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EGG PRODUCER & EGG BUYER DISCONNECT

Exploring barriers and
levers to increase cage-free
egg production in China

Guidance Memo prepared for the Tiny Beam Fund

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Abstract

China's egg industry is the largest in the world, responsible for approximately 40% of the world's eggs, 90% of which are from conventionally caged hens. Concern over the confinement of hens in cages has led to growing pressure on the egg industry. Multinational and national companies have made public commitments to source 100% cage-free eggs in China. However, compared to other countries where commitments have been made, the rate of transition to cage-free egg production has been slow. To date, the number of cage-free egg producers remains small — there is limited availability of/demand for cage-free eggs and egg products. A central reason for the slow transition is a disconnect between egg producers and egg buyers (food businesses and end consumers).

This Guidance Memo examines the egg producer-buyer disconnect and suggests ways to improve alignment and encourage progress in the cage-free transition. Three fundamental barriers between producers and buyers are described:

Understanding — Global cage-free egg campaigns have focused on the singular issue of animal welfare. 'Animal welfare' is not well understood in China and there is confusion about cage-free in the egg marketplace;

Cost — Transitioning to cage-free is expensive and comes with considerable financial risk. Egg buyers are generally unwilling to pay the resulting price increase, especially while the benefits of cage-free are not understood;

Confidence — Egg producers aren't confident that food businesses will keep their commitments. In turn, egg buyers can't always trust claims of traceability and verifiability of their eggs.

'Lever's to facilitate alignment between egg producers and buyers are then highlighted, alongside practical recommendations for animal welfare advocacy organisations working on cage-free. These include capacity building within China so that cage-free activities are delivered in a culturally relevant context; ensuring the term 'cage-free' is linked with trusted, safe, quality products; and focusing engagement and marketing on receptive corporate and consumer audiences.

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Glossary of key terms

cage-free:

there are two different types of cage-free housing systems

- 1) **indoor barns**, which comprise of a single 'tier' of nest boxes, perches/slatted area and a litter floor area or, multi-'tiers' (sometimes called aviaries) upon which birds perch, nest, feed, and rest plus a litter floor area. Flocks in multi-tiers are usually much larger due to the increased space available;
- 2) **'free-range'** where hens have access to the outdoors and indoors, the indoor area will also be single or multi-tier.

city tier system:

an unofficial hierarchical classification in mainland China. Businesses frequently refer to the tier system when devising marketing strategy: treating China as one market is simply not feasible, because consumers from different regions and cities have vastly different income levels, behaviours, and trends. Cities in different tiers also differ greatly in population size, infrastructure, and level of sophistication in products and services.

The most common system of ranking Chinese cities is to categorize them into four respective tiers, Tier 1 cities being the largest and wealthiest. As the tiers progress, the cities decrease in size, affluence, and move further away from prime locations. There are only four cities in Tier 1: Beijing, Shanghai, Guangzhou, and Shenzhen.

conventional cage:

a type of laying hen housing introduced in the 1950's to protect birds from weather, predators, and disease. Hens are kept in small groups (often six to seven birds) in wire cages on multilevel rows. Feed and water are provided by

automated systems, eggs and manure are taken away on collection belts.

Conventionally caged laying hens are among the most intensively confined animals in agriculture. Conventional cages are also called 'battery cages'.

egg buyer:

includes 1) **food businesses** (see note) that purchase shell eggs or egg products for use as ingredients in packaged goods, food, and drink or for re-selling in stores. 2) **end consumers** (see note) who purchase eggs for personal consumption.

egg producer:

individuals or companies that rear laying hens for egg production. The eggs are then sold or consumed.

end consumer:

a person who purchases products for the purpose of personal consumption rather than that of reselling them to someone else. Also referred to as a 'consumer'.

end-of-lay hens (EOL):

used to describe the period when egg production slows down and it is no longer financially viable to keep laying hens. End-of-lay can be anywhere between 60 weeks and ~90 weeks depending on strain of hen, housing system and finances of egg producing operation. Also referred to as 'spent' hens.

farmer cooperatives:

established by farmers as a means of collective action for the transportation, packaging, pricing, distribution, sales and promotion of their products. The main aim of establishing a cooperative is to increase member's production and incomes by helping better link them with finance, agricultural commodities such as feed and fertiliser, information, and markets. Cooperatives enable individuals to achieve goals that they may not otherwise be able to achieve by themselves.

food business:

any establishment or place where food is held, processed, manufactured, packaged, prepared, displayed, served, transported, or sold.

food supply chain:

the network of individuals and companies involved in the production, processing, distribution, consumption, and disposal of food products.

laying farm:

the location where laying hens are kept. There may also be facilities for rearing young laying hens, or pullets (<20 weeks old), which have not yet started to lay eggs. A farm may have multiple flocks (see flock definition) of laying hens at different or similar ages.

laying flock:

laying hens housed in a single shed, or contained in a single range, at the same time.

multinational:

a company that has business operations in at least one country, other than its home country. Generally, a multinational company has offices, factories, or other facilities in different countries around the world as well as a centralised headquarters which coordinates global management.

vertically integrated:

vertically integrated companies in a supply chain have a common owner. Each company produces a different product or service. In the egg industry a vertically integrated company is likely to own the feed mills, hatcheries, breeding, rearing, and laying farms, egg packing, grading, and processing facilities, and the abattoirs, which slaughter and further process (into ingredient products for soup, pies etc) end-of-lay hens.

Introduction

Global egg production has experienced exponential increase in the last 50 years, concurrent with the growth of the human population and demand for eggs as a nutritious form of animal protein. This expansion has been realised through intensification of the egg industry and the introduction of conventional cages or ‘battery cages’ to keep laying hens. Today, most of the world’s eggs are produced from hens in conventional cages — some of the most intensively confined animals in agriculture.

Conventional cages cause poor animal welfare, as extreme confinement restricts the expression of laying hens’ natural behaviours such as stretching wings, perching, dust bathing, nesting and foraging. This level of confinement also results in physiological problems such as musculoskeletal weakness, poor bone density and chronic disease. Conventional cages were banned in Europe in 2012, while Australia, Canada and New Zealand have commenced a legal phase-out.

Enriched cages — whereby hens are provided with nest boxes, perches, dustbathing substrate and more space per bird — have attempted to diminish some welfare issues. However, the ability of birds to move about freely remains very restricted. Eggs from hens in cage-free systems, such as free-range or indoor barn, offer a preferable solution for improving laying hen welfare: if managed well, birds are healthy, able to move about freely and express most of their natural behavioural repertoire.

Concern over the confinement of hens in cages has led to growing pressure on the egg industry. Over the last decade, hundreds of companies across the globe have committed to sourcing cage-free eggs by certain deadlines. Most of these commitments have been, or will be, fulfilled in Europe and the United States. Legislation reforms to ban the use of cage systems, including enriched cages, are being implemented in the European Union (EU) and some states in the United States. These corporate commitments and legislative reforms have been driven by well-organised animal advocacy groups and aligning consumer attitudes and behaviours.

China produces approximately 40% of the world’s eggs, 90% of which are from conventionally caged hens. The global trend of transitioning to cage-free is therefore critically important in China due to the sheer number of laying hens in these cages. Multinational and national food businesses have made public commitments to source 100% cage-free eggs in China. However, compared to other countries where commitments have been made, the rate of transition to cage-free egg production has been slow. To date, the number of cage-free egg producers remains small — there is limited

availability of/ demand for cage-free eggs and egg products. A central reason for the slow transition is a disconnect between egg producers and egg buyers and towards cage-free.

The aim of this Guidance Memo is to shed light on the egg producer-buyer disconnect and suggests ways to improve alignment and encourage progress in cage-free egg production.

There are three main sections:

- 1. China’s egg production and corporate cage-free commitments.** A contextual overview describing the scale of China’s egg industry, where and how eggs are produced and how they are sold. This section also outlines who is making cage-free commitments, who is producing cage-free eggs and the speed of progress towards commitment deadlines.
- 2. Barriers.** This section explains the three fundamental barriers causing disconnect between egg producers and buyers; why and how it affects them and how they are impeding progress in the cage-free transition.
- 3. Levers.** This section describes ‘levers’ in the form of information to use / actions to take to facilitate alignment between egg producers and buyers. Practical recommendations for support by animal welfare advocacy organisations are provided.

This memo draws from the expertise of those working in the egg industry, food business and agri-consulting. The work was carried out through a series of in-depth telephone and video interviews, as well as case-studies of egg markets in selected cities (due to COVID-19 travel restrictions) with assistance from Chinese colleagues. This was combined with desk-based literature reviews and analysis of industry data, reports, white papers, and peer reviewed papers.

The information and insight are intended for use by animal welfare advocacy groups and other organisations campaigning for, or supporting, the transition to cage-free egg production in China. I hope it will assist these groups in their important work, so that the welfare potential of cage-free for laying hens is realised.

SETTING THE SCENE

China's egg production
and cage-free corporate
commitments

01

1. China's egg production and corporate cage-free commitments

KEY MESSAGES

China's egg industry is the largest in the world and rapidly expanding. It has shifted over the last 40 years from traditional backyard farms to specialised laying farms. Specialised laying farms are increasing in size and specification.

Vertically integrated companies are controlling larger shares of the egg industry. Some of these companies have recently been ranked in the Top 10 list of the world's (largest) egg producers.

Approximately 90% of hens in China are housed in conventional cages, whereas cage-free eggs — from specialised laying farms — comprise <1% of production. The remaining ~9% live in backyard and small family farms and are a mix of free-range and caged hens. Most of these eggs are sold as fresh shell eggs, unpackaged and unbranded.

Over 70 international and national food businesses have committed to sourcing 100% cage-free eggs in China. Most of the commitments have been made by the hospitality sector with a deadline of 2025.

