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COMPASSION in world farming **Food Business**

LAYING HENS

The business case for a cage-free transition

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We are witnessing a global transition to cage-free egg production and sourcing, driven by increasing consumer demand, legislative reform and corporate policies. This document sets out the key arguments as to why companies should commit to and implement cage-free sourcing, covering business considerations, animal health and welfare, consumer and farmer attitudes, product quality, and environmental impact.

CONTENTS

1. BUSINESS

1.1. A global movement towards cage-free sourcing

There has been a global movement towards cage-free egg sourcing. Companies are making cage-free commitments across their supply; these commitments can be made across one or several egg categories (shell eggs, egg products, egg ingredients), at national, regional or global level. Globally there has been over 2500 cage-free commitments to date (source: www.chickenwatch.org). Compassion has awarded over 790 Good Egg Awards to companies for their cage-free policies or commitments since 2007, set to benefit over 112 million laying hens per year.

Importantly, companies are progressing against those commitments: out of 715 commitments across 444 companies recorded in EggTrack (see the text box below) in 2023, 511 commitments (71%) reported on progress, and overall there was a 75% transition to cage free (see the full Egg Track 2023 report here). Of the companies included in EggTrack 2023, 79 companies operate globally, 134 operate in the USA, 274 operate in Europe (including the UK) and 23 operate in APAC. Most progress towards cage free has been achieved in Europe, followed by the USA (see Figure 1). Overall, the global transition has increased by 6.9% from 2022 to 2023.

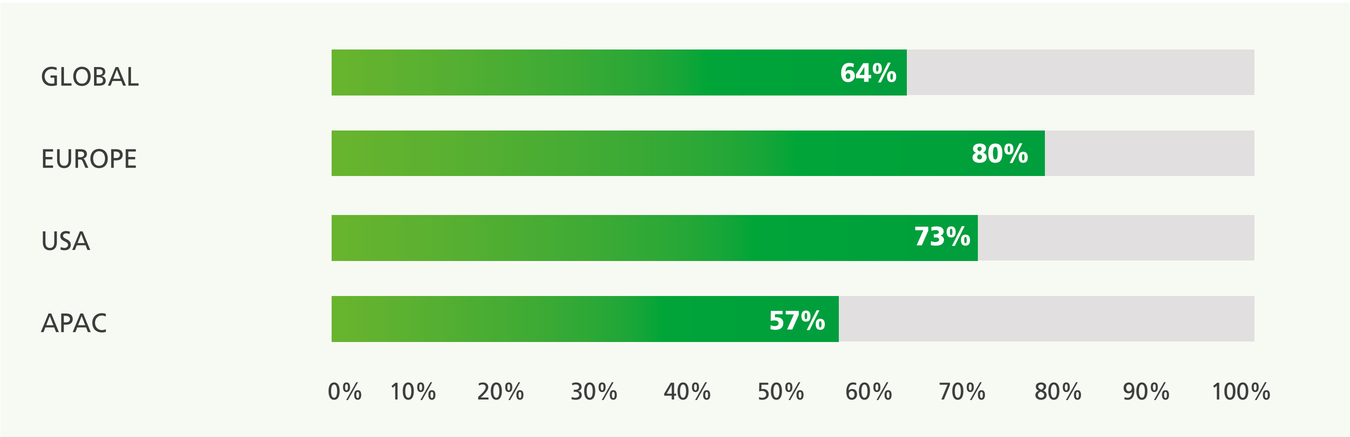
Eggtrack

EggTrack monitors company progress towards cage-free egg commitments (at national, regional, and global level). Its purpose is to promote transparency, highlight leaders in the space, motivate those who are lagging and encourage new companies to make public cage-free commitments.

FIGURE 1 Progress by region in 2023. The average transition rate within companies that have made commitments by region and the percentage of commitments being reported on. Egg Track, 2023

Average transition by region in 2023

Only a certain number of countries are included for Europe (34) and APAC (5)



Percentage of commitments being reported on in 2023

Region	Number of Commitments	% of Commitments Reporting
Global	88	56%
Europe	440	75%
USA	147	74%
APAC	40	60%

Forward thinking companies started early on to introduce and promote products made with cage-free eggs, such as Unilever with their iconic brands of mayonnaise (Hellmann's, Amora, Calvé) in 2009. This generated a ripple effect across the industry which led to other European and global brands soon following their example.

In Europe, there are over 1400 cage-free egg commitments, with 800 already fulfilled, including major companies like Albert Heijn, Aldi Nord, LIDL, Auchan, Carrefour, Biedronka, Netto, REWE Group, Kaufland, KFC, Subway, Barilla, Ferrero, Danone, Mars, Nestlé, and Unilever. Driven by consumer demand, the voluntary transition of these industry leaders has led to a substantial rise in cage-free egg production across the EU in recent years (from 47% to over 60% between 2017[i] and 2023[ii]).

[i] European Commission (2022) Laying hens by way of keeping https://agriculture.ec.europa.eu/farming/animal-products/eggs_en Accessed 29/11/2024
[ii] European Commission (2024) Dashboard: Eggs https://agriculture.ec.europa.eu/farming/animal-products/eggs_en Accessed 29/11/2024

1.2. Legislative landscape

There is a global trend for the phasing out of conventional cages, and even of all cages – barren and enriched, in some forward-thinking countries. Conventional battery cages have been prohibited in the EU (and UK) since 2012, while some EU countries have introduced national legislative bans on enriched cages, including Austria (since 2020), Germany (from 2026, or 2028 in exceptional cases), Czech Republic (from 2027), France (effective, for new caged systems), and Wallonia in Belgium (from 2028). In June 2021, The European Commission committed to revising its animal welfare legislation, including Council Directive 1999/74/EC which details the minimum standards protecting laying hens, and is due to introduce a legislative proposal to phase out the use of cages for laying hens and all other farmed species in Europe. Outside of the EU, barren cages have been, or are being, phased out in Iceland (2021), New Zealand (2022), Mexico (2024), Israel (2029), Australia (2036) and Canada (2036). There is currently no specific legislation establishing minimum welfare standards for laying hens in China, Brazil or the USA. In the US, 10 states have a ban on battery production - although the bans refer specifically to battery production, enriched cages are essentially banned too as all the laws resemble the USDA definition of cage-free in some form (Arizona, California, Colorado, Massachusetts, Michigan, Nevada, Oregon, Rhode Island, Utah and Washington[1,2]). Of these states, 9 have an additional ban on in-state sale of caged eggs (exception Utah[1,2]). Additionally, Ohio has a ban on the installation of new caged systems[1].

It is therefore extremely important for companies operating in geographies where the legislation is currently evolving, to anticipate and adapt early on to those changes. In geographies where there is as yet no legislation, companies should still be looking to eliminate caged production from their supply through voluntary standards for cage-free systems which are fit for purpose, to drive change and fall in line with the wider global trend towards cage-free egg production.

