LOHMANN TRADITION PRACTICAL EXPERIENCES AND FUTURE PROSPECTS

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Changing consumer preferences and regulatory requirements, along with biological constraints are among the key factors which determine breeding goals. Growing customer demand for eggs from floor and free-range systems in recent years has increased the requirement for hens that are specially adapted to these management systems.

Along with a strong plumage and docile behaviour, commercial producers demand above-average egg weights. The higher energy requirement of hens in alternative management systems leads to a reduction in egg weight unless the shortfall is made up by increased feed consumption or by raising the energy density of the diet. In the past bodyweight and feed intake capacity of laying hens were continuously reduced in an effort to improve feed conversion rate and hence reduce production costs per egg. Attempts to increase feed consumption in the short term to cover supply deficits, especially at the onset of production, often fail on commercial farms. The consequence may be weight loss at an age when the hens should still be gaining weight. This is associated with physiological stresses which impose a heavy strain on the metabolism and may increase susceptibility to disease. Until these stress factors can be identified and alleviated by changes in management and feeding practices, the birds are at high risk of sustaining permanent damage. Poor egg weight is the least of the problems encountered. Far more serious consequences are feather loss and coli infections because these may also be associated with rising losses due to cannibalism.

The traditional demand by the market for more eggs of weight classes L and XL, especially from alternative systems, has lost its significance under current market conditions. In particular, inadequate shell strength in some lines towards the end of the production period has led to major technical problems among producers and marketers. Specific management measures via lighting programmes, ration adjustments and feeding restrictions to reduce the late increase in egg weight are often impracticable under alternative systems. Battery systems provide more opportunities for using these control tools efficiently and hence adapting egg weight more closely to market requirements.

Due to biological constraints, several years often elapse between adjustments in breeding programmes and their realisation in the end product; there is therefore always a danger that the products cannot be accurately matched to short-term market conditions. But required adaptation processes assume that the desired changes in the product specification can be implemented within one or two generations. As all performance and behavioural characteristics are subject to complex interactions and nature always seeks a biological equilibrium, continuity and time are needed to implement product adjustments.

Under current market conditions, metabolic stability and plumage along with docile behaviour continue to be valid selection priorities. As regards egg size, requirements have changed considerably, with the exception of direct marketers who always insist on L and XL eggs. At present, more added value can be achieved with class M eggs than with eggs of class L, both in battery and in alternative systems. In order to successfully cover both market segments, two breeding products with a different genetic disposition for egg size would currently be needed.

Energy requirement of laying hens

In order to ensure metabolic stability of laying hens and reduce their general susceptibility to stress, producers are increasingly looking for hens with a higher bodyweight. But heavier hens must eat more every day to maintain their bodyweight.

The energy requirement of a laying hen is determined by the maintenance requirement, which is linked to liveweight, the requirement for egg formation and the requirement for liveweight gain. Egg formation accounts for the largest proportion of a hen's energy requirement. The increase in body mass in the course of the laying period plays a secondary role.

The maintenance requirement includes the basal metabolism, which is defined as the energy requirement at rest, while fasting and under themoneutral conditions. Also included is the energy required for eating and digestion, motor activity and maintenance of body temperature. This implies that the maintenance requirement of laying hens in cage systems differs from that of free-range hens, not only because of the far greater freedom of movement of free-range hens, but also because the latter expend more energy on heat formation and on conduction and on eating.

In addition, the energy required for maintaining body temperature is greatly influenced by the condition of the plumage. The requirement for metabolisable energy for maintenance in laying hens has been set by the GfE at 480 kJ/kg $W^{0,75}$ per day (1999), assuming an ambient temperature of 15 to 28°C. The energy requirement for egg formation is dependent on the composition of the egg. The energy content per g of egg mass is not constant during the course of the laying period. It is determined by the ratio of egg yolk to albumen and by the dry matter content of the two fractions.

