# LOHMANN LSL-EXTRA

## LAYERS

# MANAGEMENT GUIDE

## CAGE HOUSING

BREEDING FOR SUCCESS … TOGETHER

LOHMANN BREEDERS

# CONTENTS

# INTRODUCTION

## Why should you study this management guide?

Most people who are involved in commercial egg production, have seen management guides for different strains of layers before and may think "if you have seen one, you've seen them all". Others take the contents more seriously and expect frequent updates to find specific data which apply to the current generation of layers and current management practices. Newcomers in the business may need more detailed explanations than can be presented in this compact format.

We hope that each reader will find some useful information, to confirm proven management practices or to stimulate improvements.

# TOP PERFORMANCE BY SYSTEMATIC SELECTION

**LOHMANN – the right partner for progressive, successful poultry management.**

In recent decades, advanced methods have significantly improved breeding quality. Due to the development of powerful electronic data processing systems, it has become possible to put the theory of selection systematically into practice – thus turning modern quantitative genetics into reality.

From very early on, LOHMANN used these new techniques and can therefore offer an extensive range of experience and know-how. A highly qualified team of specialists guarantees prompt utilization of the latest research results. The market's changing demands can therefore be met quickly and effectively.

Moreover, nationally and internationally, LOHMANN is ranked as first class for questions on poultry health, which is one of the decisive factors for performance and profitability.

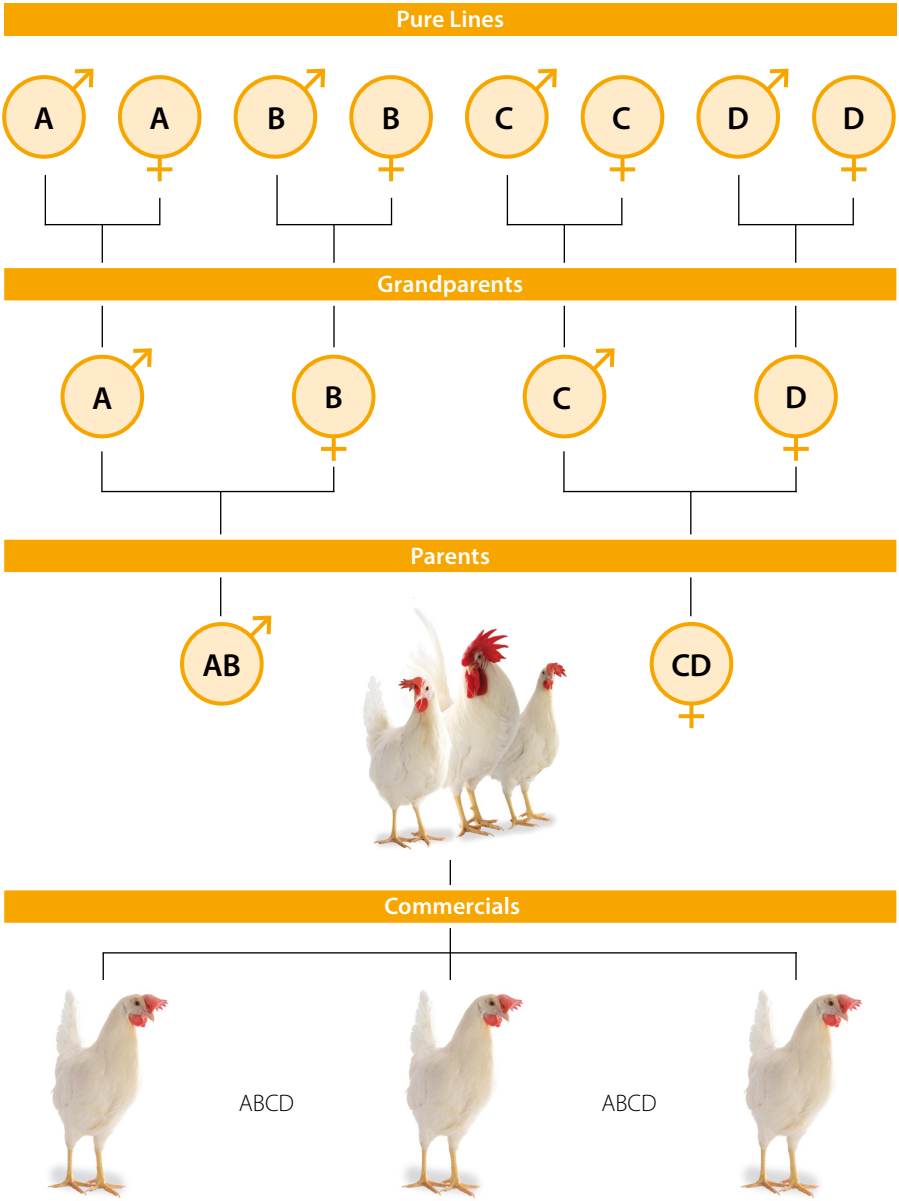
Intensive research from our veterinary experts, besides increasing resistance to diseases by genetic means and ensuring the strictest conditions of hygiene, is fundamental to the quality of LOHMANN products.

In addition, LOHMANN also provides expert advice on all questions of feed, nutrition and technical service.

Practice profits from this extensive expertise in all aspects of poultry management. With LOHMANN products, eggs are produced in top quality and at competitive costs.

Results of performance comparisons in the field and in independent institutes are proof of this success. LOHMANN products are often the winners and are always among the few at the top, worldwide.

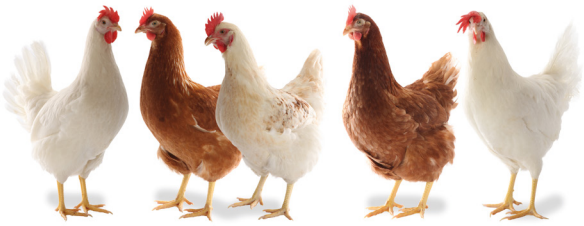
# BREEDING SCHEME



# PERFORMANCE DATA

## LOHMANN LSL-EXTRA Layer

| | | |
|---|---|---|
| **Egg Production** | Age at 50 % production | 140–145 days |
| | Peak production | 93–95 % |
| | **Eggs per Hen Housed** | |
| | in 72 weeks of age | 316 |
| | in 80 weeks of age | 358 |
| | in 95 weeks of age | 426 |
| | **Eggs Mass per Hen Housed** | |
| | in 72 weeks of age | 20,25 kg |
| | in 80 weeks of age | 23,10 kg |
| | in 95 weeks of age | 27,89 kg |
| | **Average Egg Weight** | |
| | in 72 weeks of age | 64,0 g |
| | in 80 weeks of age | 64,5 g |
| | in 95 weeks of age | 65,5 g |
| **Egg Characteristics** | Shell colour | attractive white |
| | Shell breaking strength | > 40 Newton |
| **Feed Conversion Ratio** | 1.9–2.1 kg/kg egg mass | |
| **Body Weight** | at 17 weeks | 1,30 kg |
| | at the end of production | 1,86 kg |
| **Liveability** | Rearing | 97–98 % |
| | Laying period | 92–93 % |



# HOUSING CHICKS

## General Recommendations

- Before bringing in the chicks, check that everything is in good working order.
- Warm up the house in good time up to 35–36 °C. In summer start heating at least 24 hours and in winter at least 48 hours before the chicks arrive. When the right temperature has been achieved, supply minimum ventilation. This will avoid temperature differences within the house.
- Maintain the recommended temperatures (35–36 °C) during the first 48–72 hours.
- Relative humidity should be at least 60 %.
- The right height of the drinkers must be adjusted to allow the chicks to drink water without difficulty.
- Reduce the water pressure of the nipples in order to enable the chicks to find water easily.
- Keep drinking water temperature between 20–25 °C by temporarily flushing the nipple drinker lines or renewing the water in the chick founts.
- Follow the recommended lighting programmes (refer to page 26).

## Cage Systems

- Adjust the cage floors and feeding grids according to the manufacturer's instructions.
- Place sheets of paper on the cage floor for the first days and distribute a bit of feed on this paper. The papers must be removed by day 7.
- Unload all chick boxes and distribute them in the house. Remove all lids and place them on the top of the boxes.
- Quickly place the chicks near feeders and drinkers. Distribute the chicks evenly among the cages starting at the far end of the house.
- Trigger nipples/water cups to encourage birds to drink.

## Floor Systems

- Before arrival of the chicks, litter should be spread only after heating the house, when the floor has reached the optimum temperature. Softwood shavings or straw make suitable litter.
- After arrival, place chicks under brooders as soon as possible.
- Measure the brooder temperature by placing the thermometer 8 cm inside the outer edge of the brooder and 8 cm above the litter.
- Dip the beaks of a few chicks into water and trigger nipple or water cups to help them start drinking. When drinking water has been found by all chicks (this will take approx. 2–3 hours), they will start to eat.
- Supply the chicks with additional feeding bowls to ensure a better feed intake in the first few days.
- Chicks should be fully feathered before brooding equipment has to be removed.

## Body Temperature of the Chicks

The body temperature of housed chicks is a very useful indicator to adjust house temperature in an optimum way. A simple tool to measure the body temperature of day old chicks is usage of modern ear thermometers, known from human medicine. The correct application to measure the body temperature is just to touch the cloaca gently with the thermometer probe. The optimal body temperature of the chicks is about 40 to 41 °C.

Obtain samples of the chicks distributed in different parts of the house in order to have reliable results. Proceed in a way you normally do while weighing chicks/pullets to check their uniformity. Collect the information, calculate the average and adjust house temperature accordingly to achieve optimal chick temperatures. For example increase the house temperature by 0.5 °C, if the average body temperature of the chicks is 39.5 °C.

Besides house temperature, there are other factors which could affect the body temperature of the chicks negatively:

- Insufficient air distribution in the house
- Low humidity level (heat transfer capacity of the air)
- Missing to pre-warm the house at the right time

After a few hours, check whether the chicks have settled down well. The chicks behaviour is the best indicator of their well-being:

- If the chicks are evenly spread out and moving freely, temperature and ventilation are all right.
- If the chicks are crowding together or avoiding certain areas within the house, temperature is too low or there is a draught.
- If the chicks are lying about on the floor with outspread wings and gasping for air, temperature is too high.

**At first signs that the chicks are not feeling well determine the reason, correct the situation and check more frequently.**

# ENVIRONMENT

Environmental conditions have an effect on the well-being and performance of the birds. Important environmental factors are temperature, humidity and level of toxic gases in the air. The optimal temperature depends on the age of the birds. The following table is a guide to the correct temperature at bird level. As mentioned before, the birds behaviour is the best indicator for correct temperature. Always reduce temperature gradually, and avoid sudden changes.

If the ventilation system is used to regulate temperature, take care that the necessary fresh air is supplied.

## Table 1: Desired Temperatures at Bird Level Dependent on Age

| Age | Temperature °C |
|---|---|
| Day 1–2 * | 35–36 |
| Day 3–4 | 33–34 |
| Day 5–7 | 31–32 |
| Week 2 | 28–29 |
| Week 3 | 26–27 |
| Week 4 | 22–24 |
| From Week 5 | 18–20 |

** Body temperatures of 40–41 °C are the optimum for the chicks.*

The relative humidity inside the house should be about 60–70 %.