The small number of farms producing eggs to an industry cage-free standard or above are independent producers that have seen a business opportunity in cage-free. The largest egg production companies have not yet made any public commitments to cage-free.

The quantities of eggs currently being produced in specialised cage-free systems, is estimated at <20% of the egg supply needed by 2025.

This section provides a contextual overview of China's egg industry and the transition to cage-free egg production:

— the scale of China's egg industry, where and how eggs are produced and how they are sold

— who is making cage-free commitments, who is producing cage-free eggs and the speed of progress towards commitment deadlines

LANDSCAPE OF EGG PRODUCTION

Size of egg industry

China has ~1.1 billion laying hens producing ~308 billion eggs per annum. This is three times the size of the second largest producer, the United States, with ~300 million hens producing ~88 billion eggs annually.

In response to increased demand for animal products, egg production has expanded rapidly in the last 10 - 12 years. From 2010 to 2020 there was a 22% growth in egg production. **Consumption of eggs in China is amongst the highest in the world, at 280 eggs per person per year.**

China is self-sufficient in shell egg production and only imports a very small number of eggs which are offset by exports.

Where and how eggs are produced

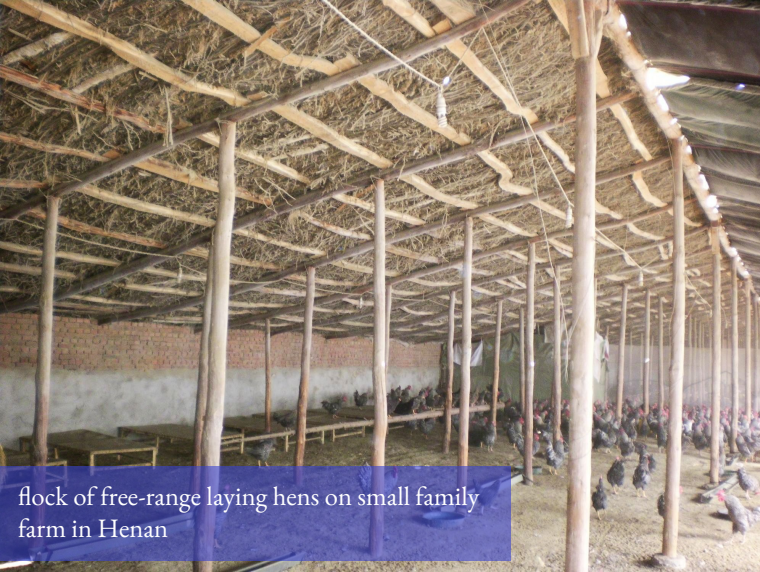
Egg production is mainly located in northern and central China, where grain is produced for chicken feed and the climate is more suitable for raising chickens. Eggs are then transported by road from North and Northeast China to the Southeast and Southern regions as well as into big cities like Beijing, Tianjin and Shanghai. Backyard farms (<2,000 hens) and small family farms (2-10,000 hens), keep laying hens alongside other livestock and crops.

Over the past 40 years the egg industry has been shifting gradually from traditional backyard farming to specialised layer farms.

Specialised layer farms can be split by flock size:

- medium (10-50,000 hens)
- large (50-100,000 hens)
- very large (>100,000 hens)

BOX 1 The 1.1 billion laying hen figure is based on an industry inventory of breeding stock, sales of chicks and culling of laying stock, plus an estimate of laying hens in backyard and small family farms. It is significantly lower than the latest FAO estimate for 2020 of ~3.1 billion laying hens. However, ~1.1 billion hens is considered more reliable by the egg industry than the FAO estimate, which calculates laying hen numbers from tonnes of production (31 Mt in 2021). Based on the tonnes of production and estimate of ~3.1 billion laying hens, a comparatively low egg per bird production rate is being used (184 eggs per bird per year). Modern laying breeds have a higher egg production rate (conservative estimate of 280 eggs per bird per year) and are used on 90% of Chinese laying farms. The FAO calculation is likely to be a substantial overestimate of China's national layer flock.



flock of free-range laying hens on small family farm in Henan

conventional cages. Cage-free eggs from specialised laying farms comprise <1% of production, the remaining ~9% are in backyard and small family farms and are a mix of free-range/caged.

Where and how eggs are sold

Approximately 95% of eggs are sold as fresh shell eggs. Brown eggs are the most common, followed by pink, white and then blue.

The majority of these are traded through egg dealers and are sold unpackaged and unbranded.

While most layers are still kept in flocks of <50,000 hens, there has been an unprecedented development of large egg corporations over the past decade and the structure of egg production in China is rapidly changing.

- In 2010, the Chinese Ministry of Agriculture started a nationwide project to promote the standardisation and expansion of layer farms. The number of layer farms has been decreasing and the average farm size increasing. Many smaller farms have ceased production.
- Since 2010, several large vertically integrated companies have been established, which manage large operations including: feed milling; the breeding, hatching and rearing of pullets (young laying hens); laying hen husbandry; and the transport, packing and processing of egg products. The largest companies have ~5-20 million hens and have recently been ranked in the Top 10 list of world's (largest) egg producers. More Chinese companies are expected to reach the Top 10 list in the next few years. Vertically integrated companies will continue to expand and control larger shares of the total national flock, following similar trends in Europe and North America.
- Layer farms of all sizes have become more up to date — artificial lighting, ventilation, automated feed and water delivery systems and specially formulated feed are common.
- Most farms use commercial breeds of layer hens specifically selected for their high egg production. These layers come from both local and overseas genetics companies. Traditional Chinese breeds of chicken are still kept, but predominantly in backyard and small family farms, and are often reared for their eggs and meat.

Regardless of farm size, most laying hens are housed in cages. Approximately 90% of hens in China are housed in



eggs for sale at local market in Beijing

The proportion of shell eggs sold through grocery retail stores (supermarkets and convenience stores) is increasing, particularly in large cities. Some of these eggs are packaged and branded.

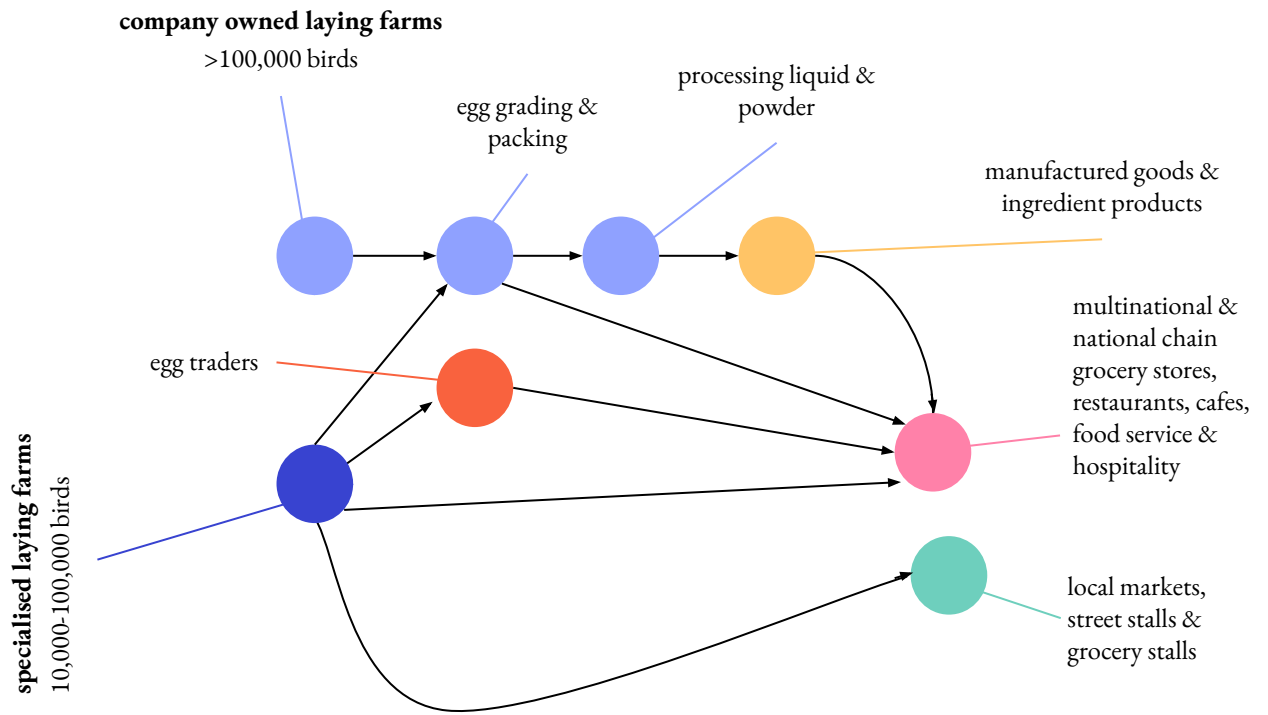
- Branded eggs yield a two to five-fold premium in margin over the generic product.
- Egg packaging and branding is rapidly developing, and many large egg producers are promoting their own brands with efficient distribution networks.
- E-commerce platforms are widely used to market branded table eggs. Some smaller producers with speciality eggs also package and brand their own and sell direct to retail outlets, restaurants, and hotel chains.

Less than 5% of the total volume of eggs produced are further processed into liquid or powder for manufacturing.

