MANAGEMENT-GUIDE

for Laying Hens in Deep Litter, Perchery and Free-Range Systems

LOHMANN
TIERZUCHT

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INTRODUCTION

The trend away from conventional battery cages towards deep litter, perchery and free range housing systems for laying hens has intensified in recent years. In West European countries in particular laying hens are increasingly kept in production systems that are consistent with the ethical and moral principles of these societies. Biofarms managed in accordance with specific guidelines for organic farming are also gaining market shares.

The management of laying hens in deep litter, perchery and free range systems requires considerably more expertise and time, which should be invested in caring for the birds, than conventional battery cages. Any farmer who decides to keep hens in these alternative production systems should first acquire a basic knowledge of management practices in alternative systems and, before starting production himself, should preferably have gained some practical insight into what is involved by taking a good look around a well-managed and successful operation.

These management recommendations for keeping laying hens in deep litter, perchery and free range systems are intended to provide basic information and help poultry farmers to fully exploit the genetic performance potential of Lohmann breeding products in alternative systems. The recommendations draw on results of scientific studies and, most importantly, practical experience gained in the field.

This management programme is intended as a guide for newcomers while at the same time assisting experienced poultry farmers with a view to optimising their work with Lohmann breeding products in alternative systems.

LOHMANN BREEDING PRODUCTS

Laying hens in alternative systems are mainly brown layers as brown-shelled eggs currently predominate in this market segment. However, white eggs are also increasingly produced in alternative systems. Some direct marketers have started to sell random mixtures of white and brown eggs and manage their flocks accordingly. Lohmann Tierzucht is ready to supply the appropriate breeding product via its contractors:

LOHMANN BROWN is a hen with a high performance potential, medium egg weight and first-class shell quality. She is robust, a good eater, has good nesting behaviour and enjoys growing popularity among alternative laying hen producers.

LOHMANN TRADITION is a breed specially designed for the self-marketer segment. A rapidly increasing egg weight, uniform shell colour and shell strength are the salient features of the eggs produced by this hen. Lohmann Tradition hens are calm, robust and good eaters.

LOHMANN LSL being a white breeding product is highly suitable for deep litter, perchery and free range systems. The high adaptability of this hen to alternative housing systems, a calm disposition, good plumage and high egg numbers with medium egg weight are particularly advantageous.

LOHMANN SILVER is a predominately white feathering layer for the production of uniform brown eggs with reduced egg weight. Her special advantage is the excellent feathering. In organic farming the bird enjoys growing popularity.

HOUSING SYSTEMS

Design of laying houses

This manual does not propose to describe the technical construction of alternative laying hen housing in detail. It merely outlines the basic requirements for laying houses. Before planning and executing any building work on new housing or converting existing buildings to deep litter houses and percheries it is essential to consult experts.

The construction of deep litter and perchery housing, with additional outdoor facilities in the case of free range systems, must meet different and often higher standards than cage housing. As the birds spend at least part of the time directly on the shed floor this should be heat-insulated. A lower stocking density per m^2 of floor space compared with conventional cages and the associated reduction in the amount of heat generated by the hens in the room must be taken into consideration when designing ventilation and air-conditioning installations.

The dispersion of the hens within the building depends on its size, any compartments within the shed, but especially air flow and house climate. If the latter two factors are relatively uniform the hens will disperse evenly within the shed and feel comfortable. Otherwise the birds will crowd together in areas of the shed they find agreeable. The litter in such overused areas can become heavily soiled, the proportion of harmful gases can rise and in the worst case scenario the hens could crush each other to death.

Nests must be easily accessible to all hens and preferably positioned in a central location in the laying house. As the hens can choose whether or not to use the nests for egg-laying and as not every hen has learnt to lay eggs in the nest, some eggs will be deposited in the scratching area, on the dropping pit or in the perchery. It is therefore vital to get the hens used to the nests. Eggs laid outside the nest are hygienically undesirable and have to be marketed at discounts.

In deep litter or perchery housing a large quantity of dust is generated by hens using the littered scratching area and moving about, which can pose a health hazard for the birds.

If the deep litter house or perchery is combined with an outdoor enclosure, the building should be aligned in a north-south direction. This avoids the walls heating up at different rates and differences in the amount of light entering the two halves of the building when the popholes are open.

The design of the building and its installations should be user-friendly to allow easy servicing.

Deep litter housing

Deep litter housing for laying hens can vary considerably in design and layout depending on the type of building. The classic form consists of 80-90 cm high dropping pits covered with wooden, wire mesh or plastic slats, which take up two-thirds of the floor space. Feeders, drinkers and laying nests should be positioned on top of the dropping pit and the drinkers should be mounted at a distance of 30 to 50 cm directly in front of the entrance to the nest.

A littered scratching area of sand, straw, wood shavings or other materials which occupies one-third of the floor space gives the hens room for moving about, scratching and dust-bathing. The littered scratching area take up about one-third of the total floor space, but can be replaced completely by perforated flooring in a modified variant. In this case it is recommended to provide an additional winter garden where the birds can express their natural behaviours such as scratching and dust-bathing.

Stocking densities should not exceed nine hens per m^2 (of usable floor space). Rails or other elevated perching facilities should be provided as resting places for the hens.

Percheries

Percheries are systems where the birds can roam on several levels. The levels are covered with wooden, wire mesh or plastic slats and can have manure belt ventilation installed if desired. Feeding and watering facilities are usually located on the lower tiers. The upper tiers usually serve as resting areas for the birds. Depending on the perchery type, the laying nests are either within the system or outside the perchery. A stocking density of up to 18 hens per m^2 of floor area is permitted in this housing system. Controlled lighting and staggered feeding times encourage the birds to move around the different levels.

Manufacturers now supply a wide range of perchery types where laying hens can be kept successfully and achieve high production. Before deciding on which system to use, the egg producer should look at the existing construction and select an installation that can be readily adapted to the existing building. When constructing a new facility the house carcass and the perchery installation should preferably be designed to match. If the perchery where the pullets were raised is similar to the type installed in the subsequent laying house, familiarisation problems can be minimised. This aspect should also be considered when establishing a perchery system for laying hens.

Free range systems

In free range systems a normal deep litter house or perchery is combined with an outdoor enclosure (4 m^2 floor area per hen) for the hens. This facility must be available to the birds during the day. Popholes along the entire length of the building provide access to the exterior. A winter garden attached to the poultry house has proved highly beneficial. The hens cross the winter garden to get to the outdoor enclosure. Winter gardens in front of the laying house have a positive effect on both litter quality and house climate. Most of the dirt carried by the hens from outside remains in the winter garden. When the popholes are opened cold air does not flow straight into the building so that the climate indoors is less affected than without a winter garden.

PULLETS

Requirements of pullets

It is recommended that pullets destined for deep litter or perchery housing should have been reared in the same management systems. This ensures that the birds settle down quickly in their new surroundings and that transfer to the laying house will not cause stress, which may result in production losses.

Pullets to be housed in alternative systems should have their beaks carefully treated. Birds who have not had their beaks slightly treated can cause each other serious injury and possibly death since stressful situations are sometimes unavoidable in such management systems. The geneticists at Lohmann Tierzucht breed for a calm temperament and high stress resistance. But as long as vices such as feather pecking and cannibalism are still observed in commercial poultry holdings beak treatment is essential. The treatment should be carried out in accordance with current legal requirements in the respective countries. The laying hen keeper should therefore discuss this with the pullet supplier in good time.

The bodyweight of the pullets should preferably be above the breeder's standard. A slight overweight gives the birds a reserve during the stressful transfer phase. When weighing pullets on arrival, the fasting loss incurred during transit should be taken into account.

Producers buying in pullets should not just look at the price of the pullet but should also consider bodyweight and flock uniformity. As birds kept on litter floors and in percheries have an approx. 10 % higher energy requirement for maintenance, which is even higher for free range hens (+15 %), the pullets must be capable of eating more food than birds in conventional battery cages. The ability to **consume sufficient food as soon as possible after arrival is of paramount importance** for the hens, who should be trained for this during the pullet phase by a focused feeding programme.

