

California Proposition 12: Will it solve sustainability concerns in egg production?

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Animal welfare. Worker safety. Food Safety. Food security. Environmental responsibility. Who knew all of these complex issues could be involved in the simple decision to buy eggs? Currently, activist organizations are driving discussions that can fundamentally change how meat and eggs are produced and potentially reduce consumer choice. Next week, as California voters we will make an important decision when voting on Proposition 12, "[The Prevention of Cruelty to Farm Animals Act](#)," backed by the Humane Society of the U.S. (HSUS).

As a doctoral student studying cattle genetics at UC Davis, I am familiar with beef production but not as much with egg production. I wanted to educate myself before voting on Proposition 12, so I reviewed the scientific literature and met with UC Davis animal scientists. Now, I am sharing what I learned so that other voters can benefit from my "homework" and have the facts when making their own decision on Proposition 12.

FAST FACTS

Proposition 12:

- Will ban the sale of meat and eggs from calves raised for veal, breeding pigs, and egg-laying hens confined in areas below a [specific number of square feet](#).
- Egg-laying hens:
 - Require 144 square inches per hen in 2020 and by 2022 the hens must be confined in cage-free systems, based on the [United Egg Producers' 2017 cage-free guidelines](#), which means the hens will be allowed to roam inside barns and have access to enrichments such as perches and a nesting box.
 - Will ban enriched colony systems, which are an optimum option combining many of the benefits of conventional and cage-free systems
- These requirements would be applied **within California and out-of-state** meat and egg producers seeking to sell in California, which is likely to increase consumer prices for pork and eggs.

Sustainability factors of conventional vs. cage-free housing¹

- Hen Health & Well-Being: The cage-free system offered hens more behavioral freedom with nesting areas, perches and a litter area. However, twice as many hens died in the cage-free system compared to conventional, with cage-free hens being 6 to 20 times more likely to be cannibalized or pecked extensively by other birds.
- Worker Health/Safety & Food Safety/Quality: Indoor air quality (dust and ammonia) was worse in the cage-free system. Workers in this system were exposed to significantly higher concentrations of airborne dust that can carry pathogens into workers' airways and lungs. Also, it is known that microbe levels are higher on eggs produced in high dust environment, so when eggs were laid on the cage-free floor the shells had higher levels of microbes and coliforms, which some can cause food-borne illnesses.
- Food Affordability: Higher operating and capital costs resulted in the cage-free eggs costing 36 percent more to produce than conventional eggs.
- Environment: Cage-free hens required more space and feed per egg produced, which means more natural resources were needed to produce the same amount of eggs as the conventional system. Ultimately, the cage-free system created a larger carbon footprint.

¹ Summary of the [Coalition for Sustainable Egg Supply](#) (CSES) research findings

If this initiative sounds familiar, it is because 10 years ago, in 2008, California passed a similar HSUS initiative, [Proposition 2](#), which required that egg-laying hens (and calves raised for veal and pregnant pigs) be confined only in ways that “allow these animals to lie down, stand up, fully extend their limbs and turn around freely.” Given that very few calves for veal or pigs are raised in California, the initiative mostly impacted the egg-layer industry.

Although some voters may have interpreted Proposition 2 as “cage-free,” the proposition language was not specific. In 2013, the California Department of Food and Agriculture (CDFA) stipulated that each hen must have 116 square inches of floor space for the farm to be “[California Shell Egg Food Safety Compliant](#).” On Jan. 1, 2015, both the initiative and a related legislative bill ([SB 667](#)) took full effect. Combined, these regulations effectively prohibit the sale of shelled eggs produced on farms—including out-of-state farms—that do not comply with California’s animal care standards for egg-laying hens (minimum of 116 square inches/hen).

The regulations were phased in between 2008 and 2016. By 2016, California had 10 million fewer egg-laying chickens, which resulted in 34 percent less in-state egg production. Consequently, from December 2014 to September 2016, the cost per dozen eggs increased on average by 24 percent (initially increased by 33 percent per dozen and then stabilized at 9 percent more per dozen). [Malone and Lusk \(2016\)](#) estimate that Californians pay between \$0.48 and \$1.08 more for a dozen eggs as a result of Proposition 2.

What will Proposition 12 do?