1.3. Invest in the best: key considerations when planning a cage-free transition

We strongly encourage producers and companies to invest in future-proof systems when planning their cage-free transition, ensuring that hens are free from confinement throughout their lives and reared in higher welfare systems such as spacious indoor barn systems, ideally equipped with a wintergarden, and free-range systems. See **Table 1** for Compassion's key recommendations for higher welfare cage-free systems.

Some egg producers have adopted the use of 'combination' cages (also called 'combi cages', convertible housing systems or 'lock-back' cages, 'select/limited access systems'[3]). These have doors and partitions within the tiers so that when the doors are shut, the birds are caged and are confined at a stocking density comparable to that associated with enriched cages. When the doors are open, producers classify the system as cage-free, although the welfare conditions for hens are poorer than in genuinely cage-free systems because the partitions make movement within and between the tiers more difficult, leading to crowding and competition for feed, water, and nest access. The transition from the open to closed position is also an important source of stress for the hens and key features that encourage normal behaviours, such as nesting and scratching, are lacking. Hens should have access to all tiers, including the floor, at all times and be provided with sufficient space for dustbathing and scratching. Hens should be encouraged to move within and between tiers with ease.

Combination systems should be banned along with conventional and enriched cages since they can be used as cages, and, when the doors are open, they make for poorly designed, highly stocked, barn systems. During any phase out period when combination systems may be transformed into cage-free systems, the fronts and side partitions should be removed (and structure strengthened) to improve navigation around the shed. Additionally ensure the stocking density is appropriate for cage-free production (see **Table 1**).


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TABLE 1 **Summary of Compassion in World Farming's recommendations on the best practice for housing laying hens**

Housing feature	CIWF recommendations on key indoor housing features for laying hens	
	Better practice	Best practice
Stocking density	≤ 9 laying hens/m² of usable space and ≤ 18 laying hens/m² of floor space.	≤7 laying hens/m² of usable space and 15 laying hens/m² of floor space.
Nest boxes	No more than 7 hens/nest (meets EU legislation) or for group nests at least 1 m² of nest space per 120 hens.	1 nest box per 5 hens or for group nests, more than 1 m² nest area per 120 hens if needed; nests tip at night to exclude hens and maintain hygiene.
Perches	15 cm/hen usable perching space is provided (meets EU legislation).	Minimum 18 cm/hen (ideally 22 cm) usable perching space is provided. Perches within the tiers allow birds to stand upright in a comfortable position, and are positioned so that perching birds cannot be pecked at by birds standing below. Other opportunities to perch outside the structure at different heights should be provided.
Pecking substrates	At least 2 categories of pecking substrates provided per 1000 hens.	At least 2 categories of pecking substrates per 1000 hens and additional areas for dustbathing, scratching and pecking should be provided.
Natural light	Natural light is highly recommended. Light levels are sufficient to allow all hens to see one another (i.e. minimum 20 lux). Birds are provided with a continuous dark period of 8 hours. A dawn and dusk period are incorporated into the light management programme.	Natural light should be provided and incorporated into the light management programme with dawn and dusk period with 8 hours of continuous darkness.
Litter	Dry, friable litter is provided on at least 1/3 of the floor area from day 0 at the layer farm.	Dry, friable litter is provided over the whole floor area, with at least 560 cm² of littered floor/hen from day 0 at the layer farm.
Additional space: winter garden / veranda	Access to a veranda is strongly recommended.	Hens have access to a well-managed veranda that provides functional space. Enrichments provided in the veranda (shelter, dust baths) to make the area attractive for birds.
Outdoor range	Recommended: Outdoor range available all day, with good cover of vegetation including grass and herbs, as well as shelter provided by bushes, trees or artificial shelters, and areas for dustbathing. At least 8 m² of artificial shelters recommended for 1000 hens, always available when access to the outdoor range is permitted.	
Key welfare indicators	Active programme for monitoring and improvement of key welfare indicators: mortality, keel bone fractures, feather cover, cleanliness, pododermatitis, and positive welfare indicators (dustbathing, ranging outdoors, perching, foraging, positive social interactions).	

1.4. Costs of the transition and mitigation strategies

1.4.1 Costs of transition

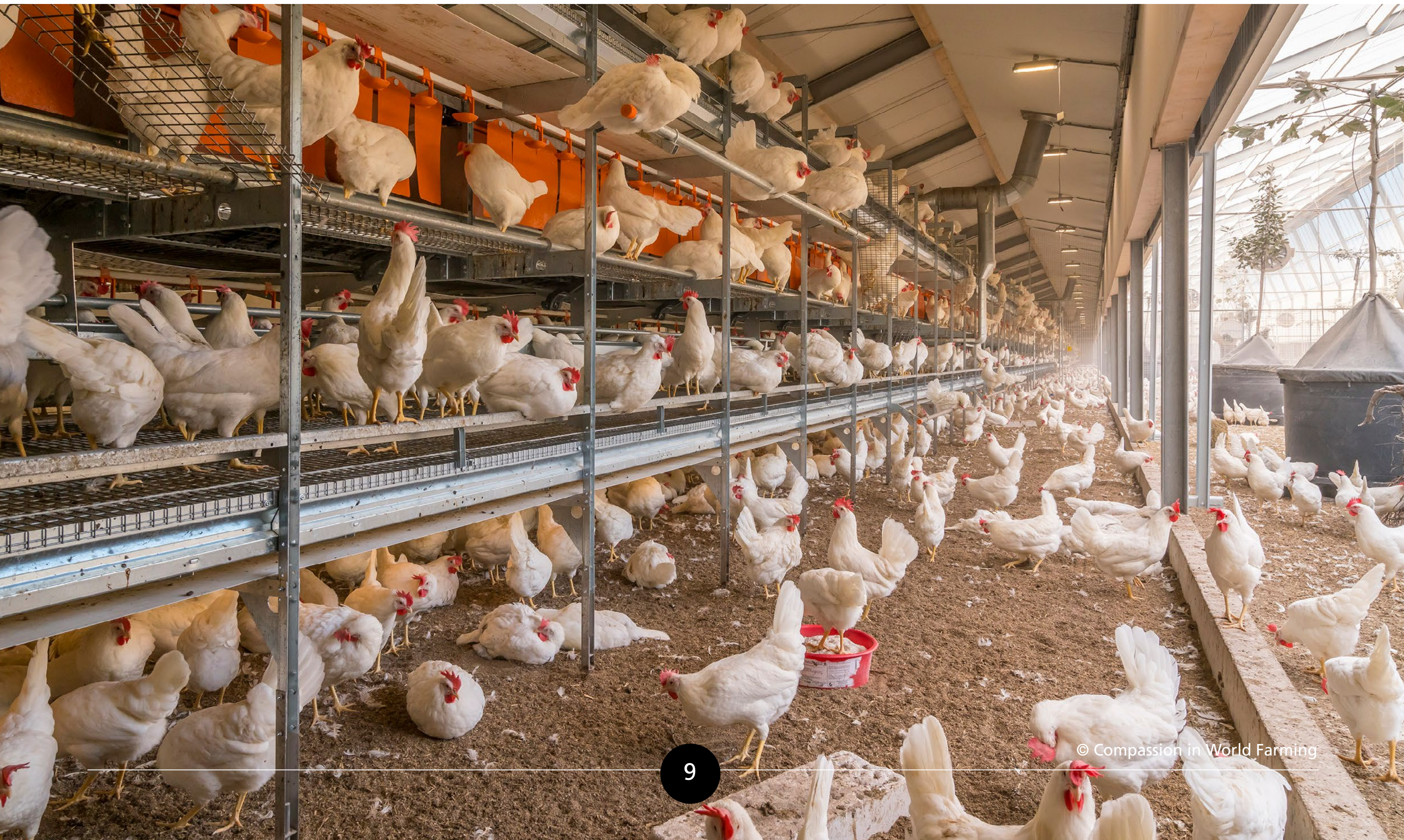
One of the major costs of transition is the capital investment of cage-free housing. In interviews with 7 US producers (representing more than 25% of the U.S. egg industry, covering shell egg and liquid egg marketplaces, and supplying retailers and food manufacturers), Caputo et al.[4] report that the producers identified the capital costs of cage-free systems to be a major barrier. Producers stated that the capital costs will require funding from a bank or government subsidy which could pose an issue if producers have to transition simultaneously, and as would the time (anticipated to be several years) taken to build the new/ convert existing sheds[4].