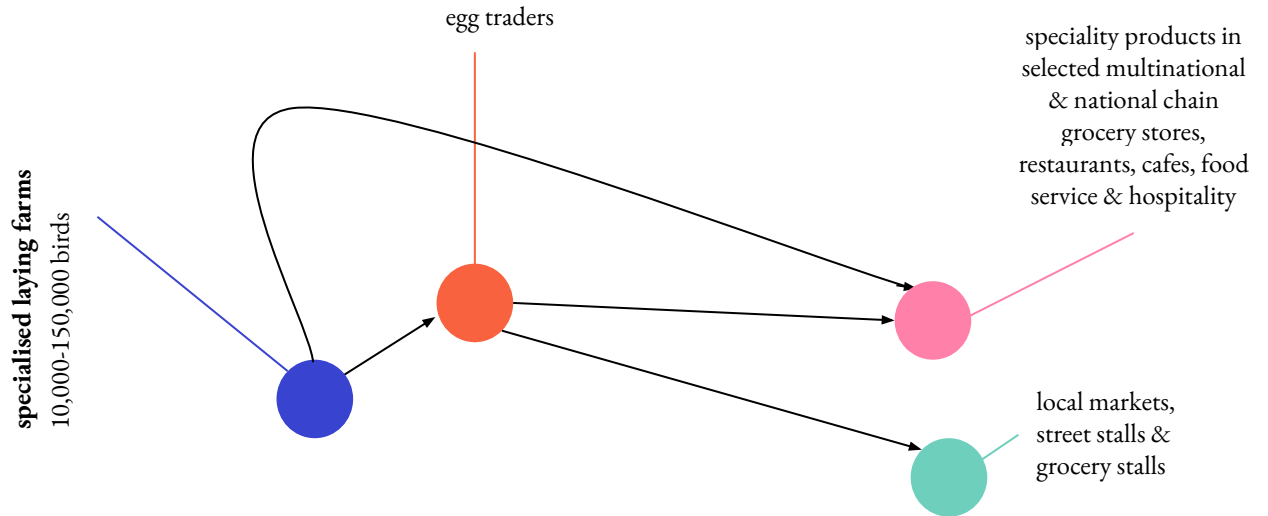
Because of the diversity of farms sizes, production systems, and ownership structures, Chinese egg supply chains are much more complex than in Europe and United States (Appendix 1). Understanding how eggs get from farm to market in China is key to the progression of cage free production. An overview of key 'farm to market' routes for eggs in China is shown in Figure 1.

FIGURE 1

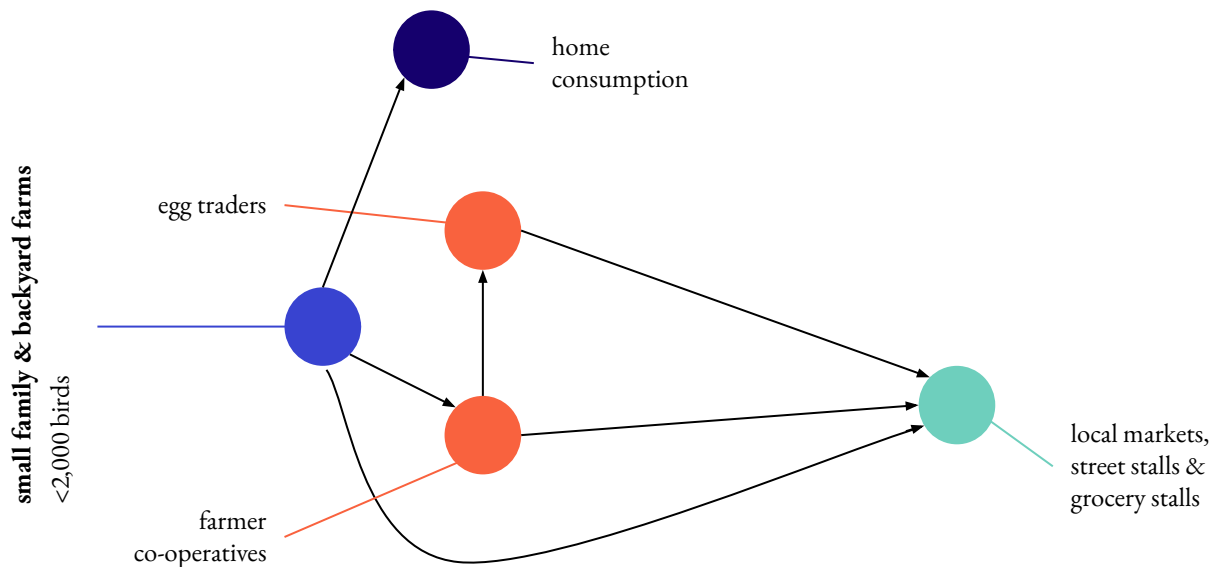
A



B



C



Overview of key 'farm to market' routes for eggs in China

A. Specialised laying farms – conventional cage egg production; B. Specialised laying farm – cage-free egg production; C. Small family and backyard farms – cage or free-range egg production, crops and livestock.

CAGE-FREE COMMITMENTS IN CHINA

Over 70 international and national food businesses have committed to sourcing 100% cage-free eggs, including the Chinese market. These commitments are from café and restaurant chains such as Starbucks, Zoo Coffee (national) and Subway; retailers, including METRO, City Super (national); manufactured goods, including Unilever and Nestle; food service companies, such as A Star (national), Sodexo and Aramark; and hotel chains Radisson, Marriott and Wyndham, among others.

Most commitments have been made by the hospitality sector (~40%), followed by manufactured goods (~20%) and restaurants (~20%). There are comparatively few grocery retailers or food service providers and there are no commitments, as yet, from the egg production companies.

What are their timelines?

Over 50% of the timelines for global (inc. China) commitments have been made for 2025, with the remainder split between 2026 through to 2030. There were seven new cage-free company commitments (inc. China) in 2022, compared to eight in 2021, 12 in 2020 and 11 in 2019.

What progress has been made?

Food businesses

According to publicly available cage-free commitment trackers, seven companies have achieved their global commitments and are sourcing 100% cage-free, including in China. The companies that have achieved their commitments on the tracker are manufactured goods producers with relatively small requirements of liquid or powder egg products. The tracker does not require specifying where the cage-free product comes from, just that the source is cage-free. Approximately 60% of the companies that have made global commitments, which include China, are not reporting their progress.

Egg producers

Until October 2021 there was no defined cage-free standard for China. Then China Chain Store and Franchise Association (hereinafter CCFA) and China Animal Health and Food Safety Alliance (hereinafter CAFA) jointly released their 'Evaluation Guidelines of Cage-Free Egg Production' Group Standard. This set of guidelines provides a unified definition of 'cage-free' for producers and lays out certain requirements for keeping flocks in cage-free systems.

There are a small number of producers who have seen a business opportunity in cage-free and have built (or converted to) indoor barn cage-free systems. Based on reports of birds-on-the-ground, there are <500,000 laying hens (~140 million eggs annually) in this 'modern' cage-free production (Figure 1) and which meets the CCFA/CAFA standard or above. These farms are typically owned and operated by individual producers and not part of the very large egg production companies (Figure 1).

There are many specialised free-range, pastured or organic egg laying farms (and which also fit the cage-free definition). These farms have modern and traditional housing systems, and laying breeds. However, they are variable in their biosecurity, management, and bird husbandry, some needing significant improvement to supply food business with the consistent quality and quantity of product required in their sourcing standards.

The largest egg production companies, such as Sundaile, Hanwei and DQY have not made any *commitments* to cage-free. They are however, building indoor barn and free-range systems and will/do have the capacity to produce cage-free eggs within the next year. These are likely to be small and experimental, at least initially, eg, one or two flocks of 20,000 birds.

Progress versus commitment – how is it going?

An analysis of the corporate cage-free commitments in China, predicts food businesses will require ~1.8 billion eggs from ~6.4 million additional layer hens per year.

The quantities of eggs currently being produced in specialised cage-free systems, to the sourcing standards of food businesses, is estimated at <20% of the egg supply needed by 2025.

BARRIERS

Egg producer and egg
buyer disconnect —
three fundamental barriers

02

2. Egg producer and egg buyer disconnect — three fundamental barriers

KEY MESSAGES

The global cage-free egg campaign has been led by animal welfare advocacy organisations in Europe and the United States focused on the singular issue of animal welfare. It has not resonated in China the same as in western countries.

— the term ‘animal welfare’ is not well understood and there is confusion about cage-free in the egg marketplace.

— priority in China is on food safety. Until cage-free eggs are linked to safe, high quality, healthy food, demand for an egg production system change is unlikely to happen.

Transitioning to cage-free is expensive and comes with considerable financial risk, particularly for small and independent producers. Food businesses and end consumers are unwilling to pay the resulting price increase, especially while the benefits of cage-free are not understood or linked to safe, quality products.

Egg producers aren’t confident that food businesses will keep their commitments. In turn, egg buyers can’t always trust producer claims of traceability and verifiability of their eggs so are unwilling to pay a price premium.

The outcome of this disconnect is a limited cage-free egg production capacity.