The air quality should meet the following minimum requirements:

## Table 2: Minimum Air Quality Requirements

| | | |
|---|---|---|
| $O_2$ | over | 20 % |
| $CO_2$ | under | 0.3 % |
| CO | under | 40 ppm |
| $NH_3$ | under | 20 ppm |
| $H_2S$ | under | 5 ppm |

# VACCINATION

## General Recommendations

Vaccination is an important way of preventing diseases. Different regional epidemic situations require suitably adapted vaccination programmes. Therefore, please be guided, by the advice of your local veterinarian and poultry health service. Only healthy flocks should be vaccinated. Check the expiration date of the vaccine. The vaccine must not be used after this date. Keep records of all vaccinations and vaccine serial numbers.

## Vaccination Methods

**Individual Vaccinations** such as injections and eye-drops are very effective and generally well tolerated but also very labour intensive.

**Drinking Water Vaccinations** are not labour intensive but must be carried out with the greatest care to be effective. The water used for preparing the vaccine solution must not contain any disinfectants. During the growing period, the birds should be without water for approximately 2 hours prior to vaccination. During hot weather reduce this time accordingly. The amount of vaccine solution should be calculated for complete consumption within 2–4 hours. When vaccinating with live vaccines, add 2 g of skim milk powder per litre of water or canned milk in order to protect the virus titre, if no water stabilisator is available.

**Spray Vaccinations** are not labour intensive and are highly effective, but may occasion ally have side effects. For chicks up to the age of 3 weeks apply only coarse spray. Use distilled water for vaccination.

## Special Recommendations

**Marek Re-Vaccinations** have proved to be successful after long transportation and in areas with high infection risk. Consult your veterinarian and the LOHMANN Technical Service Team for further information.

**Mycoplasmosis Vaccinations** are only advisable if the farm cannot be kept free of mycoplasmosis. Infections with virulent mycoplasma species during the production period lead to performance depression. The best performance is achieved by flocks which are kept free of mycoplasmosis and are not vaccinated.

**Vaccination against Coccidiosis** is the most reliable method in the floor rearing to develop immunity against this disease. Never use coccidiostats in the feed when pullets are vaccinated.

**Applying Vitamins** in the first two to three days after vaccination can help to reduce stress and prevent undesired reactions. To what extent depends on the specific situation on each farm.

# VACCINATION

## Table 3: Example of a Vaccination Programme for LOHMANN LSL-EXTRA Layers

| Disease | Occurrence | | Application Methods | Remarks |
|---|---|---|---|---|
| | World-wide | Locally | | |
| Marek | ● | | SC – IM | Day 1 – Hatchery |
| Newcastle * | ● | | DW – SP – SC – IM | Number of vaccinations according to disease pressure |
| Gumboro | ● | | DW | 2 live vaccinations recommended |
| Infectious Bronchitis * | ● | | DW – SP – SC – IM | Number of vaccinations according to disease pressure |
| AE | ● | | DW – SC – WW | Vaccination of PS and Commercials is recommended |
| Mycoplasmosis | | ● | SP – ED – SC – IM | Vaccination before transfer |
| Fowl Pox | | ● | WW | Vaccination before transfer |
| Pasteurellosis | | ● | SC | 2 vaccinations approx. at week 8 and 14 |
| Infectious Coryza | | ● | SC | 2 vaccinations approx. at week 8 and 14 |
| Salmonella | | ● | DW – SP – IM | Vaccination before transfer |
| ILT | | ● | DW – ED | 2 vaccinations between 6–14 weeks |
| EDS | | ● | SC – IM | Vaccination before transfer |

***DW:*** *Drinking Water*
***SP:*** *Spray*
***ED:*** *Eye Drop*
***WW:*** *Wing Web*
***IM:*** *Intramuscular Injection*
***SC:*** *Subcutaneous Injection*

*Vaccination against Coccidiosis is optional for floor rearing systems*

** An implementation of early live vaccination for Newcastle Disease (ND) and Infectious Bronchitis (IB) is of high value in order to induce local protection in the respiratory system of the chicks (priming effect). The right choice of vaccine is crucial. Never vaccinate very young birds with high-virulence live vaccine. Depending on infectious pressure, birds are vaccinated with inactivated vaccine during the rearing and/or prior onset of lay for booster the immunity. Revaccination with live ND and/or IB every 6–8 weeks during production period is beneficial in order to improve the local immunity.*

*A severe vaccination programme especially intramuscular injections may depress the body weight development.*

# BEAK TREATMENT

Beak treatment is not necessary under optimal conditions. In practice, it is widely used in environmental controlled and light-tight facilities, as an efficient precaution against cannibalism and feather pecking. Such behaviour may develop at any age as a result of excessive light intensity, unbalanced feed, poor ventilation, overstocking or boredom.
Especially in floor management and/or open houses with uncontrollable light intensity, we recommend beak treatment subject to local animal welfare regulations. A very gentle and highly recommended method of beak treatment is the infrared treatment of the upper and lower beak by means of a special technique, performed shortly after chicks hatch. This procedure can already be done in the hatchery under very hygienic conditions by specially trained personnel. Another method of beak treatment is to treat the beaks with a hot blade.

## Observe the following precautions for a conventional beak treatment:

- Treat only healthy, unstressed birds, at the age of 7–10 days.
- Allow only experienced personnel to do the work.
- Work slowly and carefully.
- Use only equipment and blades in perfect working order; adjust the blade temperature so that cauterisation is guaranteed and the beak is not damaged.
- Adjust temperature and duration of the treatment according to the chicks beak size, strength and quality.
- Do not feed for 12 hours before treating.
- Offer free feeding immediately after treating.
- Increase the level of feed in the troughs.
- Increase the temperature in the house for a few days after treating.
- For 3–5 days after beak treating provide an extra hour of light and supply feed in the late evening or at night.
- Giving vitamins via the drinking water can also help to alleviate stress.

# NUTRITION

## General

To get the best out of the genetic performance potential of LOHMANN LSL-EXTRA layers, feeding them with a good structured mash feed with full nutritive value is a must. Such nutrition can best be guaranteed by a complete feed adapted to the performance potential.

Our feeding recommendations concentrate on the essential nutrients and are designed to cover the requirements for the best performance in every stage of development.

## Ad Libitum Feed Supply

LOHMANN Layers and their breeders are specialised birds selected for a high egg production. Because of their high turnover rates "feed into food", they have a big demand for nutrients.

Layers in full production convert roughly one third of the consumed nutrients into eggs. There is no danger in wasting feed by supplying feed ad libitum, because the hens can adjust their intake to the nutrient density of the feed. But there is a real danger in restricting birds in feed intake. An undersupply of nutrients will harm the birds. They lose production and once exhausted, they easily can run into a health problem.

## Feed Consumption

Feed consumption is mainly affected by:

- Body weight
- Performance
- House temperature: Low temperature increases the maintenance requirement for energy.
- Condition of feathering: Poor feathering condition due to management mistakes or malnutrition increases the maintenance requirement for energy.
- Feed texture: Coarse texture increases while fine texture decreases feed intake.
- Energy level: The higher the energy level of the feed, the lower the feed intake and vice versa.
- Nutrient imbalances: The hen will try to compensate for any nutrient deficits by increasing feed consumption especially in the latest age of production.

## Table 4: Body Weight Development with Standard Lighting Programme of LOHMANN LSL-EXTRA Pullets/Layers

| Age in Weeks | Body Weight (g) | | Feed* |
|---|---|---|---|
| | Average | Range | |
| 1 | 75 | 73–77 | Grower / Starter |
| 2 | 125 | 121–129 | |
| 3 | 191 | 185–197 | |
| 4 | 269 | 261–277 | |
| 5 | 362 | 351–373 | |
| 6 | 461 | 447–475 | |
| 7 | 560 | 543–577 | |
| 8 | 659 | 639–679 | |
| 9 | 754 | 731–777 | Developer |
| 10 | 840 | 815–865 | |
| 11 | 913 | 886–940 | |
| 12 | 982 | 953–1011 | |
| 13 | 1049 | 1018–1080 | |
| 14 | 1114 | 1081–1147 | |
| 15 | 1178 | 1143–1213 | |
| 16 | 1239 | 1202–1276 | |
| 17 | 1298 | 1259–1337 | |
| 18 | 1355 | 1314–1396 | Pre-Layer |
| 19 | 1410 | 1368–1452 | |

*Due to starvation before and during transport, weight losses of up to 15 % of body weight may occur.*

**The basis of switching between diet types is the hen's body weight development. The correct time for switching the diet is determined not by age but by body weight. Chicks and pullets should therefore be weighed at regular intervals.*

*Chicks / pullets at all times should be supplied ad libitum with feed. Never limit feed intake!*

# NUTRITION

## Table 5: Recommendations for Nutrient Levels for LOHMANN LSL-EXTRA Pullets/Layers

| Diet type* | | Starter** | Grower | Developer | Pre-Layer |
|---|---|---|---|---|---|
| Nutrient | | Week 1–3 | Week 1–8 | Week 9–17 | Week 18–5 % prod. |
| Metabol. Energy | kcal<br>MJ | 2860<br>12.0 | 2750–2800<br>11.5–11.7 | 2700–2750<br>11.3–11.5 | 2700–2750<br>11.3–11.5 |
| Crude Protein | % | 19.0–20.0 | 17.5–18.5 | 15.0–15.5 | 17.5 |
| Methionine | % | 0.52 | 0.46 | 0.31 | 0.42 |
| Dig. Methionine | % | 0.44 | 0.39 | 0.26 | 0.35 |
| Meth./Cystine | % | 0.88 | 0.81 | 0.56 | 0.76 |
| Dig. M/C | % | 0.75 | 0.69 | 0.48 | 0.63 |
| Lysine | % | 1.18 | 1.01 | 0.66 | 0.84 |
| Dig. Lysine | % | 1.00 | 0.86 | 0.56 | 0.70 |
| Valine | % | 0.92 | 0.79 | 0.53 | 0.74 |
| Dig. Valine | % | 0.78 | 0.67 | 0.45 | 0.62 |
| Tryptophane | % | 0.23 | 0.21 | 0.16 | 0.18 |
| Dig. Tryptophane | % | 0.19 | 0.18 | 0.13 | 0.15 |
| Threonine | % | 0.78 | 0.70 | 0.46 | 0.59 |
| Dig. Threonine | % | 0.66 | 0.60 | 0.39 | 0.49 |
| Isoleucine | % | 0.81 | 0.77 | 0.50 | 0.67 |
| Dig. Isoleucine | % | 0.69 | 0.65 | 0.43 | 0.56 |
| Arginine | % | 1.24 | 1.06 | 0.70 | 0.87 |
| Dig. Arginine | % | 1.05 | 0.90 | 0.59 | 0.73 |
| Calcium | % | 1.05 | 1.00 | 0.90 | 2.00–2.50 |
| Phosphorus, total*** | % | 0.75 | 0.70 | 0.58 | 0.60 |
| Phosphorus, avail. | % | 0.48 | 0.45 | 0.37 | 0.40 |
| Sodium | % | 0.18 | 0.17 | 0.16 | 0.17 |
| Chloride | % | 0.20 | 0.18 | 0.17 | 0.18 |
| Linoleic Acid | % | 2.00 | 1.40 | 1.00 | 1.00 |

** The basis for switching between diet types is the hens' body weight development. The correct time for changing the diet is determined not by age, but by body weight. Chicks and pullets, should therefore be weighed at regular intervals.*

*** Chicks should be fed starter feed, if the standard body weight is not reached by feeding grower feed or if the daily feed intake is expected to be (too) low.*

**** without adding phytase*

## Nutrition and Egg Weight

Within certain limits egg weight can be adapted to farm specific requirements by adjusting rations. The following nutritional factors should be noted:

- Growing
  - Feeding for higher body weight/frame size increases the egg weight throughout the whole laying period.
- Feed composition
  - crude protein and methionine
  - linoleic acid
- Feeding technique
  - feed texture
  - feeding time
  - feed level in troughs
  - controlled feeding
  - frequency of feeding

By stimulating feed intake egg weight can be increased and limited by controlled feeding. In the case of appropriate house construction, there's the possibility to adjust the house temperature in the opposite direction of desired egg weight and feed intake.

