

# Wide range of housing options for layers



**Since the introduction of cages, egg producers have a wide range of options to choose from when deciding how to house their laying hens. For a long time, cages have been the standard, but changes in consumer demand have prompted the use of alternatives.**

By Jan Hulzebosch, *International Poultry Training Centre (PTC<sup>+</sup>) Barneveld, The Netherlands*  
([j.hulzebosch@ptcplus.com](mailto:j.hulzebosch@ptcplus.com))

The majority of all commercial layers in the world are kept in confined housing systems with light control, power ventilation, mechanical feeding and, often, automatic egg collection. Initially, laying hens were kept on the floor in a free range environment. During the past century, many alternative systems have been developed, but no system has become as popular as the battery cage. This system became popular because it proved to be the best option for disease prevention. The fact that these cages were made of mesh wire, accommodating as many as four to seven birds per compartment, with no space to satisfy the natural needs like sand bathing and wing flapping, made people question whether this was an ethically acceptable system. The EU decided to ban the traditional cage system and in the USA fast food chains, together with the egg

producers, have also set minimum standards. The EU ban on cages prompted the development of various alternatives. Most of these systems are modifications of what was developed many, many years ago. Thanks to new insights and technology, floor systems and aviary systems were redesigned to meet current economical standards. Several of these systems have proven to be viable and fit for commercial use. As a result, today's egg producer has a choice of three main systems in housing layers: floor, aviary and cage systems.

## Floor systems

Floor systems combine the use of litter material and wire, wooden or plastic slats. The birds have freedom to move around and practise their natural behaviour, but have no access under the slatted floor areas. Depending the litter/floor ratio, different densities can be used. Systems most often used in this group are:

- full litter system: the whole floor surface is covered with litter.
- partial floor system: a combination of litter and floor (wire, wooden or plastic slats). Manure can be stored under the slatted floor for a certain period of time, depending on the depth of the 'droppings pit'. Common floor/litter ratios are:
  - 1/3 wire or slats: 2/3 litter
  - 1/2 wire or slats: 1/2 litter
  - 2/3 wire or slats: 1/3 litter.

The higher the proportion of slats, the higher the density can be.

- full floor system: the whole floor sur-

## EU standards for laying hens kept in different housing systems

### Floor housing systems and aviary systems:

- eating space of at least 10 cm/bird for a long feeder; 4 cm/bird for a round feeder
- drinking space of at least 2.5 cm per bird for a long drinker; 1 cm per bird for a round drinker
- at least 1 drink cup per 10 birds
- at least 1 individual laying nest per 7 birds or 1 m<sup>2</sup> laying nest per 120 birds
- at least 15 cm perch space per bird
- at least 33% of living space covered with litter
- a maximum of 9 birds/m<sup>2</sup> living area.

### Enriched or modified cages:

- total pen space of at least 2000 cm<sup>2</sup>
- floor space of at least 750 cm<sup>2</sup> per bird
- laying nest should be available
- litter area should be available
- at least 15 cm of perch per bird
- eating space of at least 12 cm per bird
- at least 2 nipple drinkers or cups reachable by each bird
- inspection patch of at least 90 cm
- equipment to shorten nails (sandpaper).

### Traditional cages (allowed until 2012)

- cage floor space of at least 550 cm<sup>2</sup> per bird
- eating space of at least 10 cm per bird
- 2 drinking nipples or cups available per cage
- cage height of at least 35 cm but 66% should be more than 40 cm
- floor slope of not more than 14 cm/m (14%)
- equipment to shorten nails (sandpaper).

face is slatted or made out of wire. This system is seldom seen because it relatively expensive and inconvenient for the farmer to provide regular service to the birds.

## Cage systems for layers

Conventional laying cages are usually small enclosures with welded wire mesh sloping floors. They provide equipment only for feeding, drinking, egg collection, manure removal, insertion and removal



of hens, and (in the EU) claw shortening. Most common structures are:

- flat deck
- stair step battery cage
- pyramid battery
- compact battery
- multi tier system
- welfare or modified cages.