In addition, the reduction in flock size resulting from a lower stocking density in cage-free systems, can also affect the farm profitability. This may be offset by an increase in the farm size, to maintain production output, but will require additional capital investment and can lead to an increase in production costs due to additional labour required.

Production costs may also be higher in cage-free system for other reasons, including a higher feed intake in cage-free hens, as hens are more active and may start to consume more feed[5], and increased labour due to litter management[4,6–9].

De Luna *et al*.[10] surveyed laying hen farmers across China, Japan, Indonesia, Philippines, Malaysia and Thailand on the adoption of cage-free systems and found that 24.8% of respondents responded ‘Yes’, and 40.6% responded ‘Maybe’ when asked if they perceived cage-free systems to be feasible in their country. However, the major barriers to adopting cage-free systems were cited as being reduced profitability, limited land and cost of land, and higher production costs[10].

A study conducted in Greece looked at the costs of moving from enriched cages to barn production and reported that labour costs increased the most (an increase of 67%, compared to feed, electricity, water and packaging), while feed increased by 4.8%[11]. Overall, there was an increase of 18.1% in production and capital costs (which included changes to buildings and equipment), however, this was mostly offset by an 11.4% increase in revenue from the premium for barn eggs[11].



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Kato *et al.*[12] estimated costs (capital investment and production costs) for conventional cages, enriched cages, aviary and barn systems in Japan by modelling data from existing farms throughout Japan. Costs included land purchases, construction of buildings, equipment, feed and staff wages. Similarly to Greece[11], the retail price of aviary (37.27 yen/egg) and barn eggs (48.53 yen/egg) were higher than caged (conventional, 24.68 yen/egg; and enriched, 28.07 yen/hen) eggs[12].

In the EU, the cost of egg production was estimated to be approximately 17% higher in barn/aviary systems and approximately 30% higher in free-range systems[13], compared to enriched cage systems.

Therefore, it is unavoidable that the transition to a cage-free system will incur upfront investment costs, and potentially higher production costs, although this will vary due to different factors and the region of the world where producers operate. However, there are a number of strategies that can be used to mitigate against the economic impact of a cage-free transition, which are discussed in the following section.


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1.4.2 Cost mitigation strategies

There are a number of strategies that can be implemented by the producer and the company to mitigate the increase in costs associated with a cage-free transition and maintain the economic viability of cage-free systems[11,14]:

- **Transition period**: Costs of transition can be mitigated through a gradual transition period with a clear transition plan, to allow the costs to be spread out.
- **Selling at a higher price**: The cage-free egg market has shown that eggs from higher welfare systems can have a higher price paid to the farmer to offset the costs of transitioning to a cage-free system[9]. The selling price of aviary eggs can be higher than for caged eggs, which can help compensating the higher production costs[11,15].
- **Secured contracts**: Having a guaranteed buyer or contract has been identified by producers as being imperative for them to consider transitioning without legislation[4].

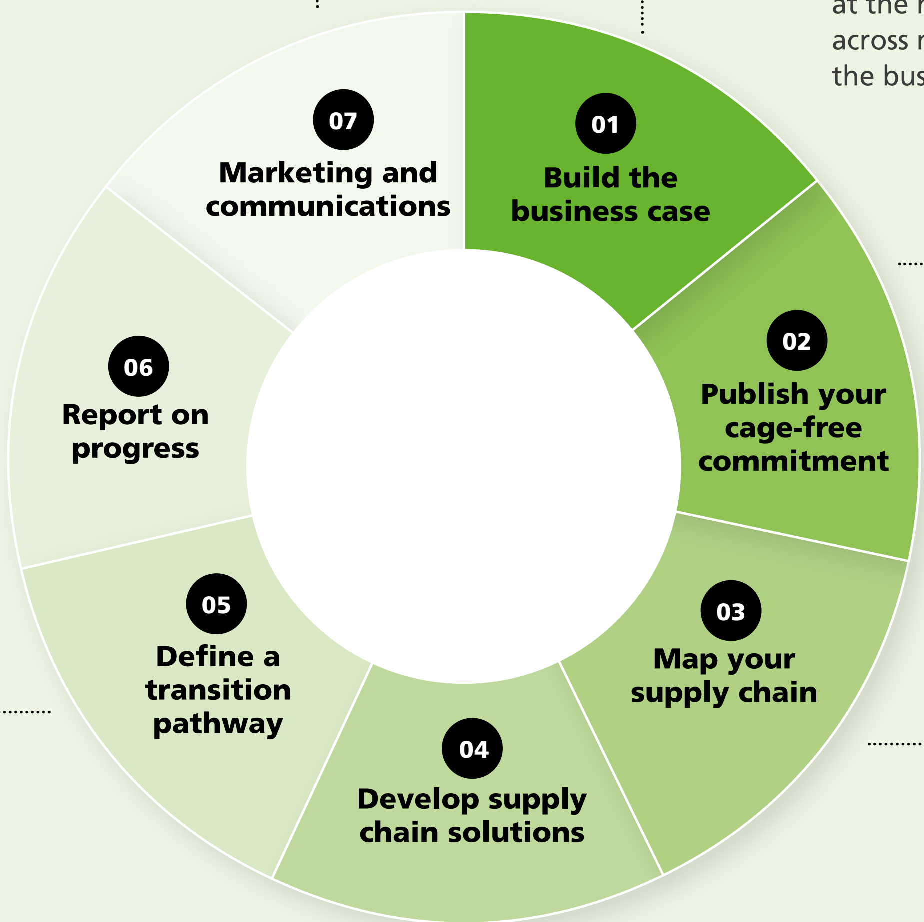
Industry and market development, increased sales, and an increased price point have been cited as key solutions to the barriers to moving to cage-free egg production by farmers in Asia[10].