Contact your LOHMANN specialists for specific programmes with recommendations for nutrition and management adjusted to your conditions and requirements.

### Table 6: Recommended Particle-Size Distribution for Chick Starter, Grower, Developer and Layer Feed (MASH)

| Sieve Size | Passing Part | Sieve Size Interval | Part of Interval |
|---|---|---|---|
| 0.5 mm | 19 % | 0–0.5 mm | 19 % |
| 1.0 mm | 40 % | 0.51–1.0 mm | 21 % |
| 1.5 mm | 75 % | 1.01–1.5 mm | 35 % |
| 2.0 mm | 90 % | 1.51–2.0 mm | 15 % |
| 2.5 mm | 100 % | > 2 mm | 10 %* |
| | | | 100 % |

** Individual Particles not bigger than: > 3 mm in chick superstarter-/starter diets*
*> 5 mm in grower, developer and layer*

*The above table should be understood as an example for a homogenous mash feed structure. Different technique in feed production may lead to different particle sizes and variation. The overall target for mash feed structure needs to be optimal homogeneity. Mash feed with "some finer" or "some coarser" structure will be optimal as well, as long the structure ensures optimal homogeneity. Variation in feed structure from batch to batch and within different feed deliveries should be as low as possible. A minimum amount of added fat and/or oil supports homogeneity and palatability of mash feed in the rearing and laying phase.*

# NUTRITION

## Table 7: Recommended Micro-Nutrient Specification

| Supplements per kg Feed | | Starter/Grower | Developer | Pre-Layer/Layer |
|---|---|---|---|---|
| Vitamin A* | I.U. | 10000 | 10000 | 10000 |
| Vitamin $D_3$ | I.U. | 2000 | 2000 | 2500 |
| Vitamin E | mg | 20–30*** | 20–30*** | 15–30*** |
| Vitamin $K_3$ | mg | 3**** | 3**** | 3**** |
| Vitamin $B_1$ | mg | 1 | 1 | 1 |
| Vitamin $B_2$ | mg | 6 | 6 | 4 |
| Vitamin $B_6$ | mg | 3 | 3 | 3 |
| Vitamin $B_{12}$ | mcg | 20 | 20 | 25 |
| Pantothenic Acid | mg | 8 | 8 | 10 |
| Nicotinic Acid | mg | 30 | 30 | 30 |
| Folic Acid | mg | 1.0 | 1.0 | 0.5 |
| Biotin | mcg | 50 | 50 | 50 |
| Cholin | mg | 300 | 300 | 400 |
| Antioxydant | mg | 100–150*** | 100–150*** | 100–150*** |
| Coccidiostat | | as required | as required | – |
| Manganese** | mg | 100 | 100 | 100 |
| Zinc** | mg | 60 | 60 | 60 |
| Iron | mg | 25 | 25 | 25 |
| Copper** | mg | 5 | 5 | 5 |
| Iodine | mg | 0.5 | 0.5 | 0.5 |
| Selenium** | mg | 0.2 | 0.2 | 0.2 |

* *Higher level might be possible according to local state and national regulations.*
** *So called "organic sources" should be considered with higher bioavailability.*
*** *according to fat addition* **** *double in case of heat treated feed*

## Supplements

Supplements ensure the necessary supply of essential vitamins, trace elements and substances such as anti-oxidants or carotenoids. Suitable supplementation can compensate for the varying contents of raw materials and safeguard the supply of all necessary nutrients.

Remark: Vitamin C is synthesised by poultry normally. This vitamin is not considered as essential, but in some circumstances, like heat stress or hot climate, it may be important / beneficial to add 100–200 mg/kg complete feed during production period.

**Table 8: Continuous Supply of Fine and Coarse Limestone**

(Recommended Relation in Feed)

| Feed type | Fine Limestone 0–0.5 mm | Coarse Limestone * 1.5–3.5 mm |
|---|---|---|
| Layer Phase 1 | 30 % | 70 % |
| Layer Phase 2 | 25 % | 75 % |
| Layer Phase 3 | 15 % | 85 % |

** can be partly replaced by oyster shells*

## Crude Fibre

Crude fibre, sometimes described as insoluble NSP*, may not have nutritional values for poultry, but it does have other benefits for a healthy and stable digestive physiology. Used in the second half of the rearing period, it can positively influence the development of the digestive tract, the crop size and the appetite of pullets. This is beneficial for young layers, especially at the start of production, when the appetite of the birds is sometimes not sufficient enough to meet their nutrient demands. The tool has been proven to be very beneficial under varying feeding situations in a lot of countries. This is the reason for the implementation of a minimum recommendation of crude fibre (5–6 %) in the developer feed for LOHMANN layers.

Cereals and their by-products (e.g. bran) or oil seed by-products (e.g. meal of sunflowers or rapeseed), can be used as a source of crude fibre. DDGS** can be used as a source of crude fibre as well. Other raw materials, which are rich of crude fibre, may be used if available, but only as long as their inclusion does not reduce the energy level of the diet. With a classical corn-soy diet, the recommended crude fibre content can hardly be achieved. In such cases, other feed ingredients must be used. For advice, please contact the technical service department at LOHMANN .

** Non-Starch Polysaccharides*
*** Dried Distillers Grains with Solubles*

# NUTRITION

## Rearing

A balanced and nutritious diet during the rearing stage is essential to enable the chick to develop into a mature pullet. Chicks and pullets should be fed a coarse diet (for particle sizes see table on page 17) of a meal-type consistency. A high proportion of very fine components or a structure that is too coarse can lead to selective feed intake and an unbalanced nutrient supply. A diet with an extremely fine consistency reduces the feed intake of the birds and can result in a lacking supply of certain nutrients. If pelletising of feed is inevitable for hygienic reasons the pellets should be crumbled to the recommended consistency. During the different growth phases of chicks and pullets, qualitatively different feed varieties should be used in which the nutrient content meets the birds changing needs. The diets are matched to the nutrient requirement and weight development at each stage of growth. The use of chick starter is recommended if the standard body weight is not reached by feeding grower feed or if the daily feed intake is expected to be low. The switch to developer should only be made when the standard body weight has been reached. A reduced nutrient density and an increased content of crude fibre (5–6 %) during this phase is beneficial for improving eating capacity. The pre-layer diet has about twice the calcium content of developer as well as higher levels of protein and amino acids. Feeding such a diet for about 10 days prior to the planned start of lay is therefore beneficial. This diet improves flock uniformity by providing a better nutrient supply to late maturing birds and by enabling early maturing birds to obtain sufficient calcium for eggshell production of the first eggs.

### Table 9: Ideal amino acid ratios

(Digestible Lysine as 100 – others as ratios to 100)

| | Starter | Grower | Developer | Pre-lay | Layer Feed |
|---|---|---|---|---|---|
| Lysine | 100 | 100 | 100 | 100 | 100 |
| Methionine | 44 | 45 | 47 | 50 | 50 |
| Met + Cyst | 75 | 80 | 85 | 90 | 90 |
| Threonine | 66 | 70 | 70 | 70 | 70 |
| Tryptophane | 19 | 21 | 24 | 21 | 22 |
| Isoleucine | 69 | 76 | 76 | 80 | 80 |
| Valine | 78 | 78 | 80 | 88 | 88 |
| Arginine | 105 | 105 | 106 | 104 | 104 |

*The feed should be based / calculated on the level of digestible amino acids according to an ideal amino acid profile, above table shows the ratios of the most important amino acids as ratios to Lysine on digestible level.*

## Correct Use of Pre-Layer Feed

Pre-layer feed should be used for a short period of time before a flock starts being supplied with phase 1 layer feed. This leads to a smooth transition from the developer feed (low calcium and low nutrient density) to a diet with high calcium and nutrient levels. It helps to avoid the often reduced appetite/daily feed intake during early production. Typically, pre-layer feed contains about 2.0–2.5 % calcium. This is too much for a typical feed for rearing but not enough for a bird starting to produce eggs. From a nutritional point of view, it's therefore considered a compromise and never as "optimal" feed. Nevertheless, it's worthwhile to use pre-layer feed for a short period of time. Correct use can enhance the uniformity of a pullet flock. It's especially beneficial for flocks with very low uniformity and also aids the development of Ca-metabolism in medullar bones. Since pre-layer feed is a compromise feed for the short transition period, it cannot supply a bird in full lay sufficiently. Therefore, it cannot be used when feed logistics and correct timing do not work.

Please consider the following recommendations while using pre-layer feed:

- Start using pre-layer feed dependent on to the birds sexual maturity, age and their standard body weights.
- Use pre-layer feed for about 10 days with a maximum of 1 kg per bird.
- The wrong way to use pre-layer feed is either to start using it too early and/or use it too long.

For example if the onset of lay is scheduled for the 19$^{th}$ weeks of age, you may start feeding the birds with pre-layer feed only after they are 17 weeks old.
In case of an earlier or later production, adjust this schedule accordingly.

| Age at transfer | | Feeding programme | | |
|---|---|---|---|---|
| week | days | Developer Feed kg feed | followed by → | Pre-Layer Feed kg feed |
| 15 | 105 | 1.0 | → | 1.0 |
| 16 | 112 | 0.5 | → | 1.0 |
| 17 | 119 | – | → | 1.0 |
| 18 | 126 | – | → | 0.5 |
| after 18 | after 126 | immediately supply start lay feed or layer phase 1 feed | | |

# NUTRITION

## Laying Period

Aiming at an optimal start of production with feed intake around 90–100 g/day, it is recommendable to use a phase 1 feed with 11.6 ME MJ/kg for a duration of 5–6 weeks. At around 26 weeks a normal phase-feeding programme with 11.4 ME MJ/kg should be introduced. The basis for the feed formulation in terms of nutrient and mineral content in each phase is the daily nutrient requirement and actual feed consumption.
The diet for phase 1 is designed to cover the requirement for maximum egg mass.

The recommended nutrient allowances shown in the tables 10–12 (phase 1–3) assume a dietary energy concentration of 11.4 MJ/kg (2725 kcal) metabolisable energy, a house temperature of 20 °C and good plumage.