Proposition 12 will initially increase the minimum number of square inches per hen and eventually eliminate cages. Starting in 2020, the space requirement will be increased to 144 square inches, or 1 square foot. By 2022, the hens must be confined in cage-free systems, based on the [United Egg Producers' 2017 cage-free guidelines](#), which means the hens will be allowed to roam inside barns and have access to enrichments such as perches and a nesting box. These requirements will also be applied to out-of-state egg producers seeking to sell shelled and liquid eggs in California. More room for chickens to stretch their wings sounds like a good idea, but what else do we need to know?

The nonpartisan state [Legislative Analyst’s Office](#) estimates that similar to Proposition 2, consumer prices for eggs are likely to increase, due to the increased cost of production and decreased supply. Unlike Proposition 2, Proposition 12 will apply not only to animals raised in California but will also ban the sale of products from animals raised out-of-state that do not meet Proposition 12 requirements. Consequently, pork prices are also likely to increase for California consumers.

The initiative name implies that animal welfare will improve, but what does the science say?

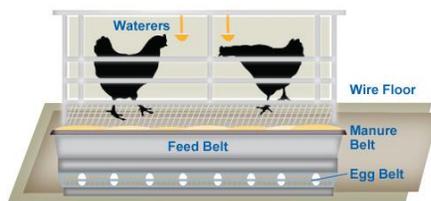
To help answer this and other sustainability questions, the [Coalition for Sustainable Egg Supply](#) (CSES) was formed to support research evaluating the sustainability of laying hen housing systems. The CSES was made up of leading animal welfare scientists, academic institutions, non-government organizations, egg suppliers, and restaurant/foodservice and food retail companies.

Prior to the CSES study, [Swanson et al., \(2011\)](#) identified that laying hen housing system research on a U.S. commercial scale was limited.

The goal of the CSES study was to identify risk factors and provide scientifically based information on the trade-offs related to the sustainability of egg production by conducting holistic research on a commercial farm that had 3 different hen housing systems. The [three housing systems](#) studied were, conventional caged, enriched colony and cage-free aviary. All systems housed the hens indoors (climate-controlled) with manure belts to keep manure away from the birds and egg belts for egg collection. All hens had daily access to food and water.

- **Conventional cages:**

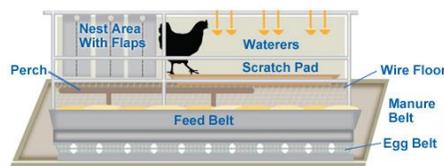
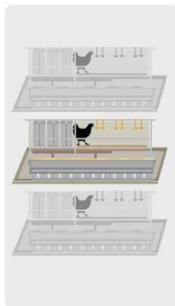
- Most common housing system in U.S. egg production
- Multilevel rows of enclosures with wire mesh floors
- Six hens per enclosure, with each hen provided 80 square inches of floor space, which is less than the minimum of 116 square inches per bird to be California Shell Egg Food Safety Compliant



[Video](#)

- **Enriched colony:**

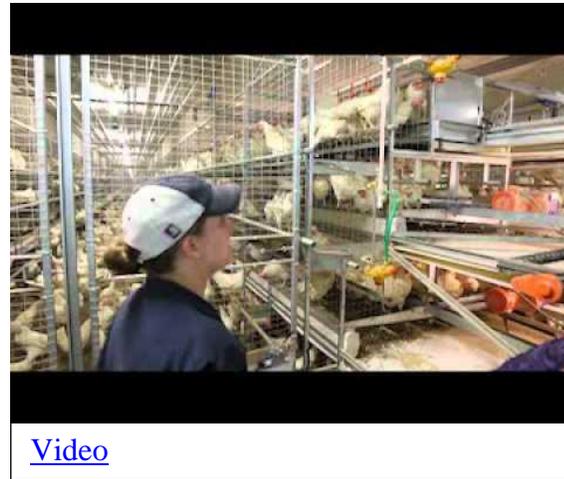
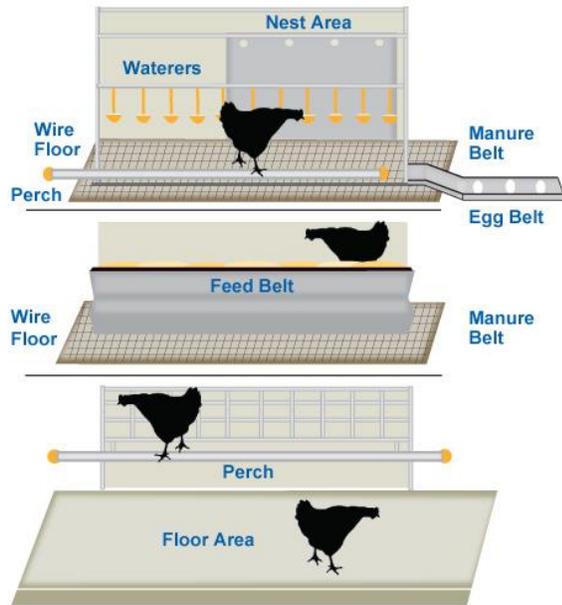
- Modern alternative housing system but would be banned by Proposition 12
- Multilevel rows of enclosures with wire mesh floors
- Sixty hens per enclosure, with each hen provided 116 square inches of floor space, which is enough space for each hen to stand, sit, turn around and extend her wings
- Enrichments in the enclosure allow for natural bird behaviors, like perching, scratching, dust bathing and nesting