Alongside cage-free system design, training of staff is vital to ensuring a successful transition to reduce the risk of problems arising and improve efficiencies of cage-free systems[6]. Cage-free systems require different skills, knowledge and experience. Farmers across Asia identified training to be key in the support of transitioning to cage-free systems, including technical advice, training and resources[10]. Proper training will aid performance, production, and animal health and welfare, leading to economic benefits and job satisfaction for workers[6]. Companies should provide support for their producers in the form of education and training in how to set up and manage a cage-free system.

STEP-BY-STEP:
A GUIDE TO DEVELOPING AND IMPLEMENTING A CAGE-FREE EGG POLICY

Committing to improve the lives of farm animals, via a cage-free policy for example, is an important first step in building a more humane and sustainable food system, but the work does not stop with a commitment. Mapping out a route and developing supply chain solutions to implement the transition are key, whilst publicly reporting on progress and gaining consumer support are essential steps to ensure commitments are fulfilled. This requires working with key stakeholders within the business and external stakeholders in the supply chain. Publishing clear timebound commitments, defining transition timelines with progress milestones and reporting annual progress against transition targets are critical for success.

The diagram below details the steps recommended for the development and implementation of a cage-free egg policy:



- Secure internal buy-in at the highest level and across multi-functions in the business

- Include the scope (region, product, category)
- Include the year for full implementation

- By region, egg category and production systems
- Initiate early signals to the supply base about the commitment made

- Work with internal and external partners, supporting your suppliers in their transition
- Identify and address key challenges
- Ensure that investments are future-proof

- Set annual goals and progress milestones by categories and regions
- Publicise those transitions timelines transparently

- Demonstrate compliance with company policies

- Provide regular updates to your stakeholders
- Bring the consumer on the journey

1.5. Marketing and communication opportunities

Higher welfare standards are a great way to raise brand values and be seen as a leader on a key societal concern, as well as reducing reputational risk. It's important to communicate about your commitment at an early stage and be proud of it:

- Ensure it is positioned clearly on your company's animal welfare policy pages
- Clearly state what you will do and by when
- The geographical boundaries of the commitment should be clear
- Include any supportive quotes from other relevant partners such as NGOs

A variety of marketing tactics can be explored to help communicate with customers on farm animal welfare and take them on the journey with you. It is important to share each challenge or success throughout the process via regular updates (rather than communicating only at the start and end of the process). Options to consider include:

Market research:

- Gather market analysis data to assess what your competitors are doing, which you can use in your marketing to highlight yourself as a leader in this space
- Understand consumer awareness of farm animal welfare and the drivers for purchasing higher welfare products
- Use surveys and focus groups to identify marketing strategies for increasing/supporting the demand for higher welfare products and to assess the willingness to pay for them

Messaging:

- Bring the consumer on the journey through regular public updates. When customers understand what cage-free really means for laying hen welfare, they are much more likely to choose higher-welfare products
- The messenger is as important at the message, so use 'trusted messengers' that consumers will respond positively to
- Focus on what's gained for both the animals and the consumer
- Keep messaging simple and positive
- Use language that consumers are using – be on the same page as them
- Communicate with the consumer of tomorrow

Animal welfare promotional campaign:

- Better for the animals
- Better for your health
- Better for the environment

Marketing channels:

- Shelf barkers and in-store communications
- On pack – use QR codes linking to the company website
- Social media
- TV and media
- Celebrity endorsement
- Outdoor advertising
- Leaflets – explain your animal welfare journey and highlight the work done by farmers that care for their animals in order to connect consumers and farming practices
- Recipe cards and associated promotions/ coupons for higher welfare products

Labelling:

- Ensure clear labels on products
- Include relevant certifications
- Help to drive consumer choice

Investors and NGOs are examples of other stakeholders that companies need to communicate with on their animal welfare policies, management and performance. There are tools created specifically to communicate with these stakeholders, for example the Business Benchmark for Farm Animal Welfare (BBFAW) and CIWF's EggTrack.

2. ANIMALS

Animal welfare encompasses both the physical and mental wellbeing of an animal as well as their ability to engage in behaviours that are important to them. To ensure good welfare, animals must be free from negative states, such as hunger, pain and fear, while also being able to experience positive states, such as pleasure and contentment. The modern laying hen has a number of innate behaviours that they are highly motivated to express. The ability to perform those innate behaviours is dependent on the provision of adequate space and access to diverse resources in the housing system. Extensive scientific reviews demonstrate that only cage-free systems provide the possibility for hens to express their full behavioural repertoire and therefore have a higher potential to deliver good welfare[16,17]. While systems with a low welfare potential such as cages will never be able to deliver good welfare due to their intrinsic limitations, systems with a higher welfare potential may not always deliver good welfare, if they are not well managed. Therefore, it is important to manage cage-free systems for laying hens appropriately, so that their welfare potential can truly result in improved welfare for the birds. Particular attention should be given to manage risk factors that are associated with injurious pecking, keel bone damage, foot health problems and mortality, as well as providing opportunities for the birds to express important highly motivated behaviours such as perching, scratching, and dustbathing.

2.1. Health and physical welfare

Producers have concerns over mortality in cage-free systems. However, recent research shows that mortality in cage-free systems has been steadily decreasing as the industry becomes more experienced in managing them. A large meta-analysis of mortality data in cage-free indoor and caged systems for laying hens in 16 countries confirmed that, looking at the most recent figures, there is no longer a significant difference in mortality between indoor cage-free and enriched cage systems[18]. Improved management, for example, an appropriate veterinary health plan (including vaccination and worming programmes), and education of producers have been shown to improve health status and mortality rates on farm[19,20].

Plumage loss, emaciation, fractures and stress occur in all systems and reflect the poor health and focus on performance of the modern genotype[21]. This needs to be addressed urgently through breeding strategies that prioritise these welfare concerns, to produce robust breeds that can thrive in higher welfare systems[22–24].

2.1.1. Skeletal health

Laying hens in all systems can suffer from weak bones, which results in an increased risk of osteoporosis and bone breaks. For example, osteoporosis is prevalent in caged birds due to a lack of exercise[25], while fractures of the keel bone are associated with poor perch design in enriched cage and cage-free systems[26,27] as well as collisions and falls in vertically complex cage-free systems such as multi-tier aviaries[28]. Keel bone damage is a complex, multifactorial issue in laying hens[29] and all moderate and severe keel bone deformities are likely to be painful[30].

The risk of keel bone damage can be mitigated through genetic selection for bone strength, and providing a diet that promotes bone strength, as well as improved housing design in cage-free (mainly multi-tier aviary) systems and inclusion of natural light in the system. Perch design, including location in the shed, material and shape, is important for reducing the risk of keel bone damage. Perches that are soft, round and have a low-pressure loading are recommended[31–33], as are ramps connecting the floor, tiers and perches, and > 2 m between tiers to facilitate safe movement in aviary systems[28,34,35]. The rearing period is extremely important for the bird's welfare throughout their life. Pullets need to learn to use and navigate the space and resources (such as perches, nest boxes and outdoor access) in more complex housing environments like a multi-tier aviary as adults, to develop a stronger skeletal structure and reduce the risk of keel bone damage. Therefore, pullets should be reared in environments as close to their laying system as possible.