The laying hen keeper should also bear in mind that in order to successfully adapt hens to alternative systems other factors need to be considered which may have to be discussed with the pullet supplier. One is that the more closely the growing facility resembles the future production system, the easier it will be for the pullets to settle down in their new surroundings. Furthermore, hens in deep litter housing and percheries must also be able to move around by flying and jumping. In order to train chicks in these skills it is essential to provide facilities like rails or perches **before the age of six weeks.** In deep litter systems rails with a feeding chain suspended overhead have proved effective. In percheries it is important to ensure that the levels are opened **before the chicks are six weeks old.** Staggered feeding times on the different levels encourage the birds to move around within the building.

Housing of pullets

It is advisable that pullets from alternative rearing systems are transferred to laying houses in good time before the anticipated onset of production. The recommended age is 17 or 18 weeks. The move from the grower to the layer facility should be handled with care but speedily. Capture, transportation and vaccination are stressful to the hens. Gentle rehousing and careful adaptation of the flock to the new surroundings are crucial for good production results.

After transfer the hens should be dispersed evenly across the building (in the system) and placed close to feeders and drinkers. Water and feed must be available immediately.

On arrival in the new quarters the light should be left on so that the hens can find their way around. In extreme cases the light should not be switched off for up to 24 hours, while observing the day/night rhythm. However, if the pullets are extremely fatigued on arrival it may be preferable to turn the light off for a short rest period.

Room temperatures should be within a comfortable range for the birds. If the building is too cold the hens may be inactive and neither drink nor eat. They should not be disturbed during the first 24 hours after the move. Inspections of the stock should therefore only be carried out in an emergency. The attendants should be calm and quiet and always wear the same clothing. Nervous attendants cause stress among the newly housed pullets.

MANAGEMENT

Management during the early days

During the first few days after housing it is important to stimulate a sufficiently high feed intake. The hens should be encouraged to increase their food consumption as quickly as possible. Some ways to achieve this are:

- Providing an attractive meal type ration with good structure
- Running the feeding lines more frequently
- Feeding when the trough is empty
- Lighting of feeding installations
- Moistening the feed
- Use of skim milk powder or whey-fat concentrate
- Vitamin supplements

Pullets must on no account lose weight after rehousing. They should continue to gain weight, or at least maintain their bodyweight. If the housing system permits it and provided stocking densities are not exceeded by doing so, the hens should be confined to the grid above the dropping pit or the perchery until they have reached approximately 75 % production. Partially closing the scratching area (leaving the birds a minimum amount of space in that scratching area) and manually moving disorientated hens back onto the dropping pit or into the system have also proved effective. Light sources should be placed in such a way that the entire building and the entrance to the nests are well lit and should be programmed so that only the light above the dropping pit or in the perchery is on before the end of the light day.

Litter

The type and quality of the litter are of importance for the hens and the house climate. Different materials may be used:

- Sand or gravel up to 8 mm granule size
- Wood shavings
- Wheat, spelt, rye straw
- Bark mulch
- Coarse wood chips

Sand and gravel should be dry when put down. Wood shavings should be dust-free and not chemically pretreated. Straw must be clean and free of mould. A litter depth of 1 – 2 cm is sufficient. Litter should preferably be put down after the hens have been housed and spread by the hens themselves if possible. This prevents the formation of condensation water between floor and litter if room temperatures are low. Straw litter has the advantage of encouraging the hens to forage in the litter material. This stimulates their natural investigative and feeding behaviours and reduces vices. Removal and replacing of litter in heavily frequented areas of the building is often unavoidable during the laying period. A well designed winter garden has a positive impact on litter quality. This beneficial effect of a winter garden can be improved further by staggering the location of the popholes in the building and the winter garden.

House climate

Room temperatures of 18° C are considered optimal for laying hens in alternative systems. A relative humidity of between 50 and 75 % is tolerated by the hens. Lower temperatures during the winter months also pose no problem for the hens, provided they have got used to them. But high temperatures exceeding 30° C are less well tolerated. During heat spells, when room temperatures above 30° C are unavoidable, sufficient air movement around the hens should be ensured to enable the birds to give off body heat into the atmosphere. The use of additional fans in the poultry house is highly effective in such situations.

Hens with access to a winter garden or an outdoor enclosure should be made to get used to colder winter temperatures. The quality of the plumage needs to be considered in temperature management programmes for laying hens in alternative housing. Climate and room temperature are heavily influenced by the activity of the birds, the stocking density and the presence of popholes, if any.

Draughts are harmful for the birds. Draughty areas are avoided by the hens, who prefer to congregate in poorly ventilated parts of the building. Mortalities due to crushing and the incidence of floor eggs are promoted by poor ventilation. The ventilation system should ensure that in summer warm air is extracted quickly from the birds' surroundings and in winter the building does not become too cold. High concentrations of noxious gases should be avoided. Ammonia reduces bird comfort and is injurious to health. A well designed winter garden and the use of outdoor pens or wind protection (strip curtains)

in front of the popholes prevent the ventilation system in the poultry house from breaking down if a negative pressure system is used.

If any problems occur with the ventilation system in deep litter or perchery housing it is advisable to consult experts.

Minimum requirements for air quality in poultry buildings are as follows:

O_2	over 16 %
CO_2	under 0.3 %
CO	under 40 ppm
NH_3	under 20 ppm
H_2S	under 5 ppm

Equipment needed / Minimum technical requirements*

Darkness	At least 8 hours or natural dark phase
Feeder space	Trough 10 cm/hen; circular feeder 4 cm/hen
Drinkers	Circular drinker 1 cm/hen; 10 hens/nipple
Distances	Max. 8 metres to feeder/drinker
Nest boxes	5 – 7 hens / individual nest; for communal nests 120 hens/m^2
Proportion of litter	At least 33 % of the floor area
Droppings box	80 – 90 cm deep to hold the droppings from one batch if no manure scraper is available; 7° gradient up to the nest
Perches	15 cm/hen; distance between perches 30 cm
Exit popholes	Minimum size: 45 cm high, 500 hens per metre

* complies with EU regulations

Feeding

The genetic production potential of Lohmann breeding products can only be realised with a highly nutritious diet. In conjunction with the lighting programme and adequate bodyweight development, feeding is the third and crucial factor in making hens attain their genetic potential.

The nutrient requirement of a laying hen is divided into the requirement for maintenance, for growth and for egg production. In this way recommended nutrient allowances can be formulated irrespective of the production system. This enables allowances to be accurately matched to alternative management systems.

The maintenance requirement of a laying hen is approximately 60 – 65 % of the total energy requirement. Compared with laying hens kept in cages or in small groups under optimal management conditions, the maintenance requirement in alternative systems is higher due to the increased activity of the hens. It has been calculated at +10 % for floor hens and +15 % for free range hens.

The daily nutrient intake of laying hens can be calculated using the following formula:

Nutrient content in the diet x feed intake / hen / day = nutrient intake / hen / day

Example: 11.4 MJ / kg x 115 g / hen / day = 1.31 MJ / hen / day

The necessary prerequisites for a good and sufficiently high nutrient intake of hens are:

- a diet with a sufficiently high energy content/nutrient density
- and an adequate feed intake

Raising the nutrient density/nutrient content of layer diets is not always economically viable so that an adequate feed intake per hen and day is an important prerequisite for the normal expression of the hen's genetic production potential.

The feed intake capacity of the laying hen is determined by many factors and can also be altered by genetic measures. It is mainly dependent on:

- The hen's bodyweight
- Laying performance
- Ambient temperature
- Condition of the hen's plumage
- Energy content of the ration
- Genetics
- Health status

Feeding at onset of lay

In alternative systems pullets are sometimes moved to the laying house as early as 16 – 17 weeks old. But at that age the birds are not yet fully grown and should therefore not be fed a layer diet. The high calcium content of a layer diet would prematurely stimulate the hens to lay eggs. Layer diets with more than 3 % calcium should therefore not be introduced too early. At 16 – 18 or 17 – 19 weeks of age the hens in the laying house are still fed a pre-lay diet for another two weeks. The change to a high-density layer starter should not be made until about 5 % production is reached. The time for feeding a pre-lay diet and the best time for switching should be agreed with the pullet supplier.

