for 10 birds	1 for 15 birds	1 for 10 birds
Starting feed pans	1 for 50 chicks		1 for 50 chicks	
Linear chain feeders	2.5 cm per bird		2.5 cm per bird	
Pan feeders	1 for 30 birds		1 for 30 birds	

- ***Circular brooder guards (rings or surrounds)***
  - these confine chicks to the brooder area
  - choose a diameter of 3 to 4 m at day old but ensure the ring can be enlarged 48 hours after the arrival
  - ensure the surround can be easily removed after the birds have familiarised themselves with the location of the drinker and feeder systems

- ***Starting in cages***
  - pay attention on drinking
  - cave a light intensity high enough for the chicks to find the nipple drinkers or water system
  - make sure that the relative humidity is 55 to 60 % to prevent dehydration of the chicks

Management of the temperature during the rearing period

	Under the brooder	Near the circular guard	Room temperature	Relative humidity
Week 1	35 – 33°C	32 – 31°C	30 – 28°C	55 – 60%
Week 2	32°C	30 – 28°C	28 – 26°C	55 – 60%
Week 3	28°C	28 – 26°C	26 – 24°C	55 – 60%
Week 4			22 – 20°C	55 – 60%
Week 5			21 – 20°C	60 – 65%
Week 6			20 – 19°C	60 – 65%
Week 7			19 – 18°C	60 – 70%
Week 8			19 – 17°C	60 – 70%
Till transfer			19 – 17°C	60 – 70%

- Check the distribution and behaviour of the chicks to adapt and manage the temperature.
- Raise the house temperature at least 36 hours before chick arrival to 29°C – 30°C.
- Take into account the temperature at chick level.

> FLOCK MANAGEMENT DURING THE REARING PERIOD

Stocking density, drinker space and feeding space from 2 to 5 weeks old

	FLOOR		CAGES	
	Temperate climate	*Hot climate*	*Temperate climate*	*Hot climate*
Stocking density	15 birds/m²	15 birds/m²	40 birds/m²	30 birds/m²
Hanging drinkers	1 for 100 birds	1 for 75 birds		
Nipple drinkers	1 for 12 birds	1 for 10 birds	1 for 15 birds	1 for 10 birds
Linear chain feeders	4 cm per bird		4 cm per bird	
Pan feeders	1 for 25 birds		1 for 25 birds	

Stocking density, drinker space and feeding space between 5 weeks old and transfer

	FLOOR		CAGES	
	Temperate climate	*Hot climate*	*Temperate climate*	*Hot climate*
Stocking density	12-14 birds/m²	8-10 birds/m²	25 birds/m²	20 birds/m²
Hanging drinkers	1 for 100 birds	1 for 75 birds	1 for 100 birds	1 for 70 birds
Nipple drinkers	1 for 12 birds	1 for 10 birds	1 for 12 birds	1 for 10 birds
Linear chain feeders	6 cm per bird		6 cm per bird	
Pan feeders	1 for 25 birds		1 for 25 birds	

- Important points:
  - Pre-heat the whole house 30 to 40 hours prior to chick arrival ensuring the floor is fully warmed before placement.
  - Never overheat the chicks and give them a choice within the desired temperature range.
  - Depending on the brooder design, place the brooders high enough above the litter (at least 1.5 m) at an angle, to allow for uniform distribution of the chicks.
  - Ensure proper ventilation from the moment the chicks arrive (minimum ventilation needs during the brooding period = 0,8 m³ per kg liveweight per hour). Unless there are cold air drafts in the house, use wire mesh fences or surrounds instead of cardboard.
  - If brooding takes place in only part of the house, do not exceed a stocking density of 25 chicks per available m². It is better to allow the chicks to spread quickly over the whole house by 7 days at the latest.

Beak trimming

- Beak trimming is sometimes undertaken where either light intensity can not be controlled due to the design of the house or when parent stock are kept at a high number of birds per square metre. The beak trimming procedure is performed to prevent feather pecking and cannibalism under these conditions and also to reduce feed wastage.
- Beak trimming is a delicate operation and should only be carried-out by well-trained and experienced operators. Poor beak trimming can affect the ability of the birds to eat and drink correctly and leads to unevenness. Attention should be paid to local regulations regarding beak trimming and it is advisable to seek veterinary advice to ensure the procedures are being correctly applied.
- Beak trimming could be practiced on females at 7-10 days. Under some specific conditions where permitted, a second debeaking may be undertaken at 8-10 weeks.

