Producer Economic Survey: Guidance for Companies Seeking Cage-Free Eggs

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HUMANE SOCIETY INTERNATIONAL

Contents

PHOTOS BY: JULIE BUSCH BRANAMAN/FOR THE HSUS

Executive summary

AROUND THE WORLD, food businesses are committing to exclusively purchase cage-free eggs. This is an important advancement for animal welfare, as most egg-laying hens are confined to cages, small wire enclosures that severely restrict movement and natural behavior. There are challenges for producers and food businesses to keep up with the global movement to improve animal welfare, and chief among them is cost. This report is one of several that Humane Society International has created to provide solutions and tools to help mitigate and meet those challenges for a smooth transition. For example, while there are many viable cage-free alternatives, these usually cost slightly more because the hens have more space and there are fewer hens in each barn. Egg producers are concerned about not earning enough to support a viable cage-free egg business, and buyers need to know how to negotiate a fair and reasonable price.

To assist with meeting these needs, Humane Society International surveyed egg producers from Asia and Latin America to better understand their cage-free production costs and economic situations. Thirteen egg producers from six countries responded, including six farms from three countries in the Americas (Brazil, Chile and Mexico) and seven farms from three countries in Southeast Asia (India, Viet Nam and the Philippines). This data was used to produce a financial analysis of small (1,000-3,000 hens) and medium-sized (3,000-10,000 hens) cage-free egg farms. Average revenue for the two regions were calculated along with break-even egg prices and sample payback periods for their capital investments.

Feed costs were the largest production expense, making up over 52% of operating costs in Latin America and nearly 70% in Asia. The second-largest cost was for pullets, the young birds who must be raised (and fed) until they are 16 weeks of age, old enough to lay eggs. Other costs include labor, utilities, egg packing and distribution.

Many of the producers in the survey, particularly those from Asia, were not earning a profit. Their revenue was insufficient to cover production expenses. The average break-even egg price for each region was 0.128 USD (U.S. dollars) per egg in Latin America and 0.095 USD per egg in Asia. Egg producers face losses unless they earn more than their individually calculated break-even egg price.

Transitioning to cage-free production or investing in a new cage-free egg barn can be risky unless producers have long-term purchasing agreements. For companies wishing to fulfill their cage-free egg commitments, offering producers support through the transition with a longer-term purchasing agreement is an important, often necessary step. These agreements require flexibility to account for changing expenses, such as feed costs that can rise due to drought, conflict or many other factors that are outside the control of the egg producer. Effective collaboration and communication between buyers and sellers can provide a road map for a successful transition to 100% cage-free egg production.

Introduction

The Farm Animal Welfare and Protection program of Humane Society International works around the world to encourage the adoption of cage-free egg production systems. Globally, most hens kept for egg production are confined in small, wire cages. Cage-free systems improve the welfare of hens by providing much more freedom of movement and the opportunity to express natural behavior such as scratching, nesting, perching and dustbathing. For decades, companies have paid very little for eggs, and price pressures have driven producers to keep the animals in ever tighter spaces.The hidden cost of cheap, cage eggs is animal cruelty.

Major brands, local and international, acting on principles of social responsibility, want to do better and are adopting policies to purchase only cage-free eggs. However, these companies may be operating under cost constraints and want to be sure they are paying a fair price for the eggs they source. Conversely, egg producers incur increased production costs in cage-free systems and need to be compensated accordingly to maintain a viable business.

To facilitate the discussion, clarify production differences and improve understanding, HSI surveyed egg producers in two regions of the world (Asia and Latin America), gathering basic information on the costs associated with producing cage-free eggs. The collated survey results are presented in this report, which is intended to assist businesses making cage-free egg purchasing decisions. The results summarize the inputs and constraints on producers of cage-free eggs so that buyers understand why cage-free eggs cost more. We also provide general guidance on how much consumers should expect to pay.