The move to the laying house exposes hens to considerable stress. The development from pullet to mature laying hen is associated with fundamental changes affecting all major physiological and hormonal processes. The phase of juvenile growth and body

mass increase ends on reaching sexual maturity, which is followed by the start of laying activity. The hens are not yet fully grown at onset of lay. Their growth curve does not level out until about 30 weeks, when the weekly weight gain falls to less than 5 g.

The changes occurring during the transition phase from pullet to laying hen often lead to a reduced feed intake, which may in some cases drop to well below 100 g per hen and day. This rate of consumption does however not meet the hen's nutrient requirement at that age and, based on the standard energy levels of commercial layer rations, must definitely be considered too low. A suboptimal nutrient supply at the onset of lay places a strain on the birds' metabolism as endogenous energy reserves have to be mobilised and it can potentially contribute to the development of fatty liver syndrome.

During this phase every effort must therefore be made to increase the feed intake as quickly as possible to at least 120 g per bird and day.

An effective way of boosting the nutrient intake is to offer the hens a ration with a higher nutrient density (11.6 – 11.8 MJ/kg) and correspondingly increased amino acid concentrations. An inadequate nutrient supply in early lay jeopardizes the success of the entire laying period and leads to irreversible loss of egg production.

Feeding during the laying period

Recommended nutrient allowances for brown-egg laying hens in deep litter and free range systems*

Nutrient	Unit	Based on 100 g daily feed intake		
		Phase 1	Phase 2	Phase 3
Crude protein	%	18.7	18.2	18.0
Methionine	%	0.44	0.40	0.38
Methionine + Cysteine	%	0.80	0.74	0.70
Lysine	%	0.87	0.85	0.80
Tryptophan	%	0.21	0.20	0.20
Threonine	%	0.64	0.60	0.60
Arginine	%	1.04	1.01	0.98
Isoleucine	%	0.52	0.51	0.49
Calcium	%	4.10	4.30	4.40
Phosphorus, total	%	0.60	0.54	0.47
Phosphorus, available	%	0.42	0.38	0.33
Sodium	%	0.17	0.17	0.17
Chloride	%	0.17	0.17	0.17
Linoleic acid	%	2.00	1.60	1.20
Metabolisable energy	MJ	1.415	1.410	1.398

* Information on recommended nutrient allowances and feeding programmes for white-egg layers is available on request from Lohmann Tierzucht

A universally valid conversion of these nutrient requirement data for all feeding situations, stated as nutrient content per 100 g feed, is not possible, mainly because actual feed consumption per bird and day varies widely in real-life commercial situations. But when formulating diets for laying hens in alternative management systems it should be remembered that to achieve normal performance from hens in alternative systems requires both a diet with a higher nutrient density and the highest possible feed intake. The aim should be a daily consumption of 120 – 125 g feed per hen and day.

Phase feeding

The basis for any feeding programme in alternative production systems must be the hens' nutrient requirement. This changes continuously as the birds get older. To match the hens' evolving nutritional needs requires diets formulated according to different criteria at each stage:

- Layer starter (phase 1) with high nutrient density for a safe start to the laying period
- Balanced phase 2 diet to ensure good laying persistency with a reduced protein and amino acid content
- Phase 3 diet for optimal shell quality and corresponding egg weights

The basic principles of phase feeding can also be implemented in laying hen operations with several age groups and only one feed silo. Here, too, the hens' changing nutrient requirements can be met by selecting appropriate feed types, although expert advice should be sought from a poultry nutritionist. But the best way of ensuring an optimal feed and nutrient supply is to have a separate feed silo for each age group. This variant is also preferable from an economic perspective. In larger laying hen holdings with several housing units it is recommended to supply each housing unit via two silos. This facilitates cleaning of the silos and allows a quick change of diet if necessary. The alternate filling of two separate feed silos makes it easy to check the feed consumption of each flock with a view to determining the feed intake per hen. But in large operations modern, computer-controlled systems should be available for an accurate measurement of feed consumption.

Example of a field-tested phase feeding programme for brown-egg laying hens in alternative management systems*

Nutrient	Unit	Phase 1	Phase 2	Phase 3
ME	MJ/kg	11.6	11.4	11.4
Crude protein	%	18.0	17.0	16.5
Methionine	%	0.40	0.38	0.35
Methionine + Cysteine	%	0.73	0.70	0.64
Lysine	%	0.85	0.80	0.75
Calcium	%	3.80	3.80	4.10
Phosphorus**	%	0.50	0.45	0.40
Sodium	%	0.15	0.15	0.15
Chloride	%	0.17	0.17	0.17
Linoleic acid	%	2.00	1.50	1.10

* Information on recommended nutrient allowances and feeding programmes for white-egg layers is available on request from Lohmann Tierzucht.
** When using phytase

Deviations from these examples are possible depending on production targets and individual circumstances.

Feeding and egg weight

Egg weight can to some extent be manipulated by adjusting nutrition to fit farm-specific requirements. The hens' diet can be adjusted for different objectives:

- During rearing the hens are fed for a high/low bodyweight at onset of lay, aiming at a high/medium egg weight throughout the laying period.
- By increasing dietary crude protein, methionine and linoleic acid concentrations while maintaining a balanced energy supply, egg weight development is influenced positively or, alternatively, restricted by reducing the above components.
- Egg weight can be increased by stimulating feed intake with structured feed, selecting the optimal feeding time and adjusting the number of daily feedings.
- Egg weight development can be kept in check by controlled feeding, if necessary with restriction of feed intake.

The production of eggs of the correct weight for the market is of prime importance in alternative housing systems. Egg weight and shell quality are negatively correlated. Large eggs at the end of lay often have a poorer shell quality. Measures to control egg weight should therefore begin during the pullet rearing phase and be implemented early on. In high-production flocks a noticeable reduction in egg weight is very difficult to achieve during the laying period.

It is therefore advisable to talk to the pullet producer and the feed supplier as early as possible about the diet formulations to be used.

Condition of plumage and feed intake

Maintaining the hens' plumage in good condition throughout the production period should be a major concern of every poultry keeper. In doing so he fulfils his legal obligations under animal welfare laws, but well-maintained plumage is also essential for keeping the hens in good health. It protects against heat loss, thus restricting feed consumption.

Condition of plumage and daily energy maintainance requirement:

	Plumage					
%	100	90	80	70	60	50
Additional maintainance requirements, kcal	0	7.2	14.4	21.6	28.8	36
Additional feed requirement, g / day*	0	2.6	5.2	7.8	10.4	13

* Feed with 2770 kcal, or 11.6 MJ/kg

The increased feed and nutrient requirement of hens with damaged plumage is explained by the maintenance requirement, which accounts for 60 – 65 % of the total nutrient requirement and in this case is needed to maintain the birds' body temperature. A daily feed consumption of 130 g/hen/day (or more) is therefore not unusual in special situations.

Grit

Insoluble grit or fine gravel should be provided for free access feeding. Due to the specialised digestive system of birds, this can stimulate digestion and improve feed intake capacity. The following are reference values for granulation and amount of grit to be supplied:

Once a month 3 g/hen (4 - 6 mm granulation)

Water

Good water is the most important part of the diet for all animals, including poultry. To ensure health and optimum egg quality the water supplied to the hens should be of potable standard. The poultry farmer should therefore always ask himself if he would be prepared to drink the water offered to his birds himself.

Feed and water intake are closely correlated. Under normal conditions the correct feed to water ratio is 1:2. Hens who do not drink enough water have an inadequate feed intake. Regular checks to ensure that drinkers are working properly are therefore recommended.