[Video](#)

- **Cage-free aviary:**

- Modern alternative housing system required by Proposition 12 by the year 2022
- Hens are allowed to roam inside the barn within defined sections
- Each hen was provided 144 square inches (1 square foot) of floor space
- Open floor space (litter area) and multiple levels in the enclosure allow for natural bird behaviors, like perching, scratching, dust bathing and nesting



[Video](#)

Although, the enriched colony system had intermediate results for most of the sustainability factors and may be a good compromise between conventional and cage-free systems, I will not discuss further because **Proposition 12 would ban this system.**

This graphic visually summarizes the [overall CSES findings](#) for the five sustainability factors measured: animal health and well-being, worker health and safety, food safety and quality, food affordability and environment. The bars represent either a negative (left), neutral (center) or positive (right) impact of the cage-free system when compared to the conventional system. The colors indicate the five sustainability categories. The graphic shows the potential sustainability trade-offs between conventional and cage-free housing systems and can assist in supporting informed decision-making.

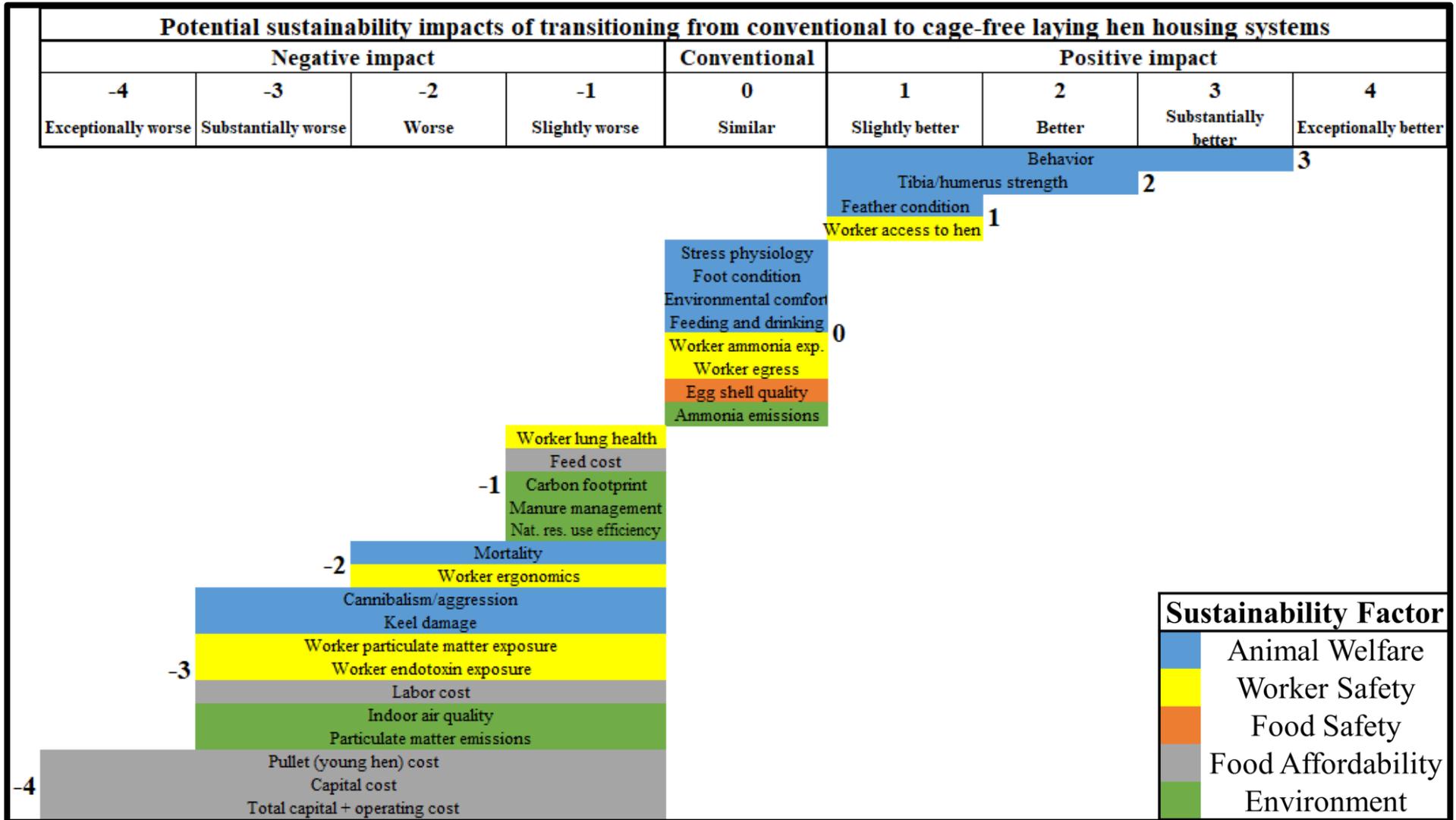


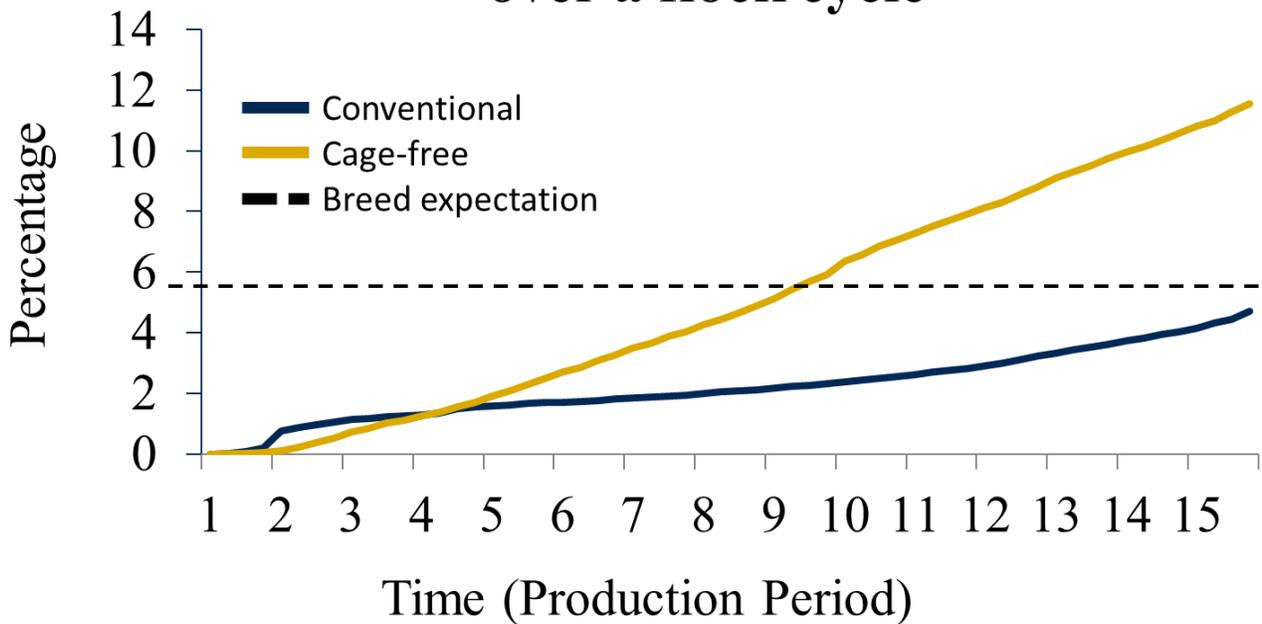
Figure by Mueller, adapted from <http://www2.sustainableeggcoalition.org/final-results>

Hen Health & Well-Being ([Blatchford et al., 2015](#); [Campbell et al., 2016a,b,c](#); [Cotter 2015](#); [Regmi et al., 2015a,b](#))

The CSES assessment of hen welfare involved an integrated evaluation of hen behavior, health, production and physiology. They found that both systems have positive and negative effects on hen health and well-being. The cage-free system offered hens more behavioral freedom with the nesting area, perches and litter area. The litter area was used for dust bathing, but eggs were also laid on the litter, which caused both worker and food safety issues. Additionally, the cage-free hens had better wing (humeri) and leg (tibiae) bone quality, but also had increased breastbone (keel) bone fractures, which can cause pain, decrease egg production and limit natural behaviors, like perching. Hens in the cage-free system had less feather loss, but dirtier feathers compared to the conventional system.