In addition to the results summarized in this report, tailored individual responses were sent to each egg producer who responded to the survey. Individual reports allowed producers to compare their operations to peers inside and outside their regions, enabling them to determine if their costs (e.g., for feed, labor, veterinary services, etc.), were comparable to regional averages, or if they were closer to a minimum or maximum. HSI also produced a basic budgeting tool for egg producers that calculates how production cost changes translate into adjustments to the egg price needed to break even. Capital (investment) costs were also considered, and simple payback periods for new or retrofitted barns were discussed.

The hidden cost of cheap, cage eggs is animal cruelty.

Methods and results

The survey consisted of 25 questions. Of these, 11 questions related to production costs (such as annual feed costs, veterinary care, bedding/litter etc.); seven questions focused on housing costs (including building costs and environmental enrichments); and seven questions were about income (such as the expected annual income from egg sales).

HSI received a total of 13 responses from six countries, including six responses from three countries in the Americas (Brazil, Chile and Mexico) and seven responses from three countries in South/Southeast Asia (India, Viet Nam and the Philippines). This data was used to produce a financial analysis of small (1,000-3,000 hens) and medium-sized (3,000-10,000 hens) commercial cage-free egg farms using single-level floor housing systems (not multilevel aviaries). Some had outdoor access for the hens and so were also free-range systems.

The data were aggregated for each of the two regions. While the quality of the responses was good, if the survey was missing information (e.g., reported no information for veterinary costs per bird), the average value for that region was used. Further, if a range of values was reported for a given survey question, the midpoint of that range was used for the analysis. One survey result from the Americas region had to be removed from the analysis because it was not a commercial-sized operation and greatly skewed the results. Otherwise, the small and medium producers in each region were combined for analysis.

For ease of comparison, all budget items were converted to per hen values and to USD (using the currency conversion value on the date of completed survey).

PRODUCTION COSTS

The first section of the survey inquired about individual costs of production. Table 1 summarizes these results and displays the lowest cost reported in a survey, the calculated average and the highest reported values for each production cost for each region. In Table 1 and throughout, individual low and high values may have come from different surveys, as no one producer had the lowest or highest values for every production cost.

Table 1: Lowest, calculated average and highest annual per hen production costs are shown for each region (USD).

Production costs per hen	Americas			Asia		
	Low	Avg	High	Low	Avg	High
Feed	11.69	20.44	27.89	12.81	18.15	26.15
Pullets	4.14	6.76	8.37	0.93	4.28	8.24
Labor	2.80	4.41	5.86	0.16	1.52	3.71
Electricity	*0.02*	*0.32*	*0.76*	*0.00*	*0.64*	*2.74*
Bedding	*0.02*	*0.63*	*1.39*	*0.00*	*0.81*	*5.00*
Veterinary costs	*0.01*	*0.90*	*3.35*	*0.00*	*0.74*	*2.00*
Egg handling / packaging	*0.02*	*1.83*	*3.60*	*0.00*	*0.08*	*0.45*
Other costs	*0.21*	*1.61*	*4.25*	*0.00*	*0.64*	*3.81*
Transport	*0.02*	*1.37*	*3.24*	*0.00*	*0.07*	*0.30*

