Exhibit 2

Economic Aspects of Alternative California Egg Production Systems

by

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Executive Summary

California egg producers who use battery cages must adopt a new production system before January 1, 2015 to continue marketing eggs in California. This report examines costs of production for alternative egg production systems in California and the estimated economic impacts of adopting an alternative system. The egg production systems examined include the current battery cage system, colony systems with 93 and 116 square inches of cage space per hen and cage free production.

There are egg production cost studies available but they are difficult to compare because of the time periods covered, differences in input prices (especially feed) and scarce data for colony and cage free production. This study uses an economic engineering approach that fixes input prices and focuses on the impact of basic input/output relationships on costs of production. The current battery cage system is used as a base with differences in factors such as feed consumption, egg production, hen mortality, building and equipment and labor requirements measured against the base. Information on input/output relationships is taken from published budgets and data provided by California producers.

Cost of production increases over the base battery cage system are estimated at 6.58 percent for a system with 93 square inches per hen, 12.48 percent for 116 square inches per hen, and 34.80 percent for cage free production. These estimated cost increases are primarily due to increased feed per dozen eggs produced, increased labor, and higher building and equipment charges for increased space per hen. Lower hen mortality in the cage systems is significant when comparing costs to the cage free system. The equilibrium impact of these higher costs of production on California egg production and farm and retail egg prices is estimated. There is a small decrease in estimated production with the main impact of the cost increase being higher prices for eggs. This result is due to price elasticity of demand for shell eggs being quite inelastic and elasticity of supply being quite elastic for a relatively short adjustment period. These adjustments can be placed in perspective using the colony cage system with 116 square inches per hen production results. As noted, estimated costs of production for one dozen eggs increased 12.48 percent. Assuming a price elasticity of demand of -0.20 and elasticity of supply equal to 10.0, equilibrium

California egg production would decrease 2.45 percent while estimated retail prices would increase 12.0 percent.

There are significant short- and long-run economic impacts from changing to a new egg production system in California. In the short-run, meeting a standard of 116 square inches per laying hen, for example, could easily cost California egg producers $400 million for new and remodeled buildings and equipment. Over time, operating these new facilities will involve increased inputs, including labor and feed, and higher production costs will result in higher farm, wholesale and retail prices. There is an estimated increase in California employment totaling 368 jobs, a small decrease in California shell egg consumption (less than 5 eggs per capita annually), and an increase in total egg expenditures (estimated to be $2.52 per capita annually). Using California Department of Finance projections, July 1, 2015 estimated population of 38,926,281 would result in annual revenues from California retail shell egg sales increasing an estimated $98 million.

There is a great deal of legislative uncertainty with implications for California egg production. This report assumes that both Proposition 2 and AB 1437 are effective on January 1, 2015. An amendment (the "King Amendment") to the federal Farm Bill making it illegal for one state to enact regulations that would apply to out-of-state agricultural producers, if signed into law, would invalidate AB 1437 and could spell the eventual demise of egg production in California. At the same time, a federal lawsuit that challenges the legal validity of Proposition 2 on the basis that it is unconstitutionally vague and does not inform egg farmers how to confine their hens so as to avoid the criminal penalties that are part of the law, could forestall implementation of new space requirements. H.R. 3798 and S. 3239 would establish national standards for egg laying hen enclosures, including cage dimensions that are lacking in Proposition 2. Finally, CDFA Proposed Regulations to reduce SE contamination of shell eggs includes a minimum space standard of 116 square inches per hen, in addition to vaccination, environmental testing and labeling requirements. Most California egg producers are waiting for definitive space requirements before making production and investment decisions. These decisions must be made within the next few months for needed construction and conversions to be in place for 2015 deadlines.

Economic Aspects of Alternative California Egg Production Systems

Introduction

California egg producers have faced considerable uncertainty about acceptable production methods since passage of Proposition 2 in November 2008. Scheduled to take effect on January 1, 2015, Proposition 2 adds provisions to the California Health and Safety Code Sections 25990 – 25994 that prohibits confining egg-laying hens on a farm, for all or the majority of any day, in a manner that prevents the hen from (a) lying down, standing up and fully spreading both wings without touching the sides of the enclosure or other egg-laying hens, and (b) turning around freely. While Proposition 2 is silent with regard to space requirements for an acceptable egg-laying hen enclosure, it is clear that the conventional "battery cage" system, used for almost all egg production in California and the rest of the U.S., is unacceptable.

Analysis of the probable impacts of Proposition 2 on California egg production and state economic activity published prior to the November 2008 vote assumed that no cage-type enclosure would satisfy the Proposition's requirements. Sumner, et al. (2008), Promar International (2008), and Newman, et al. (2008) examined the probable economic impacts of switching from existing egg production practices to a cage free system. These studies found that the significant increase in costs of production incurred when changing from the conventional "battery cage" system to a cage free system would place California producers at such a competitive disadvantage that most egg production in California would no longer be economically feasible. The outlook for the future of egg production in California was dire as many California producers considering quitting egg production or moving their operations to other states. Economic impacts from the loss of a primary producer with annual sales averaging $380 million and direct employment of some 3,000 workers would be substantial. Impacts on California consumers were expected to be relatively small since other states could rapidly increase egg shipments to California with little increase in marginal costs or average prices per dozen.

Post-Proposition 2 Developments

California egg producer expectations improved significantly when the California legislature enacted AB 1437 (Huffman) in 2010 that applies the Proposition 2 housing requirements to all eggs sold in California including those produced in other states. Abstracting from enforcement issues, this means that egg producers in other states must meet the same more costly production requirements facing California producers in order to ship eggs to the California market. While uncertainty continued regarding acceptable production methods, California producers were encouraged by a growing body of research and production experience indicating that Proposition 2 requirements could be met by cage production systems. Research on space requirements for natural behavior of egg laying hens led the European Union (EU) to ban conventional (battery) cages for egg-laying hens effective at the beginning of 2012. The EU established a minimum standard of enriched colony housing with 750 square centimeters (116.25 square inches) per hen. Mench (2011) examined space use by laying hens and determined that the behaviors specified in Proposition 2 can be satisfied in an enclosure with 93 square inches per hen. However, while cage production systems with increased space per hen permit hens to perform all of the behaviors required by Proposition 2, the amount of space required remains undefined.

The next development was a surprise announcement on July 7, 2011 of an agreement between the Humane Society of the United States (HSUS) and the United Egg Producers (UEP). The two groups agreed to work jointly for federal legislation for new standards on housing for most egg-laying hens in the United States (Smith, 2011; O'Keefe, 2011). The major points of the HSUS/UEP agreement are embodied in H.R. 3798 and S. 3239 that would establish national standards for egg laying hen enclosures, including cage dimensions.[1] If enacted into law, these proposed standards, that initially require enriched colony housing with 116 square inches per hen for white hens and 134 square inches per hen for brown hens, would be phased in by the end of 2029 except in California where the 2015 Proposition 2 implementation deadline would hold. They also require all eggs to be labeled with the type of housing used for their production. The

1). U.S. Senate bill S.3239, the Egg Products Inspection Act Amendments of 2012 by Senator Dianne Feinstein (D-CA) and a counterpart bill in the House of Representatives, HR. 3798, would establish nationwide space requirements for laying hens consistent with the HSUS-UEP agreement.

four alternatives are: eggs from free-range hens; eggs from cage-free hens; eggs from enriched cages; or eggs from caged hens.