The energy requirement for maintenance and production for laying hens in cage systems can be calculated according to the following formula:

$$AME_N \text{ (kJ/d)} = (480 + (15\text{-}UT) \times 7) \times W^{0.75} + 23\,\Delta W + 9{,}6 \times EM$$

EM = daily egg mass (g)
W = liveweight (kg)
$W^{0.75}$ = metabolic bodyweight
UT = ambient temperature
ΔW = liveweight change

Assuming a constant ambient temperature within the optimal range and a constant bodyweight, the equation can be reduced to:

$$AME_N \text{ (kJ/d)} = 480 \times W^{0.75} + 9{,}6 \times EM$$

In order to allow for the greater energy needs under alternative management systems, the energy requirement should be increased by 10 % for floor-reared hens and by 15 % for free-range hens. These figures are recommendations only and are not backed by accurate measurements.

As ambient temperatures in floor and free-range systems can fall considerably below the optimum range during the winter months, feeding capacity and feed supply have to be flexible to maintain a constant level of production. For example, if the ambient temperature falls by 10°C, the maintenance requirement rises by 15 %. This implies that for the same level of production the feed intake needs to be raised by about 10 g to maintain body temperature.

As can be seen from Table 1, a hen weighing 2.2 kg needs 10 % more energy and feed than a hen weighing 1.8 kg under the same management system. If we compare the requirement of a light cage-reared hen with that of a heavy free-range hen, the additional energy requirement is 20 %. For heavy hens in free-range systems to produce an egg mass of 60 g per day requires almost 30 % more energy than that needed by cage-reared hens for an egg mass of 50 g per day.

Table 1: Relative energy requirement of laying hens in relation to egg mass production, bodyweight and management system

Egg mass g/day	Bodyweight 1800 g			Bodyweight 2200 g		
	Cage	Floor	Free-range	Cage	Floor	Free-range
40	92	98	102	102	109	112
45	96	102	105	106	113	116
50	**100**	106	109	110	117	120
55	104	110	113	114	121	124
60	108	114	117	118	124	128
65	111	118	121	121	128	132

Cage, 50 g egg mass per day and 1800 g bodyweight = 100 %

These data demonstrate that direct marketers operating a free-range system who want heavy table hens and large eggs must expect a 30 % higher feed input to achieve the required performance profile.

Heavy free-range hens, even at a low level of production, have an energy requirement equivalent to that of a high-performance flock in cages (Fig. 1). Irrespective of the management system, a safety margin in the form of a higher bodyweight as a buffer for stress and deficiency situations must be bought with a 10 to 15 % higher feed intake. We do not know exactly how much higher the energy requirement is in free-range systems compared with cage systems for an identical level of production and an identical bodyweight. The figure of 10 to 15 % is an estimate (GfE, 1999) and is not backed by extensive scientific research.

Practical experiences with LOHMANN TRADITION

Compared with LOHMANN BROWN, LOHMANN TRADITION can be expected to produce heavier eggs, with a slightly reduced laying intensity. The more docile behaviour and, consequently, the lower risk of cannibalism and feather pecking reduces the loss rate in alternative systems, which more than makes up for shortfalls in the laying rate. Adaptability in feed intake and above-average egg weights even at lower dietary nutrient densities result in excellent feed conversion.

Figure 1: Energy requirement of laying hens: 1800 g bodyweight, cage-reared 2200 g bodyweight, free-range

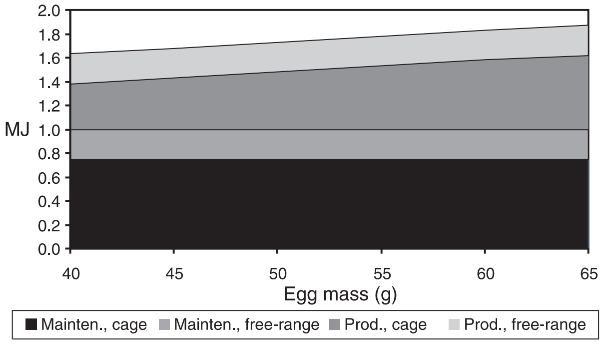


Table 2 shows that the test group at Haus Düsse finished with an excellent feed conversion. Both bodyweight and shell strength are on average for brown-egg layers. The shell colour of first generation LOHMANN TRADITION hens still leaves room for improvement.