> FLOCK MANAGEMENT DURING THE REARING PERIOD

- Before beak trimming:
  - check that the birds are healthy
  - do not beak trim when the birds are reacting to vaccinations
  - add vitamin K to the drinking water (to prevent haemorrhaging)
  - check that the temperature of the trimming blade is high enough to prevent haemorrhaging, but not too high which may risk chicks being burned.
- To limit the effect of beak trimming on the feed consumption and water intake, it is important to increase the water level in the drinkers and the pressure in the pipes. Ensure that the depth of the feed in the feeders is correct.
- As outlined above, in addition to technical recommendations, any local code or regulation concerning animal welfare should be observed.

Monitoring bodyweight and uniformity

- The main objective is to reach the appropriate bodyweight and uniformity targets at different stages of bird development:
  - at the early stage (4 – 6 week: period of frame development)
  - at sexual maturity with an even growth curve (a low bodyweight at sexual maturity could affect later performance)
  - at the start of lay to the peak of production

- ***Bodyweight control***
  - The birds must be sample weighed weekly from the first week. During the first 4 weeks, collective weights can be taken in batches of 5 or 10 birds using a bucket. Subsequently, the birds can be weighed individually.
  - From 26 weeks old, weigh the birds every 2 weeks and monthly from 32 weeks old,
  - Weigh a sufficient number of birds (around 100) cornered using lightweight screens or frames in 2 or 3 places in the house. For an accurate interpretation of the result, it is important to weigh all the birds caught in the sample. Weights can be recorded on a weighing sheet which is available from our technicians.
  - After weighing, average body weight and uniformity are calculated and immediately plotted on the growing curve chart. The analysis of the growing curve helps to accurately adjust the feed allowance (the quantities indicated in our Feed section are only to be considered as a guideline) and, when required, to take the appropriate steps to correct the uniformity.

- ***Uniformity control***
  - The uniformity target is set to ensure 80 % of the body weights are in a range between within + 10 and -10 % of the flock mean body weight.
  - The following factors play an important role in achieving and maintaining good uniformity:
    - ↗ access to feed and water (see equipment standards)
    - ↗ health status of the flock
    - ↗ disease and parasitism
    - ↗ quality of beak trimming.

> FLOCK MANAGEMENT DURING THE REARING PERIOD

Health programme

- It is impossible to devise a health programme to adequately suit all geographic areas. For this reason, it is strongly recommended that a local specialist be consulted to help produce a prevention programme adapted to that region.
- This guide limits its comments to the description of some rules for the use of vaccines and other treatments. To be successful, respecting these rules is as important as choosing the right products.
    - Staff should be properly trained to carry out veterinary operations. It is useful to create a Standard Operating Procedure Manual that describes in full details the way to perform each vaccination or treatment.
    - All the necessary equipment (sprayers, syringes, etc.) must be correctly maintained and checked before each use.
    - Each operation should be planned and supervised by a technically competent person.
    - Vaccines and treatments should be stored in appropriate conditions, in suitable quantities considering the requirements and supply time.
    - Report carefully in the flock records the details of all operations: date, time, vaccine batch number, route, etc.
    - Finally, it is useful to have the help of a laboratory in order to anticipate health problems ahead of time and to assess the efficiency of the operations:
        - control of disinfection, water and feed quality
        - serological monitoring
        - post mortem examination, routine parasite checks.

Grit and grain

- We advise giving the birds grit and grain from 4 to 5 weeks of age to maintain an active feeding behaviour, to aid the development of the digestive tract and to encourage the birds to scratch the litter.
    - grit (insoluble stone particles of 2 to 4 mm diameter): 3 to 5 g per week per bird, distributed over 2 or 3 days
    - grain (broken maize, or whole wheat): 3 g per bird every day, or every other day.
- This is distributed on the litter, a few hours before the dark period.

> LIGHTING PROGRAMMES

General rules

Sexual maturity and production are largely influenced by the changes in day length to which pullets are exposed. Carefully chosen lighting programmes will help to optimise the performance of commercial layers. Remember that sexual maturity and bodyweight at sexual maturity influence egg production, egg size, liveability, and egg shell quality.
It is difficult to advise a universally optimum and perfect lighting programme. The following lighting programmes are examples and have to be considered as a guideline to help formulate a lighting programme adapted to your own situation.