The California Department of Food and Agriculture (CDFA) has proposed regulations to reduce SE contamination of shell eggs that include a minimum space standard of 116 square inches per hen.[2] This space standard is consistent with the European Union (EU) standard, the working agreement of HSUS/UEP as well as the initial requirements in H.R. 3798 and S. 3239. If approved, the CDFA proposed regulations provide California egg producers with an official space standard and a basis for production and financial planning.

Recent legislative developments have increased the economic uncertainty facing California egg producers. Rep. Steve King (R-Iowa) amended the federal Farm Bill to make it illegal for one state to enact regulations that would apply to out-of-state agricultural producers, an amendment that if approved, will invalidate AB 1437. If this happens, California egg producers can only remain competitive if Proposition 2 is found to be illegal in federal court as a result of ongoing litigation, if CDFA proposed regulations are adopted and are applicable to out-of-state producers, or if Proposition 2 is replaced by national standards for egg laying hen enclosures as contained in H.R. 3798 and S. 3239.

Since egg production costs vary by production system, the specification of minimum space standards for California egg production has economic implications for both producers and consumers. This study will focus on assembling information on costs of production for alternative egg production systems and using this information to estimate impacts on California egg production and prices.

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[2] This proposal would require any person registered with the Department to engage in business in California as an egg producer or egg handler, and any out-of-state egg handler or egg producer selling eggs in California to (1) implement SE reduction measures consistent with state and federal requirements; (2) comply, within a commercially reasonable time frame, with a minimum numeric enclosure requirement for egg-laying hens if the eggs produced from those hens are sold in California; and (3) comply with specified egg container label requirements to include an affirmative label statement on every package of shell eggs that are for sale in California, certifying that those eggs were sold in compliance with these standards.

Objectives

The objectives of this report are to:

1. Review recent studies of laying hen welfare and costs of production for different housing/production systems.
2. Assemble and present economic engineering type data comparing average costs of California egg production for conventional battery cages of 67 square inches per hen, colony housing of 93 and 116 square inches per hen, and cage free production.
3. Estimate the economic impacts on California egg prices, egg consumption, and household budgets of increasing laying hen space allocations.
4. Discuss possible changes in California economic activity resulting from the above changes.

Review of Previous Work

A growing body of research on egg-laying hen space allocations and costs of production has been stimulated by legislative deadlines eliminating conventional battery cages in the EU at the beginning of 2012 and in California in 2015. Some of these studies also comment on possible economic impacts of changing production systems. The controversy over space allocations is stimulated by questions of egg-laying hen welfare. While conventional battery cages tend to yield the lowest costs of egg production due to comparatively low feed consumption, low labor costs, low hen mortality, relatively high egg production per hen and low per hen facility costs, critics charge that the space available makes it difficult for hens to perform natural behaviors such as to stand, sit, turn around and extend their wings. However, when changing from cage to cage free production, costs per dozen eggs produced increases due to increased feed consumption, increased pullet costs, increased labor costs, increased hen mortality, increased facility costs, and reduced per hen egg production. Food safety concerns also tend to increase when moving from enclosure to cage free housing options.

Hen Welfare Studies

Various studies have examined the welfare aspects of different egg-laying hen production systems, including traditional cages, enriched cages, and cage-free systems (barn, free range, organic). LayWel (2007), in a study funded by the EU, examined the welfare implications of changes in production systems for laying hens using a database obtained from experimental and commercial housing systems by the nine LayWel partners between 1998 and 2005, with most of the data from 2001 onwards. Each production system was rated for its probability of "good or satisfactory" performance or medium or high risk of a poor welfare outcome. Welfare indicators included natural behaviors (stand, sit, turn around, extend wings, dusting, nesting) and systems outcomes (feather pecking, cannibalism, mortality, bone fractures, disease, internal parasites, air pollution). The database was also subjected to limited statistical analysis to determine whether there were significant correlations between the different welfare indicators at a flock level. Very few of the estimated relationships were statistically significant at the 1% level. The study concluded that each production system has advantages and disadvantages and noted that evidence in the report substantiated previous scientific knowledge that the welfare of laying hens is severely compromised in conventional cages (p. 27). The report also noted that furnished (enriched) cages retain many of the advantages of conventional cages without the drawback of severe behavioral restriction. The main advantages of the non-cage and free-range systems are a greater opportunity to express natural behaviors. Risks of a number of undesirable outcomes, such as increased mortality, bone fractures, and disease may also increase with free-range egg production.

Lay et al. (2011), at a Poultry Science Association Symposium, presented a comprehensive review of studies related to laying hen welfare in various housing systems. Factors related to welfare in different housing systems that are reviewed include disease, skeletal and foot health, nutrition, pest and parasite load, behavior, stress, affective states, and genetics.

Mench (2011) used a new research technology, 3-D kinematics, to determine the amount of space used by white hens to perform the behaviors required by Proposition 2. The average floor space used by hens to stand up, lie down fully extend their limbs (i.e. extend both wings, a behavior called "wing flapping"), and turn around freely was measured for each behavior using the maximum length and width of the hens. A minimum space allocation of 93 square inches per hen provides sufficient room for one hen to flap her wings without touching other hens or the side of the enclosure and all other hens to stand. Mench developed an equation to express the floor space required per hen for cage enclosures holding from 5 to 10,000 bird groups. Mench notes that the space value calculated for 60-hen groups is virtually identical to the minimum EU usable floor space requirement for furnished cages (116.3 sq. inches per hen), which would typically contain from 5-60 hens.

Food Safety

Egg quality characteristics tend to vary by production system, with the greatest variation between cage and non-cage production. It is generally acknowledged that hens in non-cage systems are more susceptible to bacterial infections and parasites than are caged hens. In addition to hen welfare, the LayWel (2007) database includes information on egg quality characteristics in cage and non-cage systems. About five percent of eggs in non-cage systems were laid outside of the nest boxes and eggs from non-cage systems were almost twice as likely to be soiled than those from cage systems (8.4 percent vs. 4.9 percent). Overall, 7.8 percent of eggs from non-cage systems were downgraded as compared to 6.5 percent from conventional cages. Regardless of production system, all California eggs are cleaned and inspected. California egg farmers have a long-term commitment to provide California consumers with a safe nutritious food product. The California Egg Quality Assurance Program (CEQAP), implemented in 1994 in response to public and governmental agencies' concerns regarding product quality and food safety associated with salmonella and chemical residues in eggs, is recognized as the premier egg quality assurance plan in the United States.

The Center for Disease Control and Prevention (CDC) reported in 1990 that Salmonella *enteritidis* (SE) had become the leading Salmonella serotype causing food borne illnesses in the United States.[3] CDC also reported that, prior to 1995, California accounted for 25 percent of the of the nation's reported cases of Salmonella *enteritidis.* Since CEQAP's inception in 1994 the incidence of SE has declined dramatically. In the year 2000 there was one reported incident that could not be confirmed as egg related. California produced eggs have not been traced back to a human illness associated with Salmonella *enteritidis* since 2001.

[3] Information in this and the following paragraph concerning CEQAP are from personal correspondence with Debbie Murdock (2012).