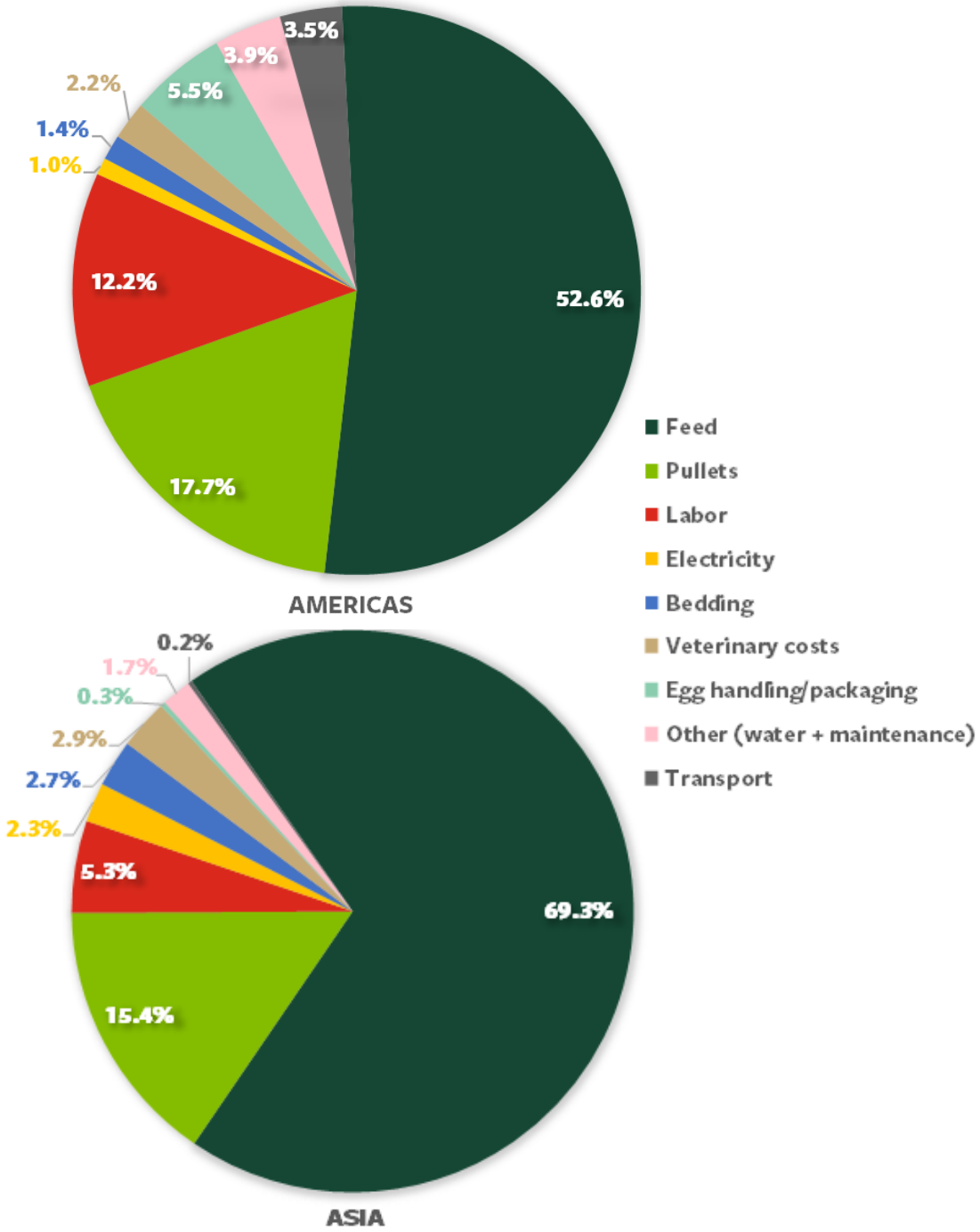

Figure 1: Average production cost percentages for the Americas (top) and Asia (bottom).

Based on data from the survey, the average itemized production costs (labor, egg handling and packaging, transportation and other costs) are generally lower in Asia than the Americas. In several instances, the average itemized costs in the Americas are more than double those in Asia, and there are only two average production costs that are higher in Asia than the Americas (electricity and bedding).

The total production cost per hen varied greatly between farms and locations. For the Americas, the calculated average was 38.26 USD. The lowest total cost per hen reported by a producer in the Americas was 26.61 USD per hen, and the highest was 49.15 USD. For Asia, the average calculated total cost per hen was much lower, 26.92 USD. The lowest reported total cost per hen from a single survey in the Asia region was 17.16 USD and the highest was 41.97 USD.

Figure 1 shows the average percentage of the total attributed to each production cost. (See Appendix A for additional percent costs.)

The most substantial cost of egg production is feed, which averaged 52.6% of total production costs in the Americas' region and 69.3% in Asia. The cost of pullets (young birds who must be fed and raised to maturity before they begin laying eggs) is the next-highest cost, accounting for more than 15% in both regions. Labor is also an important cost (average of 12.2% of total costs in the Americas and 5.3% in Asia), with the remaining costs relatively small in comparison.