To establish your own lighting programme, it is important to take into account the following factors:

- Your location (changes in light duration (day length) during the year)
- The characteristics of the rearing unit (light-controlled, semi-dark or open house type)
- Season of the year (increasing or decreasing day length)
- Temperature (light duration at the highest temperature)
- Date of the hatch (what is the natural day length at the bodyweight targetted when light stimulation will take place?)
- Growth of the flock
- Past records of performance obtained in this rearing unit.

• *Lighting programme during the first weeks of the rearing period*

In order to encourage frame development and growth, a slow step down lighting programme is advised for all the conditions of housing.

The decrease in artificial light duration per day is then adjusted according to the housing type. For an open house system (and above 20° Latitude), determine the natural light day length that the birds will encounter before 16 weeks of age. This will then help determine the maximum day length the flock will be given and help avoid an unwanted early light stimulation before the flock has matured sufficiently. Early light stimulation will be promoted by a natural increase in day length during rearing.

• *Lighting programme between 8 weeks old till the age at which light stimulation is targeted*

In order to control sexual maturity and to avoid early sexual maturity at an inadequate and immature bodyweight, it is important avoid any increase in the light duration each day (due to a natural increase in day length) during this period.

According to the season, in a dark house system, a stable day length can be used between 7 weeks old and the age when light stimulation is targeted. The light duration during this period can also be adapted according to the growth of the pullets (10, 11 or 12 hours could be used when growth is slow).

In an open house system, which is the most difficult system for controlling sexual maturity, the natural day length the pullets will be exposed at 16 weeks old will determine the light duration at the plateau to avoid any increase of light duration before 16 weeks old.

• *Increasing day length to stimulate egg production*

For all the conditions, the main indicator to determine the time of light stimulation is the bodyweight.

• *Lighting programme during production*

Never decrease the artificial light duration during the production period as this will risk an early decline in egg production.

• *Light intensity*

A higher light intensity during the brooding period will encourage growth by promoting higher levels of activity of the flock and a higher feed intake.

> LIGHTING PROGRAMMES

After 2 or 3 weeks and according to the behaviour of the chicks, the light intensity may be reduced to match the field conditions and the light intensity the birds will be exposed to during the production period (degree of darkness of the rearing house and the laying house).

Various housing and lighting situations to consider – example programmes

- Light-controlled rearing house to light-controlled laying house:
  - Use a slow step down lighting programme until 6 weeks of age
  - A constant 9 hour day length from 7 weeks to light stimulation (12 hours may used be where needed according to growth)
  - Increase the light duration by 2 hours when body weight is between 1125-1185 g
  - Add 1 hour and/or 30 minutes per week until 15.30 hours or 16 hours total light duration is obtained.
- Light-controlled rearing house to open or semi-dark laying house:
  - Use a slow step down lighting programme until 6 weeks of age
  - A constant 9-10 hour day length from 7 to 15 weeks of age
  - Increase light duration by 2 hours when body weight is between 1125-1185 g
  - Add 1 hour and/or 30 minutes per week until 15.30 hours or 16 hours total light is obtained
  - Light intensity in rearing should be managed to avoid any dramatic and sudden increase in light intensity at transfer time.
- Open or semi-dark rearing house to light-controlled laying house:
  - Use a slow step down lighting programme until 6 weeks of age
  - A constant 9-10 hour (or natural) day length from 7 to 15 weeks of age
  - Increase light duration by 2 hours at 1125-1185 g of bodyweight when there is a decreasing day length
  - Increase light duration by 1 hour at 1125-1185 g of bodyweight when there is an increasing day length
  - Add 1 hour and/or 30 minutes per week until 15.30 hours or 16 hours total light is obtained
  - Light intensity from transfer time should be managed to avoid any dramatic and sudden decrease of light intensity.
- Open or semi-dark rearing house to open or semi-dark laying house:
  - Use a slow step down lighting programme until 6 weeks of age
  - A constant 9-10 hour (or NDL) day length from 7 to 15 weeks of age
  - Increase light duration by 2 hours at 1125-1185 g of bodyweight when there is a decreasing day length
  - Increase light duration by 1 hour at 1125-1185 g of bodyweight when there is an increasing day length
  - Make light stimulation more effective by adding the additional hours of light in the morning instead of the evening
  - Add 1 hour and/or 30 minutes per week until 15.30 hours or 16 hours total light is obtained.
- In a hot climate:
  - Use a slow step down lighting programme until 12 weeks of age
  - A constant natural day length from 12 weeks of age to 2-5% of production
  - Increase light duration by 1 hour and/or 30 minutes from 2-5% of production in the morning
  - Add 1 hour and/or 30 minutes per week until 15.30 hours or 16 hours total light is obtained
  - The light on should be adapted to allow the birds to eat during the cooler part of the day.

