

Compassion Note:

Multi-tier colony and net flooring systems for broilers

August 2017

Broiler chickens are mostly 'ground-reared' in sheds on a littered floor, with substrates such as wood shavings, chopped rice hulls, and straw. Depending on the house design (led by the ventilation system), natural light may be allowed to enter the shed, usually via windows, curtain sides or solar panels, but fully enclosed sheds without natural light provision or minimal light entry through the ventilation vents and fans system are also common. Sheds are usually barren and stocked at high densities (for example a derogation up to 42kg/m² under EU legislation). In warmer countries, or in higher welfare systems lower stocking densities are in place (for example 30 kg/m² in higher welfare indoor systems). Some EU countries have additional legislative requirements for broiler production, for example, provision of natural light is mandatory in Sweden.

Other systems exist, such as net flooring systems (mainly used in Asian countries such as China and Thailand), and modern caged systems are gaining popularity (predominantly in places such as Turkey and Russia, but are also beginning to be used in the US and the EU in various forms).

**CAGED OR CONTAINER SYSTEMS AND NETTED SYSTEMS ARE NOT ACCEPTED
UNDER COMPASSION'S GOOD CHICKEN AWARD.**

CAGED / CONTAINER SYSTEMS FOR BROILERS

Research into multi-tiered systems with different floor types was conducted in the 1970's and abandoned after results demonstrated high rates of wing and leg breakages due to lack of exercise and wing movements. While these systems were never widely adopted in Europe and the United States, due to the increasing pressure of high volume – low margin economies in broiler production, and the drive to rear ever increasing numbers of broilers from a given area, caged systems are once again on the rise. The new caged systems are either multi-tier colony cages or containers and are an assembly of cage units provided with automated features for distributing feed, and removing waste.

Commercial examples are given below:

1. Multi-tier colony cages with slatted flooring:

The typical size of cage is between 3.3m² and 5.3m² (image 1 to 4), with a cage height of around 0.5m. These systems typically have 3 to 4 tiers, with a removable cage floor made of flexible polypropylene

mesh and a somewhat translucent rolling manure belt below. There is internal illumination¹, and the cages are barren. The caged systems are housed in automatically controlled ventilation housing. Typically, individual cage units or containers are removed by fork lift truck and placed on a truck bed for transport to the poultry processing plant.



Figure 1- Big Dutchman 'Avimax sliding' - 1.6 m x 2.4m - <http://www.bigdutchman.co.za/pdf/AviMax%20Sliding.pdf>



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Figure 2- Jansen 'Bromaxx' system - 2.9mx1.8 m - <http://www.jpe.org/en/products/broilers/bromaxx-broiler-colony-system/bromaxx-broiler-colony-system/>



Figure 1 - Brodhan 'BroilerCage' (2.9m x 1.8m) - <https://s3-eu-west-1.amazonaws.com/expomatch/upload/48903.pdf>

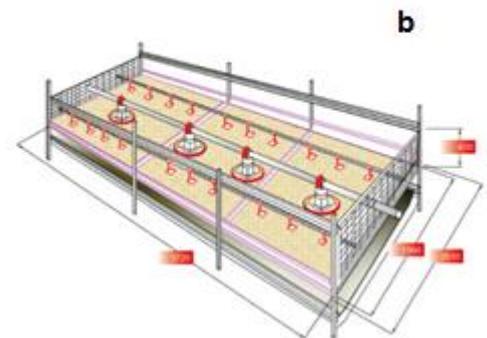
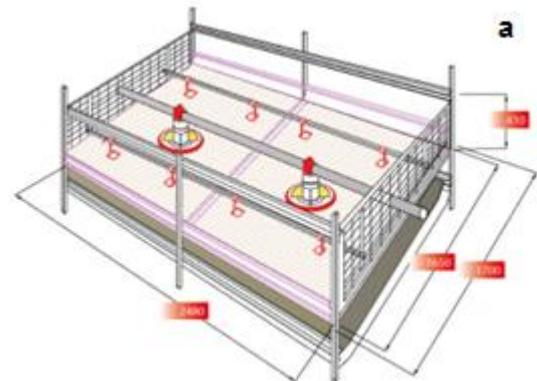