Under these conditions the daily feed consumption of LOHMANN LSL-EXTRA is expected to be 105–115 g/day. The feed formulations for phases 2–3 cater for the reduced requirement for organic nutrients and the increasing requirement for calcium as the hens age. **The time for switching diets is determined more by the level of production and the need for calcium rather than by age.**

## Phase Feeding

**What is the basic idea of a phase feeding program for layers?**

It is and should be a smooth and continuous adaptation to the – in detail daily – varying nutrient demand of a high prolific layer hen. The nutritional demand for protein, amino acids and the main minerals are changing constantly as the performance changes gradually from the start of lay, reaching the peak performance in terms of laying percentage and afterwards of egg mass output. Finally in aging layer flocks the egg shell quality is the biggest challenge and needs support from nutrition. All changes in diets need to follow the basic nutrient demand for egg mass production – means mainly amino acids – and the changing demand for optimal egg quality. As high prolific layers absolutely do not like big changes in the nutrient content of the feed and also in the physical feed structure – all changes must be carried out in small steps and smoothly. Even the raw material composition of the diet should only be changed in small steps. If these requirements are ignored – production and egg quality can easily be affected.
Basic changes of the content of energy, protein and amino acids should be carried out only with regard to the egg mass performance of a layer flock. This means that as long as the egg mass output of a flock does not drop – one should not decrease any of these basic nutrients in order to prevent deficiencies which will/would finally harm the flock.

## Table 10: Recommended Nutrient Levels for LOHMANN LSL-EXTRA Layers in Phase 1 per kg of Feed for Different Daily Feed Consumptions

Week 19 – approx. 50*; egg mass above 59 g/hen/day

| Nutrient | | Requirement g/Hen/Day | Daily Feed Consumption | | | |
|---|---|---|---|---|---|---|
| | | | 105 g | 110 g | 115 g | 120 g |
| Protein | % | 18.00 | 17.14 | 16.36 | 15.65 | 15.00 |
| Calcium** | % | 4.10 | 3.90 | 3.73 | 3.57 | 3.42 |
| Phosphorus*** | % | 0.60 | 0.57 | 0.55 | 0.52 | 0.50 |
| Av. Phosphorus | % | 0.42 | 0.40 | 0.38 | 0.37 | 0.35 |
| Sodium | % | 0.18 | 0.17 | 0.16 | 0.16 | 0.15 |
| Chlorine | % | 0.18 | 0.17 | 0.16 | 0.16 | 0.15 |
| Lysine | % | 0.94 | 0.90 | 0.86 | 0.82 | 0.78 |
| Dig. Lysine | % | 0.80 | 0.76 | 0.73 | 0.70 | 0.67 |
| Methionine | % | 0.47 | 0.45 | 0.43 | 0.41 | 0.39 |
| Dig. Methionine | % | 0.40 | 0.38 | 0.36 | 0.35 | 0.33 |
| Meth./Cyst. | % | 0.85 | 0.81 | 0.77 | 0.74 | 0.71 |
| Dig. M/C | % | 0.72 | 0.68 | 0.65 | 0.63 | 0.60 |
| Arginine | % | 0.98 | 0.95 | 0.89 | 0.85 | 0.83 |
| Dig. Arginine | % | 0.83 | 0.79 | 0.76 | 0.72 | 0.69 |
| Valine | % | 0.82 | 0.78 | 0.75 | 0.72 | 0.69 |
| Dig. Valine | % | 0.70 | 0.67 | 0.64 | 0.61 | 0.58 |
| Tryptophane | % | 0.21 | 0.20 | 0.19 | 0.18 | 0.17 |
| Dig. Tryptophane | % | 0.18 | 0.17 | 0.16 | 0.15 | 0.15 |
| Threonine | % | 0.66 | 0.63 | 0.60 | 0.57 | 0.55 |
| Dig. Threonine | % | 0.56 | 0.53 | 0.51 | 0.49 | 0.47 |
| Isoleucine | % | 0.75 | 0.72 | 0.68 | 0.65 | 0.63 |
| Dig. Isoleucine | % | 0.64 | 0.61 | 0.58 | 0.56 | 0.53 |
| Linoleic Acid | % | 2.00 | 1.90 | 1.82 | 1.74 | 1.67 |

* *Until the maximum daily egg mass is reached, please refer to table 18.*
** *Please refer to table 8 about relation of fine and coarse limestone.*
*** *without phytase*

# NUTRITION

## Table 11: Recommended Nutrient Levels for LOHMANN LSL-EXRTA Layers in Phase 2 per kg of Feed for Different Daily Feed Consumptions

Approx. week 50–70*; egg mass above 55 g/hen/day

| Nutrient | | Requirement g/Hen/Day | Daily Feed Consumption | | | |
|---|---|---|---|---|---|---|
| | | | 105 g | 110 g | 115 g | 120 g |
| Protein | % | 17.50 | 16.67 | 15.91 | 15.22 | 14.58 |
| Calcium** | % | 4.40 | 4.19 | 4.00 | 3.83 | 3.67 |
| Phosphorus *** | % | 0.58 | 0.55 | 0.52 | 0.50 | 0.48 |
| Av. Phosphorus | % | 0.40 | 0.38 | 0.37 | 0.35 | 0.34 |
| Sodium | % | 0.18 | 0.17 | 0.16 | 0.16 | 0.15 |
| Chlorine | % | 0.18 | 0.17 | 0.16 | 0.16 | 0.15 |
| Lysine | % | 0.92 | 0.87 | 0.83 | 0.80 | 0.76 |
| Dig. Lysine | % | 0.78 | 0.74 | 0.71 | 0.68 | 0.65 |
| Methionine | % | 0.46 | 0.44 | 0.42 | 0.40 | 0.38 |
| Dig. Methionine | % | 0.39 | 0.37 | 0.35 | 0.34 | 0.33 |
| Meth./Cyst. | % | 0.83 | 0.79 | 0.75 | 0.72 | 0.69 |
| Dig. M/C | % | 0.70 | 0.67 | 0.64 | 0.61 | 0.59 |
| Arginine | % | 0.96 | 0.91 | 0.87 | 0.83 | 0.80 |
| Dig. Arginine | % | 0.81 | 0.77 | 0.74 | 0.71 | 0.68 |
| Valine | % | 0.80 | 0.76 | 0.73 | 0.70 | 0.67 |
| Dig. Valine | % | 0.68 | 0.65 | 0.62 | 0.60 | 0.57 |
| Tryptophane | % | 0.20 | 0.19 | 0.18 | 0.18 | 0.17 |
| Dig. Tryptophane | % | 0.17 | 0.16 | 0.16 | 0.15 | 0.14 |
| Threonine | % | 0.64 | 0.61 | 0.58 | 0.56 | 0.54 |
| Dig. Threonine | % | 0.55 | 0.52 | 0.50 | 0.47 | 0.45 |
| Isoleucine | % | 0.73 | 0.70 | 0.67 | 0.64 | 0.61 |
| Dig. Isoleucine | % | 0.62 | 0.59 | 0.57 | 0.54 | 0.52 |
| Linoleic Acid | % | 1.60 | 1.52 | 1.45 | 1.39 | 1.33 |

* *After the maximum daily egg mass is reached, please refer to table 18.*
** *Please refer to table 8 about relation of fine and coarse limestone.*
*** *without phytase*

## Table 12: Recommended Nutrient Levels for LOHMANN LSL-EXTRA Layers in Phase 3 per kg of Feed for Different Daily Feed Consumptions

Approx. after week 70

| Nutrient | | Requirement g/Hen/Day | Daily Feed Consumption | | | |
|---|---|---|---|---|---|---|
| | | | 105 g | 110 g | 115 g | 120 g |
| Protein | % | 16.80 | 16.00 | 15.27 | 14.61 | 14.00 |
| Calcium* | % | 4.50 | 4.29 | 4.09 | 3.91 | 3.75 |
| Phosphorus** | % | 0.55 | 0.52 | 0.50 | 0.47 | 0.46 |
| Av. Phosphorus | % | 0.38 | 0.36 | 0.35 | 0.33 | 0.32 |
| Sodium | % | 0.18 | 0.17 | 0.16 | 0.16 | 0.15 |
| Chlorine | % | 0.18 | 0.17 | 0.16 | 0.16 | 0.15 |
| Lysine | % | 0.87 | 0.83 | 0.79 | 0.76 | 0.73 |
| Dig. Lysine | % | 0.74 | 0.70 | 0.67 | 0.64 | 0.62 |
| Methionine | % | 0.44 | 0.42 | 0.40 | 0.38 | 0.36 |
| Dig. Methionine | % | 0.37 | 0.35 | 0.34 | 0.32 | 0.31 |
| Meth./Cyst. | % | 0.78 | 0.74 | 0.71 | 0.68 | 0.65 |
| Dig. M/C | % | 0.67 | 0.63 | 0.60 | 0.58 | 0.55 |
| Arginine | % | 0.90 | 0.86 | 0.82 | 0.79 | 0.75 |
| Dig. Arginine | % | 0.77 | 0.73 | 0.70 | 0.67 | 0.64 |
| Valine | % | 0.76 | 0.72 | 0.69 | 0.66 | 0.63 |
| Dig. Valine | % | 0.65 | 0.62 | 0.59 | 0.56 | 0.54 |
| Tryptophane | % | 0.19 | 0.18 | 0.17 | 0.17 | 0.16 |
| Dig. Tryptophane | % | 0.16 | 0.15 | 0.15 | 0.14 | 0.14 |
| Threonine | % | 0.61 | 0.58 | 0.55 | 0.53 | 0.51 |
| Dig. Threonine | % | 0.52 | 0.49 | 0.47 | 0.45 | 0.43 |
| Isoleucine | % | 0.70 | 0.66 | 0.63 | 0.60 | 0.58 |
| Dig. Isoleucine | % | 0.59 | 0.56 | 0.54 | 0.51 | 0.49 |
| Linoleic Acid | % | 1.30 | 1.24 | 1.18 | 1.13 | 1.08 |

* *Please refer to table 8 about relation of fine and coarse limestone.*

** *without phytase*

# LIGHTING

## General

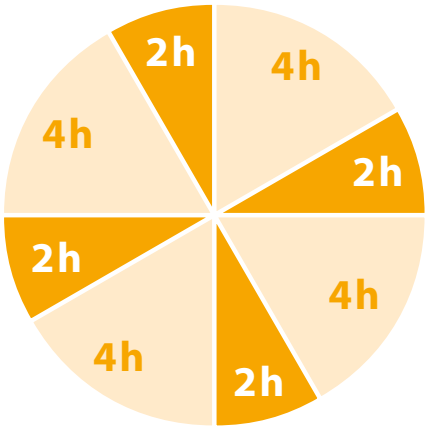
The lighting programme controls the onset of lay and affects the performance. Within certain limits, performance can be adapted to farm specific requirements by adjusting the lighting programme. Easiest to follow are the lighting programmes in closed houses without the effect of natural daylight.
In these, the hours of light and light intensity can be adjusted to changing needs.
Rearing birds in closed houses and producing eggs in light-tight houses enable the producer to maximize performance. Follow the lighting programme which is recommended for this type of housing system and commercial variety. For open or brown-out houses (houses with incidence of daylight), a tailor made programme has to be developed which reflects the season and geographical location where the pullets are being reared and stimulated to lay.
In general, the lighting programme should follow the basic principles:

- **Never increase hours of light during the rearing period until planned stimulation starts.**
- **Never decrease hours of light during the production period.**
- **Always keep in mind that natural daylight can influence the lighting programme in open or brown-out houses.**

## Intermittent Lighting Programme for Day Old Chicks

When the day old chicks arrive on the farm, they have already been intensively handled in the hatchery and often have a long transport to their final destination. Common practice is to give them 24 hours of light to help them recover in the first 2 or 3 days after arrival and to provide them enough time to eat and drink. In practice, it can be observed that after arrival and housing, some chicks continue to sleep whereas others start to look for feed and water. The activity of the flock will always be irregular. Especially in this phase, poultry men have difficulties interpreting the chicks behaviour and their condition.
There is a practically proven principal in splitting the day into phases of resting and activity using a special designed intermittent lighting programme. The aim is to synchronize the chicks' activities. The farmer gets a better impression of the flocks condition and the birds are encouraged by the groups behaviour to search for water and feed.
Therefore, LOHMANN advises to give chicks a rest after they arrive at the rearing farm and then start with four hours of light followed by two hours of darkness.