- ***Midnight lighting***

It is possible to use an additional 1.00 to 1.30 hours of light in the middle of the dark period in order to promote an optimal feed intake during the first weeks of production or to compensate for the adverse effect of high temperature during the summer.

This extra light period may be introduced and removed during the production period at any time after the increase in light duration at the start of lay.

Please do not hesitate to contact directly the NOVOGEN technician in your area for more specific advice.

> LIGHTING PROGRAMMES

Lighting programme in light-controlled rearing houses (<0,5 lux)

Age (weeks)	Age (days)	Bodyweight at start of the week (g)	Average laying rate of the week	Light duration in hours	Light intensity
0	0 to 2			22.00	20-40 lux
1	3 to 7			20.00	20-30 lux
2	8 to 14			19.00	10-20 lux
3	15 to 21			17.00	5-10 lux
4	21 to 28			15.00	5-10 lux
5	29 to 35			13.00	5-10 lux
6	36 to 42			11.00	5-10 lux
7	43 to 49			10.00	5-10 lux
8	50 to 56			09.00	5-10 lux
9	57 to 63			09.00	5-10 lux
10	64 to 70			09.00	5-10 lux
11	71 to 77			09.00	5-10 lux
12	78 to 84			09.00	5-10 lux
13	85 to 91			09.00	5-10 lux
14	92 to 98			09.00	5-10 lux
15	99 to 105			09.00	5-10 lux
16	106 to 112	(3)		09.00 (3)	5-10 lux
17	113 to 119	1125-1185		11.00	5-15 lux
18	120 to 126	1190-1255	0-1%	12.00	5-15 lux
19	127 to 133	1250-1320	0-3%	13.00 (1)	5-15 lux
20	134 to 140	1315-1390	2-25%	13.30	5-15 lux
21	141 to 147	1365-1440	30-55%	14.00	5-15 lux
22	148 to 154	1405-1482	55-82%	14.30	5-15 lux
23	155 to 161	1450-1530	80-90%	15.30	5-15 lux
24	162 to 168	1485-1570	85-92%	15.30 (2)	5-15 lux
25	169 to 175	1515-1600	88-93%	15.30 (2)	5-15 lux
25+	176 to 182	1545-1630		15.30 (2)	5-15 lux
	183 to 189	1575-1660		15.30 (2)	

(1) From 19 weeks of age, midnight lighting could be added.
(2) Could be increased to 16 hours according to feed consumption.
(3) According to the average egg weight requested by the market, it could be possible to light stimulate the pullets one week earlier.

> LIGHTING PROGRAMMES

Lighting programme in semi - dark or open rearing houses (>0,5 lux)

Age (weeks)	Age (days)	Bodyweight at start of the week (g)	Average laying rate of the week	In decreasing day lenght in hours	In increasing day lenght in hours
0	0 to 2			22.00	22.00
1	3 to 7			20.00	20.00
2	8 to 14			19.00	19.00
3	15 to 21			17.00	17.00
4	21 to 28			15.00	15.00
5	29 to 35			13.00 (or NDL)	13.00 (or NDL)
6	36 to 42			12.00 (or NDL)	12.00 (or NDL)
7	43 to 49			10.00 (or NDL)	10.00 (or NDL)
8	50 to 56			10.00 (or NDL)	10.00 (or NDL)
9	57 to 63			10.00 (or NDL)	10.00 (or NDL)
10	64 to 70			10.00 (or NDL)	10.00 (or NDL)
11	71 to 77			10.00 (or NDL)	10.00 (or NDL)
12	78 to 84			10.00 (or NDL)	10.00 (or NDL)
13	85 to 91			10.00 (or NDL)	10.00 (or NDL)
14	92 to 98			10.00 (or NDL)	10.00 (or NDL)
15	99 to 105			10.00 (or NDL)	10.00 (or NDL)
16	106 to 112			10.00 (or 16.00)	+1.00 (or 16.00)
17	113 to 119	1125-1185		+2.00 (or 16.00)	+1.00 (or 16.00)
18	120 to 126	1190-1255	0-1%	+1.00 (or 16.00)	+1.00 (or 16.00)
19	127 to 133	1250-1320	0-3%	+1.00 (or 16.00) (1)	+1.00 (or 16.00)
20	134 to 140	1315-1390	2-25%	+0.30 (or 16.00)	+0.30 (or 16.00)
21	141 to 147	1365-1440	30-55%	+0.30 (or 16.00)	+0.30 (or 16.00)
22	148 to 154	1405-1482	55-82%	+0.30 (or 16.00)	+0.30 (or 16.00)
23	155 to 161	1450-1530	80-90%	16.00	+0.30 (or 16.00)
24	162 to 168	1485-1570	85-92%	16.00	16.00
25	169 to 175	1515-1600	88-93%	16.00	16.00
25+	176 to 182	1545-1630			
		1575-1660			