Table 2: Random sample test Haus Düsse 1997 - 99

Trait	Average brown-egger	LOHMANN BROWN	LOHMANN TRADITION
Age at 50 %	147	146	144
No. of eggs/H.D.	322	320	316
Egg weight, g	63.5	62.5	65.6
Egg mass, kg/H.H.	20.12	19.75	20.08
Feed conversion, kg/kg	2.00	1.96	1.86
Bodyweight, g	1994	1953	1875
Shell strength, N	40.6	42.4	40.3
Albumen height	81.1	81.4	85.8
Shell colour	23.7	21.1	27.9
IOFC*	16.08	16.12	17.19

* IOFC = 1.60 x egg mass - 0.40 x egg mass x feed conversion

In order to gather extensive practical experiences with the new breed LOHMANN TRADITION, flocks were housed in various research stations and many commercial farms in 1999.

The performance data for individual flocks available so far are depicted in Figures 2 and 3.

Figure 2: Egg production (H.D.) of LOHMANN TRADITION (data from about 50,000 hens)

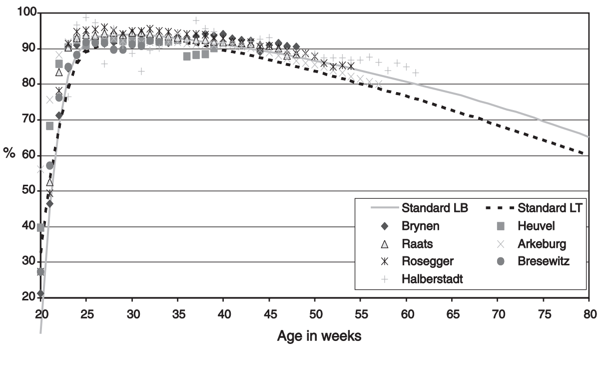
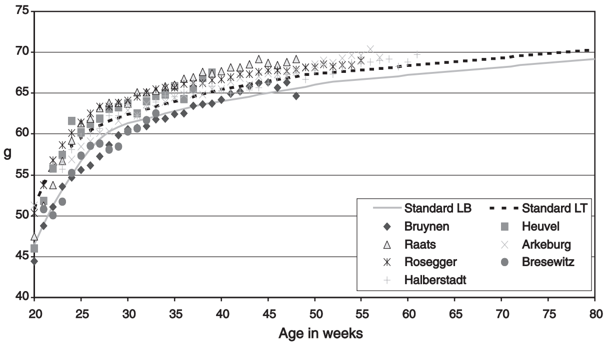


Figure 3: Egg weight (g) of LOHMANN TRADITION (data from about 50,000 hens)



For comparison, Figure 2 shows the standard egg production curves for LOHMANN BROWN and LOHMANN TRADITION. With few exceptions, the laying rate in all flocks exceeds the standard of LOHMANN TRADITION and fluctuates evenly around the standard curve of LOHMANN BROWN.

With the exception of one flock, the egg weight was well above the standard of LOHMANN BROWN, even at the start of production (Fig. 3). The vast majority of the flocks even exceeded the standard egg weight curve of LOHMANN TRADITION. Despite floor management and the associated higher energy requirement, the hens adjust their feed intake as required and convert it into eggs of above-average size.

Selection priorities

Similar to LOHMANN BROWN, the breeding strategy for LOHMANN TRADITION focuses on increasing the number of saleable eggs per hen housed.

Special attention is paid to docile behaviour and shell quality. Group cage tests have shown marked differences in behaviour and losses due to cannibalism not only between lines but also between families.