## Lighting Programme after Arrival




This programme can be used for up to 7 or 10 days after arrival, then switch to the regular step down lighting programme. The usage of the following lighting program brings about the following advantages:

- The chicks will rest and/or sleep at the same time. This means that the behaviour of the chicks will be synchronized.
- Weak chicks will be stimulated by stronger ones to move as well as to eat and drink.
- The behaviour of the flock is more uniform and the judgement of the birds is made easier.
- Mortality will decrease.

## Lighting Programme for Closed Houses

To which extent lighting hours are reduced during the growing period and the time when stimulation begins by increasing the lighting hours are means by which performance can be adjusted to specific farm requirements. The following Standard Lighting Programme is designed as an example for a quick start into production.

The light intensity measured in watt/m², lumen, foot candle or lux depends on the used light source. Giving advices concerning this measurement would rather irritate than help layer farmers.

Therefore the light intensity is just given in lux unit in the following table.

# LIGHTING

## Table 13: Lighting Programme for Windowless Houses for LOHMANN LSL-EXTRA Pullets/Layers

| Age (Weeks) | Hours of Light (Standard) | Light Intensity (Lux)* |
|---|---|---|
| Day 1–2 ** | 24 | 20 – 40 |
| Day 3–6 ** | 16 | 20 – 30 |
| 2 | 14 | 10 – 20 |
| 3 | 13 | 10 – 20 |
| 4 | 12 | 4 – 6 |
| 5 | 11 | 4 – 6 |
| 6 | 10 | 4 – 6 |
| 7 | 9 | 4 – 6 |
| 8 | 9 | 4 – 6 |
| 9 | 9 | 4 – 6 |
| 10 | 9 | 4 – 6 |
| 11 | 9 | 4 – 6 |
| 12 | 9 | 4 – 6 |
| 13 | 9 | 4 – 6 |
| 14 | 9 | 4 – 6 |
| 15 | 9 | 4 – 6 |
| 16 | 9 | 4 – 6 |
| 17 | 10 | 10–20 |
| 18 | 11 | 10 – 20 |
| 19 | 12 | 10 – 20 |
| 20 | 13 | 10 – 20 |
| 21 | 14 | 10 – 20 |
| 22 | 15 | 10 – 20 |
| 23 | 15 – 16 | 10 – 20 |
| 24 | 15 – 16 | 10 – 20 |
| 25 *** | 15 – 16 | 10 – 20 |

* *Lux = Lumen/m²*
** *or run an intermittent Lighting Programme*
*** *until the end of production*

## Lighting Programme for Open Houses

The principle for windowless houses **"Do not increase the hours of light during rearing period and do not reduce hours of light during production period"** also applies to "open" housing.

The effect of the natural daylight must be considered when designing lighting programmes, if natural light enters the building throughout the day or if the hens have free access to open-air runs.

For example in Central Europe the natural day length increases in the course of the calendar year to about 17 hours until late June and then shortens to about 8 hours until late December.

If flocks are moved to an open production house with windows that cannot be darkened, the lighting programme must be adjusted to the natural day length at the time of rehousing.

We distinguish between two variants:

1. Production starts as the natural day length decreases.
2. Production starts as the natural day length increases.

In both variations the lighting programme at 17 weeks of age should be set to a lighting period of at least 10 hours, taking the natural day length into account, and to be increased by 1 hour every week to 14 hours until 21 weeks of age.

**Never switch on the artificial light before 04.00 o'clock in the morning (CE time).**

During the spring months the lighting programme is affected by the increase of natural day length and gradually extends to about 17 hours. When the natural day length begins to decrease in Central Europe from July, the 17-hour light period should be kept constantly until the end of the production period.

This example can be accomplished in Central Europe very simply as follows:

- 04.00* o'clock in the morning: lights on – dimmer switch off at ≥ 50–60 Lux.
- Dimmer switch on at ≤ 50–60 Lux– 21.00 * o'clock in the evening lights off.

** Central European time*

These times should be varied depending on the condition of the flocks, the start of lay (production, egg size) and the facilities in the building.

If for operational reasons a different diurnal rhythm from the one described above is applied, it should not differ too much from the dawn/dusk times stated above, having regard to the diurnal rhythm of the hens.

# LIGHTING

As already mentioned, the lighting programme described here is just an example adjusted to Central European time.

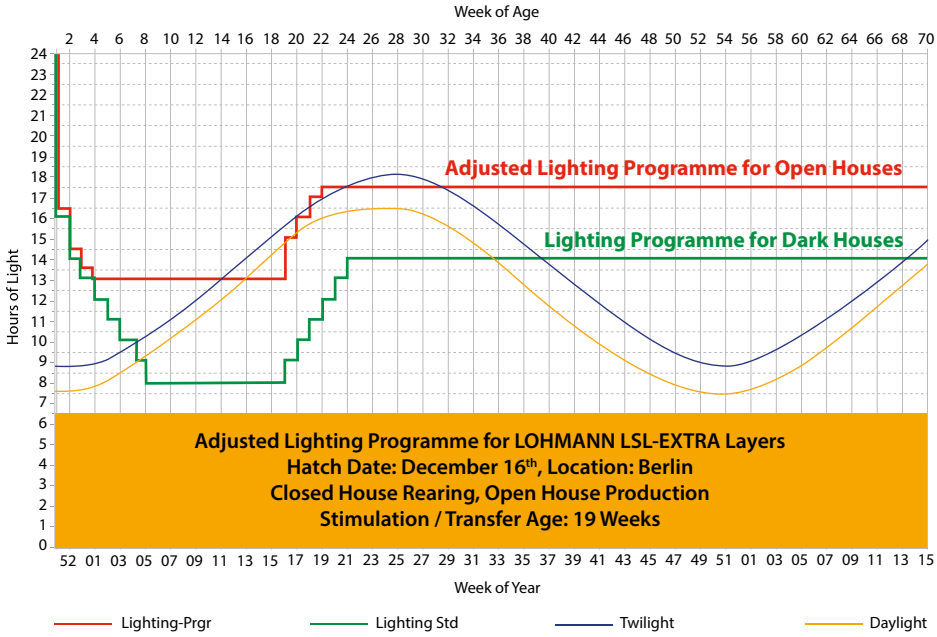
If the birds are driven indoors before the end of the natural day and if the building can be darkened completely, the lighting programme for windowless laying houses should be applied.

The times for darkening the room or opening the windows are determined by the lighting programme. It is important to follow the correct sequence:

- In the evening close the windows first, then switch off the light;
- In the morning switch on the light first, then open the windows.

Contact your LOHMANN specialists for specific lighting programmes adjusted to your location, conditions and requirements.

**An example of a lighting programme for LOHMANN LSL-EXTRA Layers adjusted to location, condition and requirements by LOHMANN lighting programme tool**



# GENERAL RECOMMENDATIONS

## Hygiene

- Set up the farm at a safe distance from other poultry houses and fence in.
- Keep birds of only one age group and no other poultry on the farm.
- Allow no visitors to enter the farm.
- Wear only the farm's own protective clothing within the farm area and also provide clothing for veterinarians, service and maintenance workers, and consultants.
- Disinfect boots before entering the houses.
- Use bulk feed if possible. Do not allow the truck driver to enter the houses.
- Safeguard the houses against wild birds and vermin. Keep rats and mice under constant control.
- Dispose of dead birds hygienically. Follow local laws and regulations.

## Daily Control

Check at least once daily:

- Health status
- Temperature
- Ventilation
- Feed and water consumption
- Lighting
- Mortality

When assessing the state of health, do not just go by the general impression and mortality rate, but also take note of feed and water consumption as well as the texture of droppings.

## Water Supply

Clean water is equally as important as good feed for top performance. Therefore fresh, clean, potable water must be available at all times for the layers and an adequate consumption must be always assured. A water meter is a very useful tool to inspect water consumption.

The optimum water temperature is about 20 °C. Furthermore feed and water intake are closely correlated. If the birds don't drink enough water for any reason, the feed intake reduces consequently.

The water to feed ratio at comfort temperature is around 1.8–2 : 1, but this relation increases up to 5 : 1 at high ambient temperatures above 30 °C. During exposure to high temperatures, birds consume less feed, but more water in an effort to cool their body down.

Check the water quality regularly, especially if you use your own water supply like well water.

For example excessive salt levels in drinking water can cause persistent damage to shell quality and hard water with high TDS* levels may cause kidney damage.

** TDS: Total Dissolved Solids*

# GENERAL RECOMMENDATIONS

## Grit

Feeding grit is not a must but is recommended when rations are supplemented by grains. This stimulates the development of the crop and the gizzard during the rearing period, which in turn has a positive effect on feed intake capacity.

**Table 14: Amount and Granulation of Grit Dependent on Age**

| | |
|---|---|
| **Week 1–2** | once a week 1 g /bird (size 1–2 mm) |
| **Week 3–8** | once a week 2 g/bird (size 3–4 mm) |
| **From week 9** | once a month 3 g/bird (size 4–6 mm) |

## Litter (Non Cage Housing)

Only use shavings from untreated wood in order to avoid poisoning and residues in the egg.
Provide sufficient ventilation to ensure good litter condition and remove wet litter, if necessary.

## Egg Quality and Egg Collection

LOHMANN LSL-EXTRA layers produce eggs of excellent quality. To preserve the quality, the following points should be observed:

- Collect eggs at least once a day.
- Store eggs at temperatures between 5 °C and 10 °C with a relative humidity of between 80–85 %.

Storing at higher temperatures and lower humidity leads to rapid loss of weight and impairs the quality of the egg white due to an increase in gas exchange.

## Nests (Non Cage Housing)

The quality of nests is also a factor which affects egg quality. Renew the litter in litter-type nests regularly and keep them clean. Provide individual nests at a rate of one nest for 4 hens. Collect floor eggs frequently to keep their rate as low as possible.
In addition to sufficient nesting space in family type nests, the following factors are important for a low rate of floor eggs:

- Clean, dry litter or soft nest lining
- Easy access
- Even distribution of the nests within the barn
- Only one type of nest in the barn

For optimum egg quality, rollaway nests in combination with slats are better than litter-type nests or family type nests.

## Stocking Density

The optimal bird density/$m^2$ depends on management conditions and to which extent climate can be controlled. 6–8 birds/$m^2$ can be taken as a general guide for non-cage housing. For cage systems, an area of 475–540 $cm^2$/bird is recommended. Take note of deviating regulations for stocking density and declaration of eggs.

## Equipment Requirements

In general, the more closely the growing house and facilities resemble the future production system, the easier it will be for the pullets to settle down in their new environment after transfer to the laying house. The following tables show the equipment requirements for rearing and production period.