NDL: Natural Day Length

(1) From 19 weeks of age, midnight lighting could be added.

> LIGHTING PROGRAMMES

Lighting programme in hot climate (between 20° North and 20° South)

Age (weeks)	Age (days)	Bodyweight at start of the week (g)	Average laying rate of the week	Light duration in hours
0	0 to 2			22.00
1	3 to 7			20.00
2	8 to 14			19.00
3	15 to 21			18.00
4	21 to 28			17.00
5	29 to 35			16.00
6	36 to 42			15.30
7	43 to 49			15.00
8	50 to 56			14.30
9	57 to 63			14.00
10	64 to 70			13.30
11	71 to 77			13.00
12	78 to 84			12.30
13	85 to 91			12.00
14	92 to 98			12.00 (or NDL)
15	99 to 105			12.00 (or NDL)
16	106 to 112			12.00 (or NDL)
17	113 to 119	**1125-1185**		12.00 (or NDL)
18	120 to 126	**1190-1255**	**0-1%**	12.00 (or NDL)
19	127 to 133	1250-1320	0-3%	+1.00 (1)
20	134 to 140	1315-1390	2-25%	+1.00
21	141 to 147	1365-1440	30-55%	+1.00
22	148 to 154	1405-1482	55-82%	+0.30
23	155 to 161	1450-1530	80-90%	+0.30 (or 16.00)
24	162 to 168	1485-1570	85-92%	16.00
25	169 to 175	1515-1600	88-93%	16.00
25+	176 to 182	1545-1630		
		1575-1660		

NDL : Natural Day Length

(1) From 19 weeks of age, midnight lighting could be added.

FLOCK MANAGEMENT DURING THE PRODUCTION PERIOD

Transfer

Transfer is advised around 16 to 17 weeks of age

- Before the appearance of the 1st eggs
- After a last vaccine planned 1 week before the transfer
- After de-worming of the flock (3 days prior the transfer).

In order to minimize the stress at transfer time, it is important to:

- Rear the birds with similar drinking system as they will encounter after transfer
- Increase light intensity to encourage water consumption
- Maintain temperature as close as temperature experienced by the pullets at the end of the rearing period.

Lighting programme during the production period

The light duration after transfer should be adjusted to match the light duration experienced at the end of the rearing period. The post transfer light duration should be at least the same length as during the rearing phase. It may be longer according to the plan for light stimulation.

As the birds remain sensitive to changes in light duration, never decrease the day length during the entire production period.

Light intensity management during the production period

It is possible after the peak of lay to reduce progressively the artificial light intensity. This may limit feed wastage, excessive activity of the birds and reduce the risk of mortality. Please take into account that light intensity should remain well distributed all over the house.

Management of the egg weight

The egg weight profile of a flock is mainly determined by the following factors:

- Bodyweight at light stimulation (or at sexual maturity).
  - ↗ The larger is the bodyweight at sexual maturity then egg weight will be larger during all the laying period.
  - ↗ The smaller is the bodyweight at sexual maturity then egg weight will be smaller during all the laying period.
  - ↗ To increase average egg weight during the production period then delay the start of egg production.
  - ↗ To decrease average egg weight during the production period then plan an earlier sexual maturity.
- Evolution of the bodyweight during the first week of production
- Setting up a cyclic lighting programme during the production period may increase the average egg weight under certain conditions.
- Nutrition also has important effects on the evolution of the egg weight during production:
  - ↗ Intake of protein or digestible amino acids
  - ↗ Metabolisable energy of the feed
  - ↗ Linoleic acid and oil content of the feed.