2.1.2. Foot health

Common foot problems in laying hens include footpad dermatitis, bumble foot, hyperketosis and excessive claw growth. Wet litter conditions and high ammonia content of the litter can cause footpad dermatitis[36]. Bumble foot and hyperkeratosis are associated with poorly designed perches, increasing compression load on the foot pads and heel and accumulation of litter on the perches[36,37]. Excessive claw growth occurs when there is a lack of abrasive materials to wear claws down[38]. These foot problems are preventable in cage-free systems; good perch design, including soft, round perches, and keeping perches clean can reduce the compression on the foot pad[39]. Good litter hygiene is essential to ensuring good foot health; permanent access to dry, friable, deep litter should be provided from day one.

2.1.3. Avian Influenza

The most recent outbreak of highly pathogenic avian influenza (HPAI) has had a devastating impact on egg producers globally. Since the 2020-2021 HPAI outbreak, it is estimated that more than 250 million poultry have been culled worldwide[40]. While the low pathogenic variant of the virus circulates naturally in wild bird populations, research shows that when the virus enters industrial poultry sheds, the close confinement of thousands of birds accelerates pathogen evolution, leading to the emergence of the highly pathogenic variant[41]. HPAI outbreaks are most frequently associated with intensive domestic poultry production[42,43]. Evidence suggests that free-range systems are not a direct risk to the introduction of the virus into a system, particularly for chicken (broilers and layers) and turkey[44].

Methods to control the spread of HPAI in free-range flocks include housing restrictions meaning that birds cannot go outdoors. This confinement poses a welfare concern as buildings may not be suitable for long-term confinement. Providing verandas/ wintergardens can provide hens with an alternative environment to the shed, increasing space allowance, providing more opportunities for exploration, foraging, dustbathing and other comfort behaviours, when hens are unable to use the range due to HPAI housing restrictions.

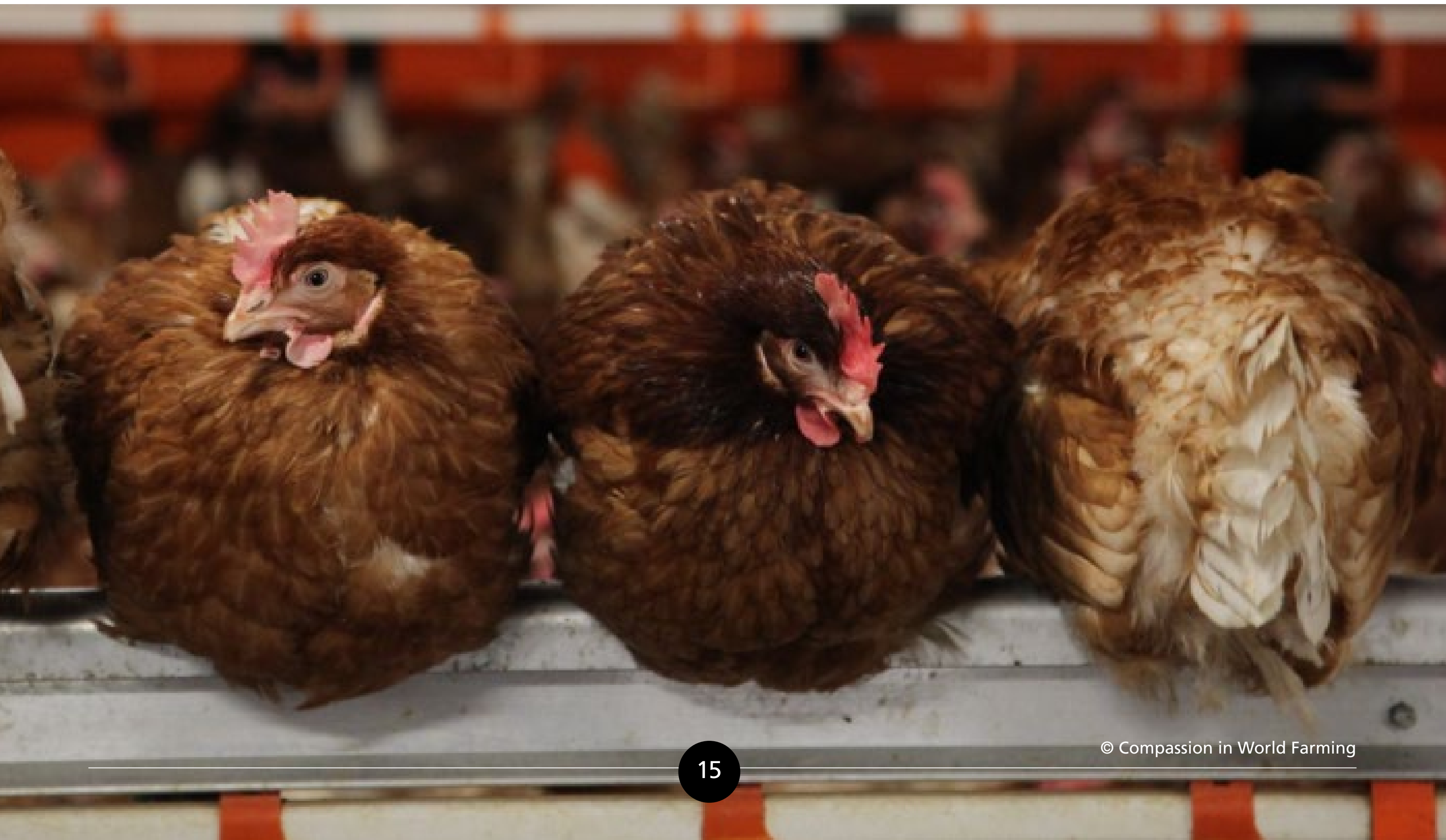
2.2. Behavioural expression

2.2.1 Space for behavioural expression

Cages severely restrict all important behaviours of the laying hens (locomotion, foraging, body maintenance, thermoregulatory behaviour) which leads to stress and exacerbates health problems such as osteoporosis. Despite enriched cages providing slightly more individual space per hen than conventional barren battery cages (750 cm^2 as opposed to 550 cm^2), and shared space within a larger group, a nest, small amount of litter and perch space, behavioural expression is still extremely limited[45–47]. Riddle *et al.*[48] found that brown hens used 670 cm^2 for standing, 631 cm^2 for lying, 25 cm^2 for perching, 1190 cm^2 for dustbathing and 2841 cm^2 for wing flapping, while white birds (who are usually smaller) used slightly less space: 572 cm^2 for standing, 558 cm^2 for lying, 20 cm^2 for perching, 1028 cm^2 for dustbathing and 3446 cm^2 for wing flapping. Therefore, the enriched cage is also considered unacceptable due to its low welfare potential. Barn systems with ≤ 7 laying hens/m^2 of usable space and ≤ 15 laying hens/m^2 of floor space provide sufficient space for hens to express their highly motivated behaviours, including wing flapping, dustbathing, and perching. The latest EFSA scientific opinion on the welfare of laying hens recommends, based on expert opinion and behavioural space modelling, a maximum stocking density of 4 laying hens/m^2 in order to effectively reduce the risk of plumage damage and allow unconstrained performance of motivated behaviours – including those which take up the most space e.g. wing flapping[33]. Also, providing a covered veranda (wintergarden) or access to an outdoor range will reduce the indoor stocking density during daytime periods while providing a more complex environment with additional behavioural opportunities.