### Table 15: Equipment Requirement for Rearing Period

| Equipment | Age in Weeks | Requirement |
|---|---|---|
| Chick founts | 1 | 1 fount (4–5 l) for 100 chicks |
| Round drinkers | to 20 | 1 drinker (Ø 46 cm) for 125 birds |
| Linear drinkers | to 20 | 1 running m for 100 birds |
| Nipple drinkers | to 20 | 6–8 birds per nipple |
| Chick feeding trays | 1–2 | 1 tray for 60 chicks |
| Cut off chick cartons | 1–2 | 1 carton for 100 chicks |
| Round feeders | 3–10<br>11–20 | 2 feeders (Ø 40 cm) for 100 birds<br>3 feeders (Ø 40 cm) for 100 birds |
| Chain feeders | 3–10<br>11–20 | 2.5–3.5 lin. m for 100 birds<br>4.5 lin. m for 100 birds |

### Table 16: Equipment Requirement for Production Period

| Equipment | Requirement |
|---|---|
| Round drinkers | 1 drinker (Ø 46 cm) for 125 birds |
| Linear drinkers | 1 running m for 80–100 birds |
| Nipple drinkers | 6–8 birds per nipple |
| Round feeders | 4 feeders (Ø 40 cm) for 100 birds |
| Single nests | 1 nest (26 x 30 cm) for 4 birds |
| Chain feeders | 5 lin. m for 100 birds |

*Further details in the LOHMANN Management Guide for floor/free range housing.*

# GENERAL INFORMATION

## Table 17: Body Weight Development of LOHMANN LSL-EXTRA

Week 1–50

| Age in Weeks | Weight Range (g) | Weight Average (g) |
|---|---|---|
| 1 | 73–77 | 75 |
| 2 | 121–129 | 125 |
| 3 | 185–197 | 191 |
| 4 | 261–277 | 269 |
| 5 | 351–373 | 362 |
| 6 | 447–475 | 461 |
| 7 | 543–577 | 560 |
| 8 | 639–679 | 659 |
| 9 | 731–777 | 754 |
| 10 | 815–865 | 840 |
| 11 | 886–940 | 913 |
| 12 | 953–1011 | 982 |
| 13 | 1018–1080 | 1049 |
| 14 | 1081–1147 | 1114 |
| 15 | 1143–1213 | 1178 |
| 16 | 1202–1276 | 1239 |
| 17 | 1259–1337 | 1298 |
| 18 | 1314–1396 | 1355 |
| 19 | 1368–1452 | 1410 |
| 20 | 1420–1508 | 1464 |
| 21 | 1470–1560 | 1515 |
| 22 | 1517–1611 | 1564 |
| 23 | 1563–1659 | 1611 |
| 24 | 1605–1705 | 1655 |
| 25 | 1640–1742 | 1691 |

| Age in Weeks | Weight Range (g) | Weight Average (g) |
|---|---|---|
| 26 | 1668–1772 | 1720 |
| 27 | 1690–1794 | 1742 |
| 28 | 1705–1811 | 1758 |
| 29 | 1715–1821 | 1768 |
| 30 | 1722–1828 | 1775 |
| 31 | 1727–1833 | 1780 |
| 32 | 1730–1836 | 1783 |
| 33 | 1732–1840 | 1786 |
| 34 | 1735–1843 | 1789 |
| 35 | 1738–1846 | 1792 |
| 36 | 1741–1849 | 1795 |
| 37 | 1744–1852 | 1798 |
| 38 | 1747–1855 | 1801 |
| 39 | 1750–1858 | 1804 |
| 40 | 1753–1861 | 1807 |
| 41 | 1756–1864 | 1810 |
| 42 | 1759–1867 | 1813 |
| 43 | 1761–1869 | 1815 |
| 44 | 1762–1872 | 1817 |
| 45 | 1764–1874 | 1819 |
| 46 | 1766–1876 | 1821 |
| 47 | 1768–1878 | 1823 |
| 48 | 1770–1880 | 1825 |
| 49 | 1772–1882 | 1827 |
| 50 | 1773–1883 | 1828 |

## Table 17: Body Weight Development of LOHMANN LSL-EXTRA

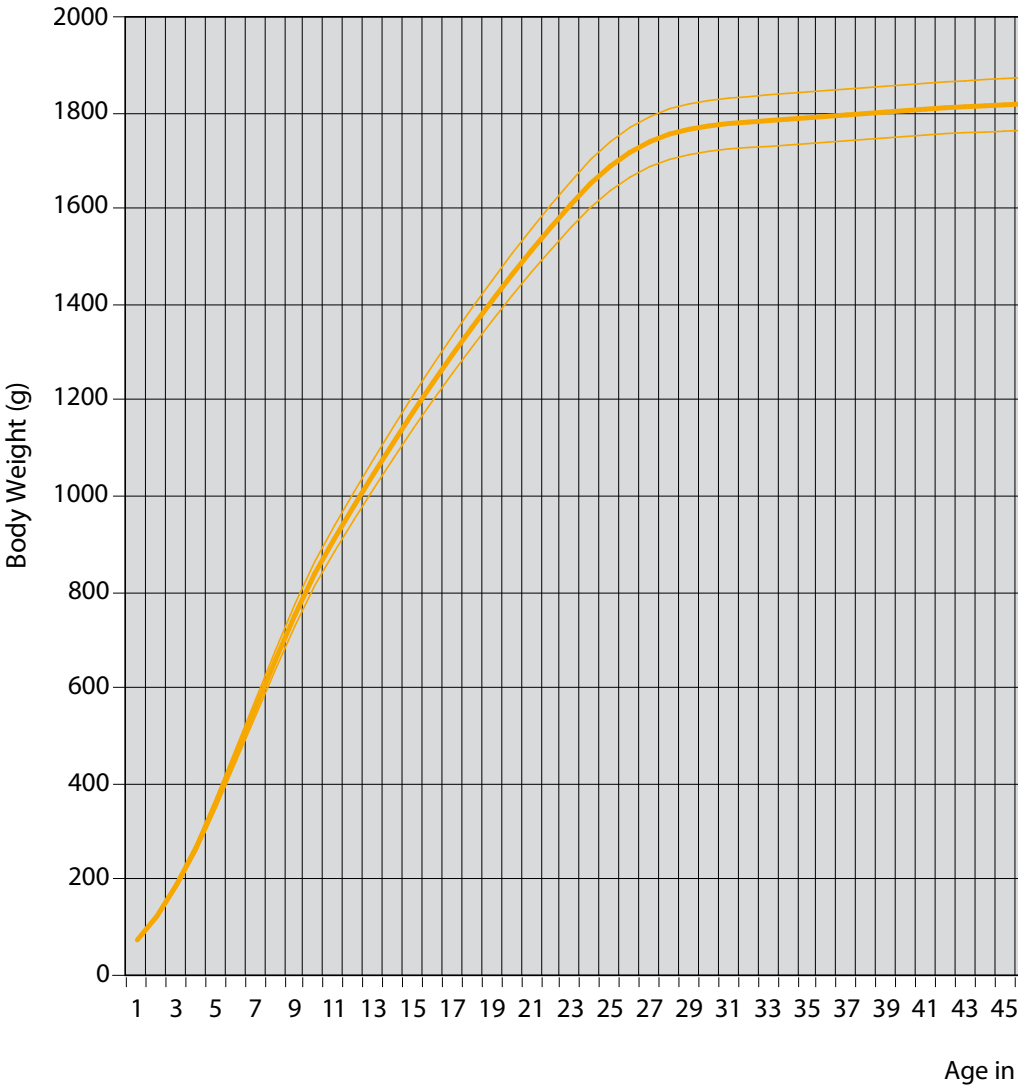
Week 51–95

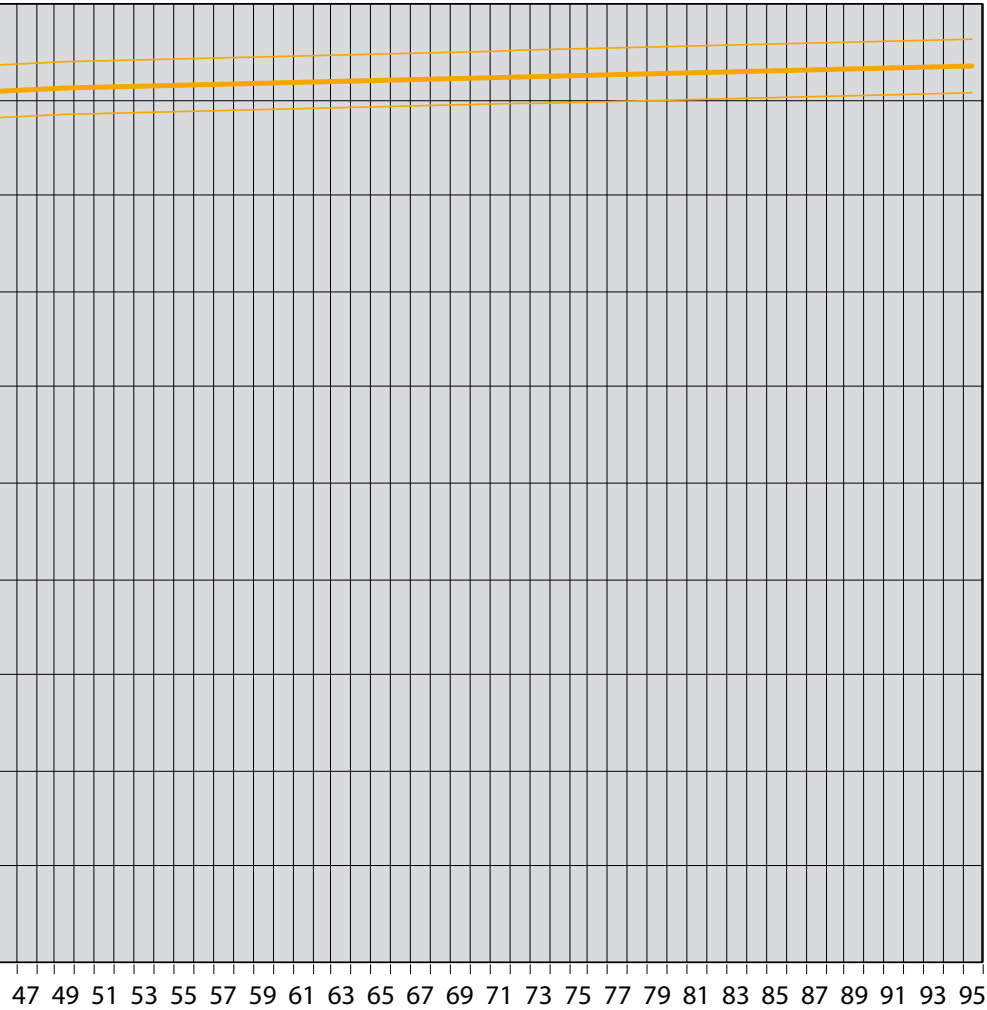
| Age in Weeks | Weight Range (g) | Weight Average (g) |
|---|---|---|
| 51 | 1774–1884 | 1829 |
| 52 | 1775–1885 | 1830 |
| 53 | 1776–1886 | 1831 |
| 54 | 1777–1887 | 1832 |
| 55 | 1778–1888 | 1833 |
| 56 | 1779–1889 | 1834 |
| 57 | 1780–1890 | 1835 |
| 58 | 1781–1891 | 1836 |
| 59 | 1782–1892 | 1837 |
| 60 | 1783–1893 | 1838 |
| 61 | 1784–1894 | 1839 |
| 62 | 1785–1895 | 1840 |
| 63 | 1786–1896 | 1841 |
| 64 | 1787–1897 | 1842 |
| 65 | 1788–1898 | 1843 |
| 66 | 1789–1899 | 1844 |
| 67 | 1790–1900 | 1845 |
| 68 | 1791–1901 | 1846 |
| 69 | 1792–1902 | 1847 |
| 70 | 1793–1903 | 1848 |
| 71 | 1794–1904 | 1849 |
| 72 | 1795–1906 | 1850 |
| 73 | 1795–1907 | 1851 |
| 74 | 1796–1908 | 1852 |
| 75 | 1797–1909 | 1853 |