> WATER QUALITY

Quality

- Water must be monitored on a regular basis (at least twice a year). The following table gives some microbiological and chemical standards.
- We recommend equipping each farm with a system to control the bacteriological quality of the water (chlorination for instance).

	Units	Very pure water	Drinkable water	Suspected water	Bad water
Total flora	number/ml	0 to 10	10 to 100	1 000 to 10 000	100 000
Salmonella	number/ml	0	0	> 0	> 0
E. coli	number/ml	0	0	10 to 50	100
Hardness		5 to 15°	15 to 30°	30°	30°
Organic matter	mg/l	0	1	3	4.6
Nitrates	mg/l	0	0 to 15	15 to 30	30
Ammonia	mg/l	0	0	2	10
Turbidity			5 units		25 units
Iron	mg/l		0,3		1
Manganese	mg/l		0,1		1,5
Copper	mg/l		1		1,5
Zinc	mg/l		5		15
Calcium	mg/l		75		200
Magnesium	mg/l		50		150
Sulfates	mg/l		200		400
Chlorides	mg/l		200		600
pH		7	7 to 8,5		6,5 to 9,2

- A water sample for analysis should be taken at the entry point of the house and/or at the end of the system.
- Sample once a year or twice a year.

Important

- Clean the pipe system during the sanitary break between flocks
- Treat the drinking water with chlorination and monitor the residual active chlorine at the end of the pipe system once a week.
- Clean drinkers on a regular basis

Nutrient recommendations per 1000 kcal (Mcal) of Metabolisable Energy (ME) for rearing period

	STARTER		GROWER		PULLET		PRELAY	
Age	0-35 days		36-70 days		71-112 days		113-5% of lay	
Suggested ME kcal/kg (1)	2900-3000		2800-2900		2700–2900		2700–2900	
Nutrient g / Mcal	**Total**	**Dig.**	**Total**	**Dig.**	**Total**	**Dig.**	**Total**	**Dig.**
Lysine	3.85	3.38	3.42	3.00	2.74	2.41	2.96	2.59
Methionine	1.75	1.62	1.50	1.44	1.24	1.14	1.43	1.32
Meth. & Cystine	2.98	2.64	2.55	2.34	2.31	2.05	2.52	2.23
Tryptophan	0.77	0.64	0.68	0.59	0.64	0.53	0.69	0.57
Arginine	4.00	3.50	3.50	3.10	3.00	2.70	3.00	2.70
Threonine	2.58	2.25	2.22	2.00	1.88	1.64	2.03	1.76
Nutrient g / Mcal	**Mini**	**Maxi**	**Mini**	**Maxi**	**Mini**	**Maxi**	**Mini**	**Maxi**
Calcium	3.6	3.8	3.6	3.9	3.5	3.9	8.1	9.3
Av. Phosphorus	1.55	1.72	1.50	1.68	1.48	1.63	1.56	1.59
Sodium	0.62	0.69	0.57	0.64	0.59	0.67	0.59	0.67
Chloride	0.55	0.69	0.57	0.71	0.59	0.74	0.59	0.74
Potassium	2.07	2.59	2.14	2.50	1.85	2.59	1.85	2.59
Linoleic acid	5.5		5.0		5.0		5.0	

(1) ME concentrations will vary according to the ingredients available locally and their cost. Lower ME concentrations are preferred where possible. To do this requires ingredients with low ME content to be available which should be of reliable nutrient concentration and free of anti nutritive factors.