In general, production cost percentages were similar between the two regions, although feed costs made up a greater proportion of the total in Asia, and labor costs made up a greater proportion of the total costs in the Americas. Egg handling and packing costs reported for Asia were a very small proportion of total production costs (just 0.3% compared to 5.5% in the Americas). Similarly, transport costs were very small in Asia (just 0.2% of the total) compared to in the Americas (3.5%).

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The estimated costs of production reported herein are lower than the true costs of production because our simplified analysis did not account for normal flock mortality or, for example, certification costs, land or interest on loans for buildings and equipment. The total number of saleable eggs was included, however, so loss and breakage are accounted for in Table 2 (below), under eggs/hen/year. For simplicity, our analysis assumed one full year of production, not a full flock cycle, which can be 90 weeks. Between flocks, there is downtime in the barn for cleaning and disinfection, before a new flock can be introduced, and this means lost days of production, that were unaccounted for in our analysis. In sum, the reported total costs should be considered lower than the actual costs.

REVENUE AND PROFIT

After questions about production costs, the next section of the survey investigated the sources of revenue for egg producers. Table 2 includes the number of birds per house; the annual egg production per hen; price per egg; and the revenue from egg sales as well as the sale of "spent hens," those at the end of their productive life. When egg production begins to decline after about 90 weeks of production, the flock is depopulated and replaced with younger birds, just coming into lay. Depending on the local market, the spent hens are sometimes sold for meat, and this can be a small additional source of income for producers. However, there is not always a market for spent hens, and they may be killed and disposed of on or off the farm.

In the survey, egg sales comprised 97% of the total revenue in the Americas and 85% of the total revenue in Asia. Both the calculated average and highest reported prices were greater for sold spent hens in Asia than those in the Americas (Table 2). Only one egg producer in each region did not sell spent hens.

For most producers, the revenue from selling spent hens was the primary non-egg revenue; however, some producers had other minor income from sales of manure or had cost savings due to reusing wastewater. Because this additional income was generally small and variable between producers, it is not accounted for in Table 2.

Table 2: Lowest reported, calculated average and highest reported values contributing to revenue.

	Americas			Asia		
	Low	Avg	High	Low	Avg	High
Birds/house	1,000	4,750	9,300	1,000	3,333	10,000
Eggs/hen/year	180	269	308	216	248	288
Earned price/egg (USD)	0.07	0.17	0.25	0.02	0.06	0.13
Sold hen price (USD)	0.05	1.12	2.76	0.00	2.24	4.23

In this survey, the average farm size in Asia (3,333 hens) was smaller than the Americas (4,750 hens); however, this pattern may not be representative of the whole region. Hens were also less productive in Asia compared to the Americas. This could be true of the whole region, or it could be an artifact of the smaller farms that participated in the survey, which do not always use commercial feed or genetics. Both the nutrition of the hens and the genetic strain have a large impact on the productivity of the hens. The price of sold hens in Asia was twice as large as the Americas, which likely reflects the commonality of this practice in Asia.

For each survey, the per-hen revenue from egg sales was calculated by multiplying the productivity per hen (eggs/hen/year) and the earned price per egg. The total per-hen revenue is the sum of the egg revenue per hen and the income from the sale of each spent hen (Table 3).

Using the production costs for both regions in Table 1 and the revenue sources in Table 2, Table 3 provides the average total production costs per hen and the average total revenue per hen. Profit per hen was then calculated using the difference between the per-hen revenue and the per-hen production costs for each region.

Table 3: Average per-hen production costs, revenue and profits by region (USD).

	Americas	Asia
Total production cost per	38.26	26.92
Per-hen revenue	45.16	18.25
Per-hen profit	6.90	-8.67

The per-hen revenue in the Americas was more than double that for Asia. This is due largely to the higher productivity per hen and the higher price per egg.

The average total production cost per hen in the Americas was 42% more than the cost in Asia, but revenue was more than double. Consequently, more of the egg production enterprises in the Americas were profitable, while those in Asia were not. Based on the data provided, three of the five producers in the Americas were profitable, while only one of the seven in Asia were profitable; thus, the majority of egg farms participating in the survey appear to be operating at a loss.