| Age in Weeks | Weight Range (g) | Weight Average (g) |
|---|---|---|
| 76 | 1798–1910 | 1854 |
| 77 | 1799–1911 | 1855 |
| 78 | 1800–1912 | 1856 |
| 79 | 1801–1913 | 1857 |
| 80 | 1802–1914 | 1858 |
| 81 | 1803–1915 | 1859 |
| 82 | 1804–1916 | 1860 |
| 83 | 1805–1917 | 1861 |
| 84 | 1806–1918 | 1862 |
| 85 | 1807–1919 | 1863 |
| 86 | 1808–1920 | 1864 |
| 87 | 1809–1921 | 1865 |
| 88 | 1810–1922 | 1866 |
| 89 | 1811–1923 | 1867 |
| 90 | 1812–1924 | 1868 |
| 91 | 1813–1925 | 1869 |
| 92 | 1814–1926 | 1870 |
| 93 | 1815–1927 | 1871 |
| 94 | 1816–1928 | 1872 |
| 95 | 1817–1929 | 1873 |

# GENERAL INFORMATION

## Growth and Body Weight (g) Development Curve of LOHMANN LSL-EXTRA




47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95
Weeks

# GENERAL INFORMATION

## Table 18: Performance Goals of LOHMANN LSL-EXTRA – Week 19 – 44

| Age in Weeks | Egg No. per H.H. | Rate of Lay % | | Egg Weight g | | Egg Mass g/H.D. kg/H.H | |
|---|---|---|---|---|---|---|---|
| | Cumulative | per H.H. | per H.D. | in Week | Cumulative | in Week | Cumulative |
| 20 | 0.7 | 10.0 | 10.0 | 45.0 | 45.0 | 4.5 | 0.03 |
| 21 | 3.9 | 45.0 | 45.0 | 49.0 | 48.3 | 22.1 | 0.19 |
| 22 | 8.2 | 62.0 | 62.1 | 52.0 | 50.2 | 32.3 | 0.41 |
| 23 | 13.4 | 74.0 | 74.2 | 54.4 | 51.9 | 40.4 | 0.69 |
| 24 | 19.3 | 84.0 | 84.3 | 56.4 | 53.2 | 47.6 | 1.02 |
| 25 | 25.5 | 89.0 | 89.4 | 58.3 | 54.5 | 52.1 | 1.39 |
| 26 | 31.9 | 91.0 | 91.5 | 59.8 | 55.5 | 54.7 | 1.77 |
| 27 | 38.3 | 92.0 | 92.6 | 60.8 | 56.4 | 56.3 | 2.16 |
| 28 | 44.8 | 92.8 | 93.5 | 61.5 | 57.2 | 57.5 | 2.56 |
| 29 | 51.3 | 93.3 | 94.1 | 62.1 | 57.8 | 58.4 | 2.96 |
| 30 | 57.9 | 93.5 | 94.4 | 62.6 | 58.3 | 59.1 | 3.37 |
| 31 | 64.4 | 93.6 | 94.6 | 63.0 | 58.8 | 59.6 | 3.79 |
| 32 | 71.0 | 93.6 | 94.7 | 63.3 | 59.2 | 59.9 | 4.20 |
| 33 | 77.5 | 93.5 | 94.7 | 63.5 | 59.6 | 60.1 | 4.62 |
| 34 | 84.0 | 93.4 | 94.7 | 63.6 | 59.9 | 60.2 | 5.03 |
| 35 | 90.6 | 93.3 | 94.7 | 63.7 | 60.1 | 60.3 | 5.45 |
| 36 | 97.1 | 93.2 | 94.7 | 63.8 | 60.4 | 60.4 | 5.86 |
| 37 | 103.6 | 93.0 | 94.6 | 63.9 | 60.6 | 60.4 | 6.28 |
| 38 | 110.1 | 92.8 | 94.5 | 64.0 | 60.8 | 60.4 | 6.69 |
| 39 | 116.6 | 92.6 | 94.4 | 64.1 | 61.0 | 60.5 | 7.11 |
| 40 | 123.1 | 92.4 | 94.3 | 64.2 | 61.1 | 60.5 | 7.52 |
| 41 | 129.5 | 92.2 | 94.2 | 64.3 | 61.3 | 60.5 | 7.94 |
| 42 | 135.9 | 91.9 | 94.1 | 64.4 | 61.4 | 60.6 | 8.35 |
| 43 | 142.4 | 91.7 | 94.0 | 64.5 | 61.6 | 60.6 | 8.77 |
| 44 | 148.8 | 91.4 | 93.9 | 64.6 | 61.7 | 60.6 | 9.18 |

## Table 18: Performance Goals of LOHMANN LSL-EXTRA – Week 45–70

| Age in Weeks | Egg No. per H.H. | Rate of Lay % | | Egg Weight g | | Egg Mass g/H.D. kg/H.H | |
|---|---|---|---|---|---|---|---|
| | Cumulative | per H.H. | per H.D. | in Week | Cumulative | in Week | Cumulative |
| 45 | 155.1 | 91.1 | 93.7 | 64.7 | 61.8 | 60.6 | 9.59 |
| 46 | 161.5 | 90.8 | 93.6 | 64.8 | 61.9 | 60.6 | 10.00 |
| 47 | 167.8 | 90.5 | 93.4 | 64.9 | 62.1 | 60.6 | 10.41 |
| 48 | 174.1 | 90.2 | 93.2 | 64.9 | 62.2 | 60.6 | 10.82 |
| 49 | 180.4 | 89.9 | 93.1 | 65.0 | 62.3 | 60.5 | 11.23 |
| 50 | 186.7 | 89.6 | 92.8 | 65.1 | 62.4 | 60.5 | 11.64 |
| 51 | 192.9 | 89.2 | 92.6 | 65.2 | 62.5 | 60.4 | 12.05 |
| 52 | 199.2 | 88.9 | 92.4 | 65.3 | 62.5 | 60.4 | 12.46 |
| 53 | 205.4 | 88.5 | 92.2 | 65.4 | 62.6 | 60.3 | 12.86 |
| 54 | 211.5 | 88.1 | 92.0 | 65.5 | 62.7 | 60.3 | 13.27 |
| 55 | 217.7 | 87.7 | 91.7 | 65.6 | 62.8 | 60.2 | 13.67 |
| 56 | 223.8 | 87.3 | 91.4 | 65.7 | 62.9 | 60.1 | 14.07 |
| 57 | 229.9 | 86.9 | 91.2 | 65.8 | 63.0 | 60.0 | 14.47 |
| 58 | 235.9 | 86.4 | 90.8 | 65.9 | 63.0 | 59.9 | 14.87 |
| 59 | 241.9 | 85.9 | 90.5 | 66.0 | 63.1 | 59.7 | 15.27 |
| 60 | 247.9 | 85.4 | 90.1 | 66.1 | 63.2 | 59.6 | 15.66 |
| 61 | 253.8 | 84.9 | 89.7 | 66.2 | 63.3 | 59.4 | 16.06 |
| 62 | 259.7 | 84.3 | 89.3 | 66.4 | 63.3 | 59.3 | 16.45 |
| 63 | 265.6 | 83.7 | 88.8 | 66.5 | 63.4 | 59.1 | 16.84 |
| 64 | 271.4 | 83.1 | 88.3 | 66.7 | 63.5 | 58.9 | 17.23 |
| 65 | 277.2 | 82.5 | 87.8 | 66.8 | 63.5 | 58.7 | 17.61 |
| 66 | 282.9 | 81.8 | 87.2 | 67.0 | 63.6 | 58.4 | 18.00 |
| 67 | 288.6 | 81.1 | 86.7 | 67.1 | 63.7 | 58.2 | 18.38 |
| 68 | 294.2 | 80.4 | 86.1 | 67.3 | 63.7 | 58.0 | 18.76 |
| 69 | 299.8 | 79.7 | 85.5 | 67.4 | 63.8 | 57.7 | 19.13 |
| 70 | 305.3 | 79.0 | 85.0 | 67.6 | 63.9 | 57.4 | 19.51 |

# GENERAL INFORMATION

## Table 18: Performance Goals of LOHMANN LSL-EXTRA – Week 71–95

| Age in Weeks | Egg No. per H.H. | Rate of Lay % | | Egg Weight g | | Egg Mass g/H.D. kg/H.H | |
|---|---|---|---|---|---|---|---|
| | Cumulative | per H.H. | per H.D. | in Week | Cumulative | in Week | Cumulative |
| 71 | 310.8 | 78.3 | 84.4 | 67.7 | 64.0 | 57.2 | 19.88 |
| 72 | 316.2 | 77.6 | 83.8 | 67.9 | 64.0 | 56.9 | 20.25 |
| 73 | 321.6 | 76.9 | 83.3 | 68.0 | 64.1 | 56.7 | 20.61 |
| 74 | 327.0 | 76.2 | 82.7 | 68.2 | 64.2 | 56.4 | 20.98 |
| 75 | 332.2 | 75.5 | 82.1 | 68.4 | 64.2 | 56.1 | 21.34 |
| 76 | 337.5 | 74.8 | 81.5 | 68.5 | 64.3 | 55.8 | 21.70 |
| 77 | 342.7 | 74.1 | 80.9 | 68.7 | 64.4 | 55.6 | 22.05 |
| 78 | 347.8 | 73.3 | 80.2 | 68.8 | 64.4 | 55.2 | 22.40 |
| 79 | 352.9 | 72.5 | 79.5 | 69.0 | 64.5 | 54.8 | 22.75 |
| 80 | 357.9 | 71.7 | 78.8 | 69.1 | 64.5 | 54.4 | 23.10 |
| 81 | 362.8 | 70.8 | 78.0 | 69.3 | 64.6 | 54.0 | 23.44 |
| 82 | 367.7 | 70.0 | 77.2 | 69.4 | 64.7 | 53.6 | 23.78 |
| 83 | 372.6 | 69.1 | 76.5 | 69.6 | 64.7 | 53.2 | 24.12 |
| 84 | 377.4 | 68.3 | 75.7 | 69.7 | 64.8 | 52.8 | 24.45 |
| 85 | 382.1 | 67.4 | 74.9 | 69.9 | 64.9 | 52.3 | 24.78 |
| 86 | 386.7 | 66.6 | 74.1 | 70.0 | 64.9 | 51.9 | 25.11 |
| 87 | 391.3 | 65.7 | 73.4 | 70.2 | 65.0 | 51.5 | 25.43 |
| 88 | 395.9 | 64.9 | 72.6 | 70.3 | 65.0 | 51.0 | 25.75 |
| 89 | 400.3 | 64.0 | 71.8 | 70.5 | 65.1 | 50.6 | 26.07 |
| 90 | 404.8 | 63.2 | 71.0 | 70.6 | 65.2 | 50.1 | 26.38 |
| 91 | 409.1 | 62.3 | 70.2 | 70.8 | 65.2 | 49.7 | 26.69 |
| 92 | 413.4 | 61.5 | 69.4 | 70.9 | 65.3 | 49.2 | 26.99 |
| 93 | 417.7 | 60.6 | 68.6 | 71.1 | 65.3 | 48.7 | 27.29 |
| 94 | 421.9 | 59.8 | 67.8 | 71.2 | 65.4 | 48.2 | 27.59 |
| 95 | 426.0 | 58.9 | 67.0 | 71.4 | 65.5 | 47.8 | 27.89 |