When ambient temperatures are high or if laying hens have health problems they consume more water. During hot weather water serves to regulate the hens' body temperature. Cool drinking water is best for this purpose and water temperatures above 20° C should therefore be avoided. During extremely hot weather with temperatures of over 30° C the feed to water intake ratio can shift to 1:5. In such situations cooling of the drinking water is beneficial. Water meters allow regular monitoring of the hens' water consumption. They are inexpensive and easy to install. A reduced or increased water intake can be regarded as a first warning sign of problems in the flock or with the technology. Minimising water wastage reduces costs and improves the house climate.

Regular cleaning of the water lines in poultry buildings is essential and special attention should be paid to checking the supply tanks. If water from wells on the farm is used regular water tests should be carried out. The assessment of water quality should be based on the standards laid down in the Drinking Water Ordinance.

The water should be of potable quality, but should meet at least the following specifications:

- Colourless, odourless and sediment-free
- pH: 6 – 8
- Nitrate content: max. 50 mg/litre
- Nitrite content: max. 0.05 mg/litre
- Ammonia content: max. 0.5 mg/litre
- Sulphate concentration (SO_4): < 100 ppm
- Iron content: max. 1 mg/litre
- Phosphate content (PO_4): max. 2 mg/litre
- Manganese content: max. 1 mg/litre
- Common salt content (NaCl): < 330 mg/litre
- Total salt content: < 1000 ppm very good
  1000 – 3000 ppm acceptable
  3000 – 4000 ppm poor (liquid excrement)
  > 4000 ppm dangerous (renal damage)

Caution: Acidic water damages vaccines and medication!

Flock control

In the early days after housing the foundations are laid for the behaviour of the flock during the 12-month laying period. Special attention to detail during the first two weeks after moving the flock to an alternative production system will pay ample dividends later on.

Every morning after the light is switched on a thorough tour of inspection is necessary. This should comprise checks for the proper functioning of:

- drinkers,
- feeders,
- lighting installations and
- laying nests

The house climate should be checked and the condition of the flock and the hens' behaviour assessed.

Immediately after the start of lay multiple inspections are recommended to gather any floor eggs. This helps the hens to get used to the attendants while at the same time rapidly reducing the proportion of floor eggs.

Laying nests

Laying nests should be designed and positioned in such a way that they are easily accessible to the hens, preferably in a central location in the room. It is recommended to keep the entrance to the nest well lit whereas the interior should be darkened. Pullets should not be allowed access to the nests too early, only just before the onset of lay (at about 10 days before start of egg production). This enhances the attractiveness of the nest and improves nest acceptance. During the laying period the nests should be opened 2 – 3 hours before the start of the light day and closed 2 – 3 hours before the end of the light day. Closing the nests at night prevents soiling and broodiness. Close-out prevents the hens from roosting in the nests overnight and also makes the nest less attractive to mites. Tilting floors have proved effective for close-out. They also help keep the nest box floor clean.

Floor eggs

The incidence of floor eggs can be reduced by incorporating the following experiences in the design of the laying house and the management of young flocks:

- Laying nests should be readily accessible to the hens and positioned in a central location in the room.
- The entire building should be well lit – dark corners and excessively littered scratching areas should be avoided.

- Draughty nests disturb the hens during egg laying and should therefore be avoided.
- The entrance to the nest must be clearly visible to the hens.
- Additional lighting of the interior of the nest can improve nest acceptance at the onset of lay.
- Litter depth should not exceed 2 cm at the onset of the laying period. Light-coloured litter material is preferable to dark material.
- Feeders and drinkers should not be more than 2 to 3 metres away from the nest area.
- The provision of drinking water in the vicinity of the nest entices the hens to this area.
- Feeders and drinkers should be positioned in such a way that they do not create attractive areas for egg laying.
- If nest boxes are mounted on the dropping pits the perforated floors should have a gradient of about 7° towards the nest. This increases the hens' motivation to deposit eggs in the nest.
- If walkable surfaces are installed in front of the nests these should incorporate barriers every two metres to stop the hens from parading in front of the nests and blocking access.
- Pullets should not be moved to the production facility before 17 – 18 weeks of age.
- The laying nests should be opened 10 to 14 days before the onset of lay.
- Hens should not be disturbed while laying eggs – avoid feeding at this time if possible.
- Do not carry out flock inspections during the main morning laying period.
- Floor eggs should be collected quickly, if necessary several times a day.
- If floor eggs still occur, increasing the daylength by adding an extra hour of light at the start of the day is often an effective remedy.
- Electric fencing and draughts help in problem areas.

Lighting

The best light source for laying hens is a high frequency bulb emitting light within the natural spectrum (frequency range above 2000 Hz). Fluorescent tubes or energy-saving bulbs (50 – 100 Hz) have a 'disco effect' on hens and encourage feather pecking and cannibalism (this does not happen with incandescent bulbs). Light sources should have a dimmer switch.

Lighting programmes

Great care must be taken to ensure that daylength is not increased up to the point of stimulation for egg-laying and is not decreased during the laying period of a flock. This is easy to achieve in windowless buildings or laying houses with windows that can be blacked out, provided that foul-air and fresh-air shafts also have effective blackout facilities. In this case the most suitable lighting programmes for the particular breeding products can be operated.

Lighting programme for darkened laying houses

Age in weeks	Light in hours		Light intensity	
	Programme LSL	Programme LB/LT	W/m^2	Lux
17	8	10	1* – 2	4 – 6*/5 – 7
18	8	11	3	10 – 15
19	9	12	3	10 – 15
20	10	13	3	10 – 15
21	11	14	3	10 – 15
22	12	14	3	10 – 15
23	13	14	3	10 – 15
24	14	14	3	10 – 15
25**	14 – 16	14 – 16	3	10 – 15

* for LSL hens ** up to the end of production

Special considerations for hens kept in buildings with natural daylight

In housing where the hens have access to winter gardens or an outdoor enclosure, or if windows, ventilation shafts and other openings cannot be blacked out sufficiently to shield the birds completely from the effect of natural daylight, this should be taken into consideration when designing the lighting programme. Bear in mind that in central Europe the natural daylength increases during the course of the calendar year to about 17 hours by late June and then shortens to about 8 hours by late December. If flocks are moved to production facilities with windows that cannot be blacked out or into which light can enter through ventilation shafts (stray light), or if the hens have free access to winter gardens or outdoor areas, the lighting programme must be adjusted to the natural daylength at the time of rehousing.

It makes a difference whether the housed pullets come from a windowless growing facility or were reared in a building whose windows were blacked-out in synchronicity with the lighting programme or whether they were fully exposed to natural daylight during the growing period. In the case of hens which were unaware of the natural diurnal rhythm

during rearing (windowless housing or windows with blackout facility) it is important to avoid excessive stimulation, and consequently stress, on transfer to open laying houses caused by an abrupt lengthening of the day (in spring and summer). An increase in the daylength by not more than 2 – 3 hours is desirable.

In open housing the lighting programme in the spring and summer months is determined by the lengthening of the natural day, reaching a maximum of about 17 hours daylight. When the natural daylength begins to decrease again from July onwards, the 17-hour daylength should be maintained constant until the end of the laying period. This is easily achieved by using an automatic time clock and dimmer switch:

- 04.00* hours: light on – dimmer switch off at $\geq$ 50 – 60 Lux
- Dimmer switch on at $\leq$ 50-60 Lux – 21.00* hours light off

* CE summer time

The artificial light should preferably not be switched on before 04.00 hours (CE summer time).

Crucial points to consider in the management of laying hens, the choice of light sources and the design of lighting programmes:

- Artificial light from fluorescent bulbs operating within a frequency range below 250 Hz is perceived as flickering by hens. Incandescent bulbs or fluorescent tubes operating at high frequencies over 2000 Hz are preferable.
- Artificial filtered light, but also unfiltered light from conventional light sources, restricts the vision of hens by limiting the light spectrum that is visible to them.
- Stimulation of hens in windowless housing follows the simple principle of shortening the light period until the desired stimulation has been achieved, followed by a lengthening of the light period. A reduction of the daylength during the laying period is not allowed.
- If technically possible, open housing for laying hens should also have facilities for blacking out the windows. These could then be opened and shut in synchronicity with the lighting programme or remain completely shut until the maximum daylength has been reached (in accordance with the lighting programme).