Figures 4 and 5 compare losses due to cannibalism per family among non-debeaked hens at high light intensity.

Figure 4: Losses per family for line 1 as a result of cannibalism among non-debeaked hens at high light intensity

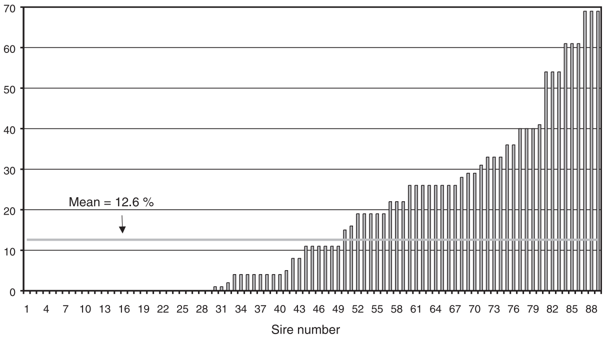
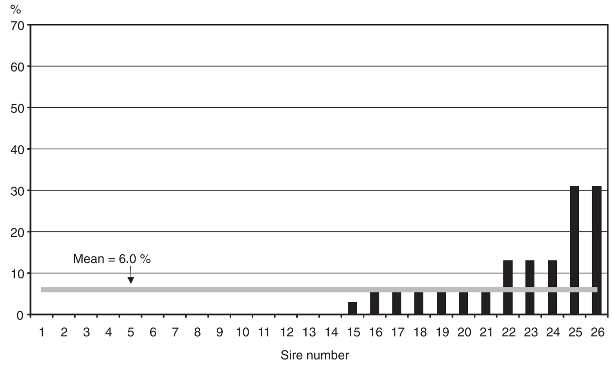


Figure 5: Losses per family for line 2 as a result of cannibalism among non-debeaked hens at high light intensity



Whereas in line 1 (Fig. 4) 12 % of the hens on average had to be prematurely removed from the groups as a result of cannibalism, only 6 % of the hens in line 2 were affected (Fig. 5). It became apparent that within the lines few families exhibit extreme values in excess of 10 %. In Figure 4 the extremes range from over 50 % to 70 %.

This illustrates that it is not only line selection but also strict selection within lines which can contribute to a reduction in the indicence of cannibalism. Preference should be given to direct selection with testing of individual families rather than indirect selection for a higher bodyweight. There is no firm correlation within the lines between bodyweight and the cull rate as a result of cannibalism. This eliminates indirect selection for higher bodyweights as a long-term strategy for reducing cannibalism.

Conclusion

The energy requirement of hens housed in floor and free-range systems is considerably higher than in cage systems. The actual requirement for the same level of production is determined by the ambient temperature and the condition of the hens' plumage.

In order to achieve rapidly rising egg weights at the start of production, the hens' feed intake must be maximised. As genetically heavier hens have a higher maintenance requirement the danger of an energy deficit at the start of production is greater than in hens with a lower bodyweight.

Direct selection for a performance-related feed intake at the onset of production reduces the risk of metabolic strain as a result of an energy deficit. From a management point of view every effort should be made to ensure that the feed intake rises as fast as possible at the start of production. In addition to the structure of the feed, its composition also plays a major role.

The high flexibility in the feed intake capacity of LOHMANN TRADITION hens is reflected in very good egg weights at the start of production. As the hens are very efficient at converting feed into egg mass there is no appreciable difference in bodyweight between LOHMANN TRADITION and LOHMANN BROWN.

Preference is given to direct selection against losses and for a stronger plumage of the hens as opposed to indirect selection for a higher bodyweight. In order to improve shell colour and strength, the proven testing procedures established for LOHMANN BROWN and LOHMANN LSL are used throughout and implemented in the selection process.

References

GfE 1999: Empfehlungen zur Energie- und Nährstoffversorgung der Legehennen und Masthühner (Broiler), DLG-Verlag