This section explains three fundamental barriers causing the disconnect between egg producers and buyers towards cage-free —

it examines why and how barriers affect egg producers and egg buyers (food business and end consumers)

KEY



egg
producers



egg buyers



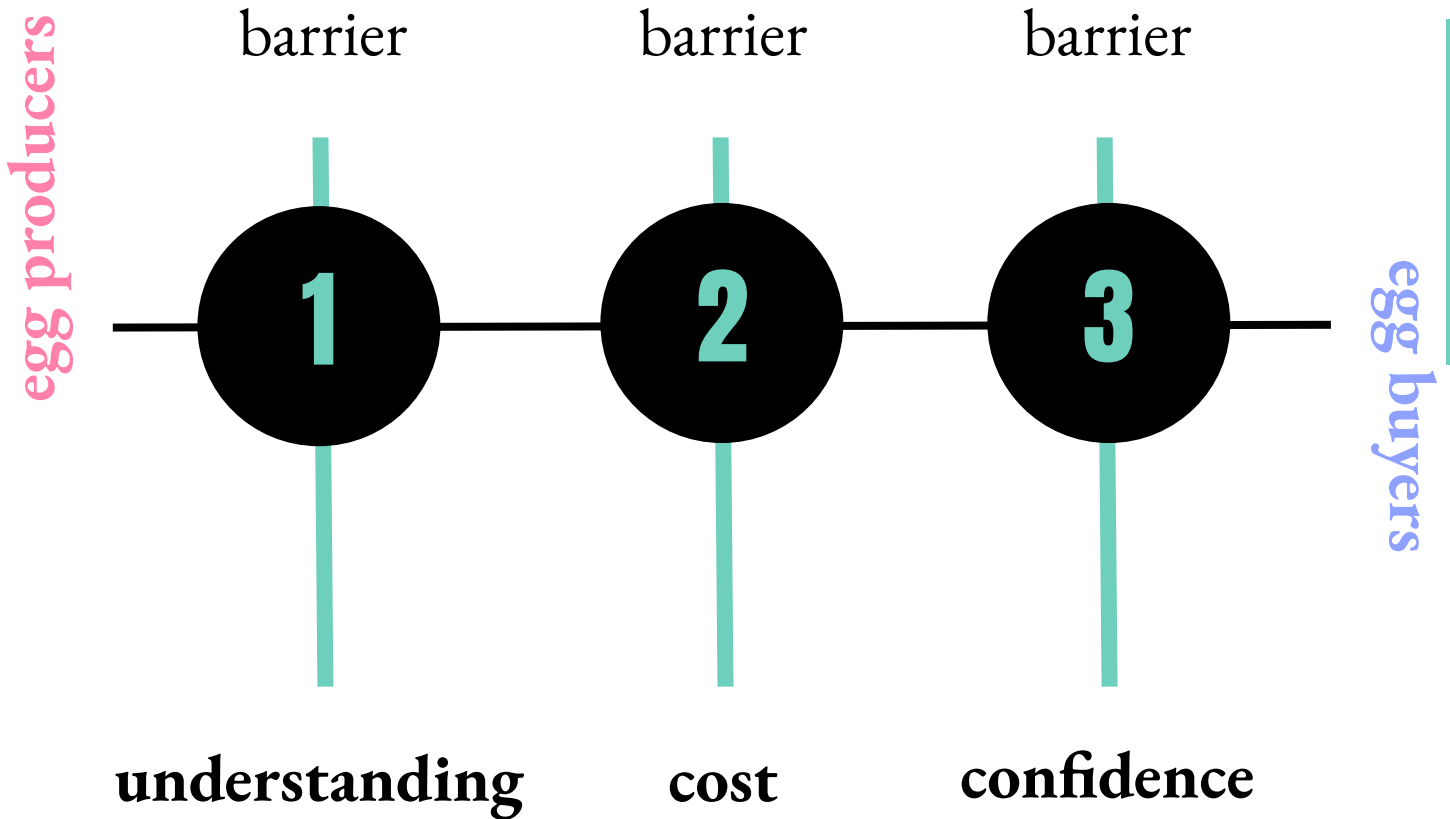
food
businesses



end
consumers

BARRIERS

The three fundamental barriers causing a disconnect between **egg producers** and **egg buyers**



barrier
outcomes

limited availability of cage-free eggs
for food businesses to source and consumers to purchase

inadequate technical & infrastructural support

(eg. equipment and veterinary medicines) for egg producers to transition smoothly

BARRIER 1: UNDERSTANDING

“ Cage-free eggs must be a product that people want and are willing to pay for ”

Director in Retail Food Business. September 2022



— The term ‘animal welfare’ was introduced into China in the 1990s; ‘dong wu fu li’ (动物福利) fu li being a term for social welfare and a concept of a high level of needs provision, which has then been applied to animals (dong wu). It is hypothesised that early translations of the term into Chinese caused misunderstanding and that some level of confusion remains today.

— In comparison to other countries¹, Chinese study participants frequently report never having heard the term ‘animal welfare’ and have the lowest level of understanding of ‘animal welfare’ (~30%).

— Level of education, age and location (rural or urban, first, second or third tier city) influence the importance placed on animal welfare. Young, highly educated urban populations from first tier cities tend to have the highest levels² of understanding and concern for animal welfare in China. This low level of national agreement as to the importance of welfare means progress on grounds of welfare alone is likely to be slow and segmented.

One of the key principles associated with the success of international animal welfare initiatives is an understanding of local audiences and contexts. The global cage-free egg campaign has been led by animal welfare advocacy organisations in Europe and the United States focused on the singular issue of animal welfare. The cage-free campaign has not resonated in China the same as in western countries and the result is a limited demand for cage-free eggs.

An overview of why is outlined:

¹ For example, in Brazil, a country similar to China in that it does not have farmed animal welfare legislation, there is a high level of understanding of animal welfare and conviction that animals feel pain and have behavioural needs. This level of knowledge and conviction presents a receptive audience for initiatives that advance animal welfare and is considered a core reason for the rapid transition to cage-free in Brazil (Appendix 1).

² For example, in surveys of university students or those with university level education, most Chinese participants agreed that the welfare of both farmed animals and companion animals was important to them (81.5%, 83.2% respectively). By contrast, in surveys of the general public, Chinese participants report lower concern (53%) for animal welfare; lower concern for farmed animals as compared to those in Russia, Brazil, and India and a lower associated importance of animal welfare as compared to fellow Asian nations.

P

— Cage-free producers in China have noted that conventional cage producers have a general unwillingness to learn a new system. Cage-free is a fundamental change in the way birds are reared and managed and, with large flock sizes, it is a significant welfare risk should problems arise, as well as economic risk if poor management results in high mortality and low egg production. To overcome these hurdles, producers need access to the right technical support and infrastructure.

— Lack of technical capability is cited as a core challenge for establishing cage-free farms. Overseas consultants are generally required to set up and train producers for cage-free management, which - with the Covid 19 pandemic and travel restrictions - has proved very difficult over the last 3 years.

FB

EC

— When questioned, Chinese consumers appear to be largely unsure what cage-free eggs are or have never heard of cage-free eggs before.

— Similarly, grocery retailers and food service companies have limited understanding of the concept of cage-free. This compounds the uncertainty of consumers because these food businesses, responsible for selling cage-free egg products, are more likely to use inaccurate or misleading messaging (Box 2).

— Providing consumers with more information about what cage-free means is frequently cited as a way to scale cage-free production in China and other countries. However, it is not clear that providing more information is necessarily helpful, especially where confusion about egg production already exists³ (Box 2).

“

Going from
cage to
cage-free
production
is like
knowing
how to ride
a bike and
then trying
to drive a car ”

Cage-free producer.
August 2022

EC

— In China, trust in the domestic food system is low because of frequent, high-profile reports of food incidents and scandals. Food safety is a very important consumptive motive alongside product quality and price. Freshness, especially in livestock, fruit and vegetables, is a core component of safety and quality.

— Linking animal welfare with safe, high quality, healthy food has not been a priority for North American or European cage-free campaigns because citizens in these countries are more willing (or have the means) to invest in causes for primarily ethical reasons. Research has demonstrated that, while animal welfare is important, concern for animal welfare as a stand-alone issue is unlikely to drive demand for an egg production system change (Appendix 2).

³ In the United States, for example, studies identified that a misunderstanding of ‘cage-free’ as synonymous with ‘free-range’ was common. When participants were shown videos of cage-free systems, their willingness to pay for cage-free eggs dropped to a price point lower than that prior to being shown the video.

List of terms used on egg packaging which relate to hens reared outdoors or in ‘natural environments’. Regional differences exist in the use of terms. Note that these are marketing terms used to attract customers and most packaging claims are not verified.

柴鸡蛋 Chai egg:

Chai meaning chicken that perch on wood/branches - refers to local breeds reared outdoors or in a natural environment.

土鸡蛋 Earth (or soil) egg:

refers to eggs from local breeds reared outdoors, scratching in the earth/soil. Most widely used.

草鸡蛋 Grass egg:

refers to eggs from local breeds reared outdoors and which have access to grass (as a feed component).

山鸡蛋 Mountain egg:

refers to local breeds reared in mountainous regions of China.

散养 Free-range:

refers to hens reared with access to outdoors. May or may not be local breeds.

有机鸡蛋 Organic egg:

refers to eggs from hens reared according to ‘organic’ principles. This may or may not be certified and often only refers to what an animal is fed as opposed to a system of production. May or may not be local breeds.

牧场饲养 Pasture raised:

refers to hens reared with access to outdoors. May or may not be local breeds.



selection of egg labels on eggs for sale in grocery stores across Beijing, Hefei and Wuhan

BARRIER 2: COST

Costs of transitioning to cage-free are high and there is high financial risk, especially for small and independent producers. The resulting price of cage-free products for food businesses and end consumers is higher than conventional cage eggs.

P

— Reports of capital costs vary from US\$30 to US\$200 per bird for a 10,000-bird flock in a modern indoor multi-tier system. This variance is largely due to limited availability of locally produced equipment and/or expertise, any issues require labour, resources or time to address. By comparison, in Europe the set up/conversion costs for an indoor aviary housing can be accurately estimated at ~US\$30 per bird, allowing producers to be more confident in their budgeting (see Appendix 1).

— Reports on operating costs also vary widely, from ~25% through to 100% over caged production. This is due to operating new systems, with steep learning curves and lack of supporting services and infrastructure (see Appendix 1 for operating cost comparisons of other countries).

— Unfortunately, producers have limited ability to set the price of eggs. The bargaining power of downstream actors in the egg supply chain (graders/packers, food business) tends to be greater than that of producers unless the producers are very large (Figure 1). The independent cage-free egg producers currently operating in China and rearing birds to the CCFA/CAFA standard or higher can sell on average ~50% of their eggs at a price premium. The remainder is sold to egg traders for the conventional cage egg price (Figure 1).

— Of the 50% of eggs that are sold at a price premium, producers report selling eggs directly through e-commerce platforms, high end grocery retailers, restaurants and hotel chains in Beijing, Shanghai, or Hong Kong. There is a variable ~10% to >100% increase on price over conventional eggs depending on their end destination.