Over the past seven years, due to animal welfare regulations, new kinds of cages have been developed (see box). The so-called enriched or modified cages provide all the equipment found in conventional cages with additional equipment to provide for some of the hens' strong behavioural preferences. These extra elements may include perches, nest boxes, a litter area and extra height. The term furnished cages is used here because it gives a more accurate description. For example, adding a perch or a nest to a cage can be factually described as furnishing it, whereas it is a matter of opinion whether or not such furnishing actually enriches the cage or the hen's experience.

The number of hens in furnished cages

varies. Authors of the EU LayWel study made an arbitrary decision to describe up to 15 birds as small group cages, 16-30 birds as medium size and 31-60 hens per cage as large FC. Neither the maximum or optimum number of hens in furnished cages is yet known or defined.

### Multi-level systems

In response to consumer demands, various alternatives to cages have been developed. These housing systems are said to offer more 'bird-friendly' conditions (see box). They often have multi-tiered floors with feeders and drinkers as well as nests and perches. By applying this multi-tiered system more birds can be kept on the same floor space as with floor housing, while the birds have the same or even more room to express their natural behaviour.

There are many differences in layout. Three major categories can be distinguished:

- ▶ **Aviaries with non-integrated nest boxes:** aviaries with several levels of perforated

floors with manure belts under them and separately arranged nest boxes. Feeders and drinkers are distributed in such a way that they provide equal access for all hens.

- ▶ **Aviaries with integrated nest boxes:** aviaries as above but where nest boxes are integrated within the blocks of perforated floors.

- ▶ **Portal aviaries:** aviaries with elevated perforated floors, the top tier of which is a single level which links the lower stepped platforms. The keeper can walk under and upon the top tier. Nest boxes are integrated in the system. Typically the litter goes fully under all the platforms, providing 100% littered ground floor.

### Extra space

In combination with the alternative systems, some systems provide an additional area for the hens. This can be either one or both of the following possibilities:

- ▶ **Covered verandas:** a covered area outside, but connected to

## Risks to welfare in different housing systems

As a general guide, the LayWel study, conducted by an EU working group, colour coded the risk to welfare for indicators relevant to on-farm welfare assessment for the main categories of housing system according to current knowledge.

**Red** shows where there is a high risk of poor welfare. Sometimes this is due to the system design (such as a lack of nest boxes in conventional cages) but in many other cases it highlights areas where the odds are that something could easily go wrong. The red areas show where those caring for hens should focus particular attention to prevent welfare problems.

**Orange** areas indicate that the risk to welfare varies a lot between flocks and farms – or that the risk to welfare is moderate. While it is perfectly possible to achieve good welfare for these indicators, results from farms have shown that in real life this is not always achieved. Thus those caring for hens should be vigilant to prevent welfare problems.

**Green** areas indicate a low risk of poor welfare. These indicators should still be monitored and you cannot afford to be complacent but, on the whole, the chances of something going wrong are lower.

Indicator	Conventional cage	Furnished cage			Non-cage		Outdoor
		small	medium	large	single level	multi level	
Mortality (%)	Orange	Orange	Red	Red	Red	Red	Orange
Mortality due to feather pecking and or cannibalism	Green	Green	Green	Green	Green	Green	Orange
Red mite	Orange	Orange	Orange	Orange	Orange	Orange	Orange
Bumble foot	Green	Green	Green	Green	Red	Red	Red
feather loss	Orange	Orange	Orange	Orange	Orange	Orange	Orange
Use of nest boxes	Red	Green	Green	Green	Green	Green	Green
Use of perches	Red	Orange	Orange	Orange	Orange	Orange	Orange
Foraging behaviour	Red	Orange	Orange	Orange	Green	Green	Green
Dustbathing behaviour	Red	Orange	Orange	Orange	Orange	Orange	Orange
Air quality	Green	Green	Green	Green	Red	Red	Green
Water intake	Green	Green	Green	Green	Green	Green	Orange

Note:

1 – In most cases the orange areas indicate a variable risk

2 – Some very recent unpublished figures indicate low mortality is achievable in large furnished cages

(Source: Dr Claire Weeks and Prof Christine Nicol, University of Bristol, UK)