2.2.2 Nesting

Cage systems do not provide hens with appropriate nesting areas due to a lack of space and nesting material. Generally, hens prefer to lay in a discrete enclosed nest with loose material such as straw or a flexible nest liner on the floor. The nest must be perceived attractive and there must be sufficient numbers to service the number of hens in the house (Compassion recommends 1 nest box per 5 hens or more than 1 m^2 nest area per 120 hens). To allow nesting behaviour, sufficient nests for all hens to use which are enclosed, gently sloped (12%), elevated and have soft deformable flooring and/or nesting material should be provided. Introducing nest boxes into the latter stages of pullet rearing helps to train the young hen to use the nest box and is vital to reduce the number of eggs laid on the floor.



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2.2.3 Foraging and dustbathing

Allowing hens to forage and dustbathe is important for their welfare as they are innate behaviours. It can also help to reduce injurious feather pecking outbreaks as the main risk factor for feather pecking is foraging being redirected to other hens.

Foraging, scratching, and dustbathing behaviours are rarely fully expressed in a cage[47,49,50]. Unable to forage due to lack of or inappropriate litter or insufficient space to carry out these behaviours, hens become frustrated, and redirect their pecking behaviour towards other birds[51]. This can lead to feather pecking and feather damage, and in extreme cases, vent pecking and cannibalism. To control feather pecking, hens are typically beak trimmed, which causes acute and chronic pain. While these abnormal behaviours can occur in cage and cage-free systems, cage-free systems can be designed and managed to allow hens to fulfill their behavioural needs, reducing the risk of feather pecking and the need for beak trimming. Factors that can reduce the risk of feather pecking include:

- Feeding high quality low-energy mash rather than pellets
- Provision of perches 70cm from the floor to prevent pecking from below
- Provision of high quality foraging material or objects, such as dry friable litter, maize, barley-pea silage, carrots, long straw, string, polystyrene blocks, pecking pans
- Encouraging use of outdoor space in free-range systems by providing tree cover, artificial shelters or verandas, and a varied, complex environment within the range that provides opportunities for foraging and dustbathing
- Verandas/ wintergardens that reduce the stocking density of the house and provide additional opportunities for exploration, dustbathing and foraging
- Provision of early outdoor access and match rear-to-lay conditions
- Provision of dark brooders in pullet rearing

2.2.4 Perching

In natural conditions, hens roost at night for protection against ground predators and for resting in daylight hours. Perches are used more in cage-free systems (53% of the observation period) than in enriched cages (23%)[45]. In cages, there is not enough horizontal and vertical space for birds to perch properly, and the placement of perches impedes movement of birds around the cage. Provision of aerial perches in commercial free-range houses has been found to reduce levels of aggression and fearfulness and improve body condition[52]. Perches should be carefully designed to encourage perching and to prevent issues including pecking from below, collisions (risk of keel bone damage) and foot health, as previously discussed.

2.2.5 Natural light

Providing proper light intensity and wavelengths, some of which are only found in natural light, is important for normal functioning in hens[53]. Chickens rely on their colour and UV vision to recognise resources (e.g. nest boxes, feed and water), to communicate with other hens, and for predator detection[54,55].

Natural light can be provided through different sources like windows, open-sided barns (in appropriate climates) and verandas and/or ranges. Hens also need 8 hours of uninterrupted darkness each night phase for proper resting. It's also good practice to simulate twilight and dawn by dimming the lights on and off to allow birds to settle and adjust. Lighting is useful in guiding behaviour and floor eggs can be reduced by better lighting under the aviaries.


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2.2.6 Additional space: outdoor access and verandas

Free-range systems provide hens with enhanced opportunities to express their behavioural repertoire and provide a choice between different environments. Use of the range has been found to improve feather cover and foot health[56]. Range use is enhanced with the provision of trees, bushes, and artificial shelters with a sand floor for dustbathing[57]. Shelter provides shade and protection from wind, rain and overhead predators, and provides a more favourable environment for the hens than just an open grassy area. Providing feed ad libitum and exposing birds to the outdoors at a young age encourages them to use the range when they are older.

A veranda (also known as a wintergarden or covered run) is "*an additional, roofed, uninsulated, outdoor addition to a building, with an outdoor climate*"[33]. A well-furnished veranda should include a flooring of dry, friable litter, and enrichment materials such perches, pecking substrates, and additional facilities for dustbathing (e.g. containers with loose litter) in sufficient quantities. Tree branches and haybales can also be provided, and additional feed, water, and supplements such as grit or oyster shells can also be offered. Verandas are highly recommended for barns systems to provide additional space and behavioural opportunities as well as natural light, improved air quality both in the barn and in the veranda for the hens. This has physical benefits for the birds such as improved skeletal health and reduced risk of respiratory problems, as well as improving mental wellbeing by reducing stress and reducing the risk of feather pecking, and increasing opportunities for positive experiences, while remaining manageable for producers. Verandas are also a beneficial addition to systems with outdoor access - a veranda offers a gradual transition between the indoor and outdoor environment, and provides additional space and an outdoor climate even when access to the range is restricted due to inclement weather or when compulsory housing orders are in place during disease outbreaks.

2.3. Mental welfare

Hens are able to experience complex negative and positive emotional states, such as pleasure, fear and stress, which are measured by behavioural and physiological changes[58]. It has been shown that hens are less fearful in indoor cage-free systems than enriched cages[45] and were least fearful in free-range systems[46]. Regular exposure to an outdoor environment at an early age has been found to reduce fearfulness in laying hens, and birds seen frequently outdoors were less fearful than those staying indoors.

Severe space restriction and high stocking densities in cages can result in group stress. Social interactions can be disrupted, with less space for hens to avoid aggressive interactions, competition over resources and high stocking density resulting in a loss of natural hierarchy[59,60]. Hens also experience frustration when unable to express highly motivated behaviours such as foraging, dustbathing and perching[43,61], which can result in abnormal behaviours such as feather pecking as redirected foraging[51].

Positive experiences are equally as important as the absence of negative experiences in order for animals to have a good life[62–64]. In laying hens, behavioural indicators of positive affective states include exploratory behaviours (foraging, scratching, and feeding) and dustbathing which are increased with environmental enrichment[65]. Therefore, promoting these behaviours are important for promoting positive affect so that laying hens can have a good life[65,66].