— Once large egg producing companies move to cage-free production, they are likely to build their own brands and marketing channels to promote their eggs – which will make it more difficult for the smaller independent producers to compete with them on price and distribution.

FB

EC

— Purchasing cage-free eggs as either shell eggs or as egg products (liquid and egg powder) is more expensive.

— When consumers and advocacy organisations support policies that increase prices beyond a point that can be reflected in higher retail sales, producers, and retailers face an unfunded mandate. *‘I will give you my vote but not my money’*. In the United States, this mismatch between the cost of cage-free egg production and the willingness-to-pay price premium of consumers is cited as evidence for producers abandoning plans to convert.

— While Chinese consumers have a stated preference for cage-free over caged eggs, most first-tier city consumers will pay <20% more for cage-free eggs and most second tier city consumers <10%. This is not enough to cover the increased costs of cage-free egg production for the Chinese producers (see left).

— Many of the food businesses that have made commitments, including in China, are for packaged goods or ingredient products. Their customers may not readily recognise these as egg-based products and thus connect them to cage-free, making it more difficult to pass on the increased costs.



cage-free eggs for sale at e-commerce platform Hema Fresh in Beijing

BARRIER 3: CONFIDENCE

Egg producers aren't confident that food businesses will keep their commitments to buy cage-free products but, in turn, struggle to demonstrate the traceability of their eggs. The limited verification and misleading messaging of egg product results in egg buyers who don't trust egg producers.



— There is concern amongst Chinese producers that companies may scale back or abandon their cage-free commitments. This concern is not unfounded.

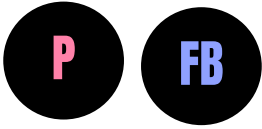
For example:

- commitment dates have been pushed back eg, Marriott, Burger King and Woolworths originally made cage-free commitment dates for pre-2020, these have been pushed back to 2025
- progress has not been reported or is not transparent eg, Walt Disney and Hilton Hotels and Resorts have simply not reported progress for cage-free commitments that have already passed their due date; Approximately 50% of the companies that have made global commitments inc, China are not reporting their progress. For those that are, there is no breakdown by country for Asia
- phrasing of commitments is vague, and leaves open the possibility to go back on commitments eg, Walmart — “Transition Walmart U.S. and Sam’s Club U.S. to a 100% cage-free egg supply chain, subject to regulatory changes and based on available supply, affordability and customer demand.” Walmart subsequently announced in 2022 that — due to supply issues, the cost of production and the strain that cage-free pledges have put on the U.S. egg industry — they will not be able to supply 100% cage-free eggs by 2025
- research by advocacy organisations in the United States has determined that United States cage-free commitments have a 60% likelihood of companies following through at the specified date, and this has dropped to 53% globally

— For food businesses, the 2025 deadline is still two years away, especially for those with small egg supply requirements for their packaged goods or ingredient products. However, producers need to be converting and building houses within the next 6-12 months to ensure a consistent egg supply by 2025. Small, independent producers need security that there will be a premium market for their eggs before making the large investment commitments for cage-free infrastructure and the risk of changing to a novel system.

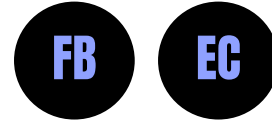


— Small and independent producers are more susceptible to government regulations and efforts to industrialise and streamline agriculture. Environmental restrictions affecting farming can be swiftly enforced and with little notice. For example recent closures of small farms in Beijing to prevent farm animals being kept close to reservoir areas for drinking water, waterways, residential areas and schools.



— There are no marketing standards for systems of egg production; eggs are often labelled and marketed as free-range when from caged systems or organic when from conventional production. Copying labels, or providing fake certification is common, which reduces producers' ability to obtain a premium price.

— Isotope testing of eggs, to guarantee to purchasers that eggs are from a particular farm, is relatively common in Europe. However, testing and verification facilities aren't yet well established in China, and the dependence on overseas labs increases time, expense, and steps in the traceability chain for issues to occur.



— The flip side. There are many terms used on egg packaging that are generally understood by Chinese consumers to mean eggs from hens reared outdoors (Box 2). It is difficult to verify origin and production system and only a small percentage of eggs will be from systems where hens actually have outdoor access, with an even smaller percentage meeting CCFA/CAFA requirements or above.

— Multinational food businesses that have made cage-free commitments will want verification that eggs are from genuine cage-free systems. However, laying hen assurance schemes like those existing in Europe and North America are in their infancy in China. In 2020 the government gave authorisation to start a program for Certified Humane eggs in China. Through 2021 and 2022 ~9 laying farms have been certified. International Non-Governmental Organisations are facing increasing scrutiny in China and it is not certain how or in what capacity they will be operating in the future.

— Large scale agricultural operations need to adhere to government regulations regarding food safety. These requirements are likely to become stricter and better enforced as China's 14th five year plan⁴ is implemented. The large vertically integrated egg production companies have the resources and financial capacity to produce eggs according to international food safety audit and quality control specifications (eg, HACCP, ISO). While they add cost, they also increase consumer trust in products from these larger companies. It is unlikely that food safety standards will be 'imposed' on smaller farms: these smaller producers will need to work hard to ensure egg buyers trust the food safety of their products and to compete with large companies. The biosecurity, management and quality control of these farms is highly variable and requires technical support and training to meet the CCFA/CAFA cage-free requirements.



modern cage-free poultry equipment

⁴ The Five-Year Plans are a series of social and economic development initiatives issued by the Chinese Communist Party (CCP). China is currently in the 14th Five Year Plan (2021-2025).

LEVERS

Egg producer and egg
buyer alignment —
five levers to assist

03

3. Egg producer and egg buyer alignment — five levers to assist

KEY MESSAGES

The expertise of stakeholders working on cage-free within China needs to be developed and deployed across the country to ensure that cage-free is presented in a context that is culturally relevant and engages and motivates both egg producers and egg buyers. Animal welfare advocacy organisations can focus their support and fund initiatives which are China led eg, working groups that are driven and set up by the Chinese egg industry and China-based stakeholders; Chinese egg producers delivering training workshops on Chinese demonstration farms.

Transparency on the status of cage-free commitments and reporting progress at national level would improve corporate accountability and would assist stakeholders working towards cage-free within China eg, to target their engagements with food business and to have accurate information to hand. Recommendations for support include developing reporting tools for cage-free commitments and progress vs commitments by country, and the establishment of a China-specific cage-free website developed and delivered within China.

Demand for cage-free eggs can be increased by positioning cage-free eggs as a premium product which addresses multiple ethical concerns, including

- 1) the relationship between improved animal welfare and improved food safety and product quality and
- 2) the relationship between animal welfare and ‘ecological agriculture’.

Animal welfare advocacy organisations can focus on: supporting producers who have transitioned, or are considering transitioning, to cage-free eg, through workshops and support materials; engaging food businesses and Chinese end consumers to purchase cage-free products eg, via messaging used in marketing campaigns; assisting cage-free producers to market and distribute to the demographics most receptive to issues such as health and product quality eg, young, well-educated professionals in Tier 1 cities.

Grocery stores provide an opportunity for driving the transition to cage-free because they connect consumers visually and physically with shell eggs. Shoppers also read packaging information and labels. Recommendations for support initiatives include: engaging the head offices of multinational grocery retailers operating in mainland China in the cage-free commitments; focused messaging on the brand benefit of having premium products.

This section describes five ‘levers’ to facilitate alignment between egg producers and buyers

Details of how to increase capacity for cage-free production is presented through practical recommendations, actions and explanations

LEVER 1: BUILD CAPACITY TO DELIVER THE CAGE-FREE TRANSITION WITHIN CHINA

To ensure that cage-free is presented in a context that is culturally relevant, engages and motivates egg producers and egg buyers alike, it needs to be driven from within China and by China.

Recommendation:

- Support and fund initiatives which are China led eg,
 - working groups driven and set up by the Chinese egg industry and China-based stakeholders
 - Chinese egg producers delivering training workshops on Chinese demonstration farms
 - Chinese based/developed cage-free certification and audit programmes (foreign accreditation bodies are unlikely to remain or will find it increasingly difficult to remain in China)
 - co-operatives of Chinese egg producers, to create a distinct cost of production for specialty eggs and to negotiate the farm price collectively.

How this will help:

International recognition is not a significant motivator for either the Chinese egg industry or food businesses. The domestic egg market dwarfs the combined markets of North America and Europe. Outside campaigns making industry or domestic companies ‘feel bad’ is not a motivator for Chinese industry, nor is addressing animal welfare concerns to manage brand image and avoid negative media.

The solutions, partnerships, and engagement with stakeholders that arise are more likely to be successful at facilitating a faster cage-free transition. Furthermore, due to changes in government policies, it is becoming increasingly difficult for foreign charities and advocacy organisations to operate in China. The expertise of stakeholders working on cage-free within China needs to be developed, retained, and deployed within the country to ensure that cage-free transition progresses.

LEVER 2: IMPROVE TRANSPARENCY & ACCOUNTABILITY OF CAGE-FREE COMMITMENTS IN CHINA

Progress against cage-free commitments is often only reported at global level so it can be difficult to find information for individual countries.

Recommendation:

Continue to improve the reporting tools for cage-free commitments, and progress against commitments, by country, in all regions. As of November 2022 [EggTrack](#) has a dedicated section for the Asia-Pacific region in addition to those devoted to the United States and Europe.

- explore how to encourage food businesses to report progress on egg tracking websites.
- explore supporting the establishment of a China-specific website developed and delivered in country eg, [Mercy For Animals Canada](#).

How this will help:

Ensuring the commitments and progress on reporting is broken down by country will aid transparency and accountability around the actual cage-free transition status in China. It won't guarantee that companies will stick to their commitments, but it will mean stakeholders can find the information.