**Table 1 – Price comparison of different housing systems for layers**

System	Available space/flock density	Production costs index
Cage	450 cm <sup>2</sup> /hen	100
Cage	560 cm <sup>2</sup> /hen	105
Cage	750 cm <sup>2</sup> /hen	115
Welfare cage	2 levels	110
Aviary system	10-12 hens/m <sup>2</sup>	112
Litter/floor combination	7-10 hens/m <sup>2</sup>	118
House and free range	1800 hens/ha	135
House and free range	400 hens/ha	150

**Table 2 – Floor/litter systems for layers (hens/m<sup>2</sup> floor space)**

	0 - 20 weeks	>20 weeks
Full litter	8	6
2/3 litter - 1/3 floor	8	7
1/2 litter - 1/2 floor	10	8
1/3 litter - 2/3 floor	12	9
Full floor	12	10
Aviary system	-	9 (per m <sup>2</sup> living area)

**Table 3 – Performance of birds kept in different housing systems**

	Days of lay	% of lay	Eggs per hen	Egg weight	Kgs per hen	Mortality %	Feed conversion
Cage	370	89.3	319	62.2	19.0	6.3	2.07
Free range	367	87.7	302	61.6	18.6	9.4	2.26
Floor	375	88.2	316	62.5	19.8	9.2	2.28
Aviary	391	88.1	325	62.6	20.0	10.7	2.24
Eco	347	87.5	294	63.7	18.6	6.7	2.27

the hen house, is provided and can be available during daylight hours. This area has a concrete, or other suitable floor, usually covered with litter. The climate is similar to that outside except for rain or snow (because of protecting devices). In some countries this area is referred to as a winter garden.

► **Free range:**

an outside unroofed area is provided, mainly covered with vegetation. Hens have access from fixed or mobile houses to this area via popholes in the wall of the henhouse and in the covered veranda, if present. Several pens may be used in rotation, or mobile houses may be moved, to control parasites and maintain good pasture quality. Areas near to the house may be covered with free draining material to maintain good hygiene both outside and within the house.

**Comparing systems**

Despite the introduction of alternative housing systems, the battery system is still considered to be the most economical way to produce eggs. But economy is not always the most influential factor anymore. When choosing a housing system for layers one should take economic as well as bird welfare aspects into consideration. This may result in an increase of the cost price of eggs. Experiences so

far have shown that consumers are prepared to pay a little extra for non-cage eggs, but that extra is not always sufficient to cover the extra costs. Therefore producers in the EU continue to strive for options that may lower the production costs without jeopardising the animal welfare rules. During their search for improvements they are confronted with a number of bottlenecks:

- Flock density with the new systems are lower than that in battery systems.
- Housing costs per bird (costs for building and equipment) are higher than those of the battery system.
- Labour requirements are higher in aviary systems.
- Flock management in aviary systems is more complicated than in battery systems
- The risk of diseases (red mite and parasites) is higher in litter-based housing systems.
- Maintaining good litter quality requires a lot of attention.
- Cannibalism is a real threat with big (-ger) flocks in litter/floor systems.
- Dust production can be enormous (this can be a worker safety issue).
- Last but not least, floor eggs can be a problem (a floor egg percentage less than 1% is very good). This problem does not occur in battery systems. The

floor egg problem has two aspects: extra labour is needed to collect floor eggs, and there is a higher percentage of broken and/or dirty eggs, resulting in a lower price.

Since the first initiatives have been taken to find alternatives to battery cages most of the attention has been given towards aviary systems. This is mainly due to the fact that it combines the floor/litter systems with high densities. Recent results collected by the Dutch feed compounder ForFarmers show that hens kept in alternative systems may lay more and heavier eggs, but their mortality and feed conversion is poorer than that of hens kept in cages. However their performance is better than free range hens. Ecologically kept hens obviously lay less eggs at a higher weight and use more feed. Their mortality is low. It is believed that in future the differences between the various systems shown in *Table 3* may become smaller due to improved management and the use of hens that have the capability to better adjust to the specific type of housing. But differences will remain, to the advantage of the traditional cage system, when keeping space per hen in mind. ■