A copy of the California Egg Quality Assurance Program (CEQAP) statement is included as Appendix III. The CEQAP is comprised of 20 plus core components that form the basis of a Hazard Analysis Critical Control Points (HACCP) plan. California Department of Food and Agriculture veterinarians inspect CEQAP participants annually to ensure compliance with the program components. CEQAP requirements are more extensive than the egg safety rule implemented by the U.S. Food and Drug Administration in July 2010. The California program requires five Salmonella *enteritidis* tests (FDA only requires three) in addition to a mandatory SE vaccination program (FDA does not require mandatory vaccination) and an annual continuing education requirement (FDA does not require continuing education).

Egg Cost of Production Studies

Estimated costs for eggs produced in conventional battery cage systems are readily available but similar estimates for other production systems, including colony cage and cage free systems are restricted due to limited experience with the newer systems. As noted above, cost estimates for cage-free systems were developed as part of the debate surrounding California's Proposition 2. Published estimates for some components of enriched enclosure systems, as currently being installed in the EU, are available but experience in the U.S. is too recent and proprietary.

Recent reports that include estimates of costs of production for eggs in California include Sumner, et al., Bell, and Lawrence, et al. Sumner, et al. (2008) developed three cost estimates, the low cost, high cost and median cost. Their low cost estimate ($0.57 per dozen) is shown in Table 1. Their median and high cost estimates were $0.745 and $0.92 per dozen, respectively. Bell's estimate, based on 2005 conditions, had lower feed costs than the other estimates. Note that Promar International used Bell's estimated costs for the items listed in Table 1 to develop their cost estimate. The California cost estimate by Lawrence, et al. was developed for a study of Iowa's competitive position in egg production, where Iowa was compared to other major egg producers including California and Pennsylvania. These estimates are shown in Table 1 together with Hermes cost estimate for Oregon egg production. While not shown in the table, three of the studies also developed cost estimates for non-cage production systems. Sumner, et al. estimated that costs for non-cage systems would range from 40 to 70 percent higher than for conventional

Table 1. Estimated egg production costs for conventional battery cage production system, dollars per dozen.

Cost Item	California[1] 2007	California[2] 2005	Oregon[3] 2007	California[4] 2007	Penn[5] 2007	Iowa[6] 2007
	---------- dollars per dozen ----------					
Feed	0.28	0.225	0.4575	0.2977	0.2643	0.2347
Pullets	0.09	0.066	0.0925	0.1004	0.1004	0.1004
Housing	0.05	0.054	0.0277	0.0310	0.0310	0.0310
Labor	0.03	0.035	0.0375	0.0111	0.0087	0.0106
Sub-total	0.45	0.380	0.6152	0.4402	0.4044	0.3767
Other costs	0.12	0.0513	0	0.0287	0.0289	0.0257
Total	0.57	0.4313	0.6152	0.4689	0.4333	0.4024

Source of estimates:
[1]Sumner, et al. (2008) low cost estimates; [2]Bell; [3]Hermes; [4]Lawrence, et al.; [5]Lawrence, et al.; [6]Lawrence, et al.

cages ($0.97 to $1.13 per dozen eggs with a median cost of $1.05 per dozen). Bell estimated costs for a barn system at $0.549 per dozen (a 27 percent increase over conventional cages). Hermes estimate for cage-free egg production in Oregon was $0.8143 per dozen (32 percent increase over conventional cages). Feed and pullet costs account for 65 to 85 percent of the budgeted total costs of egg production in Table 1 and 77 to 90 percent of the four major cost categories shown (feed, pullets, housing and labor). Since feed is also a major component of the costs of raising pullets, it is clearly the most important factor in determining comparative advantage for egg production. Conclusions regarding comparative costs between studies that can be drawn from the data in Table 1 are limited for several reasons. Included are differing time periods with variations in feed prices, changes in other input prices, and differing seasonal input/output relationships. The exception is the cost data presented by Lawrence, et al. in the last three columns of Table 1. Lawrence, et al. document that Iowa has lower costs of egg production than does either California or Pennsylvania, largely due to lower costs for major feed ingredients (corn and soybean oil meal). Iowa's overall cost advantage for shell eggs delivered to California markets, however, is much smaller than the feed cost advantage since it costs the Iowa producer an estimated $0.127 per dozen more than a California producer to ship shell eggs to Los Angeles (Lawrence, et al. p. 13).[4]

[4] Sumner, et al. (2008) compared the cost of shipping shell eggs vs. the cost of shipping feed from the Midwest to California. Using information provided by shell egg producers in California, they found that the May 2008 average cost of shipping one truckload of 23,400 dozen eggs from a Midwest origin was $3,100. This yields a

Estimated 2011 Costs of Production

Ibarburu and Bell (2011) estimate monthly feed costs (both $/cwt. and cents/dozen), other cost components, and total costs of egg production (cents/dozen) for six regions and the U.S.[5] Their estimated 2011 monthly U.S. feed costs averaged $14.33 per cwt. and estimated total costs of egg production averaged 76.91 cents per dozen. Comparing 2011 with 2010, feed costs increased 36.6 percent and cost of production per dozen eggs increased 23.2 percent. During 2011, estimated total cost of egg production for the U.S. ranged from a high of 79.78 cents per dozen in June to a low of 71.90 cents per dozen in December. Note that U.S. per dozen cost of production in 2010 was estimated at 58.91 cents in June and 71.23 cents in December. California's estimated costs per dozen ranged from a high of 84.42 cents in June 2011 to a low of 75.75 cents in November 2011.

An Analysis of Costs of Production and Laying Hen Space Allocations

The average cost of production for eggs will vary as the amount of space allocated to each laying hen changes. Previous cost studies that compare alternative production systems have found important differences in feed utilization, hen mortality, egg production, housing/equipment costs, and labor requirements. Average costs will vary for a given production system due to differences in costs of inputs, seasonal biological relationships, and differences from producer to producer. A two-step procedure is used to derive cost estimates for different production systems. The first step is to record representative data for input-output relationships for the production systems selected for analysis. Second, selected average prices for the major input categories will be applied to the input-output data to derive an estimated cost of production for each system. An important source of input-output data is California egg producers who have experience with different egg production systems, including colony cage and cage free systems. Fortunately,

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transportation cost of $0.13 per dozen eggs. The cost of shipping the feed equivalent of 23,400 dozen eggs, at a rate of 3.5 pounds of feed per one dozen eggs and using the average May 2008 feed prices, results in a cost of between $0.07 per dozen and $0.09 per dozen. They concluded that since shipments of eggs continue to arrive from the Midwest, some producers there must have costs low enough to make them competitive in the California market (p. 43).