The laying hen keeper and the pullet supplier should agree on the following in order to coordinate lighting programmes during rearing and the subsequent laying period:

- For pullets who are moved to open housing with windows that do not have a blackout facility an option is to design lighting programmes synchronised with the hatching date of the flock. In order to avoid a “light shock” if rehousing takes place during a period of very long days the step-down programme during rearing should be modified in such a way that on transfer to the laying house the hens are exposed to an increase in daylength of not more than two or three hours at most.

- Pullets should be reared in darkened housing or buildings should be adapted in such a way that the windows, if present, are opened and shut in synchronicity with the lighting programme.
- Hens reared under artificial light and later moved to housing with natural daylight have to get used to the altered perception of their surroundings. The use of true light bulbs during pullet rearing, which closely simulate the natural light spectrum, can reduce this effect.
- Pullets reared in buildings that cannot be darkened are affected by the length of the natural day, especially in the spring and summer months. Early maturing of pullets can only be prevented by adapted lighting programmes, but effective stimulation of such hens with lighting programmes is only possible to a limited extent.

ANIMAL HEALTH

Vaccinations

Pullets destined for deep litter, perchery and free range systems are vaccinated in the rearing facility against viral (Marek's Disease, IB, ND, Gumboro, ILT), bacterial (Salmonella) and parasitic diseases (Coccidiosis). In alternative layer housing systems the infection pressure from Fowlpox and EDS is so high that they should also be vaccinated against these diseases if there is any risk of infection. Combined vaccinations against IB, ND, EDS and sometimes also against ART are widely applied. In Germany booster vaccinations against ND are mandatory by law. Booster vaccinations against IB are advisable at 5 – 10-week intervals. A high infection pressure of Salmonella requires, in addition to the vaccinations given during rearing, an additional booster vaccination (for instance using an adsorbed vaccine like Salmovac). Bacterial infections such as E. coli, Erysipelas and Pasteurella Multocida are common in alternative production systems. Outbreaks depend on the type of infectious agent, the infection pressure and the condition of the flock. Immune protection can also be achieved by combined vaccinations.

Effective treatment of bacterial infections in laying hens is hardly possible. Preventative vaccination with autogenous vaccines is therefore advisable. This initial outlay can help prevent high losses and a premature end to production. The bacteria causing Erysipelas and Pasteurella infections are usually found in rodent pests in the vicinity of affected hens. Effective control of mice and rats is an important tool for prevention.

In Germany only two products are currently approved for treating bacterial infections (E. coli) in laying hens. No drugs are available for Coccidia, Pasteurella, Erysipelas etc.

If high mortality rates or any other signs of disease are observed in the flock, a veterinarian should be consulted immediately.

Parasites

Roundworms and threadworms occur in hens and are transmitted via the droppings. If worm infestation is suspected a bulk faecal sample should be taken and sent for analysis to a veterinary laboratory. If necessary the flock may have to be wormed. Red poultry mites are a major problem in alternative production systems. They damage health and reduce the productivity of flocks. Heavy infestation can also cause high mortalities (by transmitting diseases). Infestation causes distress in the flock (feather pecking, cannibalism, depressed production). Continuous monitoring of the flock is therefore advisable.

Common hiding places of mites are:

- in corners of nest boxes
- under the next box covers
- on the feet of feeding chains, trough connectors
- on crossbars of perches
- on dropping box trays
- in corners of walls and
- inside the perches (hollow tubes)

Mites should be controlled with insecticides or other suitable chemicals. These should be applied in the evening as mites are active during the night. It is important that the treatment reaches all hiding places of the mites. More important than the amount of chemical applied is its thorough and even distribution. The mite and beetle treatment should begin as soon as the flock has been depopulated, while the laying house is still warm. Otherwise the pests crawl away and hide in inaccessible areas of the laying house.

Rodent pests

Housing for laying hens should be free of rats and mice. They carry disease and are often the cause of bacterial infections in the flock. Rats and mice are also frequent carriers of Salmonella. A severe rodent infestation should be eradicated immediately and effectively by a professional pest controller. The use of suitable building materials, good structural maintenance and the closing of all openings in the walls of the building (ventilation grids) are ways of keeping rodent numbers down. Shingles and pebbledash (1 – 2 m applied to exterior walls) are avoided by rats and can reduce their numbers in the vicinity of poultry buildings.

Vices

Watch closely for any signs of abnormal behaviour such as feather pecking or cannibalism. A sudden outbreak without changes in the lighting regime can have a variety of reasons. If these vices occur check the following factors:

- **Nutritional and health status** – bodyweight, uniformity, signs of disease
- **Stocking density** – overcrowding or insufficient feeders and drinkers cause distress
- **House climate** – temperature, humidity, air exchange rate or pollution by dust and/or noxious gases
- **Light intensity / light source** – excessive light intensity and flickering light (fluorescent tubes or energy-saving bulbs, < 200 Hz)
- **Ecto- and endoparasites** – infested birds are distressed and develop diarrhoea
- **Feed consistency** – finely ground meal-type feed or pelleted feed encourage vices
- **Protein/amino acid content of the diet** – deficiencies cause problems
- **Supply of calcium and sodium** – deficiency makes birds irritable

Outdoor enclosure

Access to outdoor enclosures should be managed in accordance with external weather conditions. For the first three weeks after rehousing the hens should remain indoors. This gives the birds time to familiarise themselves fully with the facilities inside the building. Then the popholes should be opened. If a winter garden is available this should initially be opened for just one week, before eventually opening the exit popholes 4 – 5 weeks after rehousing. Popholes should only be opened after eggs have been laid. Outdoor areas in free range systems should be designed and utilised in accordance with the relevant guidelines for the marketing of free range eggs.

Young flocks going outside for the first time need to be trained in the use of the outdoor enclosure. The route from the laying house to the outside and back must be easy to find. Food and water are only available indoors.

Range / Pasture

Hens readily accept the range if the pasture area is broken up by a few trees or shrubs which provide protection from predators. The area closest to the laying house is heavily used by the flock and the grass becomes worn. Depending on the condition of this part of the range, ground care and disinfection measures should be carried out. Pasture rotation has proved effective in practice. Young pullets visiting pastures with good vegetation for the first time tend to ingest numerous plants, stones, etc. This can often greatly reduce their feed intake capacity. Failure to consume sufficient food, especially during the phase of peak egg production, jeopardises the hens' nutrient supply. In practice this often leads to weight loss, reduced production and increased susceptibility to disease. **Young flocks should therefore be introduced gradually to using the outdoor areas. It is essential to ensure that the hens consume sufficient food despite the availability of pasture.**

Perimeter fence

A solid perimeter fence for the range is a one-off investment that is definitely worthwhile. Outdoor enclosures must be capable of keeping foxes, stray cats and dogs, polecats and martens out. A two metre high fence provides protection from predators. An external electric fence can increase the level of protection.

CLEANING AND DISINFECTION

As soon as the hens have been moved out it is advisable to treat walls and ceilings with insecticides while the building is still warm. Then all portable equipment (drinkers, feeders) should be taken outside. Litter and droppings must be disposed of. All litter must be removed and spread as far away from the building as possible (> 1 km). Prior to the cleaning operation (24 h) the entire interior of the building, including walls, ceilings and the remaining furniture, should be soaked. Fat- and protein-dissolving substances should be used for this purpose. The room should then be cleaned with pressure washers, starting with the ceiling and working down towards the floor. Special attention should be paid to ventilation elements, pipework, edges and tops of beams. The room should we well lit during the cleaning operation so that dirt deposits are clearly visible. After washing, all surfaces and equipment should be rinsed with clean water. Stabilising materials such as wood chips or similar should be removed from the outdoor area adjacent to the laying house and replaced at the same time as the litter. The furniture that was taken outside and the external carcass of the building including any concrete surfaces should be washed down. Dirty drinkers are potential hazard sources and must therefore be cleaned and disinfected. Drinker lines should be thoroughly flushed out after disinfection. Disinfectant residues in drinkers should be avoided. Any leftover feed should be removed from the farm. All parts of the feeding installation and the feed silo should be thoroughly cleaned, washed and disinfected.