2.4. Assessing welfare

Welfare outcomes are an animal-based method of assessing an animal's physical wellbeing and increasingly their behavioural expression and mental wellbeing. Whilst provision of certain resources (inputs) in the hens' environment is necessary to increase the welfare potential of a system, measuring animal-based outcomes allows to assess whether that potential has been met, and so is still important to carry out in cage-free systems. Regularly scoring appropriate outcome measures can help to identify welfare problems and be used to set targets or benchmark for improvements through an active programme. The main welfare measures recommended for laying hens are:

- Disease incidence
- Keel bone fractures
- Feather cover
- Mortality
- Flock behaviour

3. PEOPLE

3.1. Consumer attitudes

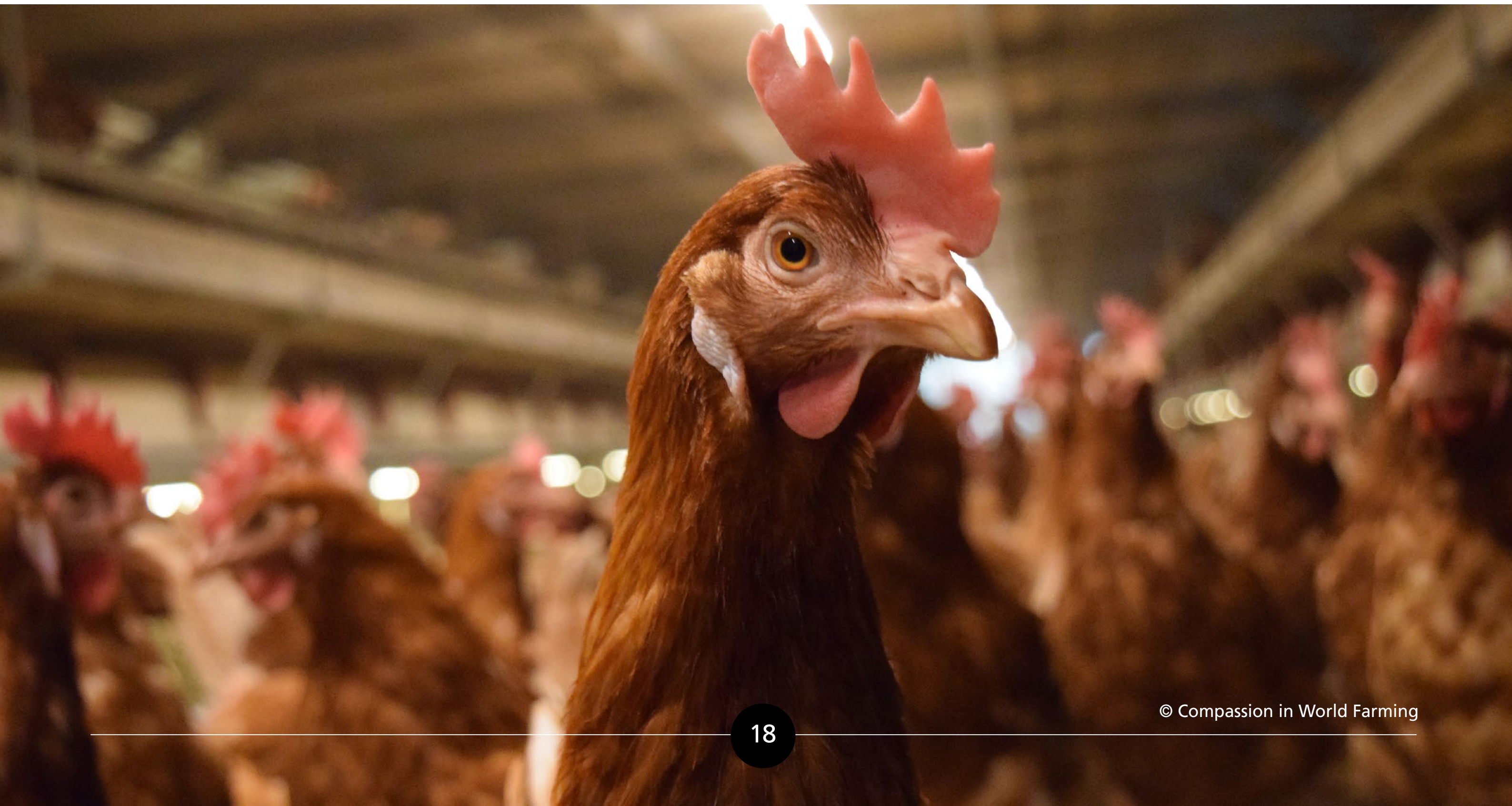
Consumers consistently show a high level of concern for laying hen welfare[67–71]. Surveys of attitudes to animal welfare across 14 countries[iii] found that the majority of adults in those countries agreed that hens can experience emotion and need room to explore and exercise[67]. Consumers' main concerns regarding laying hen welfare relate to living conditions, including outdoor access and space allowance ([67]; Ireland,[68]; UK,[72]). This is reflected in a widespread preference (e.g. willingness to pay, and stated as answers to questionnaires) for eggs from free-range systems (UK,[73]; Canada, [74]; Spain,[75,76]; Norway,[77]; Poland,[78]).

Motivation to purchase free-range and cage-free eggs is influenced by consumer perceptions that these eggs are healthier[73,79–81], safer[73,79,80,82,83], more natural[72,81], better for the environment[82], better for farm workers[82], higher quality[80–82], and taste better[72,73,80,81]. Compared with eggs from conventional cages, consumers are willing to pay more for eggs from higher welfare systems, including cage-free (Chile, [71]; Canada, 74; Spain,[75,76]) and free-range (Chile,[71]; UK,[73]; Canada,[74]; Spain,[75,76]; Norway,[77]; Poland,[78]; China,[84]) systems.

3.2. Nutritional quality

Production system is not a guarantee of egg quality, such as yolk colour and nutritional value. Egg quality may be affected by other factors, for example, genotype[85,86] and diet[87]. In the literature, findings vary, for example, eggs from free-range and organic hens were found to have higher yolk protein levels (EU organic,[88]; EU organic,[86]; free-range and EU organic,[89]), higher concentrations of monounsaturated and polyunsaturated fatty acids and omega-3 and omega-6 fatty acids (free-range, [90]) compared to eggs from caged hens. Conversely, protein content was found to be higher in eggs from caged birds compared to those produced in an organic system[91]. In another study, no differences were detected in fatty acid concentration between conventional cages, free-range, barn and organic eggs[89]. However, the nutritional quality of eggs from hens in cage-free systems may have the potential to be better than eggs from caged hens through good management practices. For example, free-range hens with access to grasses and insects are found to produce eggs with lower content of saturated fatty acids and higher content of monounsaturated fatty acids[92–95].