[5] The regions included are S. Atlantic, N. Atlantic, Midwest, S. Central, California and N. West.

several producers were able to provide economic information and data on physical input-output relationships for their operations. Experimental and trial data are also becoming available.[6]

Input-Output Relationships

Previously published work and new California producer data provide the focus for this analysis. A report by Sumner, et al. (2008) comparing costs for conventional battery cage production vs. cage free housing systems discusses sources of cost differences. They write that: *"regulations that would eliminate the option of producing eggs in conventional cage housing systems would raise production costs substantially. The increase in costs would take two forms, both of which are important. First, variable costs of production would rise by at least 20 percent and perhaps substantially more. Underlying these higher costs per dozen eggs are higher feed use per bird, higher cost per pullet, lower average productive life of a hen, higher mortality rates, fewer eggs of premium size or acceptable marketability, fewer birds per facility and higher labor costs. There is a variety of evidence on all these points. The second major cost impact of the initiative is that compliance with new laying hen housing regulations would require substantial investment in new or retrofitted housing facilities. Based on information provided by farm accountants, a new or converted non-cage housing facility costs in the range of $10 to $40 per bird" (p. 47).*

This study will examine differences in feed consumption, hen mortality, egg production, labor requirements, and investment requirements for each of the selected production systems. The systems analyzed include: (1) the current battery cage with 68 sq. inches per hen; (2) colony cages with 93 and 116 sq. inches per hen; and, (3) cage free production. The input-output relationships used to develop estimated costs for each of the production systems are outlined in Table 2. Note that the eggs per hen production estimates and the feed requirements per dozen eggs provided by our California respondents (Table 2) are slightly lower than those used by Ibarburu and Bell for their monthly estimates. The estimated building and equipment investment costs are based on current producer experience and new building and equipment quotes. Actual costs will vary by time, location, materials used and capacity. Note that the conventional total investment is 20 percent higher than the amount used by Ibarburu and Bell for their monthly Egg Industry Center budgets. Their assumptions for interest and depreciation rates are used for the housing cost

6 Examples include Coelho, A. and A. Demler (2010) and MAF New Zealand (2010).

estimates in Table 3 (25 year life for building, 10 year life for equipment, straight-line depreciation with no salvage value and 10 percent annual interest charge based on one-half of the value). The housing investment estimates in Table 2 do not include land, the price of which

Table 2. Physical and Economic Measures for Alternative California Egg Production System Cost Calculations.

Production System & Space per Hen	Conventional 68 sq. in	Colony 93 sq. in	Colony 116 sq. in	Cage Free
Physical & Economic Measures				
Eggs per hen (annual)	260	260	260	244
Feed lbs/dozen eggs	3.26	3.30	3.38	3.95
Mortality (annual)	5.3%	5.3%	4.95%	22.0%
Feed Price- $/pound	0.15	0.15	0.15	0.15
Pullets -- $/bird	4.25	4.25	4.25	4.85
Housing Investment				
Building $/hen	6.50	8.50	9.75	9.50
Equipment $/hen	5.60	9.30	12.80	10.00
Total $/hen	12.10	17.80	22.55	19.50

varies significantly depending on location. An interest expense for land of .4, .5, .6 and 1.0 cents per dozen, respectively, is included in the cost of buildings and equipment in Table 3. The estimated cost of feed per dozen eggs is based on the amount of feed required and the cost per pound for feed, both shown in Table 2. An estimated feed cost of $0.15 per pound was used for all production systems. The estimated monthly cost per pound of feed in California during 2011 ranged from a high of $0.1640 in June to a low of $0.1399 in November (Ibarburu and Bell). The cost of housing and equipment (depreciation and interest) is a major source of variability for the different production systems, with the highest costs for the colony system with 116 square inches per hen. Labor costs increase with space allocations while estimated other costs on a per dozen basis are the same for each system. The estimated cost per dozen eggs for other items is taken from Ibarburu and Bell's monthly cost estimates for California. Other items include utilities, water, medication, consultant fees, laboratory procedures, and the cost of conforming to regulatory requirements. Standardization of input costs (feed prices, wage rates and other costs) allows one to attribute most of the variation in Table 3 costs to the production system used. Comparing costs for each system to the conventional battery cage with 68 square inches per hen reveals the nature of the increase expected as space allocated to each hen increases. Estimated costs per dozen for the colony system with 93 square inches per hen increases 6.58 percent over

Table 3. Estimated Costs of Production by Major Cost Components for Alternative California Egg Production Systems.

Production System	Conventional	Colony	Colony	Cage Free
Space per Hen	68 sq. in	93 sq. in	116 sq. in	
Cost Component	---------------------------$/dozen eggs-------------------------------------			
Feed	0.489	0.495	0.507	0.593
Pullets	0.119	0.119	0.119	0.158
Housing & Equip	0.070	0.105	0.135	0.119
Labor	0.029	0.040	0.045	0.113
Other	0.086	0.086	0.086	0.086
Total Costs	0.793	0.845	0.892	1.069
% Total Cost Increase	--	6.58	12.48	34.80

the conventional cage system while the colony system with 116 square inches per hen increases estimated costs by 12.48 percent. Increased feed consumption, increased hen mortality, and increased labor requirements for the cage free system result in an estimated cost increase of 34.80 percent over conventional battery cages.

Economic Effects of Converting to Colony Cage Systems

The effects of new hen housing space requirements on egg prices and consumption can be estimated using the cost estimates developed above. In addition information from other sources on the responsiveness of egg production and consumption, as provided by estimates of the price elasticity of demand and supply, are required. Estimates will be made using the economic model of egg supply and demand developed by Sumner, et al. (2010) included as Appendix I.

Price Elasticity of Demand

Price elasticity of demand (η) describes the inverse response of per capita consumption to a change in retail prices. In simple terms price elasticity of demand is defined as the percentage change in the quantity demanded divided by the percentage change in price. Values in the range from 0 to -1.0 are described as inelastic while values < -1.0 are described as elastic. Studies of the demand for eggs typically find that demand is quite inelastic. For example, Okrent and Alston (2011) summarized eight different estimates of the retail elasticity of demand for eggs as ranging from -0.08 to -0.32 with a mean value of -0.18 (p. 57) and Sumner et al. found values in a range from approximately –0.15 to –0.3 in their review.[7] Thus, we expect changes in quantity demanded for eggs to be much less responsive than price, i.e., for η = -0.20, the percentage change in price (inverse) will be five times the percent change in quantity.

The retail elasticity of demand estimates referenced above are more elastic than elasticity of demand measured at the farm level, with the difference dependent on the nature of the marketing margin. If we assume linear demand and a constant marketing margin with the farm price equal to one-half of the retail price, the farm level elasticity will be 50 percent of the retail elasticity. If the marketing margin contains both proportional and fixed charges, the difference in elasticity between the farm and retail level will decrease as fixed charges decrease. Finally, if the margin is strictly proportional, the farm and retail elasticity will be equal. Selection of a farm level price elasticity of demand to use for our economic analysis of the impact of changing to enhanced cage housing is subject to error for several reasons. The ratio of farm to retail egg prices is constantly changing and the linkage between farm and retail egg prices (egg marketing margin behavior) is not firmly established. Given recent pricing experience and range of estimates for retail elasticity of demand for eggs, it is reasonable to expect the farm level elasticity of demand to be in a range from -0.10 to -0.20. Both values will be used for examining economic impacts.