Figure 2 - FACCO broiler multi-tier (a) 'B3' - 2.48mx1.65m (b) 'B3-MAX' - 3.72m x 1.96m - <http://www.facco.net/en/prodotti/broiler/21.html>

¹ Patent - Containerized cage system for chickens US 3900006 A

2. Multi-tier colony containers with a solid moveable belt floor:

There are two main differences between this system and other cage systems. Firstly, the moveable belt on the floor of the cage is covered with litter, and secondly the system allows for egg hatching inside the container - hatching eggs are suspended in a tray above the belt, and as the chicks hatch they drop onto the litter belt below (figure 6). During depopulation, the belt is used to remove the broilers from the containers directly onto a conveyor for transport. The Vencomatic 'Patio' system consists of 6 tiers of containers running the full length of the building, dimensions are: 32.2 m (length) × 1.43m (width) × 0.40 m (height) or 47.80 m (length) × 2.34 m (width) × 0.75 m (height) (Figure 7). The container units are more permanently installed in a purpose built automatically ventilated building.



Figure 3 - One of the 6 tiers of the Vencomatic 'Patio' system, with the hatched eggs above the chicks

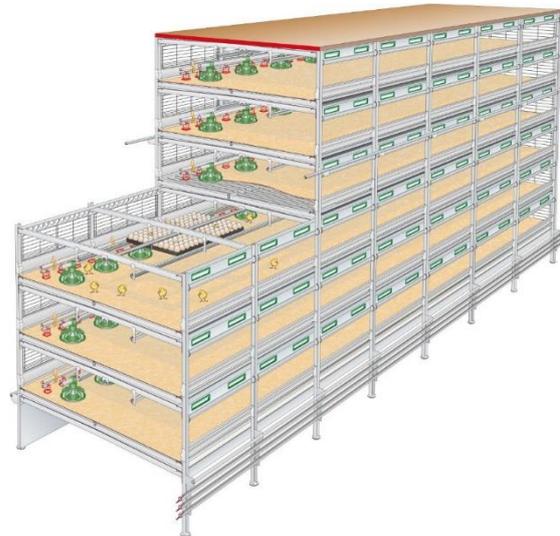


Figure 7 - Vencomatic 'Patio' system - <http://www.vencomaticgroup.com/en/products/broilers/housing-solutions/patio>

Perceived advantages (health, economic and welfare) of the multi-tiered systems as presented by the industry:

1. **Flexible plastic mesh flooring or plastic mats (when available)** - Moulds to birds weight and activity and allows the manure to fall through
2. **Separation from manure** – May reduce foot pad dermatitis and breast blisters, mortality and need for antibiotics. Although according to research this can be a downfall as well (see below).
3. **Reduced stress during depopulation and loading for transport to slaughter** - Can be fully automated and load up to 12,000 broilers per hour.
4. **Reduced need for space** – less land and resources needed, as well as bigger income per m².
5. **Reduced labour hours costs** – Mainly on the cleaning, inspection, depopulation and loading for slaughter.

DISADVANTAGES FOR ANIMAL WELFARE:

1. Stocking density: the cage density recommended by manufacturers is higher than most floor systems, and would be illegal in the EU (Jansen and Big Dutchman suggest 50kg/m², Brodhan suggests 45kg/m²). In addition, a 4-tier system quadruples the density of animal bodies in the shed, and would be expected to increase the density of pathogens and degrade air quality, depending on the effectiveness of the ventilation system adopted.

Higher stocking density influences broiler behaviour, reducing locomotion and ground pecking and increasing the time spent sitting. The higher stocking density also increases the level of behavioural disturbance experienced in the last week of rearing. Final body weight, feed intake, walking ability and feathering are reduced, and there are more scratches and bruising at higher densities³.

It may be possible to rear broilers at lower stocking densities in these systems, however, the cost of multitier colony systems has been estimated to be as much as 2.5 times higher than conventional litter floor barn systems (Lockinger, Joe, Sales Manager for Latin America at Chore-Time, November 2016); producers will therefore want to maximise output to warrant such higher capital and operating costs.