BREAK-EVEN EGG PRICE

Assuming many of the production costs and parameters affecting revenue (hens per barn and productivity) remain relatively fixed over a laying cycle, egg prices can be adjusted to cover production costs. The break-even egg price is defined as the price per egg needed to offset all production costs over the year of analysis (though providing no profit). For an egg production enterprise, the break-even price is calculated from the total production costs per hen described in Table 3, multiplied by the flock size and the total egg production per hen in a year in Table 2, and also multiplied by the flock size:

Break-even egg price = (total flock production costs – non-egg revenue*) / total number of eggs per flock

For the Americas, average break-even egg price (USD)**= (169,921.51-6,927.52)/1,276,732 = 0.128

For Asia, average break-even egg price (USD) = (87,076.62-8,384.12)/827,778 = 0.095

The average calculated break-even price in the Americas is about one-third higher than that for Asia. Considering that the production costs in the Americas were about 40% higher than Asia and the revenue for the Americas was more than double that of Asia (Table 3), the survey data suggests that producers in Asia would need a higher price for their eggs to cover their production costs.

The break-even egg price for each individual producer in each region had a large range of values (Figure 2). The lowest break-even egg price in the Americas was 0.093 USD, and the highest was 0.265 USD, while the calculated average was 0.128 USD. In Asia, the lowest was 0.063 USD, and the highest was 0.151 USD, with the average for the region at 0.095 USD.

In the Americas, the average earned price per egg was 0.168 USD, and the average break-even price was 0.128 USD, while in Asia those values are 0.065 USD earned,

*The ″non-egg revenue" includes the sale of spent hens and manure, etc.

**The average break-even egg price in both regions was calculated using average values for production costs (found by averaging the real survey data for total production costs across all producers in each region, not by multiplying the calculated average production cost per hen by the average number of hens), average non-egg revenue and average total number of eggs.