CONCLUDING REMARKS

We appreciate customer feedback about which management recommendations have proved effective in practice or about any different procedures that have produced even better results.

PERFORMANCE GOALS FOR ALTERNATIVE HOUSING

LSL - CLASSIC Layers

Age in Weeks	Egg No. per H.H.	Rate of Lay in %		Egg Weight (g)		Egg mass g/H.D. kg/H.H.	
	cumu-lative	per H.H.	per H.D.	in the Week	cumu-lative	in the Week	cumu-lative
20	1.1	15.0	15.0	42.7	50.0	6.4	0.04
21	4.2	45.0	45.0	46.6	45.6	21.0	0.19
22	8.4	60.0	60.1	49.1	47.4	29.5	0.40
23	13.4	72.0	72.1	52.1	49.1	37.6	0.66
24	19.2	82.0	82.2	54.2	50.6	44.5	0.97
25	25.3	88.0	88.2	56.0	52.0	49.4	1.32
26	31.7	91.5	91.8	57.5	53.1	52.8	1.69
27	38.2	92.7	93.0	58.4	54.0	54.4	2.06
28	44.8	93.2	93.6	59.1	54.7	55.3	2.45
29	51.3	93.4	93.8	59.6	55.4	55.9	2.84
30	57.8	93.5	94.0	60.0	55.9	56.4	3.23
31	64.4	93.5	94.1	60.4	56.3	56.8	3.63
32	70.9	93.4	94.1	60.8	56.8	57.2	4.03
33	77.5	93.3	94.1	61.2	57.1	57.6	4.43
34	84.0	93.2	94.0	61.6	57.5	57.9	4.83
35	90.5	93.0	93.9	61.9	57.8	58.1	5.23
36	97.0	92.8	93.8	62.2	58.1	58.4	5.63
37	103.5	92.6	93.7	62.5	58.4	58.6	6.04
38	109.9	92.3	93.5	62.7	58.6	58.6	6.44
39	116.4	92.0	93.3	62.9	58.9	58.7	6.85
40	122.8	91.7	93.1	63.1	59.1	58.7	7.25
41	129.2	91.4	92.9	63.2	59.3	58.7	7.66
42	135.6	91.0	92.6	63.3	59.5	58.6	8.06
43	141.9	90.6	92.3	63.4	59.6	58.5	8.46
44	148.2	90.1	91.8	63.5	59.8	58.3	8.86
45	154.5	89.6	91.4	63.6	60.0	58.1	9.26
46	160.7	89.1	91.0	63.7	60.1	58.0	9.66
47	166.9	88.5	90.5	63.8	60.2	57.7	10.06
48	173.1	87.9	90.0	63.9	60.4	57.5	10.45
49	179.2	87.3	89.4	64.0	60.5	57.2	10.84
50	185.2	86.7	88.9	64.1	60.6	57.0	11.23

Age in Weeks	Egg No. per H.H.	Rate of Lay in %		Egg Weight (g)		Egg mass g/H.D. kg/H.H.	
	cumu-lative	per H.H.	per H.D.	in the Week	cumu-lative	in the Week	cumu-lative
51	191.3	86.1	88.4	64.2	60.7	56.8	11.62
52	197.3	85.5	88.0	64.3	60.8	56.6	12.00
53	203.2	84.9	87.5	64.4	60.9	56.3	12.38
54	209.1	84.3	87.0	64.5	61.0	56.1	12.76
55	215.0	83.7	86.5	64.6	61.1	55.9	13.14
56	220.8	83.0	85.9	64.7	61.2	55.6	13.52
57	226.5	82.3	85.3	64.8	61.3	55.3	13.89
58	232.2	81.6	84.7	64.9	61.4	55.0	14.26
59	237.9	80.9	84.1	65.0	61.5	54.7	14.63
60	243.5	80.2	83.5	65.1	61.6	54.4	15.00
61	249.1	79.5	82.9	65.2	61.7	54.1	15.36
62	254.6	78.8	82.3	65.3	61.7	53.8	15.72
63	260.1	78.1	81.7	65.4	61.8	53.5	16.08
64	265.5	77.4	81.1	65.5	61.9	53.1	16.43
65	270.9	76.7	80.5	65.6	62.0	52.8	16.78
66	276.2	76.0	79.9	65.7	62.0	52.5	17.13
67	281.4	75.3	79.3	65.8	62.1	52.2	17.48
68	286.7	74.6	78.7	65.9	62.2	51.9	17.82
69	291.8	73.8	78.0	66.0	62.2	51.5	18.17
70	296.9	73.0	77.2	66.1	62.3	51.1	18.50
71	302.0	72.2	76.5	66.2	62.4	50.7	18.84
72	307.0	71.4	75.8	66.3	62.4	50.3	19.17
73	311.9	70.6	75.1	66.4	62.5	49.8	19.50
74	316.8	69.8	74.3	66.5	62.6	49.4	19.82
75	321.7	69.0	73.6	66.6	62.6	49.0	20.14
76	326.4	68.2	72.9	66.7	62.7	48.6	20.46
77	331.1	67.4	72.1	66.8	62.7	48.2	20.78
78	335.8	66.5	71.3	66.9	62.8	47.7	21.09
79	340.4	65.6	70.4	67.0	62.9	47.2	21.40
80	344.9	64.7	69.6	67.1	62.9	46.7	21.70

LOHMANN BROWN CLASSIC Layers

Age in Weeks	Egg No. per H.H.	Rate of Lay in %		Egg Weight (g)		Egg mass g/H.D.	kg/H.H.
	cumu-lative	per H.H.	per H.D.	in the Week	cumu-lative	in the Week	cumu-lative
20	1.4	20.0	20.0	45.0	45.0	9.0	0.06
21	4.2	40.0	40.0	47.5	46.7	19.0	0.20
22	8.4	60.0	60.1	50.0	48.3	30.1	0.41
23	13.7	75.0	75.2	52.5	49.9	39.5	0.68
24	19.6	85.0	85.3	54.7	51.4	46.7	1.01
25	25.9	90.0	90.5	56.5	52.6	51.1	1.36
26	32.3	92.0	92.6	57.9	53.7	53.6	1.74
27	38.8	92.6	93.3	58.9	54.5	54.9	2.12
28	45.3	92.8	93.5	59.7	55.3	55.8	2.51
29	51.8	93.0	93.8	60.4	55.9	56.7	2.90
30	58.3	92.8	93.7	61.0	56.5	57.2	3.29
31	64.8	92.6	93.6	61.4	57.0	57.5	3.69
32	71.3	92.4	93.5	61.7	57.4	57.7	4.09
33	77.7	92.2	93.4	62.0	57.8	57.9	4.49
34	84.2	91.9	93.2	62.3	58.1	58.1	4.89
35	90.6	91.6	93.0	62.6	58.5	58.2	5.29
36	97.0	91.3	92.8	62.9	58.7	58.4	5.70
37	103.3	91.0	92.6	63.2	59.0	58.5	6.10
38	109.7	90.7	92.4	63.4	59.3	58.6	6.50
39	116.0	90.4	92.2	63.6	59.5	58.6	6.90
40	122.3	90.0	91.8	63.8	59.7	58.6	7.31
41	128.6	89.6	91.5	64.0	59.9	58.6	7.71
42	134.8	89.2	91.2	64.2	60.1	58.6	8.11
43	141.0	88.8	90.9	64.4	60.3	58.5	8.51
44	147.2	88.4	90.6	64.6	60.5	58.5	8.91
45	153.4	88.0	90.3	64.8	60.7	58.5	9.31
46	159.5	87.5	89.8	65.0	60.8	58.4	9.71
47	165.6	87.0	89.4	65.2	61.0	58.3	10.10
48	171.7	86.5	89.0	65.4	61.2	58.2	10.50
49	177.7	86.0	88.6	65.6	61.3	58.1	10.89
50	183.7	85.5	88.1	65.8	61.5	58.0	11.29