2. Flooring with insufficient litter: Lack of litter or insufficient litter means that the birds are unable to express natural behaviours such as dustbathing, ground pecking and scratching – all important behaviours which when deprived can lead to stress and poor welfare⁴. In laying hens, there is evidence that the deprivation of dustbathing leads to stress. Research has also found that chickens, when in a naturalistic environment, spend 50% of their activity foraging, even when fed, showing that this behaviour is more than just a necessity related to feeding.

Separation from faecal matter can in theory make health management easier, but it can also increase the health risk. Caged housing can successfully break the lifecycle of intestinal parasites and may decrease *Campylobacter* flock persistence. Nevertheless, contact with faecal matter may actually decrease *Campylobacter* loads, by creating an environment for other competitive microorganisms to grow. Additionally, different studies have demonstrated a quicker decline on *Salmonella* shedding in cage-free chickens compared to caged ones⁵.

Note: litter must be of a good quality; be stored hygienically and kept dry; be of a suitable material and particle size with no large clumps; be managed to maintain it in a dry, friable (loose and free flowing) condition (and replaced where necessary); be an average minimum depth of 5cm to allow for the dilution of faeces; allow birds to dust bathe; be topped up daily, if necessary, with fresh litter and be managed hygienically.⁶

³ Estevez, I. Density allowances for broilers: Where to set the limits? Poul. Sci. 2007, 86, 1265–1272.

⁴ Vestergaard, K.S.; Skadhauge, E.; Lawson, L.G. The stress of not being able to perform dustbathing in laying hens. Physiol. Behav. 1997, 62, 413–419. Fouad, M.A.; Razek, A.H.A.; Badawy, S.M. Broilers welfare and economics under two management alternatives on commercial scale. Int. J. Poul. Sci. 2008, 7, 1167–1173.

⁵ Shields, Sara, and Michael Greger. "Animal welfare and food safety aspects of confining broiler chickens to cages." *Animals* 3.2 (2013): 386-400.

⁶ RSPCA welfare standards for chickens - <https://science.rspca.org.uk/ImageLocator/LocateAsset?asset=document&assetId=1232740881600&mode=prd>

3. Space restriction: Cages restrict the movement of animals in them, independent of stocking density and the provision of environmental enrichment. They negatively affect the total area covered by the birds as well as total distance travelled compared to ground reared birds who also walk and peck more⁷. In addition, lack of activity and expression of natural behaviour in caged broilers with plastic mesh floors can lead to shorter leg bones and lighter wing bones⁸.

4. Lack of opportunities for enrichment provision: A rich and stimulating environment is required to offer behavioural opportunity and deliver a good quality of life. Cages and container systems severely limit the provision of enrichment and do not have enough vertical space to provide perching opportunities. It is also challenging to provide an equal distribution of natural light throughout both the multiple rows and tiers of cages / containers, depending on their distance from the light inlet.

5. Difficulty in observing birds: Due to the higher number of birds per m² and the height and width of the structure, it is hard to observe the animals, and impossible to walk through them to assess walking ability. In some systems, attached ladders permit the observation of birds housed in higher tiers, but still do not allow for a correct observation of all animals in each tier.

6. The movement away from the land base systems: While indoor production systems can be adapted to deliver a higher level of welfare, for example by providing natural light, reducing stocking density, and providing environmental enrichment - land systems offer an unparalleled environmental complexity that is more likely to satisfy the behavioural needs of broiler chickens. Multi-tier cages and containers, irrespective of the quality of management operated, are iconic examples of the intensive, industrial systems (Factory Farms) that Compassion fundamentally believes animal production should move away from.

⁷ Leone, E.H.; Christman, M.C.; Douglass, L.; Estevez, I. Separating the impact of group size, density, and enclosure size on broiler movement and space use at a decreasing perimeter to area ratio. *Behav. Process.* 2010, 83, 16–22. Leone, E.H.; Estevez, I. Use of space in the domestic fowl: separating the effects of enclosure size, group size and density. *Anim. Behav.* 2008, 76, 1673–1682.

⁸ Tolon, B.; Yalcin, S. Bone characteristics and body weight of broilers in different husbandry systems. *Br. Poul. Sci.* 1997, 38, 132–135.