The cage-free litter area allowed for hens to fly, but 9 percent to 21 percent of these flights ended in failed landings. Failed landings occur when hens misjudge jumps or cannot fly the required distance, which results in a collision with the environment or other hens. Also, it was observed that “hens were typically spread fairly evenly across the litter area but were also seen to cluster there in large groups — with these ‘piles’ sometimes including as many as 229 hens and lasting for as long as six hours.”

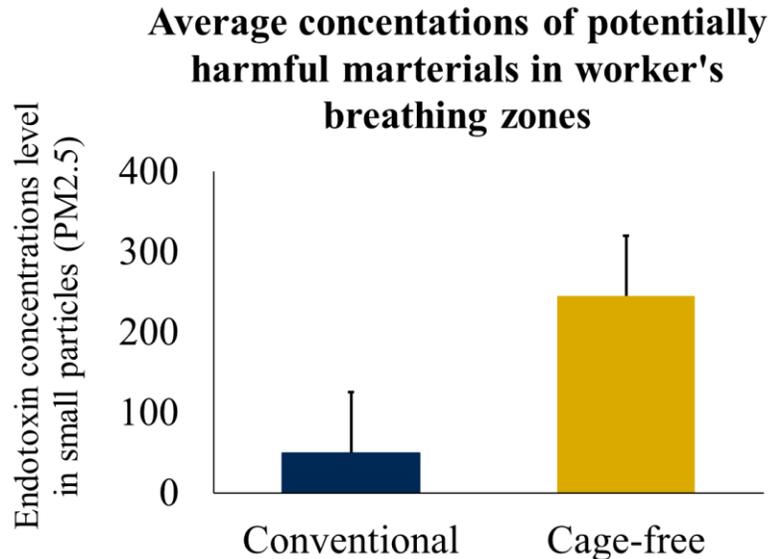
Cumulative hen deaths over a flock cycle



Twice as many hens died in the cage-free system compared to conventional. The cage-free hens were over 4 times more likely to get stuck in the metal tier structure and 6 to 20 times more likely to be cannibalized or pecked extensively by other birds. Hence the term “pecking order.”

Worker Health & Safety ([Arteaga et al., 2015](#) and [Mitchell et al., 2015](#))

Even though Proposition 12's language is focused on hen welfare, changes in housing systems also have consequences for workers tasked with taking care of the hens.



Airborne dust can make its way into workers' airways, with smaller particles even making it into lungs and directly to the bloodstream. The small dust particles ([particulate matter size less than 10 micrometers](#)) can carry pathogens, which are microorganisms that can cause disease. Workers in the cage-free system were exposed to significantly higher concentrations of airborne dust and endotoxins (toxic components of bacteria) than when working in the conventional house.

Ergonomic stressors (force, repetition and posture) were assessed. Both systems required workers to adapt extreme body positions when loading/unloading conventional cages and when gathering eggs laid on the floor in the cage-free floor system. Additionally, workers gathering cage-free floor eggs were exposed to multiple respiratory hazards while crawling or lying on the litter floor.

Food Safety & Quality ([Jones et al., 2015](#) and [Karcher et al., 2015](#))