Age in Weeks	Egg No. per H.H.	Rate of Lay in %		Egg Weight (g)		Egg mass g/H.D. kg/H.H.	
	cumu-lative	per H.H.	per H.D.	in the Week	cumu-lative	in the Week	cumu-lative
51	189.6	85.0	87.7	65.9	61.6	57.8	11.68
52	195.5	84.4	87.2	66.0	61.7	57.5	12.07
53	201.4	83.8	86.7	66.1	61.9	57.3	12.46
54	207.2	83.2	86.1	66.2	62.0	57.0	12.84
55	213.0	82.5	85.5	66.3	62.1	56.7	13.23
56	218.7	81.8	84.9	66.4	62.2	56.3	13.61
57	224.4	81.1	84.2	66.5	62.3	56.0	13.98
58	230.0	80.4	83.6	66.6	62.4	55.7	14.36
59	235.6	79.7	82.9	66.7	62.5	55.3	14.73
60	241.1	78.9	82.2	66.8	62.6	54.9	15.10
61	246.6	78.1	81.4	66.9	62.7	54.5	15.46
62	252.0	77.3	80.7	67.0	62.8	54.1	15.83
63	257.4	76.5	79.9	67.1	62.9	53.6	16.19
64	262.7	75.7	79.2	67.2	63.0	53.2	16.54
65	267.9	74.9	78.4	67.3	63.1	52.8	16.90
66	273.1	74.0	77.6	67.4	63.1	52.3	17.24
67	278.2	73.1	76.7	67.5	63.2	51.8	17.59
68	283.2	72.1	75.7	67.6	63.3	51.2	17.93
69	288.2	71.1	74.8	67.7	63.4	50.6	18.27
70	293.1	70.1	73.8	67.8	63.5	50.0	18.60
71	298.0	69.1	72.8	67.9	63.5	49.4	18.93
72	302.7	68.1	71.8	68.0	63.6	48.8	19.25
73	307.4	67.0	70.7	68.1	63.7	48.2	19.57
74	312.0	65.8	69.6	68.2	63.7	47.4	19.89
75	316.5	64.5	68.3	68.3	63.8	46.6	20.20
76	321.0	63.1	66.8	68.4	63.9	45.7	20.50
77	325.3	61.6	65.3	68.5	63.9	44.7	20.79
78	329.5	60.1	63.8	68.6	64.0	43.8	21.08
79	333.6	58.6	62.3	68.7	64.0	42.8	21.36
80	337.6	57.1	60.7	68.8	64.1	41.8	21.64

LOHMANN TRADITION Layers

Age in Weeks	Egg No. per H.H.	Rate of Lay in %		Egg Weight (g)		Egg mass g/H.D. kg/H.H.	
	cumu-lative	per H.H.	per H.D.	in the Week	cumu-lative	in the Week	cumu-lative
20	2.9	33.0	33.0	51.0	50.2	16.8	0.14
21	6.7	54.0	54.1	54.0	52.4	29.2	0.35
22	11.4	68.0	68.1	56.0	53.9	38.1	0.61
23	16.9	79.0	79.2	57.5	55.1	45.5	0.93
24	23.0	86.0	86.2	58.7	56.0	50.6	1.29
25	29.2	88.7	89.0	59.7	56.8	53.1	1.66
26	35.5	90.0	90.3	60.5	57.5	54.6	2.04
27	41.8	90.7	91.1	61.1	58.0	55.6	2.43
28	48.2	91.3	91.7	61.6	58.5	56.5	2.82
29	54.6	91.6	92.1	62.0	58.9	57.1	3.22
30	61.1	91.9	92.5	62.4	59.3	57.7	3.62
31	67.5	92.1	92.7	62.8	59.6	58.2	4.02
32	73.9	92.0	92.7	63.1	59.9	58.5	4.43
33	80.4	91.9	92.7	63.4	60.2	58.8	4.84
34	86.8	91.5	92.4	63.7	60.4	58.9	5.25
35	93.2	91.1	92.1	64.0	60.7	59.0	5.65
36	99.5	90.6	91.7	64.3	60.9	59.0	6.06
37	105.8	90.1	91.3	64.6	61.1	59.0	6.47
38	112.1	89.6	90.9	65.1	61.4	59.2	6.88
39	118.3	89.0	90.4	65.3	61.6	59.0	7.28
40	124.5	88.4	89.8	65.5	61.8	58.8	7.69
41	130.6	87.8	89.3	65.7	62.0	58.7	8.09
42	136.7	87.2	88.8	65.9	62.1	58.5	8.50
43	142.8	86.5	88.2	66.1	62.3	58.3	8.90
44	148.8	85.8	87.6	66.3	62.5	58.0	9.29
45	154.8	85.1	86.9	66.5	62.6	57.8	9.69
46	160.7	84.4	86.3	66.7	62.8	57.6	10.08
47	166.5	83.7	85.7	66.9	62.9	57.3	10.48
48	172.3	83.0	85.0	67.1	63.0	57.1	10.87
49	178.1	82.3	84.4	67.3	63.2	56.8	11.25
50	183.8	81.6	83.8	67.4	63.3	56.5	11.64

Age in Weeks	Egg No. per H.H.	Rate of Lay in %		Egg Weight (g)		Egg mass g/H.D. kg/H.H.	
	cumu-lative	per H.H.	per H.D.	in the Week	cumu-lative	in the Week	cumu-lative
51	189.5	80.8	83.1	67.5	63.4	56.1	12.02
52	195.1	80.0	82.4	67.6	63.6	55.7	12.40
53	200.6	79.2	81.7	67.7	63.7	55.3	12.77
54	206.1	78.4	81.0	67.8	63.8	54.9	13.15
55	211.5	77.6	80.3	67.9	63.9	54.5	13.52
56	216.9	76.8	79.6	68.0	64.0	54.1	13.88
57	222.2	76.0	78.9	68.1	64.1	53.7	14.24
58	227.5	75.2	78.2	68.2	64.2	53.3	14.60
59	232.7	74.4	77.5	68.3	64.3	52.9	14.96
60	237.9	73.6	76.8	68.4	64.4	52.5	15.31
61	242.9	72.8	76.1	68.5	64.5	52.1	15.66
62	248.0	72.0	75.4	68.6	64.5	51.7	16.01
63	253.0	71.2	74.6	68.7	64.6	51.3	16.35
64	257.9	70.3	73.8	68.8	64.7	50.8	16.69
65	262.8	69.4	73.0	68.9	64.8	50.3	17.02
66	267.5	68.5	72.1	69.0	64.9	49.8	17.35
67	272.3	67.6	71.3	69.1	64.9	49.3	17.68
68	276.9	66.7	70.5	69.2	65.0	48.8	18.00
69	281.6	65.8	69.6	69.3	65.1	48.3	18.32
70	286.1	64.9	68.8	69.4	65.1	47.7	18.64
71	290.6	64.0	67.9	69.5	65.2	47.2	18.95
72	295.0	63.1	67.1	69.6	65.3	46.7	19.25
73	299.3	62.2	66.2	69.7	65.3	46.2	19.56
74	303.6	61.3	65.4	69.8	65.4	45.6	19.86
75	307.9	60.4	64.5	69.9	65.5	45.1	20.15
76	312.0	59.5	63.7	70.0	65.5	44.6	20.44
77	316.1	58.6	62.8	70.1	65.6	44.0	20.73
78	320.2	57.7	61.9	70.2	65.6	43.5	21.02
79	324.1	56.8	61.1	70.3	65.7	42.9	21.30
80	328.1	55.9	60.2	70.3	65.8	42.3	21.57