Price Elasticity of Supply

Econometric estimates of the price elasticity of supply for eggs are not readily available. The lack of estimates is not unusual nor is it surprising because of the nature of supply and supply response for agricultural products. The responsiveness of the supply of a commodity to changes in price varies over time as the ability of producers to adjust resource use changes. The supply of eggs is essentially fixed in the very short run; the nature of adjustments to price changes increases over time as producers can adjust the number of hens and finally, housing capacity. Most observers

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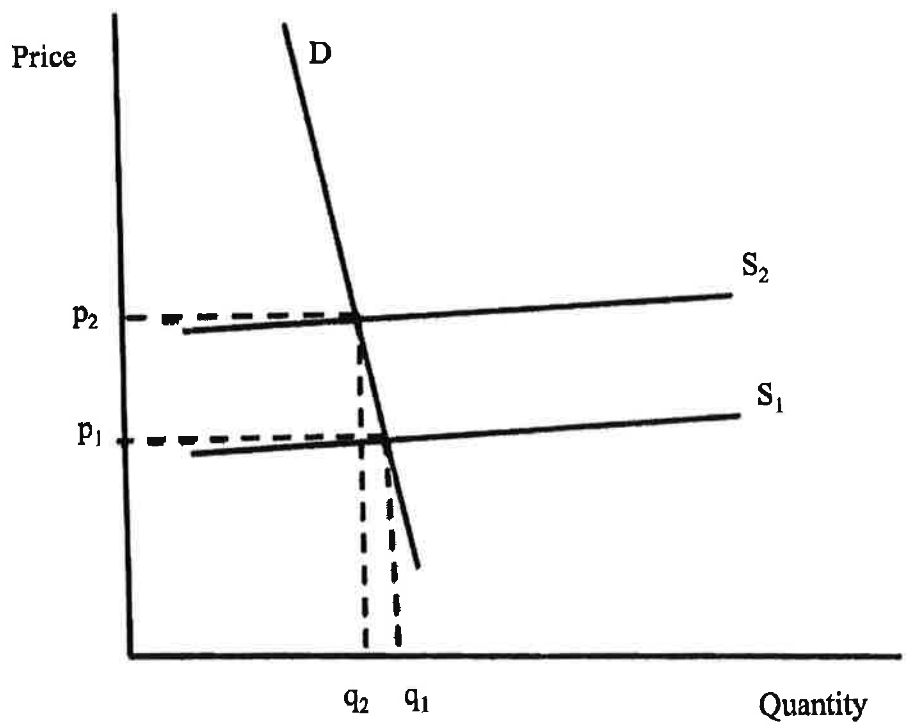
7 References listed included Kastens and Brester (1996); You, Epperson and Huang (1996); Huang and Lin (2000); and Yen, Lin, and Smallwood (2003).

believe that, given the ease of adjusting layer capacity over time and the lack of limiting resources, egg supply is very elastic. Major inputs to egg production are housing, labor, pullets, feed, health services, and general materials and services. For most of these inputs, the egg industry uses a small share of the total quantity available on the market, and changes in demand for these inputs would likely have little impact on the costs of these items, given time for adjustment to new market conditions. Sumner, et al. (2010) used elasticity of supply values of $\varepsilon = 5.0$ and $\varepsilon = 10.0$ in their simulations of the economic effects of banning cages for laying hens in California and the rest of the U.S. (p. 436). This study will use the same values to estimate equilibrium values. Note, however, that the elasticity of supply may be quite inelastic in the short run (before pullets can be raised or new housing built).

Price and Consumption Response

The measurement of the impact of increased marginal costs on the equilibrium quantity of eggs supplied to the market and on farm level unit prices is illustrated by Figure 1. The increase in

Figure 1. Price and Quantity Effects of An Increase in Marginal Costs of Egg Production.



marginal costs shifts the supply function from position S_1 to S_2 with the quantity supplied decreasing from q_1 to q_2 and farm level prices increasing from p_1 to p_2. The inelastic nature of demand (D) is illustrated by its steep negative slope while the much more elastic supply curves have very little slope. Thus, when marginal costs increase, the impact is for a much larger relative impact on equilibrium prices than on equilibrium quantities. Because of relatively inelastic demand and elastic supply for eggs, the impact of an increase in costs of production is largely on equilibrium egg prices with relatively small decreases in equilibrium quantity.

California farm level price and quantity effects can be simulated using the equations in Sumner, et al.'s supply/demand model (shown in Appendix I), the alternative elasticities of demand and supply specified above (η = -.10, η = -.20, ε = 5.0, ε =10.0), and the increased marginal cost for changing from conventional to colony cages with various per hen space allocations. The simulated effects, as shown in Appendix II and Table 4, were derived as follow: the estimated change in farm price is calculated using equation [4] from Appendix 1 and then the change in California quantity of eggs is calculated using equation [5]. Note that for this study, the increased willingness to pay for eggs produced using new space allocations (dlnB) in both equation [4] and [5] is assumed to be zero. The retail price effect assumes that the retail elasticity of demand is double the farm elasticity, i.e., retail price elasticity = -0.20 when farm price elasticity = -0.10.

The nature of the expected changes in equilibrium prices and quantities based on inelastic demand and elastic supply shown in Figure 1 is verified by the estimates in Table 4. Comparing the change from conventional cages to colony cages with 93 square inches per hen, estimated costs increase 6.58 percent while estimated farm level prices increase 6.45 percent when farm level price elasticity of demand is -0.20 and elasticity of supply is 10.0. For colony cages with 116 square inches per hen, estimated costs increase 12.48 percent while estimated farm level prices increase 12.24 percent. Cage free estimated costs of production are 34.8 percent higher than conventional battery cage costs. As shown in Table 4, a mandated switchover to cage free production would increase estimated farm level prices by 34.12 percent. Given a constant marketing margin the impact on farm prices is transferred directly to the retail level, with the impact of the price change falling primarily on egg consumers.

Table 4. The Simulated Impact of Increased Costs of Production for Possible New Hen Housing Requirements on Equilibrium Egg Production and Farm and Retail Egg Prices, California.*

Hen Space Requirement	Estimated Cost Increase	Simulated Quantity Effect	Simulated Farm Price Increase	Simulated Retail Price Increase
	---------- percent ----------			
93 Sq. In.	6.58	-1.29	6.45	6.33
116 Sq. In.	12.48	-2.45	12.24	12.00
Cage Free	34.80	-6.82	34.12	33.46

*The estimated cost increase is from Table 3. Simulated values assume that the farm level price elasticity of demand is -0.20 and the elasticity of supply is 10.0.

Economic Impacts

The expected economic impacts of increased costs of egg production for California producers can be illustrated using the simulations in Table 4. The analysis will focus on the colony production system with 116 square inches per hen, with brief comments on differences for the 93 square inch cage and cage free systems. The scenario with producer price elasticity of demand equal to -0.20 and farm elasticity of supply equal to 10.0 will be used for the discussion (other combinations of price elasticity of demand and elasticity of supply shown in Appendix II would yield slightly different estimated impacts). Factors to be examined include expected: (1) impact on California layer numbers and egg supplies; (2) investment requirements and stranded resources; (3) effects on industry employment and other inputs; and (4) effects on California egg consumers.

California Layer Numbers and Egg Supplies

There were an estimated 19.60 million laying hens in California during 2011 with estimated total production of 5,412 million eggs. While California laying hen numbers decreased from a peak of 41.55 million in 1971, they have remained in a range of 19.23 to 20.26 million since 2004 and averaged 19.65 million during the past five years (2007-2011). During the same five-year period total California production ranged from 4,938 to 5,400 million eggs and averaged 5,263 million. Average egg production per hen has been trending up over time reaching an estimated high of 276 eggs per hen during 2011. Note that estimated California production per hen increased about 9.5

percent during the two decades since 1992 when production averaged an estimated 252 eggs per hen.

Increased costs associated with the colony production system with 116 square inches per hen result in an estimated reduction in production of 2.45 percent. This would result in California laying hen numbers decreasing from 19.60 million to about 19.11 million hens. The estimated reduction in production for the 93 square inch and cage free systems is 1.29 and 6.82 percent, respectively, with equilibrium hen numbers of 19.35 and 18.26 million. This equilibrium adjustment assumes that California's share of the states' egg consumption remains at 2011 levels. Changes in feed costs or shipping rates due to changing fuel costs could either improve or decrease California's competitive position for egg production.