It will also help inform stakeholders within China on which food businesses to engage with, and how eg, those businesses that have made no progress on cage-free sourcing and those that have made a start. Given the current limitations in capacity and sourcing issues of cage-free eggs in China, those companies that have made a start are likely to be putting in significant effort (but their efforts are not currently visible) and may be more receptive to engagement.



Beyond making a commitment to source cage-free eggs, companies that publicly report their progress display an understanding of the need for transparency in their cage-free journeys. High quality reporting demonstrates accountability for this issue to consumers and investors alike.



Compassion in World Farming. EggTrack Report, November 2022

LEVER 3:

ENSURE THE TERM 'CAGE-FREE' IS ASSOCIATED WITH TRUSTED, PREMIUM PRODUCTS ADDRESSING MULTIPLE ETHICAL & SOCIAL CONCERNS

“ Promoting animal welfare has become not only an important choice for the green development of agriculture and a significant measure to ensure food safety and healthy consumption, but even more so an important embodiment of human caring in modern society. ”

Vice Agriculture Minister Yu Kangzhen. 1st World Congress on Farm Animal Welfare. Zhejiang, October 2017

In China, animal welfare has attracted significant attention. However, it may be conceptualised and labelled differently compared to North American and European countries, to be expected given the vast differences in history, culture and political, social and economic landscapes between the regions.

The frequent use of terms such as 'antibiotic', 'safety', or 'earth egg', on packaging (Figure 2), means there is obviously a receptive audience for products that are, or could be, genuinely linked to higher animal welfare. The opportunity for 'cage-free' is to cut-through this noisy and confused egg branding and become a term associated with trust, and which addresses issues Chinese consumers care about (Appendix 3).

Two broad areas of attention to animal welfare in China, which can be leveraged are:

- **The relationship between improved animal welfare and improved food safety and product quality.** Animal welfare legislation banning certain systems of production is not going to be a key driver for cage-free in China; animal welfare on its own is not a key credential for purchasing decisions for Chinese consumers. Food safety is a powerful purchasing motive and, along with product quality, an effective way to

attract attention to animal welfare. Ensuring that cage-free is associated with safe, healthy food might capture consumer attention, which will drive demand for cage-free products, and enable a price increase to cover the increased costs of production.

- **The relationship between animal welfare and 'ecological agriculture'.** Traditional Chinese culture has elements that are sympathetic toward animals, including the philosophical idea of tian ren he yi (harmony between nature and humans). Production systems where animals have room to explore and exercise and which maintain a healthy environment are linked to 'naturalness' of product. Furthermore, Chinese agriculture is increasingly challenged by the constraints of population, resources and environment from its modern development; there is an emerging focus on safe, healthy, and sustainable food produced using ecological or organic practices. This focus is both 'top-down' from state-developed standards and regulations, and 'informal' 'bottom-up' grassroots movements of farmers and community, supported agriculture schemes or markets.

Recommendation:

Support initiatives providing training and technical support to producers so that they can achieve CCFA/CAFA certification or above: cage-free is verified, trusted and meets certain standards.

Support the development of a verification system for CCFA/CAFA certified or above egg products, so that producers and buyers have a system they can trust to ensure cage-free is linked to quality products.

Explore how information in Appendix 3 can be used to support producers who have transitioned, or are considering transitioning, to cage-free in their branding and marketing eg, through workshops and support materials.

Explore how information in Appendix 3 can be used to engage food businesses and Chinese end consumers to purchase cage-free products eg, messaging used in marketing campaigns linking the term 'cage-free' with trusted safe, healthy, ecological products.

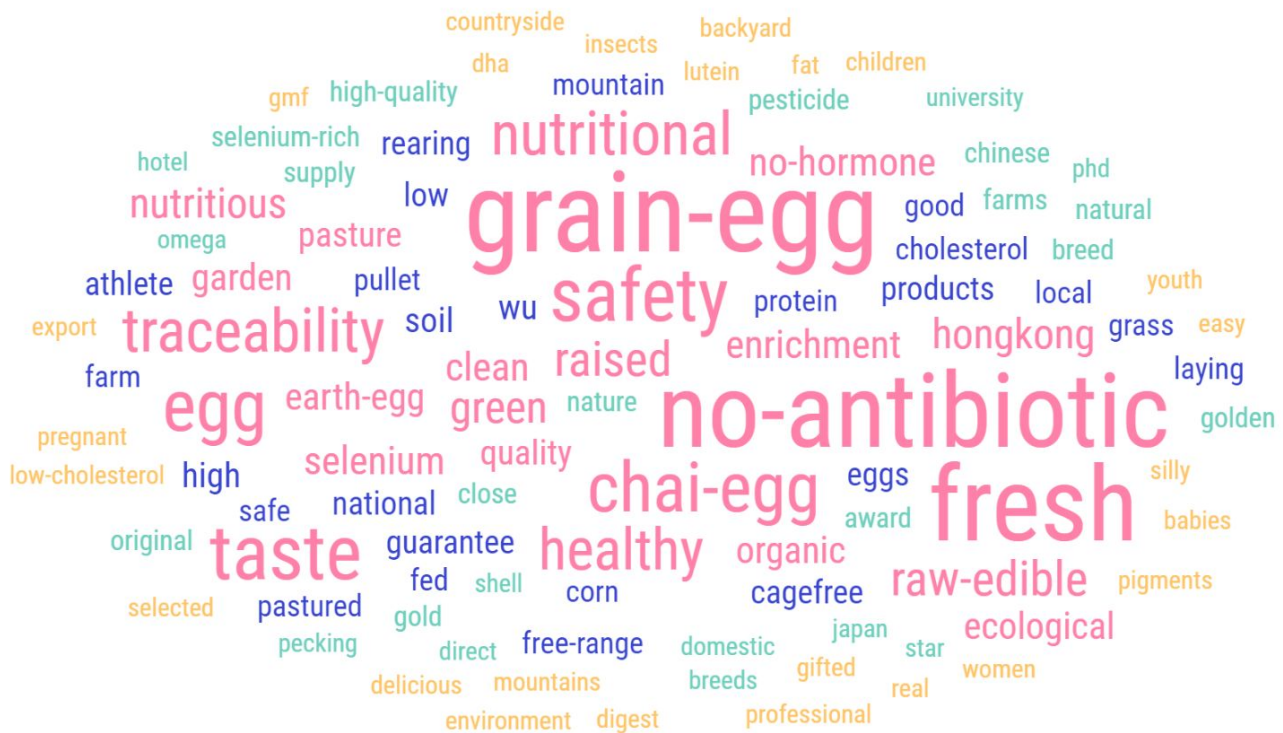
How this will help:

For egg producers, focusing on welfare will reduce production costs associated with hen mortality and disease. It will improve the ability to obtain a price premium because 'cage-free' products are trusted and are addressing multiple issues of concern to consumers. Product diversification eg, from the sale of end-of-lay hens or litter compost, improves the economic resilience of the laying operation.

For food businesses, it will drive demand and increase the attractiveness of cage-free production for the egg industry, and their capacity to produce cage-free products to support cage-free commitments. It will support brand association with premium products.

For end consumers, it will remove trade-offs or conflicts over ethical concerns eg, environment and animal welfare. It will make cage-free products more visible and relevant to them.

FIGURE 2



word cloud of terms found on egg packaging in 19 stores and 127 shell egg products in Beijing, Hefei and Wuhan

LEVER 4: MARKET CAGE-FREE TO THE RIGHT DEMOGRAPHIC

Demand for cage-free eggs can be increased by targeting receptive demographics more concerned with animal welfare⁵, safe, healthy food and a willingness to pay a price premium for products addressing these concerns.

Recommendation:

Explore how to support producers and food businesses to successfully market and use e-commerce channels for sales of cage-free products (which are linked with safety, quality etc) in places where young, urban Chinese congregate eg, subways and office blocks in Tier 1 cities.

Explore how to support producers in getting their cage-free products to this demographic market in a timely, and preferably low-cost, way eg, assisting in the establishment of co-operatives and shared distribution channels.

How this will help:

Young urban consumers shop predominantly online, have higher concerns for animal welfare, nutrition and health-related factors of food, and are more willing to pay a price premium. Focusing on this demographic will help drive demand for cage-free eggs from a receptive audience, thereby improving attractiveness and cost-effectiveness of cage-free for the egg industry (Table 1).

TABLE 1

	Example scenario	Additional eggs from cage-free systems	Additional laying hens in cage-free systems	Increase in CCFA/CAFA certified or above cage-free flock
Focus on marketing cage-free products to receptive demographic in Tier 1 cities	5% increase in cage-free labelled egg purchases	476 million eggs/year	1.7 million hens/year	4-fold increase
	10% increase in cage-free labelled egg purchases	980 million eggs/year	3.5 million hens/year	8-fold increase
Focus on securing commitments from grocery retailers	Multinational supermarkets Walmart, Carrefour, Costco: 100% of shell egg sales are cage-free (own brand and private label)	1.12 billion eggs/year	4 million hens/year	10-fold increase
	Domestic supermarkets RT Mart, Yonghui, China Resources Vanguard: 20% of shell eggs in store are cage-free	1.26 billion eggs/year	4.5 million hens/year	10-fold increase

⁵ Regard for companion animals is correlated with regard for farmed animal welfare and thus pet owners represent an opportunity for a receptive audience for higher welfare food products. There are high and increasing levels of pet ownership in China amongst young, urban, and well-educated (almost 90% of pet owners hold a university degree, despite only 24% of the overall population receiving higher education). As a reflection of this change in Chinese society, the government has recently reclassified the status of dogs from livestock to companion animals.

LEVER 5:

Focus engagement with multinational grocery retailers operating in China yet to make cage-free commitments

In the United States and Europe, cage-free commitments from grocery retailers comprise ~>50% of total commitments. In Brazil, which has seen a rapid increase in the number of cage-free eggs available, the three largest grocery retailers have all committed to 100% cage-free in their stores (Appendix 1). However, in China, the cage-free commitments are predominantly from manufacturing and hospitality. These are relatively low volumes, for ingredient products which consumers may not directly associate as 'eggy' and thus with cage-free. There are only a small number of grocery retailers that have included China in their global commitments.

