Today, there is heightened public interest in agriculture and a desire for increased accountability to ensure that meat, milk and eggs are produced responsibly and in a manner that results in food that is safe, wholesome and affordable. The members of the Coalition for Sustainable Egg Supply (CSES) are committed to meeting these expectations.

Recently, conventional laying hen housing has been criticized by groups concerned that the current system used to produce the majority of eggs in the U.S. does not provide for adequate animal welfare. CSES members believe it is important to consider all potential impacts of responsible production, including food safety, the environment, worker health and safety, animal well-being and food affordability, in evaluating modifications of the current system. CSES supports additional research to evaluate the sustainability of egg production from a holistic viewpoint.

Alternative Housing Systems

To date, two basic types of alternatives to conventional cage housing systems for laying hens exist. The first type is the cage-free (or non-cage) system, which as the name implies allows the hens to roam throughout a building or defined sectors of a building, providing them with opportunities to perform more of their normal behaviors. The second is the enriched cage system (also known as a furnished colony system), which also provides more freedom of movement because it is larger than a conventional cage and, in addition, is equipped with perches, nesting areas, and material designed to facilitate foraging and dust bathing behavior. According to the International Egg Commission, approximately five percent of U.S. eggs were produced in an alternative housing system in 2009.

Current State of Sustainability Research

Social Sustainability of Egg Production\(^1\)\(^2\), a recent study funded by the American Egg Board, identified what is known – and what is not known – about the sustainability of different laying hen production systems. This extensive review of academic literature relating to sustainability issues was conducted by a group of approximately 40 scientists, economists, philosophers, social scientists and other experts. The results were presented at the 99\(^{th}\) Annual Meeting of the Poultry Science Association in Denver in July 2010 and published in Poultry Science, available to the public online.

“Hen Welfare in Different Housing Systems”\(^3\) stated that multiple factors influence the level of hen welfare, and that although the need to evaluate the influence of these factors on welfare is recognized, research is still in the early stages. “It is evident that very little literature exists that compares all factors in different housing systems. However, it appears that no single housing system is ideal from a hen welfare perspective.

“Although environmental complexity increases behavioral opportunities, it also introduces difficulties in terms of disease and pest control. Any attempt to evaluate the sustainability of
a switch to an alternative housing system requires careful consideration of the merits and shortcomings of each housing system.”

“The Impact of Housing Systems on Egg Safety and Quality” notes: “Current information regarding safety and quality of eggs produced under different housing situations is inconsistent and, in many cases, contradictory. Much more study is necessary to determine whether moving to alternative housing systems results in a more-or-less-safe, quality product.”

“Environmental Impacts and Sustainability of Egg Production Systems” concludes that the available scientific literature on the environmental footprints of various hen housing systems remains incomplete. It identifies five gaps in knowledge, including quantification of emissions; thermal conditions and energy use in alternative housing systems; environmental footprint for different U.S. egg production systems; practical means to mitigate air emissions from different production systems; models for predicting air emissions and their fate; and interactions between air quality, housing system, worker health, and animal health and welfare.

On the economics of production, the analysis noted, “Conventional cage housing for laying hens evolved as a cost-effective egg production system. The U.S. data on production costs of such alternatives as furnished cages are not readily available and European data are not applicable to the U.S. industry structure.”

Need for Further Research
As the Social Sustainability of Egg Production study confirms, commercial-scale, holistic research on sustainable egg production in the U.S. is lacking and what exists is often contradictory.

Although animal welfare is the impetus behind the calls for a change in housing systems, animal welfare considerations alone cannot determine whether the egg production industry can remain sustainable. Determining the true impact of different egg production systems requires consideration of the environment, food safety, worker safety and food affordability. Each area can be evaluated separately and conclusions drawn, but the interconnectedness of each area must be better understood to make informed decisions about sustainable egg production.

A holistic approach for evaluating egg production systems can explore correlations that may exist between different areas. For example, a single issue such as air quality impacts the environment, worker safety and animal welfare.