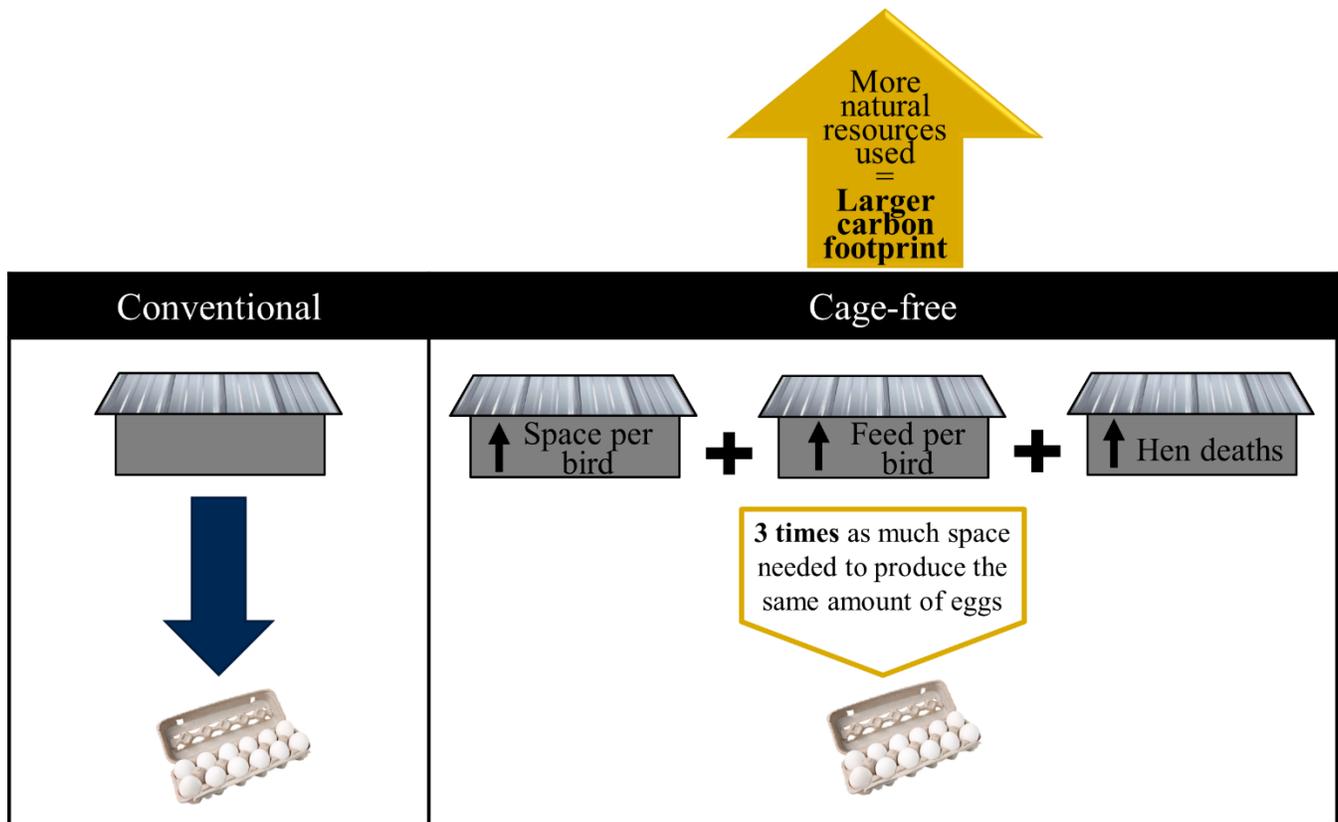
There was no difference in the presence of salmonella shedding, which is common for poultry, or egg quality between conventional and cage-free. However, the cage-free litter area had higher microbe and dust levels than the conventional system. Consequently, when eggs were laid on this litter area the shells had higher levels of microbes and coliforms, which are indicators of fecal contamination and are linked to many human pathogens that can cause food-borne illnesses.

Food Affordability ([Matthews and Sumner, 2015](#))

The largest operating cost for egg production is feed. Hens in the cage-free system produced fewer eggs per hen over time so feed cost per dozen eggs produced was higher than the conventional system. Also, the cost per dozen eggs for cage-free pullets (young hens) was substantially higher, due to higher rearing costs, more hens dying and lower egg production per hen. Additionally, in the cage-free system the cost per dozen eggs for labor and capital costs were substantially higher. The combination of these higher costs resulted in the cage-free eggs costing 36 percent more to produce than conventional eggs.

Environment ([Li et al., 2016](#); [Zhao et al., 2015](#); [Shepherd et al., 2015](#))

The amounts of ammonia and dust in the air and emitted into the environment were significantly higher in the cage-free system. The poor indoor air quality may lead to eye and respiratory tract irritation in both workers and hens. Greenhouse gas emissions were low for both systems. cage-free hens required more space and feed per egg produced, which means more natural resources are needed to produce the same amount of eggs as a conventional system. Ultimately, the cage-free system created a larger carbon footprint.



WHAT IT ALL MEANS

This holistic CSES research provides us with science-based information on sustainability factors to help guide our purchasing decisions. Currently, as consumers we have a choice in the marketplace, which allows us to weigh the trade-offs and purchase products that align with our own values, budget, and circumstances. If Proposition 12 passes, we will have limited choices and based on peer-reviewed science, it may not solve our environmental, economic and social sustainability concerns with egg production.