LOHMANN SILVER Layers

Age in Weeks	Egg No. per H.H.	Rate of Lay in %		Egg Weight (g)		Egg mass g/H.D.	kg/H.H.
	cumu-lative	per H.H.	per H.D.	in the Week	cumu-lative	in the Week	cumu-lative
20	0,7	10,0	10,0	44,5	44,5	4,4	0,03
21	3,8	45,0	45,0	47,0	46,5	21,2	0,18
22	8,6	67,8	67,9	49,3	48,1	33,5	0,41
23	14,3	81,8	81,9	51,2	49,3	41,9	0,71
24	20,5	87,7	88,0	53,0	50,4	46,6	1,03
25	26,8	90,7	91,0	54,7	51,4	49,8	1,38
26	33,3	92,2	92,6	56,2	52,4	52,0	1,74
27	39,7	92,5	92,9	57,4	53,2	53,3	2,11
28	46,2	92,6	93,1	58,3	53,9	54,3	2,49
29	52,7	92,7	93,3	58,9	54,5	54,9	2,87
30	59,2	92,6	93,3	59,3	55,0	55,3	3,26
31	65,7	92,4	93,1	59,6	55,5	55,5	3,64
32	72,1	92,1	92,9	59,9	55,9	55,7	4,03
33	78,5	91,8	92,7	60,2	56,2	55,8	4,42
34	85,0	91,5	92,4	60,5	56,6	55,9	4,80
35	91,3	91,1	92,1	60,8	56,9	56,0	5,19
36	97,7	90,7	91,8	61,1	57,1	56,1	5,58
37	104,0	90,3	91,4	61,4	57,4	56,1	5,97
38	110,3	89,9	91,1	61,6	57,6	56,1	6,36
39	116,6	89,5	90,8	61,8	57,9	56,1	6,74
40	122,8	89,0	90,3	62,0	58,1	56,0	7,13
41	129,0	88,5	89,9	62,2	58,3	55,9	7,52
42	135,2	88,0	89,5	62,4	58,5	55,8	7,90
43	141,3	87,5	89,0	62,6	58,6	55,7	8,28
44	147,4	87,0	88,6	62,8	58,8	55,6	8,67
45	153,4	86,5	88,1	63,0	59,0	55,5	9,05
46	159,5	86,0	87,7	63,2	59,1	55,4	9,43
47	165,4	85,4	87,1	63,4	59,3	55,2	9,81
48	171,4	84,8	86,6	63,6	59,4	55,1	10,19
49	177,3	84,2	86,1	63,8	59,6	54,9	10,56
50	183,1	83,6	85,5	64,0	59,7	54,7	10,94

Age in Weeks	Egg No. per H.H.	Rate of Lay in %		Egg Weight (g)		Egg mass g/H.D. kg/H.H.	
	cumu-lative	per H.H.	per H.D.	in the Week	cumu-lative	in the Week	cumu-lative
51	188,9	83,1	85,0	64,2	59,9	54,5	11,31
52	194,7	82,5	84,4	64,4	60,0	54,4	11,68
53	200,4	81,9	83,9	64,5	60,1	54,1	12,05
54	206,1	81,3	83,3	64,6	60,2	53,8	12,42
55	211,8	80,7	82,8	64,7	60,4	53,6	12,78
56	217,4	80,0	82,1	64,8	60,5	53,2	13,15
57	222,9	79,3	81,5	64,9	60,6	52,9	13,51
58	228,4	78,6	80,8	65,0	60,7	52,5	13,86
59	233,9	77,9	80,2	65,1	60,8	52,2	14,22
60	239,3	77,2	79,6	65,2	60,9	51,9	14,57
61	244,6	76,5	78,9	65,3	61,0	51,5	14,92
62	249,9	75,8	78,3	65,4	61,1	51,2	15,27
63	255,2	75,1	77,6	65,5	61,2	50,9	15,61
64	260,4	74,4	77,0	65,6	61,3	50,5	15,95
65	265,6	73,7	76,4	65,7	61,4	50,2	16,29
66	270,7	73,0	75,7	65,8	61,4	49,8	16,63
67	275,7	72,2	75,0	65,9	61,5	49,4	16,96
68	280,7	71,4	74,2	66,0	61,6	49,0	17,29
69	285,7	70,6	73,5	66,1	61,7	48,6	17,62
70	290,5	69,8	72,7	66,2	61,8	48,1	17,94
71	295,4	69,0	71,9	66,3	61,8	47,7	18,26
72	300,1	68,2	71,2	66,4	61,9	47,3	18,58
73	304,9	67,3	70,3	66,5	62,0	46,8	18,89
74	309,5	66,4	69,5	66,6	62,0	46,3	19,20
75	314,1	65,5	68,6	66,7	62,1	45,7	19,51
76	318,6	64,6	67,7	66,8	62,2	45,2	19,81
77	323,1	63,7	66,9	66,9	62,2	44,7	20,11
78	327,5	62,8	66,0	67,0	62,3	44,2	20,40
79	331,8	61,9	65,1	67,1	62,4	43,7	20,69
80	336,1	61,0	64,2	67,2	62,4	43,2	20,98

BODYWEIGHT DEVELOPMENT COMMERCIAL LAYERS

Age in weeks	Bodyweight in g			
	LSL Classic	LB Classic	Lohmann Tradition	Lohmann Silver
17	1214	1400	1426	1445
18	1264	1475	1502	1520
19	1322	1555	1584	1600
20	1386	1640	1670	1680
21	1450	1711	1743	1750
22	1500	1790	1823	1827
23	1540	1830	1864	1865
24	1580	1870	1905	1904
25	1610	1885	1920	1919
26	1630	1900	1935	1934
27	1650	1905	1940	1939
28	1670	1911	1946	1944
29	1690	1915	1950	1948
30	1700	1920	1956	1953
31	1705	1923	1959	1956
32	1710	1925	1961	1958
33	1713	1928	1964	1961
34	1715	1931	1967	1963
35	1718	1933	1969	1965
36	1720	1935	1971	1968
37	1723	1938	1974	1970
38	1725	1940	1976	1973
39	1728	1943	1979	1975
40	1730	1945	1981	1977
41	1733	1948	1984	1980
42	1735	1951	1987	1983
43	1738	1953	1989	1985
44	1740	1955	1991	1987
45	1743	1958	1994	1990
46	1745	1960	1996	1992
47	1748	1963	1999	1994
48	1750	1965	2001	1997
49	1751	1968	2004	2000
50	1753	1971	2008	2002

Age in weeks	Bodyweight in g			
	LSL Classic	LB Classic	Lohmann Tradition	Lohmann Silver
51	1754	1973	2010	2004
52	1755	1975	2012	2007
53	1756	1978	2015	2009
54	1758	1980	2017	2011
55	1759	1984	2019	2015
56	1760	1985	2020	2016
57	1761	1989	2022	2020
58	1763	1991	2028	2022
59	1764	1993	2030	2024
60	1765	1995	2032	2026
61	1766	1998	2035	2029
62	1768	2000	2037	2031
63	1769	2003	2040	2033
64	1770	2005	2042	2036
65	1771	2008	2045	2038
66	1773	2011	2048	2041
67	1774	2013	2050	2043
68	1775	2015	2052	2046
69	1776	2018	2055	2048
70	1778	2020	2057	2050
71	1779	2023	2060	2053
72	1780	2025	2063	2055
73	1781	2028	2066	2058
74	1783	2031	2069	2061
75	1784	2033	2071	2063
76	1785	2035	2073	2065
77	1786	2038	2076	2067
78	1788	2040	2078	2070
79	1789	2043	2081	2072
80	1790	2045	2083	2075

How Lohmann Tierzucht 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

For advice and diagnostic testing in all aspects of poultry health contact:

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