Investment Requirements and Stranded Resources

The present battery cages cannot be used in California after December 31, 2014. Thus, most will be removed from use and will have essentially zero salvage value. Some producers have indicated that they expect to be able to convert a portion of their existing cages to colony cages. At this point in time, both the proportion of cages suitable for conversion and the conversion costs are very uncertain. One producer indicated that he expects to convert about 25 percent of his present cages to colony cages. A sample of California producers have estimated that their accounting basis for cages and equipment made obsolete by Proposition 2 could easily be on the order of $1.75 per hen. Based on most recent laying hen numbers of 19.6 million, California producers could have useless assets with an accounting basis of over $34 million on January 1, 2015. This does not include any buildings that cannot be converted or that will no longer be used for egg production.

While large in dollar terms, the resources rendered useless by Proposition 2, are small in comparison to the new investment required by the legislation. Uncertainty regarding production facilities that will meet Proposition 2 requirements, equipment and facilities that can be remodeled and costs associated with both new and remodeled facilities make it very difficult to estimate the total capital requirements facing California egg producers. Even if all existing facilities and equipment could be remodeled to meet Proposition 2 space requirements (highly unlikely), significant investment in new buildings and equipment will be required. This can be illustrated using the housing system with 116 square inches of space per hen. As shown above, for California producers to maintain their existing market share would require about 19.11 million hens in 2015, a reduction of about 2.5 percent from the recent count of 19.6 million hens. Increasing space allocations from 68 to 116 square inches per hen will require new space for 7.62 million hens that must be met with new buildings and equipment.

New hen space requirements can be met by remodeling existing equipment and facilities and/or purchase of new equipment and construction of new housing. There is little information available on either the amount of existing housing and equipment that can be remodeled or the cost of converting existing facilities. Conversion of existing facilities are expected to have lower capital costs than a new facility, but in some cases costs of operating a converted facility may be high when compared to a new facility designed from the ground up. Responses from a number of California producers reveal a wide mix of individual strategies, ranging from building all new facilities with new equipment to only converting existing cages and equipment in present buildings.

We can attempt to estimate the capital costs of new space requirements of 116 square inches per hen by specifying a proportion of existing facilities that might be remodeled, the production system used, the expected number of California hens to be housed in 2015, and the estimated costs per hen for new and converted facilities. Suppose that half of existing buildings can be remodeled and that 25 percent of existing cages can be converted to meet new requirements. The estimated cost for all new facilities (building, cages and equipment) for 116 square inches per hen is $22.55 per hen consisting of $9.75 per hen for building and $12.80 per hen for cages and equipment (Table 2). For purposes of estimation we assume that remodeling costs are 50 percent of new costs. Thus, remodeling a building and installing new equipment would have estimated costs of $17.68 per hen while remodeling both building and equipment would have estimated costs of $11.28 per hen. For California producers to maintain their existing market share would require about 19.11 million hens in 2015.

Because of the increase in space requirements from the present 68 square inches per hen, housing the number of hens needed to maintain California producers' share of the California market will require new space for 7.62 million hens. Replacing half of existing buildings with new construction will accommodate 5.745 million hens, for a total of 13.3648 million hens at $22.55 per hen for a total investment of just over $301 million. Remodeling costs for buildings with new cages and equipment for 2.8725 million hens is estimated at almost $51 million while remodeling costs for buildings, cages and equipment for 2.8725 million hens is estimated at over $32 million. Given the above specifications, providing 116 square inches per hen will require new investment by California egg producers of about $385 million. Less space per hen will reduce, while more space will increase, total investment requirements. Note that environmental enrichments included in EU cages (and phased in to US cages under HR 3798 and S3239) are not included in these estimates.[8] The difference in cost for EU Colony cage systems with and without enrichments is reported to be $1.50 per bird, hard cost, plus $.50 per bird labor to install. Given the study assumptions, adding enrichments increase the budgeted costs of California egg production about $0.014 per dozen.

Egg producers in other states who want to continue supplying the California market will face California production requirements with similar per hen investments in facilities and equipment. Sumner, et al. (2008) estimated that out-of-state producers supplied about 35 percent of the total shell eggs consumed in California in 2007 (pg. 89). To maintain that share after January 1, 2015, out of state producers would have conversion investment costs for cages and equipment equal to about 54 percent of estimated California costs, or an additional $208 million for colony cages with 116 square inches per hen.

The large investments required to continue or enter egg production for the California market have several implications. Some producers may have problems obtaining needed capital; other producers may decide not to continue egg production for any of a number of reasons (age, retirement, access to capital, financial situation, changing interests, other opportunities, etc.); some producers may take a "wait-and-see" attitude with a phasing of conversion based on

[8] Environmentally enriched cages that contain nest boxes, perches, litter mats and scratch pads are also referred to as "furnished" or "enriched" cages or colony cages.

developing economic conditions; and other producers will plan their conversions to be in full production on January 1, 2015. These considerations will enter into the transition from the present equilibrium to a new equilibrium and the time required for the transition.

Effects on Industry Employment and Other Inputs

Changing from conventional battery cage egg production to a colony cage production system with 116 square inches per hen will increase input requirements per dozen eggs produced. Table 2 indicates that estimated feed requirements increase 3.7 percent and estimated labor requirements increase 55.0 percent for each dozen eggs produced. Given an estimated reduction in total production of 2.52 percent when moving to a new equilibrium, there will be little change in total feed requirements. We would also expect little change in the total number of employees involved in packing and transporting eggs, maintenance, administration or other on-farm activities. There will however be a significant increase in direct labor requirements for egg production.

An estimate of the increase in labor requirements can be developed from expected production and labor inputs used to construct Table 3.[9] Annual production of 5.096 billion eggs using 19.6 million hens in battery cages requires an estimated 395 full time employees. The new equilibrium production of 4.971 billion eggs from 19.12 million laying hens in colony cages (116 sq. in. per hen) requires an estimated 597 full time employees, for an increase of 202 full time employees. This increased employment will have broader economic effects on the California economy that are often referred to as "multiplier effects". Using the IMPLAN model information on "Poultry and Egg Production" as a starting point, Sumner, et al. (2008) estimated input/output multipliers for California egg production (p. 101). The estimated California employment multiplier is 1.82, which means that for every job added in California egg production an additional 0.82 jobs are added in other sectors of the California economy. Thus, the total employment impact including direct, indirect and induced effects will be an estimated increase of 368 jobs in California.

Effects on California Egg Consumers

As illustrated in Figure 1, the major impact of changing from battery cage to colony cage egg production in California will be on shell egg prices, with only a small decrease in equilibrium

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[9] A labor cost of $120 per day or $31,200 per year per full time employee is used for employment estimates.

production and consumption. The most recent estimates of California shell egg consumption, developed by Sumner, et al. (2008), were for 2007. Estimated annual California shell egg per capita consumption between 2000 and 2007 ranged from a high of 212.9 in 2002 to a low of 187.3 in 2007 (p. 89). National per capita egg consumption decreased 3.0 eggs (250.1 to 247.1) from 2007 to 2011 (Ibarburu and Bell, 2012, p.5). The national per capita consumption figure includes both shell eggs and processed eggs. National retail table egg prices averaged $1.77 per dozen during 2011 (Ibarburu and Bell, 2012, p.8).