INDOOR-NET SYSTEMS

Broilers are reared 'off the ground' rather than 'on the ground' in indoor-net systems on a single tier wired or plastic netting (usually 1x1 cm) supported by tensile steel and raised ~0.5m above the ground (figures 8 and 9). One of the main motivations for using these systems is the low initial investment, due to very few infrastructures. Bubba (Changji) Lu from Tyson (2015) reported a rise on the use of these systems over the last 10 years, and a rise of broiler cages for the last 5 years⁹.



Figure 8- Broiler shed with netting floor



Figure 9- Broilers reared on netting flooring

The perceived benefits of this system are mainly the separation of animals from their faeces, decreasing the risk of contact with pathogens such as coccidiosis, and the lower input costs of the system. In hot climates, there is also a perceived benefit of improving air flow and reducing heat stress, but this is usually associated with inadequate ventilation of the house.

The sheds may have natural light provision, as shown above, but have little opportunity for enrichment provision, especially scratching and dustbathing substrate. There is potential to provide perches and hanging pecking substrates.

Caged and container systems, as well as net systems, do not have the potential to provide what animals want and need, constraining their movement and unnecessarily limiting their behavioural expression. Systems should provide animals with a good quality of life, including good mental and physical wellbeing as well as providing an opportunity to express natural behaviour. We therefore recommend the following higher animal welfare systems for broilers:

⁹ Broiler Production and Nutrition in China -

<http://www.thepoultryfederation.com/public/userfiles/files/Broiler%20Production%20and%20Nutrition%20in%20China%20Draft.pdf>

HIGHER WELFARE INDOOR SYSTEMS

Broiler chickens reared in these systems are reared indoors on a littered floor with more space (maximum stocking density of 30kg/m² or in indoor extensive systems 25kg/m²¹⁰) and natural light; Broilers should be from a slower growing breed and are provided with environmental enrichment, such as straw bales, perches, pecking substrates and objects (Figures 10-12). Some systems may have access to verandas which give the birds better connectivity to the outdoor environment.



Figure 10 - Straw bales as environmental enrichment



Figure 11 - Perches as environmental enrichment

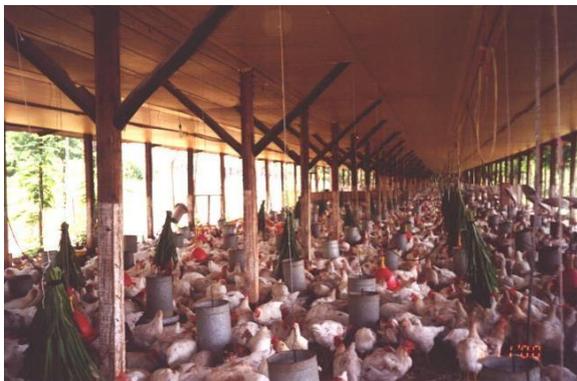


Figure 12 - Windows in a Brazilian broiler shed. Dr Elsieo Figueiredo ©



A CASE STUDY – WINDSTREEK -
This is a good example of a commercially viable solution of a broiler house that provides all the important higher animal welfare features discussed in this document (please see case

¹⁰ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32010R0557>

FREE RANGE AND ORGANIC SYSTEMS

Chickens reared in these systems have access outdoors in daylight hours, as well as to sheds which are often similar (though often smaller) to those described above. Birds are usually - but not always - closed inside the shed at night.

Hedges and trees are often provided and form natural areas of shade and shelter (from wind, rain, and sun) (figures 13 to 16) and protection from predators. Worms, insects, and grass give variety to the diet and can help to improve the nutritional quality of the meat. The chickens have greater opportunity to exercise and investigate their surroundings via pecking and scratching, whilst experiencing fresh air and natural light. Ranging behaviour however is greatly affected by breed and weather conditions.

Some free-range (e.g. Red Tractor Farm Assurance Poultry Scheme) and organic (e.g. Soil Association) standards permit fast growing breeds of chickens, whilst other limit growth to intermediate (e.g. RSPCA Assured) or slow growth rate breeds (e.g. Label Rouge and organic France). Chickens live longer in these systems - typically to 56 days (free-range) and between 70 and 81 days (organic).



Figure 13 - Shade and shelter in broiler free-range production



Figure 14 - Shrubs and trees in a free-range broiler production



Figure 15 – Broiler arch with outdoor access



Figure 16 – Broiler shed with outdoor access