[iii] Australia, Bangladesh, Brazil, Chile, China, India, Malaysia, Nigeria, Pakistan, Philippines, Sudan, Thailand, UK, and USA



3.3. Food safety

Animal health and welfare are intrinsically linked to human health and wellbeing as is recognised by the One Health and extended One Welfare concepts. Food safety is a primary concern for human health, and risks of foodborne diseases associated with the consumption of eggs and egg products raise concerns, in particular from Salmonella and Campylobacter infections. Changes in eggshell contamination may be a concern for producers when moving from caged to cage-free systems. However, there is variation within the literature[96], with some studies showing shell contamination being higher in caged systems[97–100] and others showing higher contamination in cage-free systems[101–107]. Overall, the research does not suggest large differences in egg contamination between caged or cage-free systems, particularly in commercial settings[108].

In fact, there are a number of management and system factors which can contribute to egg cleanliness and the risk of pathogen spread or infection. For example, risk factors for Salmonella contamination include large flock sizes[105,109], likely due to increased volume of faeces and dust and attraction of disease-carrying rodents[110], and stocking density, which can increase the risk of infection spread in intensive systems[111]. Any risk of poor shell cleanliness of the eggs in aviary and free-range systems can be mitigated when hens use nest boxes in which to lay their eggs[112] and housing pullets in a similar environment to the laying system to train pullets to lay in nest boxes[9,113–116,] both of which will reduce the number of floor eggs and improve egg cleanliness.

3.4. Farmers

Potential challenges of transitioning to cage-free production facing producers may include the cost to transition, increased labour demands, land availability, mortality and health of the hens and floor eggs[8,10,116]. Reasons to transition include consumer demand, improved welfare for hens and access to a wider market[8,10]. Also, farmers will transition to comply with, or in anticipation of, a legislative ban on cages (e.g., in the EU with conventional cages).

In a recent study surveying cage egg producers in China, Japan, Indonesia, Malaysia, Philippines and Thailand, the authors found that the majority of respondents (65%) felt that cage-free production was feasible in their country[10]. An important aspect of moving to cage-free production will be providing training and technical knowledge, and market development in different countries or regions[10,116].

One of the perceived challenges of barn systems for farmers is the prevalence of floor eggs (i.e. eggs laid on the floor rather than in the nests). Floor eggs create additional work for farmers collecting them by hand and are a source of economic loss as they are usually dirty or broken meaning fewer saleable eggs[112,117,118]. The prevalence of floor egg laying is variable across system, flocks and individuals[119–125]. Factors contributing to floor egg laying include individual preferences, strain, design of the housing system, management of the system and pullet training[126]. Non-optimal nest use results in floor eggs, with hens trying to lay in occupied nests (gregarious nesting) that are more attractive, such as more secluded nests, corner nests or the higher nests[127,128]. The incidence of floor eggs can be mitigated by improving the attractiveness of nests and sufficient numbers of nests, providing appropriate lighting (natural light and sufficient light intensity) and providing nests during pullet rearing to train birds to use them from an early age, as discussed previously.

Providing a better environment for the hens can also benefit the farmers. Brighter light conditions in the shed, and the inclusion of natural light, creates a better working environment for the staff, while good system design can reduce labour and losses through mortality and floor eggs.

4. PLANET

4.1. Environmental impact of egg production

Studies have identified implications for the environmental sustainability of transitioning from caged to cage-free egg production, for example, due to changes in feed consumption, electricity use and increased land occupation[129,130]. However, these factors can be mitigated against (see the example of Kipster, Page 21). There are also other broader sustainability benefits to higher welfare cage-free systems, such as lower risk of disease outbreak and zoonotic pandemics, lower use of antibiotics and therefore lower risk of antibiotic resistance, and less pollution from less intensive systems..

Feed has been found to be the largest contributor to the environmental impact of egg production (e.g., feed inputs contribute as much as 84% of environmental impacts[131]; 54-75% of the primary energy use and 64-72% of the global warming potential (GWP) of the system[129]). Specifically, soyabean and palm oil[132] and the land-use change related to their production due to the associated with deforestation[129] lead to a higher environmental impact than other feed sources such as grain.

4.2. Mitigation strategies

A broader approach to sustainability needs to ensure good animal welfare while also minimizing environmental impact. However, since shifting to higher welfare systems is expected to increase their environmental impact, we need ways to mitigate this, for example:

- **Alternative feed**: Feeding waste from human food production and sourcing feed from more responsible sources[133], optimising the feed for the breed used, taking into account land-use change and country of origin, can dramatically reduce the environmental impact of egg production[134].
- **Breed**: Another option may be to use white bird breeds, such as the Dekalb White as used by Kipster. White birds are found to have greater feed conversion efficiency compared to brown hens[135]. Also consider utilising end-of-lay hens for meat.
- **Consumption**: Overall reduction in the consumption of eggs, and therefore the number of hens reared and housed for egg production, will also help to offset any potential environmental impacts of moving to higher welfare, cage-free systems (see Barilla example, Page 21).

Example: Barilla

Barilla Group, an Italian company which manufactures pasta and bakery products, has been working on reducing egg content in some of its recipes, in parallel to its cage-free egg transition. In 2020, they launched three biscuit lines in Italy with lower egg content and higher plant-based proteins. This commitment resulted in an 8% global reduction in egg usage and a 14% decrease in the number of hens reared (over 330,000 fewer hens), earning Barilla Compassion's Special Recognition Award in 2021.

Read more about Barilla.

Example: Kipster

Kipster was founded on the idea of a carbon-neutral system for producing eggs. Three key aspects were considered: energy requirements, the bird and feed. They have installed 1078 solar panels on the roof of their building which covers the electricity needs of the farm. They have chosen a white bird, for greater feed efficiency and welfare reasons (they have a lower prevalence of feather pecking and therefore do not requiring beak trimming). For feed, they work with and feed their birds a nutritionally balanced feed from waste products. In addition, they meet the Beter Leven 3-star assurance scheme standards and rear their male chicks and end-of-lay birds for human consumption to reduce waste of resources across the entire production cycle.

Learn more about Kipster.

CONCLUSION

Individual companies, governments, and consumers are all driving a global market shift to cage-free egg production. There is a large body of evidence showing the welfare and health benefits of cage-free systems to laying hens, but there are also important social benefits to consumers, farm workers and the wider population regarding zoonotic disease outbreaks and antimicrobial resistance. While there are economic and environmental considerations around the cage-free transition, there are effective strategies to mitigate any impact on costs and on the environment. Animal welfare is an integral part of a sustainable model of egg production, and only a cage-free systems have the potential to deliver good welfare while improving brand reputation and meeting societal demand for ethical food.

Further reading – Compassion's Laying Hen resources available here, including:

Production

- Review of global egg production 2023
- Consumer perception of eggs
- Standards comparison table

Case studies

- Kipster
- Noble Foods
- Verandas (wintergardens) for laying hens

Cage Free

- Hen welfare in cage-free systems
- Practical guide to higher welfare systems
- Additional guidance on multi-tier systems
- Why combination systems are not appropriate
- Why enriched cages are not appropriate
- Laying hens - welfare outcome summary

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