The impact of increased shell egg prices on California consumers can be estimated using the above data. With base consumption of 187.3 eggs per capita and an average retail price of $1.77 per dozen, annual per capita egg expenditures would be $27.63. If consumption is reduced 2.45 percent to 182.7 eggs and average prices increase 12.0 percent to $1.98 per dozen, annual per capita egg expenditures would increase to $30.15. Thus, the increase in annual equilibrium expenditures due to a switch from battery cages to colony cages is estimated at $2.52 per capita. With an estimated 2011 population of 37,691,912, the annual cost to California consumers is expected to be almost $95 million.

The Response to New Regulations

The comparisons above are for a change from the present equilibrium to a new equilibrium after adjustments to new production system regulations are complete. The change from one production system to another, however, takes time and is not likely to be as smooth as implied by the comparison. California egg producers are uncertain of the specifications for a production system that will meet requirements even though almost two-thirds of the six-year adjustment period has passed. Most will wait until there is a binding final resolution from federal lawmakers, the California Department of Food and Agriculture and/or the courts before finalizing their planned adjustments. After their plans are in place, execution will require time to obtain financing, obtain required approvals and permits, order equipment, build or convert housing, and stock the new facilities. Timing is very important because producers must have the new systems in place by December 31, 2014 to market eggs after that date. Being too early, however, can have significant costs with little or no expected increase in egg prices until January 1, 2015. There will also be costs associated with downtime while facilities are converted.

The European Union experience with legislation banning the use of battery cages for egg-laying hens provides an example of adjustments to a mandatory change in production systems. The EU law was finalized in 1999 with an effective date of January 1, 2012. Some producers moved to cage-free systems to meet the requirements, but most responded by installing colony cage production systems. A lack of response by producers in several countries, even with 12 years to plan for the changeover, is a continuing problem. The European Commission began proceedings against 13 of the 27 member countries in early 2012 for noncompliance with the ban on battery cages. These countries, including major egg producers such as France, Italy and Spain, were estimated to have some 46 million laying hens in battery cages after the ban became effective on January 1, 2012. Producers who made substantial investments to meet the deadline were (and continue to be) unhappy to be in competition with eggs illegally produced in the less costly battery cages.

Given the planning requirements, timing issues and the unprecedented financial requirements for new production systems, January 2015 California egg supply could easily be less than the expected equilibriums discussed above. Short-term egg shortages will result in significant price increases as a result of the inelastic demand for eggs. For example, a 10 percent reduction in California's estimated equilibrium egg supply in January 2015 could easily lead to a 50 percent increase in average farm level prices, given a farm level price elasticity of demand of -0.20. Such short-term price increases can be expected to encourage additional capacity, increased production and movement toward the long-run equilibrium. California producers and suppliers in other states must exercise caution to prevent excess capacity as these adjustments occur because of lags between commitments to expand production and the resulting production. Overexpansion of industry capacity, if it occurs, sometimes takes longer than expected to adjust downward due to the non-reversibility of supply functions. Under these conditions, associated with large fixed investments, prices must decrease more to obtain a given reduction in quantity supplied than was required to obtain the initial increase in quantity supplied.

Finally, it is worth emphasizing that the long-term viability of California egg production is dependent on AB 1437 (Huffman) that applies the same housing requirements to all eggs sold in

California. The budgeted costs of production, using alternative egg production housing systems, range from 6.6 to 12.5 to 34.8 percent greater than the present battery cage system. Even for the lowest cost increase of 6.6 percent, without AB 1437, the competitive advantage for producers in other states would result in the eventual demise of those California producers that were not serving a small market niche. The only difference between colony cage and cage free production would be the time required for California egg producers to exit the industry. Thus, AB 1437 helps maintain egg production in California and assures that California consumers share in the costs imposed by new hen housing requirements. The future of California's AB 1437 and the future of California egg production, however, is once again in doubt since Rep. Steve King (R-Iowa) amended the federal Farm Bill to make it illegal for one state to enact regulations that would apply to out-of-state agricultural producers. If the Farm Bill is approved with this amendment in place and AB 1437 cannot be implemented, California egg producers' survival will be dependent on a successful challenge to the legality of Proposition 2 and its vague requirements, or on adoption of CDFA Proposed Regulations to reduce SE contamination of shell eggs with application of all producers supplying shell eggs to California, or on approval of HR 3798 and S 3239 that establish national standards for egg laying hen enclosures, including cage dimensions.

It has been almost four years since Proposition 2 was approved, with a little over two years remaining until it becomes effective on January 1, 2015. The time required for conversion or construction and equipping facilities to meet the deadline leaves little time to spare. Egg producers need much better information and definitive space standards before making investment decisions.

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APPENDIX I.

An Example Algebraic Model of the Egg Market Response to National Layer Housing Restrictions[10]

This appendix develops a standard economic model of US egg supply and demand. [See Sumner, et al. (2008, 2010) for an application to the California hen housing regulations.] Consider first the specification of a demand function that depends on price and consumer preferences or willingness to pay for eggs produced using an alternative housing system. For simplicity, consider a demand function for eggs of log differential form so that the percentage or proportional change in the US demand for eggs is given by

$$d\ln Qd = \eta(d\ln P - d\ln B), \qquad [1]$$

where Qd is the quantity of US eggs demanded; P is price; η is the price elasticity of demand for eggs in the United States, which is negative; and B represents the additional willingness to pay for eggs produced using a particular noncage housing system. The term dlnB represents a percentage or proportional increase in the willingness to pay or demand price that would be experienced in the market. Notice that as willingness to pay under the alternative increases, the quantity demanded increases.

Analogously, consider a simple supply function where the percentage or proportional change in the quantity of eggs supplied to the US market takes the form

$$d\ln Qs = \varepsilon(d\ln P - d\ln C), \qquad [2]$$

where Qs is the quantity of eggs supplied to the US market and dlnC is a vertical cost shifter reflecting the added marginal cost of producing eggs using the noncage alternative to the

10 This appendix is taken from Sumner, D. A., W. A. Matthews, J. A. Mench, and J. T. Rosen- Molina. 2010. "The economics of regulations on hen housing in California." Journal of Agricultural and Applied Economics, 42,3(August): 429–438.

conventional cage environment. The elasticity of supply, ε, is positive because the higher the price, the more eggs will be supplied to the market. Notice that as costs increase, the quantity of eggs supplied decreases.

To determine the effects of the shift to the alternative system, we use the equilibrium condition $d\ln Qd = d\ln Qs = d\ln Q$, and insert equations [1] and [2]. [3]

Solving this equation for the proportional change in price as a function of the US egg market elasticities of demand and supply and the 2 shifters yields

$d\ln P = [-\varepsilon/(\eta - \varepsilon)](d\ln C) + [-\eta/(\eta - \varepsilon)]d\ln B.$ [4]

This expression shows that the more that costs increase with the increase in the cost of production due to the alternative housing system, the more the price of eggs in the United States increases. This term is positive because the elasticity of supply is positive and the elasticity of demand is negative so the denominator is negative.