Recommendation:

Explore how to engage head offices of multinational grocery retailers operating in mainland China in the cage-free commitments eg, Walmart and Carrefour. Focus messaging in these engagements on the financial benefit to the organisation of having premium products associated with multiple issues of concern to an influential demographic.

How this will help:

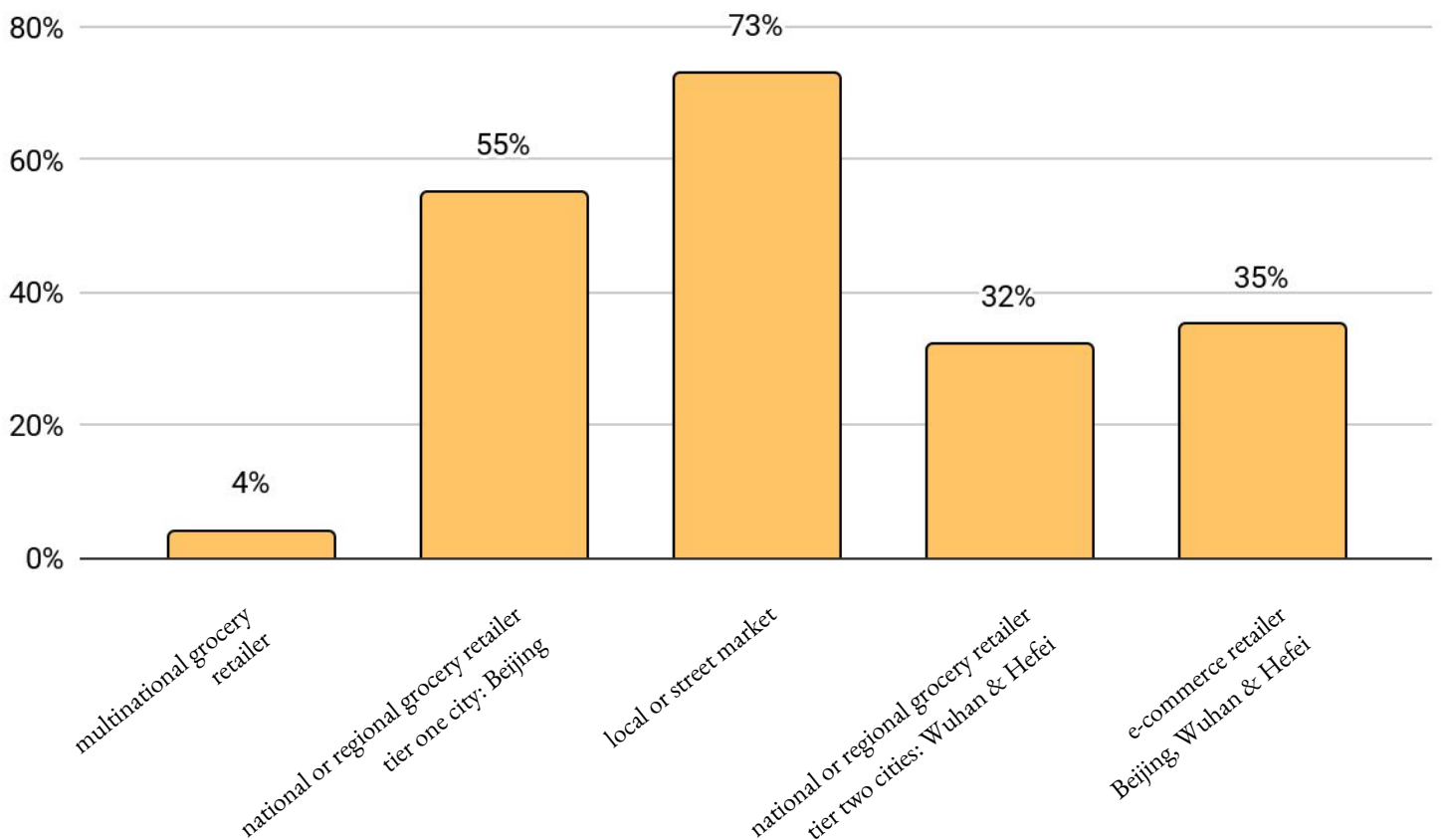
While large grocery stores are not (currently) a main sales channel for shell eggs in China, they are increasing in popularity, particularly amongst young urban shoppers. Grocery stores are an opportunity to facilitate the transition to cage-free because they connect consumers visually and physically with shell eggs. Shoppers can see packaging information and labels, which then influences purchasing decisions/price premiums. Multinationals have more robust verification procedures in place, so shoppers can be confident about product credentials, helping link the term 'cage-free' with trusted products (Figure 3).

Grocery retailers also require very large volumes of eggs, and therefore represent an opportunity to increase requirements for secure supplies of cage-free for producers and growing cage-free capacity for the industry (see Table 1 for the difference multinational retailers committing to cage-free sourcing would make to the scale of cage-free egg production in China).

Domestic grocery retailers will eventually follow multinationals if consumers notice product differentiation offerings and start to demand the same from local counterparts. For example, lead-free paint products from multinational companies: domestic companies followed suite as customers noticed the difference and demanded the same.

FIGURE 3

% of egg labels or pack information referring to cage-free production



The percentage of egg labels or pack information referring to cage-free production ('chai egg', 'earth egg', 'grass egg', 'mountain egg', 'organic', 'free range', 'pasture raised') in surveyed stores across Beijing, Hefei and Wuhan (n = 19 stores and 127 shell egg products).

Note:

- 1) the difference between Tier 1 multinational grocery stores and national/regional stores, because of verification requirements of own brand and private label products;
- 2) eggs sold at local or street markets are unlikely to be packaged, but do often have accompanying product information (eg, varying details about how, when and where they have been produced).

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Appendix 1: Characteristics of egg industry and key learnings from countries that have transitioned or are transitioning to cage-free egg production

Characteristic	Country			
	<i>Brazil</i>	<i>United States</i>	<i>Germany</i>	<i>United Kingdom</i>
<i>National laying flock</i>	~170 million hens; largest producer in South America; 6th largest global producer	~290 million hens; 2nd largest global producer	~58 million hens; largest producer in Europe	~40 million hens; 6th largest producer in Europe
<i>Egg market</i>	<p>>95% sold as shell eggs; entirely self-sufficient in egg production; egg consumption of 257 eggs per person, per year (35% per capita increase since 2016).</p> <p>Only ~0.5% of egg production is exported, mostly to Saudi Arabia and as shell eggs. This is a small percentage of production but it is a 100% increase in 2021 compared to 2020.</p>	<p>69% sold as shell eggs; 27.8% food manufacturing; 2.9% to export; egg consumption is ~290 eggs per person, per year.</p>	<p>~70% sold as shell eggs; 30% food manufacturing; 73% self-sufficient in egg production (one of the largest importers of shell eggs and egg products globally (primarily from Netherlands and Poland); egg consumption 240 eggs per person, per year.</p>	<p>83% sold as shell eggs; 17% food manufacturing; 4% export; 90% self-sufficient in egg production; consumption of 200 eggs per person, per year.</p>
<i>Housing systems</i>	<p>Egg production has changed rapidly over the last 5-7 years: in 2015 ~1% of eggs were produced in free-range (mostly organic) systems compared to ~10% in barn and free range/organic estimated today. The remaining 90% are in conventional cages.</p>	<p>~30% is in cage-free, up from 14% in 2016 and 4% in 2010; ~ 7% are organic and 23% are non-organic cage-free.</p>	<p>~59% in barn or aviary, 22% free range; 14% organic; ~5% in enriched cage.</p>	<p>60% free-range; 4% organic; 34% in enriched cages; 1.5% in barn or aviary systems.</p>
<i>Cage-free housing</i>	<p>Producers have converted old broiler (meat chicken) sheds into laying houses, and these are, to date, exclusively flat deck systems housing 10-15,000 birds.</p>	<p>The United States Department of Agriculture does not break down cage-free into barn/aviary and free range, but the majority of non-organic cage-free are in aviary systems.</p> <p>Flock size is highly variable for aviaries: 10,000-60,000; free-range/pastured/organic: 2,000-10,000.</p>	<p>Multi-tier aviaries dominate housing systems.</p> <p>Flock sizes ~20-30,000 birds.</p>	<p>Over the last 5-8 years, the housing systems have shifted from free-range single level flat deck to free-range aviary and multi-tiers.</p> <p>Flock sizes have increased from 2,000-4,000 birds in 2005 to ~15,000 birds in 2022.</p>

cont.