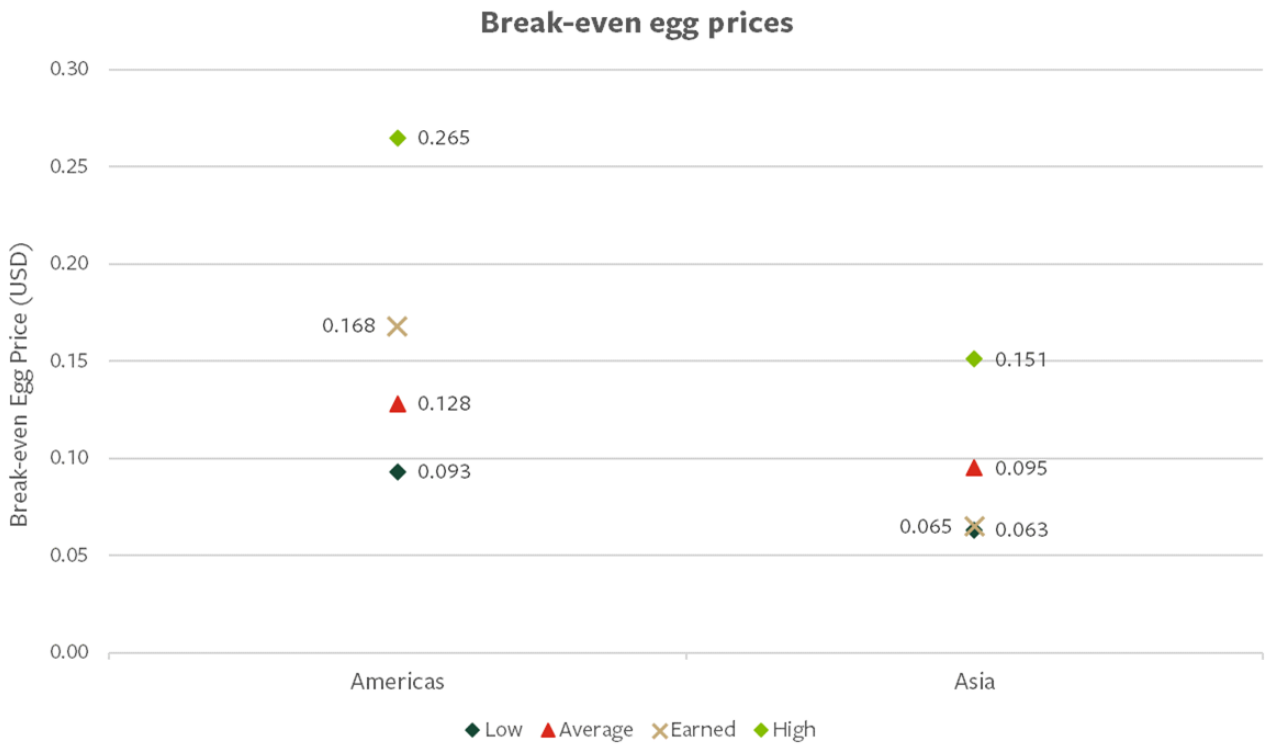

Figure 2: High and low break-even egg prices, along with the calculated average and average earned price received for each region.

compared to 0.095 USD break-even. This comparison indicates that generally producers in the Americas were operating at a profit (earning 4 cents per egg), and those in Asia were operating at a loss (losing 3 cents per egg), as described under Table 3.

Producers must set their price per egg above their break-even price to earn a profit. The budgeting tool developed in conjunction with this survey helps producers calculate their break-even price and can calculate a projected profit when the earned price per egg exceeds the break-even price. Earning just a penny per egg more than the break-even price can have a large effect on the total profit because the increase in egg price is multiplied by the total egg production for the barn (both the number of eggs per hen times the number of hens per barn). In one year, the flocks in our survey produce roughly 1 million eggs, so a penny per egg increase would provide about 10,000 USD more in revenue.

Using the calculated averages from the data obtained in the surveys (cost percentages and revenue), a general budget for each region was created to investigate how different costs and revenue can influence profit. This model budget (described in Appendix B) was used to investigate how profits change with small fluctuations around the break-even egg price (Figure 3).

The slope of each of the lines in Figure 3 indicates the change in profit as the egg price moves away from the break-even price. For the average flock size in each region (Asia 3,333 hens; Americas 4,750 hens), a penny-per-egg price increase over the break-even point results in an 8,278 USD profit in Asia and a 12,767 USD profit in the Americas. This profit is directly related to the total number of eggs per flock (number of eggs per hen times the number of hens per barn), because the break-even price already accounts for the costs and other revenue, which are held fixed. If the production per hen and the number of hens per barn were the same for each region, these lines would collapse onto each other.

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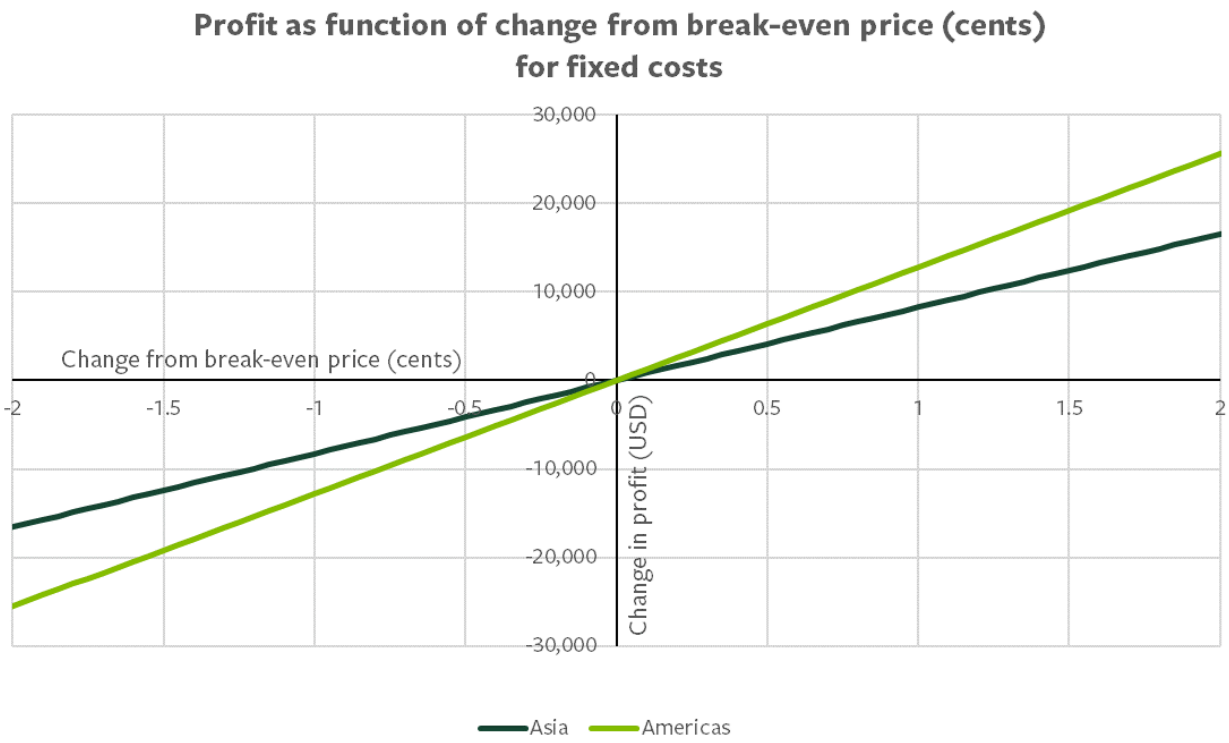