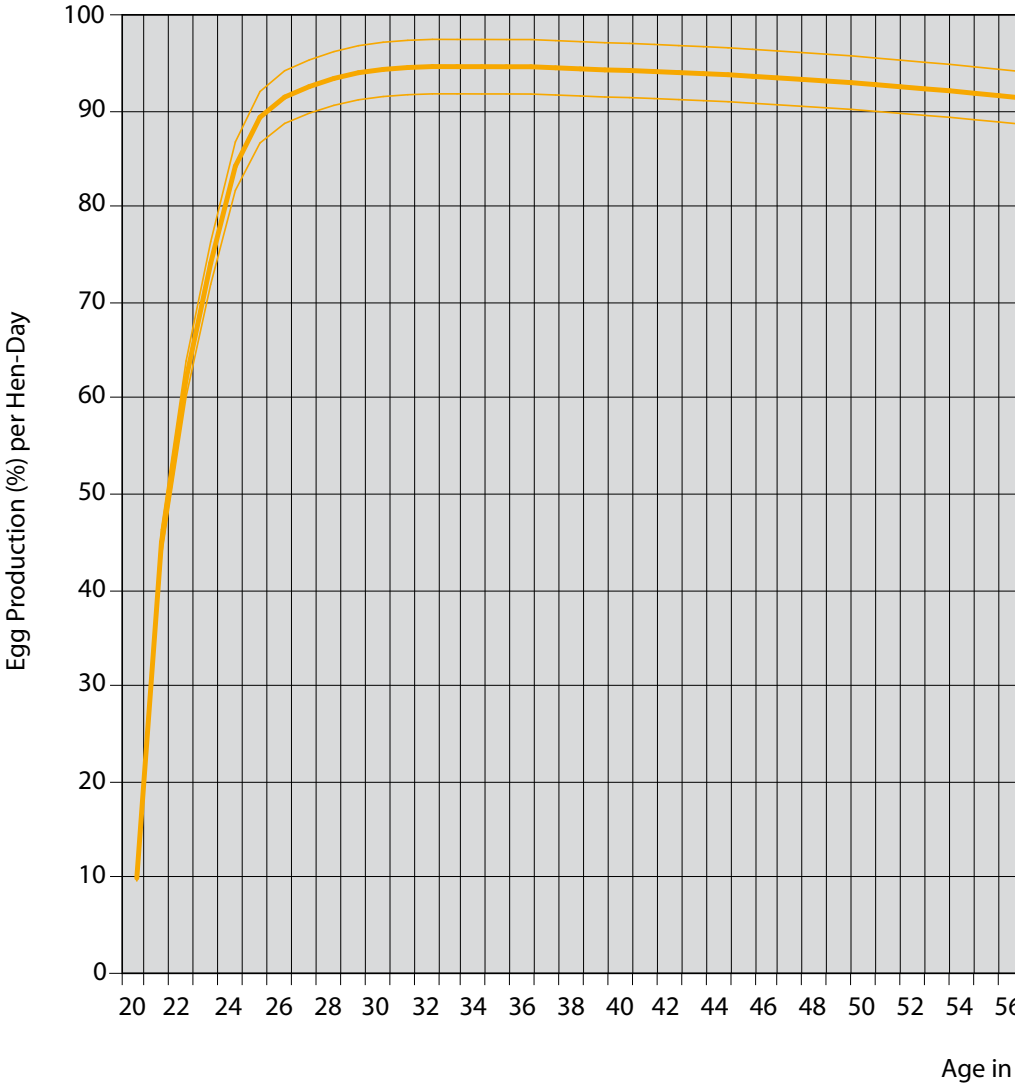
## Table 19: Egg Grading for LOHMANN LSL-EXTRA

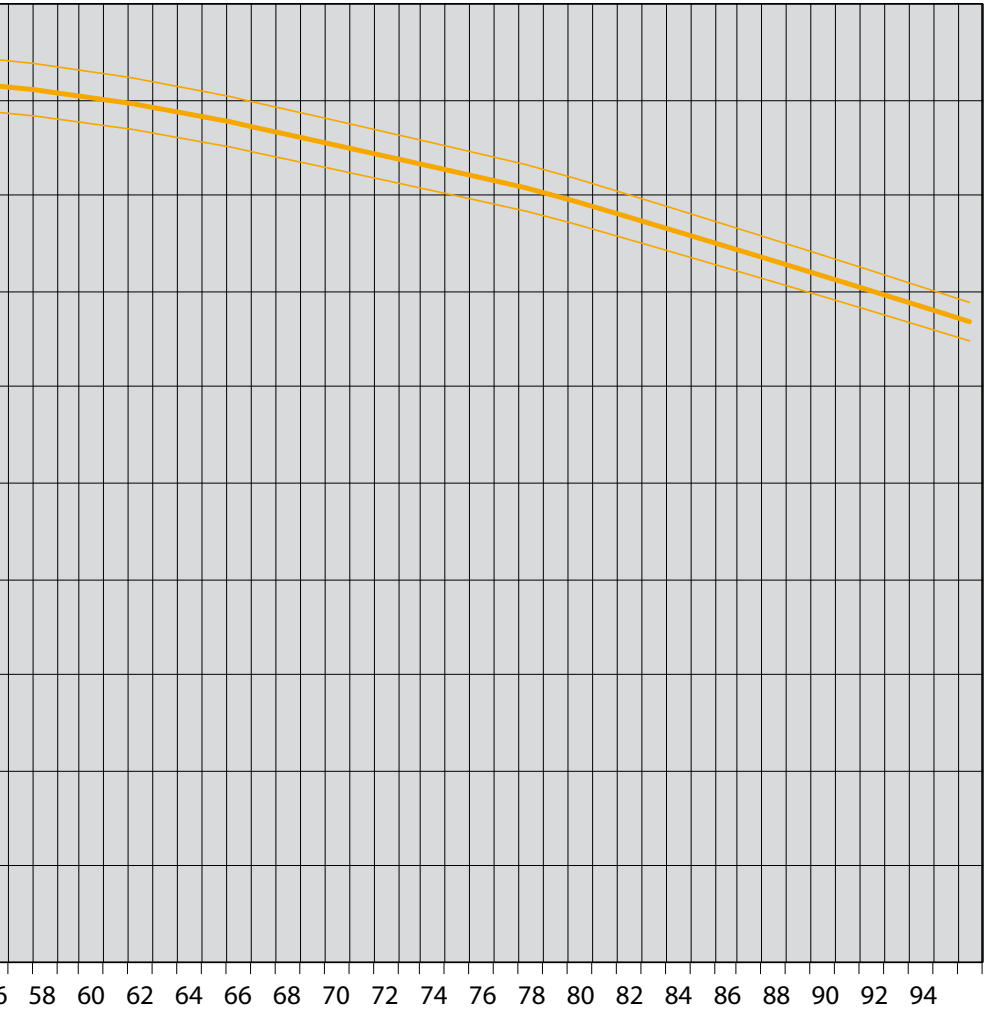
| Expected Egg Grades (%) for Different Egg Weights* Depending on Average Egg Weight | | | | |
|---|---|---|---|---|
| Egg Weight (g) (Flock Average) | S | M | L | XL |
| | Below 53 g | 53–63 g | 63–73 g | Above 73 g |
| 46 | 98.5 | 1.5 | 0.0 | 0.0 |
| 48 | 93.2 | 6.8 | 0.0 | 0.0 |
| 50 | 80.4 | 19.6 | 0.0 | 0.0 |
| 51 | 71.2 | 28.8 | 0.0 | 0.0 |
| 52 | 60.8 | 39.1 | 0.1 | 0.0 |
| 53 | 50.0 | 49.6 | 0.4 | 0.0 |
| 54 | 39.6 | 59.5 | 0.9 | 0.0 |
| 55 | 30.2 | 67.9 | 1.9 | 0.0 |
| 56 | 22.2 | 74.0 | 3.8 | 0.0 |
| 57 | 15.8 | 77.5 | 6.7 | 0.0 |
| 58 | 10.9 | 78.2 | 10.9 | 0.0 |
| 59 | 7.4 | 76.0 | 16.6 | 0.0 |
| 60 | 4.8 | 71.5 | 23.6 | 0.1 |
| 62 | 1.9 | 57.2 | 40.3 | 0.6 |
| 64 | 0.7 | 40.5 | 56.6 | 2.2 |
| 66 | 0.2 | 25.6 | 67.7 | 6.5 |
| 68 | 0.1 | 14.6 | 70.6 | 14.7 |
| 70 | 0.0 | 7.6 | 65.3 | 27.0 |
| 72 | 0.0 | 3.7 | 54.1 | 42.2 |
| Week** | Expected Egg Grades (%) of Total Produced Eggs* Depending on Flock Age*** | | | |
| 60 | 4.7 | 41.2 | 51.3 | 2.7 |
| 65 | 4.2 | 39.3 | 53.2 | 3.3 |
| 70 | 3.9 | 37.4 | 54.7 | 4.0 |
| 75 | 3.6 | 35.6 | 56.0 | 4.9 |
| 80 | 3.3 | 33.9 | 56.9 | 5.9 |
| 85 | 3.1 | 32.4 | 57.5 | 7.0 |
| 90 | 3.0 | 31.0 | 57.9 | 8.2 |
| 95 | 2.8 | 29.7 | 58.0 | 9.5 |

** Excluding double-yolk eggs **Cumulative up to Week *** According to the given standard*

# GENERAL INFORMATION

## Egg Production Curve for LOHMANN LSL-EXTRA Layers




6 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94
Weeks

# NOTES

# NOTES

# NOTES

# INFORMATION

## How LOHMANN is calculating the energy content of feed and raw materials (International WPSA-formula):

ME MJ/kg = g crude protein x 0.01551
+ g crude fat x 0.03431
+ g crude starch x 0.01669
+ g sugar x 0.01301 (as Saccharose)

*ME = metabolizable energy in MJ/kg*

*1 kcal = 4.187 kJ*

## Disclaimer

The information, advices and suggestions given in this management guide should be used for guidance and educational purposes only, recognizing that local environmental and disease conditions may vary and a guide cannot cover all possible circumstances. While every attempt has been made to ensure that the information presented is accurate and reliable at the time of publication, LOHMANN cannot accept responsibility for any errors, omissions or inaccuracies in such information or management suggestions.
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