Finally, using the expression for dlnP in equation [4] to insert into either equation [1] or equation [2] yields the following equation for the effects of the change in housing system on the new quantity of eggs:

$d\ln Q = [-\eta\varepsilon/(\eta - \varepsilon)](d\ln C - d\ln B).$ [5]

In equation [5], we see that the larger the cost increase from the new housing system, the fewer eggs will be sold ($[-\eta\varepsilon/(\eta - \varepsilon)]$ is negative). However, the larger the increase in the willingness to pay for eggs produced under the alternative system, the more eggs will be sold. Overall, the quantity effect will be negative not as a matter of the algebra but because the eggs produced under the alternative system are available currently and command a very small share of the market. That means the additional willingness to pay by consumers must be small relative to the additional cost of production for the eggs under the alternative housing system.

APPENDIX II.

Simulations of Possible New Hen Housing Space Requirements on Changes in Equilibrium Prices and Quantities of Eggs in California for the Estimated Cost Increases Shown in Table 3.

93 square inches per hen				
Farm Elasticity of Supply	Farm Elasticity of Demand	Farm Price Effect (percent)	Retail Price Effect (percent)	Quantity Effect (percent)
5.0	-0.10	6.45	6.33	-0.65
10.0	-0.10	6.51	6.45	-0.65
5.0	-0.20	6.33	6.09	-1.27
10.0	-0.20	6.45	6.33	-1.29

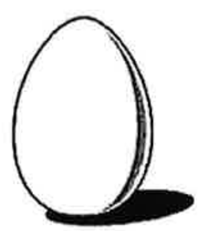
116 square inches per hen				
Farm Elasticity of Supply	Farm Elasticity of Demand	Farm Price Effect (percent)	Retail Price Effect (percent)	Quantity Effect (percent)
5.0	-0.10	12.24	12.00	-1.22
10.0	-0.10	12.36	12.24	-1.24
5.0	-0.20	12.00	11.56	-2.40
10.0	-0.20	12.24	12.00	-2.45

Cage Free				
Farm Elasticity of Supply	Farm Elasticity of Demand	Farm Price Effect (percent)	Retail Price Effect (percent)	Quantity Effect (percent)
5.0	-0.10	34.12	33.46	-3.41
10.0	-0.10	34.46	34.12	-3.45
5.0	-0.20	33.46	32.22	-6.69
10.0	-0.20	34.12	33.46	-6.82

APPENDIX III.

CALIFORNIA EGG QUALITY ASSURANCE PROGRAM

AN ANIMAL PRODUCTION FOOD SAFETY PROGRAM



Developed by the
California Egg Industry in Cooperation with:
California Department of Food and Agriculture
U.S. Department of Agriculture
U.C. Cooperative Extension
California Animal Health and Food Safety Laboratory
California Department of Health Services
U.S. Food and Drug Administration

CALIFORNIA EGG QUALITY ASSURANCE PROGRAM

The California Egg Quality Assurance Program is a voluntary Pre-harvest Food Safety program designed to ensure product quality and food safety associated with salmonella and chemical residues in eggs. The program contains core components which form the basis of a Hazard Analysis Critical Control Points (HACCP) plan. Training, record-keeping, and research are integral components in documenting the success of the program.
Each participant will implement an approved CEQAP plan specific to their operation. Farm and processing facilities will be annually reviewed by California Department of Food and Agriculture veterinarians to ensure compliance with the program components.

CORE COMPONENTS

A. Administrative

1. Develop a written farm/premises flock egg quality assurance plan.
2. Designate an official quality control supervisor(s) for in-house operations.
   a) The official quality control supervisor(s) shall attend one continuing education session every year.

B. Production

1. Purchase chicks and pullets from hatcheries participating in the National Poultry Improvement Plan (NPIP) "U.S. *Salmonella enteritidis* Monitored Program" or equivalent state plan. Chicks should be delivered with a certifying letter. Started pullets must be obtained from sources with an acceptable salmonella prevention and control program.
2. Chicks and pullets should always be transported in coops and trucks that are cleaned and disinfected between flocks.
3. Obtain feed from mills that follow accepted feed industry "Good Manufacturing Practices" and the "Recommended Salmonella Control for Processors of Livestock and Poultry Feeds, 1988", published by the American Feed Industry Association (AFIA), 1501 Wilson Boulevard, Suite 1100, Arlington, VA 22209 or an equivalent.
4. Use only animal protein ingredients originating from rendering plants participating in the Animal Protein Producers Industry (APPI) Salmonella Reduction Education Program or equivalent.
5. If used, medications, feed additives and pesticides must be administered adhering to approved label directions.
6. Maintain a flock health program to include vaccinations, monitoring and periodic necropsy of mortality or cull birds.
   a) Maintain a vaccination program to protect against infection with *Salmonella enteritidis* (SE) which includes a killed or inactivated vaccine, or a demonstrated equivalent SE vaccination program as determined by a licensed veterinarian.
7. Maintain a farm rodent monitoring and reduction program.
8. Pullet and layer buildings will be cleaned and disinfected before restocking by wet or dry methods. Third-party visual inspection of cleaning and disinfection is required by an official quality control supervisor(s).
9. The farm will maintain an appropriate biosecurity plan to maintain flock health and will train employees on proper procedures to execute the program. Document employee training and comprehension annually. At a minimum this plan will address:
a) Training of employees including documentation
b) Premises security
c) People movement including visitors
d) Disposal of manure, mortality, trash and spent fowl.
e) Vehicle, equipment and supply movement and sanitation (Cleaning & Disinfecting) in the secure poultry area.
10. Implement a *Salmonella enteritidis* environmental monitoring program which includes the following testing protocols:

a) Testing of chick papers at delivery
b) Environmental Test at 14 – 16 weeks
c) Environmental Test at 40 – 45 weeks
d) Environmental Test at 4 – 6 weeks post molt
e) Environmental Test pre depopulation

C. Processing

1. Follow plant operating guidelines:
   a) Facilities and equipment must be kept clean and in good repair and shall be completely washed at the end of each day's operation.
   b) Lighting and equipment should be adequate to properly identify egg defects in the processing area.
   c) Potable water with less than 2 ppm of iron shall be used for egg washing.
   d) Wash water shall be maintained at 90 degrees Fahrenheit or higher and at least 20 degrees Fahrenheit higher than the temperature of the eggs to be washed.
   e) A USDA approved cleaning compound shall be used in the wash water.
   f) USDA wash water guidelines shall be followed.
   g) Washed eggs shall be spray rinsed with warm water and a USDA approved sanitizer.
   h) If eggs are to be oiled, follow USDA guidelines.
2. Refrigerate eggs according to applicable federal, state or local laws.
3. Label egg cartons according to applicable federal, state or local laws.
4. The plant will maintain an appropriate biosecurity plan to limit cross contamination by egg flats, pallets, racks or other materials that are returned to ranches. Plastic egg flats must be washed and sanitized after each use and must be returned to the originating farm. Fiber egg flats cannot be sanitized and thus must be destroyed after first use.
5. The plant will maintain an appropriate biosecurity plan to limit cross contamination of unprocessed and processed eggs. New egg cartons and fiber flats should be used for all consumer packages.
At a minimum the plan must address:
a) Training of employees including documentation
b) Premises security.
c) People movement including visitors.
d) Vehicle, equipment and supply movement and sanitation (Cleaning & Disinfecting) related to the egg processing plant.
6. No returned product shall be reprocessed for retail shell egg sales.