Figure 3: Graph of the change in total annual profit (USD) as egg price changes (cents) from the calculated break-even egg price when holding production costs fixed for the farms surveyed in Asia and the Americas.

CAPITAL COSTS

The final section of the survey looked at investments in housing and equipment. The calculated averages for housing and equipment costs for each region are summarized in Table 4. In the Americas, one producer reported no housing costs, and in both regions some individual producers reported no investments in equipment. The reasons for this result were not explained, but these producers may have inherited their barns and equipment, or they may no longer have records. The average capital costs for housing in Asia (5.67 USD per hen) were about half the costs in the Americas (10.45 USD), and the average for investment costs for equipment in the Americas (2.56 USD) was about six times higher than in Asia (0.42 USD). These averages may be underestimates, because they included zero values for surveys reporting no expenditures for housing or equipment.

Paying off investments can be viewed in two simplified ways (excluding taxes, depreciation, etc.). The first is the payback period. This is the time (in years) required to pay off the investment and is calculated using the total investment cost divided by total profit. This payback calculation assumes all profit goes toward paying the costs associated with the new system.

Table 4: Average capital costs per hen are shown for each region (USD).

Capital costs	Americas	Asia
Housing	10.45	5.67
Equipment	2.56	0.42
Per hen	**13.01**	**6.09**

Using the reported survey values, the regional average for capital investments (across the individual producers) in the Americas was calculated as approximately 59,878 USD for one barn plus inventory. While profits varied widely, the average for this region was 71,372 USD in a year (profits were calculated from the production costs and revenue from each individual producer survey, and then averaged). The payback period for the Americas was then calculated to be approximately 11 months. A similar payback period for Asia could not be calculated because the average barn was operating at a loss. Assuming instead that the average profits in Asia were about 10% of the total production costs* (8,700 USD) and applying this toward the average capital investments

*The average total production cost for Asia was 87,076.62 USD and is given in the equation above for break-even egg price.

for the region (21,512 USD* for a barn and inventory), the payback period for a new cage-free floor system would be approximately 2.5 years.