Characteristic	Country			
	<i>Brazil</i>	<i>United States</i>	<i>Germany</i>	<i>United Kingdom</i>
<i>Capital and operating costs of cage-free</i>	<p>Capital cost of converting a broiler shed to single tier laying house is US\$7-10 per bird.</p> <p>Operating costs are between 18-30% more than conventional cage.</p>	<p>Capital cost of US\$40 per bird to build a cage-free production system.</p> <p>Operating costs are ~24% over conventional cage.</p>	<p>Capital cost of €17.50 (US\$18) per bird.</p> <p>Operating cost of barn/aviary ~17% more than enriched cage.</p>	<p>Capital cost of ~£20 (US\$23) per bird to convert from enriched cage to barn.</p> <p>Operating costs of barn/aviary are 15% more than enriched cage.</p> <p>Operating costs of free range are 30% more than enriched cage.</p>
<i>Price premium of cage-free eggs</i>	<p>Barn/aviary farm gate egg price is ~30-50% higher than conventional cage.</p>	<p>Cage-free retail egg price is ~15-20% higher than conventional, but highly variable eg, in 2022 there was as much as a 60% average higher cage-free price down to as little as 8%.</p>	<p>Barn/aviary farm gate egg price is ~18% higher at farm gate than enriched cage.</p>	<p>Free range egg price is ~34% higher at farm gate than enriched cage.</p> <p>Barn/aviary farm gate egg price is not disclosed by industry (due to competition because share of production is so small), however supermarkets are selling for similar prices to enriched cage.</p>
<p><i>What can we learn?</i></p> <p><i>Factors which supported or hindered the cage-free transition</i></p>	<p>There is no welfare legislation driving the change to indoor barn cage-free egg production.</p> <p>Animal welfare campaigns have promoted awareness to receptive and highly motivated consumers. Consumers are supported by information they want and trust (on farm system but also health and quality traits) when purchasing eggs.</p> <p>The largest grocery retailers which sell shell eggs direct to consumers have all made cage-free commitments.</p> <p>The main egg production companies are all producing cage-free eggs.</p> <p>There is a clear price premium for cage-free eggs.</p>	<p>Producers are making the shift to indoor aviary cage-free egg production predominantly because of state legislation changes.</p> <p>While consumers appear to be receptive to animal welfare messaging, demand for higher welfare egg products is not stable and is price dependant. Providing more information on cage-free production does not always result in a higher willingness to pay for cage-free eggs.</p> <p>High volatility in cage-free egg price means producers don't always obtain a price premium.</p> <p>Highly consolidated farm ownership with large vertically integrated companies. One company houses 15% of total national flock and ten largest companies have 53% of total flock.</p>	<p>Consumer demand and cage-free commitments initially drove the development of a large indoor aviary production. National level legislation followed swiftly to embed the shift in egg production.</p> <p>A ban on enriched cages will come into force from 2025 onwards (in exceptional cases from 2028).</p> <p>Legislation implemented a stepwise rather than fundamental change for consumers and producers:</p> <p>— Consumers were/are already accustomed to a high proportion of cage-free eggs for sale from a range of certified schemes. Legislation changes have not significantly altered choice or price.</p>	<p>Consumer demand has driven free-range egg production, supported by the implementation of EU legislation on the conventional cage-ban.</p> <p>Cage-free commitments are driving indoor aviary production.</p> <p>Consumers have clear preference and willingness to pay for free-range eggs. There is a range of certification schemes to provide assurance on hen welfare.</p> <p>Some large grocery retailers are committing to only sourcing free-range. Cage-free from indoor aviaries is likely to become lowest tier product offering, but one that has significant capital and operating costs.</p>

cont.

Characteristic	Country			
	<i>Brazil</i>	<i>United States</i>	<i>Germany</i>	<i>United Kingdom</i>
<p><i>What can we learn? Factors which supported or hindered the cage-free transition</i></p>	<p>The cost for converting to cage-free housing is comparatively low.</p>	<p>Small producers are having to compete with large producers for what was, <5 years ago, a niche product. They will need to differentiate further to maintain competitiveness.</p>	<p>— There was/is a high proportion of indoor aviary cage-free systems in place. This provided a backdrop of knowledge and infrastructure to support producers transitioning.</p> <p>The culling of male chicks was banned from 1 January 2022. The German Federal Ministry of Food and Agriculture has promoted the breeding of dual-purpose chickens as another alternative to chick culling.</p> <p>Mix of independent, contract farms and large vertically integrated company-owned farms.</p> <p>Main egg producing companies will produce or contract eggs for all housing systems.</p> <p>Supply chains and market for small and large producers are generally the same.</p>	<p>The UK egg industry and farm animal welfare organisations collaborated to write an ‘acceptable to both’ indoor cage-free standard.</p> <p>Free-range systems have changed from simple single tier systems to modern multi-tier aviaries and a corresponding increase in flock size.</p> <p>Mix of independent, contract farms and large vertically integrated company-owned farms.</p> <p>Main egg producing companies will produce or contract eggs for all housing systems.</p> <p>Supply chains and market for small and large producers are generally the same.</p>

Appendix 2: Summary of relevant research on attitudes towards animal welfare in China

A survey of animal welfare literature demonstrated that animal welfare research in China is pragmatic, focused on husbandry practices aimed at good productivity and product quality. The concept of animal welfare for the sake of the animals, for a higher ethical purpose, has not been explored.

Similarly, agricultural leaders identified improved performance and product quality as key reasons for improving animal welfare (rather than because it matters to the animals themselves).

Food safety and product quality are ascribed the most important consideration in relation to agriculture, and purchasing decisions, while animal welfare and methods of production were the least importance (of those assessed).

Chinese consumers have a higher willingness to pay for food safety attributes than for other attributes such as animal welfare, environmental stewardship, organic production, or country of origin.

In a survey of China offices of multinationals that had made cage-free commitments, nearly half (48%) of companies claimed that they knew about the 2025 cage free egg commitment but were yet to take any action:

- The Chinese based offices of multinational food businesses have different management, ownership, knowledge, and priorities compared to their overseas counterparts. National security restrictions also limit the traditional protest activities of animal-welfare organisations to raise consumer awareness. Thus, animal welfare and the cage-free commitments sit lower down on the list of pressing concerns that in-country offices are dealing with in China's huge domestic market (Covid-19, reduced economic growth, rising cost of living, for example).

Appendix 3: Summary of relevant research related to linking cage-free with food safety, quality, and ecological agriculture

Food safety, health, and product quality

This information highlights ways in which cage-free egg production can be genuinely linked to food safety, health, and product quality.

Omega 3

The beneficial effects of omega-3 polyunsaturated fatty acids (**PUFA**) including α -linolenic acid (**ALA**), eicosapentaenoic acid (**EPA**), and docosahexaenoic acids (**DHA**) on growth, health, and immune function for humans and animals is well acknowledged. Supplementation of various n-3 fatty acids into the diet of laying hens has been a nutritional attempt to raise the levels of omega-3 PUFA in edible eggs. The most studied dietary supplements for n-3 PUFA are fish oil, flaxseed, or microalgae.

Although fish oil is rich in Omega-3 PUFA, especially EPA and DHA, there are negative reports that laying hens fed with fish oil-added diet produced fishy-tainted eggs. As a source of EPA or DHA, dietary microalgae has been recently marketed, but the relatively high production cost and fibre contents may limit its use as a feed supplement. As flaxseed is a rich source of protein, oil, and ALA, flaxseed (as oil or ground) incorporated into feed has been used to produce omega-3 enriched eggs or meats in the poultry industry.

Food safety

The safety of the food chain is directly connected to the welfare of farm animals, due to the close links between animal welfare, animal health and food-borne diseases. Chinese consumers have increased discernment and expectation around food safety because of COVID-19.

Improvements in the welfare of laying hens in cage-free housing systems — where hens are not kept in closely confined spaces and are allowed to perform natural behaviours — have the potential to:

- reduce incidence of infectious disease on farms eg, Avian Influenza, Newcastle disease
- reduce incidence of food-borne infections such as *Salmonella* and *E. coli*
- reduce stress-induced immunosuppression and the risk of consuming animals (or animal products) which have an impaired auto immune system
- reduce antibiotic use and antibiotic resistance due to irresponsible use eg, group prophylaxis, whereby all animals in the flocks are treated with antibiotic to prevent illness regardless of whether any clinical signs have been observed.

End-of-Lay Hens

End-of lay (EOL) hens from cage-free systems are a valuable product in China (eg, for use in restaurants or at home for soups and hot pots). Darker meat cuts such as legs and thigh fetch a price premium over breast meat because of taste preference for darker and more muscled meat (and the association with activity and ‘naturalness’). Hens from cage-free systems do demonstrate advantages compared to conventional caged systems in terms of meat and carcass qualities: ie heavier gizzards and bones and a lower breast meat percentage. Meat of breast and thigh was significantly darker (redder) and had higher moisture content than caged birds.

Chinese cage-free producers report high demand for their EOL hens and comparatively high per bird prices, at ~35% more per bird than caged EOL hens. These birds are not going to abattoirs for further processing but sold direct to end consumers or local markets. This is a direct contrast to EOL processing in Europe, which can provide a minimal income (ie 1% of the price of a pullet) or even be a cost to the producer.

Ecological agriculture

Climate change is an issue of increasing importance on the Chinese government's agenda. For example, the government has set goals for carbon emissions to peak by 2030 and to reach carbon neutrality by 2060. The current Five Year Plan has a strong emphasis on green development and innovation with goals of agricultural modernisation, smart farming and adaptation to climate change.

The most intensive systems of livestock production are generally considered 'efficient' in terms of ratio of inputs (labour, feed, space) compared to outputs (animal products). Carbon footprints are a measure of carbon emissions efficiency (measured as kg CO₂ equivalents/kg of product) and modern conventional caged egg production has a lower carbon footprint compared to cage-free. This can lead to competition between the acceptability of more extensive, higher welfare livestock systems on the one hand and environmental performance on the other.

The information opposite highlights ways in which cage-free egg production can be linked to, or support
a) the concept of ecological agriculture, and
b) be aligned with reduced climate and environmental impact goals:

Indoor barn system

- production systems where animals have room to explore and exercise and maintain a healthy environment are linked to 'naturalness' of produce (and therefore also to safety and product quality)
- use of solar and 'smart' technology reduces reliance on fossil fuels and improves energy efficiency
- use of litter in composting for application to other crops provides organic fertiliser and improves recycling of nutrients
- use of insects or human feed waste as animal feed reduces reliance on cereal crops.

Free-range systems

As above plus:

- incorporation of laying hens with fruit, nut, or timber crops improves biodiversity, soil health, nutrient recycling, and farm diversification
- small-holders are critical for delivering food security and biodiversity. A recent global meta analysis concluded that "smaller farms, on average, have higher yields and harbour greater crop and non-crop biodiversity... than do larger farms".