Besides inter-dependencies between areas, the trade-offs must be investigated and better understood. A system change can result in both benefits and costs for different sustainability indicators, so evaluating multiple indicators in the same study provides reliable information for making decisions. Therefore, the best approach is to evaluate the impacts on environment, food safety, worker safety, food affordability, and animal health and well-being as a result of different housing systems in a well-coordinated interdisciplinary research effort that evaluates several variables simultaneously.

CSES Laying Hen Housing Research Project
CSES is sponsoring a commercial-scale study of housing alternatives for egg-laying hens in the U.S. The study seeks to fill knowledge gaps identified by the Sustainability of Egg Production project and to provide science-based information from which egg purchasers and producers can make informed decisions. Led by Michigan State University and University of California, Davis, the study will examine the impacts of three different laying hen housing systems on the following elements of a sustainable egg supply:
Environmental: The environmental study will determine the environmental impacts of different laying hen housing systems, evaluating indoor environmental conditions and air quality, gaseous and particulate emissions, feed and energy utilization efficiency, and manure nutrient management. In addition, it will include farm emission modeling, evaluate regional climatic condition impacts and gather data to develop a life cycle assessment of environmental footprint for different egg production systems.

Food Safety: The food safety research will evaluate egg quality and egg safety in different housing systems. Egg quality evaluation will include assessment of the physical quality of eggs, including attributes such as shell thickness, and also egg content quality including membrane strength and elasticity. The egg safety evaluation focuses on the effect of housing systems on bird response to Salmonella vaccination as well as microbiological evaluation of the hen housing system and eggs.

Worker Safety and Health: This research includes both respiratory and musculoskeletal health components. An ergonomic analysis will compare job tasks and impact on workers for each hen housing system. Respiratory health monitoring will include measures of individual exposure to endotoxins and ammonia as well as pre- and post-shift health testing for short-term lung effects.

Animal Health and Well-being: Behavioral observations will provide information on how hens use space and resources in the different house systems. Welfare scoring, skeletal evaluation, stress measurement and health evaluations will provide data for understanding the impact and potential trade-offs of housing systems on specific aspects of hen welfare.

Food Affordability: This study will evaluate the ways in which different production systems impact costs of egg supply from the farm. Farm costs affect market prices for eggs and therefore the consumption of and expenditure on eggs by consumers. Estimates of cost and price effects of the different systems will be used to approximate impacts of changing production systems on consumption of and expenditures on eggs and the implications for households with different incomes.

CSES Research is Unique
The CSES Laying Hen Housing Research Project is underway; the first research flocks were placed in April 2010. The research, which is the first of its kind, will be replicated over two flocks and is expected to be completed in 2014. It differs significantly from existing research in several ways:

Scale. The CSES study is being conducted in houses built to U.S. commercial production scale. Each house will have the capacity for at least 50,000 laying hens and will use commercially available equipment and furnishings. Previous U.S. research has been conducted primarily under small-scale research conditions, which may or may not accurately reflect commercial production conditions.

U.S. location. The farm where the research is being conducted is located in the U.S., using genetics, equipment and management systems typical of the U.S. While some European research data are undoubtedly applicable, differences in equipment, age of housing systems, management and other factors make the applicability of non-U.S. research findings questionable.

Integration. To date, most laying hen research has been one dimensional, i.e. looking at a single area of interest such as hen well-being. Egg production is in
fact an integrated system, and changes in one aspect may impact other areas. The CSES research will evaluate the impact of system changes across multiple aspects of sustainability and provide insight into potential tradeoffs between systems.

**Multi-system comparison.** Three different housing systems are being studied at the same location, allowing comparison across the systems under the same environmental conditions.

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**About CSES**

The Coalition for Sustainable Egg Supply is a multi-stakeholder group comprised of leading research institutions, non-governmental organizations, egg suppliers, food manufacturers, restaurant/foodservice and food retail companies. Our constituents are people, animals and the planet. The goal of the CSES is to evaluate various laying hen housing systems by considering the impact of multiple variables on a sustainable system. CSES takes into account the full scope of sustainability concerns. The Coalition’s work will result in meaningful, science-based data that will help guide future production and purchasing decisions.

For more information, please visit [www.SustainableEggCoalition.org](http://www.SustainableEggCoalition.org).

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