Example of diet specifications for rearing period

	STARTER		GROWER		PULLET		PRE-LAY	
	Crumbs		Crumbs or mash		Coarse mash		Coarse mash	
Nutrient	Low ME	High ME	Low ME	High ME	Low ME	High ME	Low ME	High ME
ME kcal/kg (1)	2900	3000	2800	2900	2700	2900	2700	2900
ME kcal/lb	1316	1361	1270	1316	1225	1316	1225	1316
Crude Protein % (2)	20.0-20.5	20.5-21.0	18.5-19.0	19.0-19.5	16.0-17.0	16.5-17.5	16.5-17.0	17.0-17.5
Crude Fat %	3.5 - 5.0	4.0 - 5.5	3.0 – 4.5	3.5 - 5.0	2.5 - 4.0	3.0 - 5.0	3.0 - 4.5	3.5 - 5.0
Crude Fibre %	2.5 - 3.5	2.0 - 3.5	3.0 – 4.0	2.5 - 4.0	3.5 - 6.5	4.0 - 6.0	3.5 - 6.5	4.0 - 6.0
Tot Lysine %	1.12	1.16	0.96	0.99	0.74	0.80	0.80	0.86
Tot Méthionine %	0.51	0.53	0.44	0.45	0.33	0.36	0.39	0.41
Tot Méth & Cystine %	0.86	0.89	0.74	0.77	0.62	0.67	0.68	0.73
Tot Tryptophane %	0.211	0.218	0.187	0.193	0.140	0.150	0.151	0.162
Tot Thréonine %	0.75	0.78	0.64	0.67	0.51	0.55	0.55	0.59
Dig Lysine %	0.98	1.01	0.84	0.87	0.65	0.70	0.70	0.75
Dig Méthionine %	0.47	0.49	0.40	0.42	0.31	0.33	0.36	0.38
Dig Méth & Cystine %	0.76	0.79	0.66	0.68	0.55	0.59	0.60	0.65
Dig Tryptophane %	0.185	0.192	0.164	0.170	0.143	0.154	0.154	0.165
Dig Thréonine %	0.65	0.67	0.56	0.58	0.44	0.47	0.48	0.51
Calcium %	1.05-1.10	1.05-1.10	1.00-1.10	1.00-1.10	0.95-1.05	0.95-1.05	2.20-2.50	2.30-2.60
Av. Phosphorus % (3)	0.45-0.50	0.46-0.50	0.42-0.47	0.43-0.48	0.40-0.44	0.42-0.45	0.42-0.45	0.43-0.48
Sodium %	0.18-0.20	0.20-0.22	0.16-0.18	0.16-0.20	0.16-0.18	0.16-0.20	0.16-0.18	0.16-0.20
Chloride %	0.16-0.20	0.16-0.22	0.16-0.20	0.16-0.22	0.16-0.20	0.16-0.22	0.16-0.20	0.16-0.22
Potassium %	0.60-0.75	0.62-0.78	0.50-0.75	0.62-0.78	0.50-0.70	0.52-0.72	0.50-0.70	0.52-0.72
Linoleic acid min %	1.50	1.60	1.40	1.50	1.30	1.40	1.30	1.40

(1) (1)ME concentrations will vary according to the ingredients available locally and their cost. Lower ME concentrations are preferred where possible. To do this requires ingredients with low ME content to be available which should be of reliable nutrient concentration and free of anti nutritive factors.

(2) The crude protein concentrations shown are as a guide and will vary according to local ingredients. Try to avoid excess protein wherever possible.

(3) Assumes available phosphorus basis. Special care should be taken on the phosphorus value used for phytase (if used).

Nutrient recommendations per 1000 kcal (Mcal) of Metabolisable Energy (ME) for production period

	LAYER 1		LAYER 2	
Age	*From 5%*		*From 50 weeks*	
Suggested ME kcal/kg (4)	2750-2900		2720–2900	
Nutrient g/Mcal	**Total**	**Dig.**	**Total**	**Dig.**
Lysine	2.94	2.58	2.90	2.54
Methionine	1.50	1.39	1.48	1.37
Meth. & Cystine	2.52	2.23	2.48	2.19
Tryptophan	0.70	0.58	0.69	0.57
Arginine	3.50	3.19	3.40	3.15
Threonine	2.04	1.77	2.01	1.75
Nutrient g/Mcal	**Mini/Maxi**	**Mini/Maxi**	**Mini/Maxi**	**Mini/Maxi**
Calcium	13.0	13.5	12.5	12.9
Av. Phosphorus	1.53	1.64	1.36	1.47
Sodium	0.58	0.65	0.58	0.65
Chloride	0.58	0.73	0,58	0.73
Potassium	2.18	2.73	2.18	2.73
Linoleic acid	5.5		4.5	

(4) ME concentrations will vary according to the ingredients available locally and their cost. Lower ME concentrations are preferred where possible. To do this requires ingredients with low ME content to be available which should be of reliable nutrient concentration and free of anti nutritive factors.

Example of diet specifications for production period

	Layer 1				Layer 2 - (3)			
	Coarse mash				Coarse mash			
Nutrient	**Low ME**		**High ME**		**Low ME**		**High ME**	
ME kcal/kg (1)	**2750**		**2900**		**2720**		**2900**	
ME kcal/lb	**1248**		**1316**		**1234**		**1316**	
Crude Protein % (2)	17.5-18.0		18.0-18.5		17.0-17.5		17.5-18.0	
Crude Fat %	3.5 – 4.5		4.0 – 5.0		3.0 – 4.0		3.5 – 4.5	
Crude Fibre %	4.0 – 6.0		3.5 – 5.0		4.0 – 6.0		3.5 – 6.0	
Daily feed cons. In g	< 106	> 106	< 102	> 102	< 113	> 113	< 108	> 108
Tot Lysine %	0.87	0.83	0.90	0.85	0.83	0.79	0.88	0.84
Tot Methionine %	0.44	0.42	0.46	0.43	0.42	0.40	0.45	0.43
Tot Meth & Cystine %	0.74	0.71	0.77	0.73	0.70	0.67	0.75	0.72
Tot Tryptophan %	0.194	0.185	0.203	0.194	0.183	0.175	0.200	0.191
Tot Threonine %	0.61	0.58	0.62	0.59	0.57	0.55	0.61	0.58
Dig Lysine %	0.77	0.73	0.79	0.75	0.72	0.69	0.77	0.74
Dig Methionine %	0.41	0.39	0.42	0.40	0.39	0.37	0.42	0.40
Dig Meth & Cystine %	0.66	0.63	0.68	0.65	0.62	0.59	0.67	0.64
Dig Tryptophan %	0.170	0.161	0.180	0.170	0.160	0.152	0.170	0.170
Dig Threonine %	0.53	0.50	0.54	0.51	0.50	0.48	0.53	0.51
Calcium %	3.55 – 3.70		3.80 – 3.90		3.40 – 3.50		3.60 – 3.80	
Av. Phosphorus % (4)	0.42 – 0.45		0.43 – 0.48		0.37 – 0.40		0.38 – 0.42	
Sodium %	0.16 – 0.18		0.17 – 0.20		0.16 – 0.18		0.17 – 0.20	
Chloride %	0.16 – 0.20		0.16 – 0.22		0.16 – 0.20		0.16 – 0.22	
Potassium %	0.60 – 0.75		0.62 – 0.78		0.60 – 0.75		0.62 – 0.78	
Linoleic acid min %	1.50	1.40	1.60	1.50	1.20	1.00	1.30	1.00

(1) ME concentrations will vary according to the ingredients available locally and their cost. Lower ME concentrations are preferred where possible. To do this requires ingredients with low ME content to be available which should be of reliable nutrient concentration and free of anti nutritive factors.

(2) The crude protein concentrations shown are as a guide and will vary according to local ingredients. Try to avoid excess protein wherever possible.

(3) Layer 2 must have the same physical form and use similar ingredients as Layer 1 to ensure a smooth transition.

(4) Assumes available phosphorus basis. Special care should be taken on phosphorus value used for phytase (if used).

Target nutrient intakes at peak of egg output

Metabolisable energy	310 kcal / day at 20°C in cage
Digestible Amino Acids	**In mg/day**
Lysine	800
Methionine	430
Methionine and Cystine	690
Tryptophan	180
Arginine	990
Threonine	550
Minerals	**In mg/day**
Calcium	4150
Available phosphorus	475

Vitamin and mineral premix recommendations

Nutrient		Starter	Starter & grower	Pre-lay & layer
Manganese	Ppm	80	80	80
Zinc	Ppm	80	80	80
Iron	Ppm	60	60	60
Copper	Ppm	10	10	10
Selenium (2)	Ppm	0,2	0,2	0,2
Iodine	Ppm	1	1	1
Vit. A	U.I./kg	15000	10000	10000
Vit. D3	U.I./kg	3000	2000	2500
Vit. E (1)	U.I./kg	50 - 100	30 - 100	20 – 50
Vit. K	mg/kg	3	2	3
Thiamine B1	mg/kg	3	2	2
Riboflavin B2	mg/kg	8	6	5
Pantothenic acid B5	mg/kg	15	10	12
Nicotinic acid B3	mg/kg	60	40	40
Pyridoxine B6	mg/kg	4	3	5
Folic acid B10	mg/kg	1.5	1	0.75
Cyanocobalamin B12	mg/kg	0.02	0.01	0.015
Biotine Vit. H (3)	mg/kg	0.20	0.10	0.05
Choline (3)	mg/kg	700	600	700

(1) The higher dose can help to increase immunity.

(2) Assumes inorganic and organic sources - check local regulations for the maximum permitted amount of selenium.

(3) Biotin levels can be reduced for standard maize and soya based diets by 0.05mg/kg and choline by 400 mg/kg.

> NOTES

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