A second way to approach paying off investments is to assume a reasonable payback period (e.g., three years) and then calculate the additional price needed per egg over the break-even price to pay back the investment in that defined period. This calculation could be done on any time scale (e.g., one year, five years, etc.) depending on a producer's budget and preference for paying off debts. To successfully apply this differential, an operation needs to already earn the break-even egg price at minimum. The price increase for a three-year payback period is calculated as:

Price increase needed to payback investment in three years = Per hen investment cost/three years/eggs per hen

Americas: Price increase needed (USD) = (59,878 / 4,750) / 3 / 269 = 0.0156

Asia: Price increase needed (USD) = (21,512 / 3,333) / 3 / 248 = .0087

In this analysis, the egg price increase was approximately 10% over the break-even price for a three-year payback period. For the Americas, the average break-even price was 12.8 cents per egg, and the egg price increase needed to pay back the new system (costing 59,878 USD) in three years would need to be 1.56 cents per egg. For Asia, the average break-even price is 9.5 cents per egg, and the egg price increase needed to pay back the new system (costing 21,512 USD) in three years would need to be 0.87 cents per egg.

EFFECTS OF CHANGING PRODUCTION COSTS ON BREAK-EVEN EGG PRICE

As production costs change, logically, so does the break-even egg price. Using the model budgets for each region, Figures 4-6 show how the break-even price changes with production costs. (Details of costs, revenue and break-even egg price for the model budgets appear in Appendix B.)

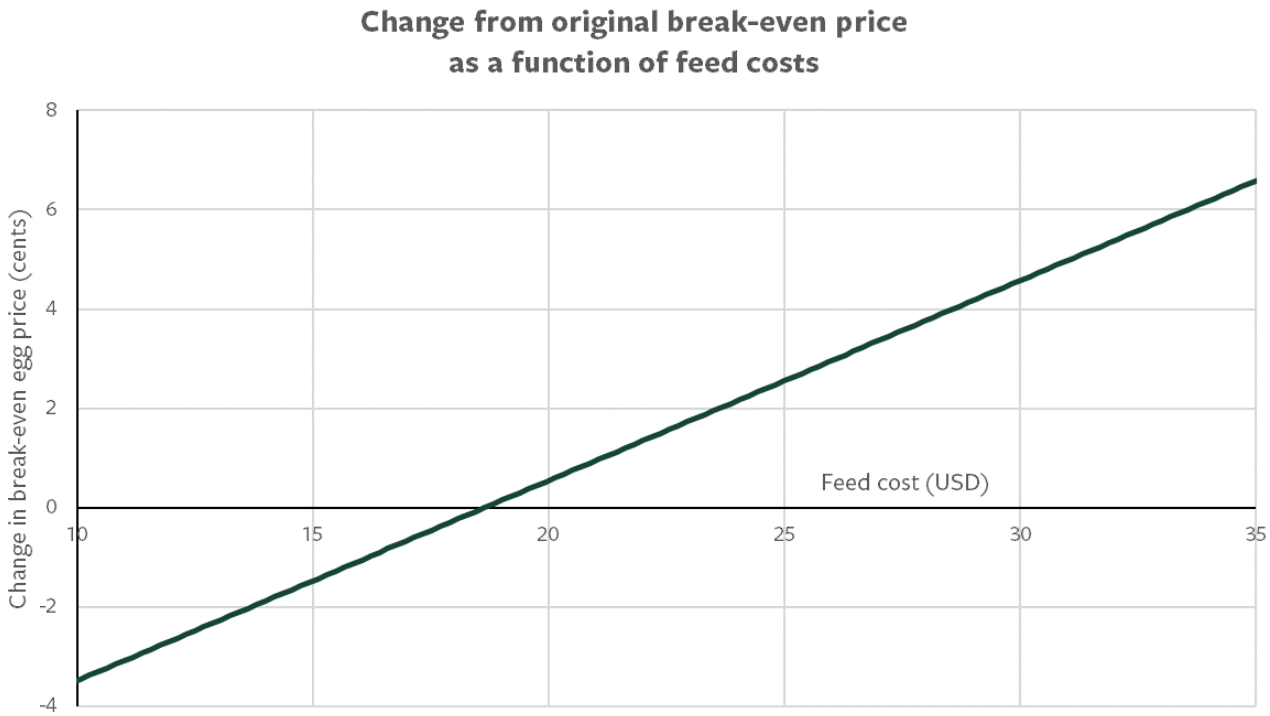

Figure 4: Graph of the change in break-even egg price (US cents) as a function of annual feed costs per hen for Asia survey results.

*Calculated from individual survey responses, then averaged.

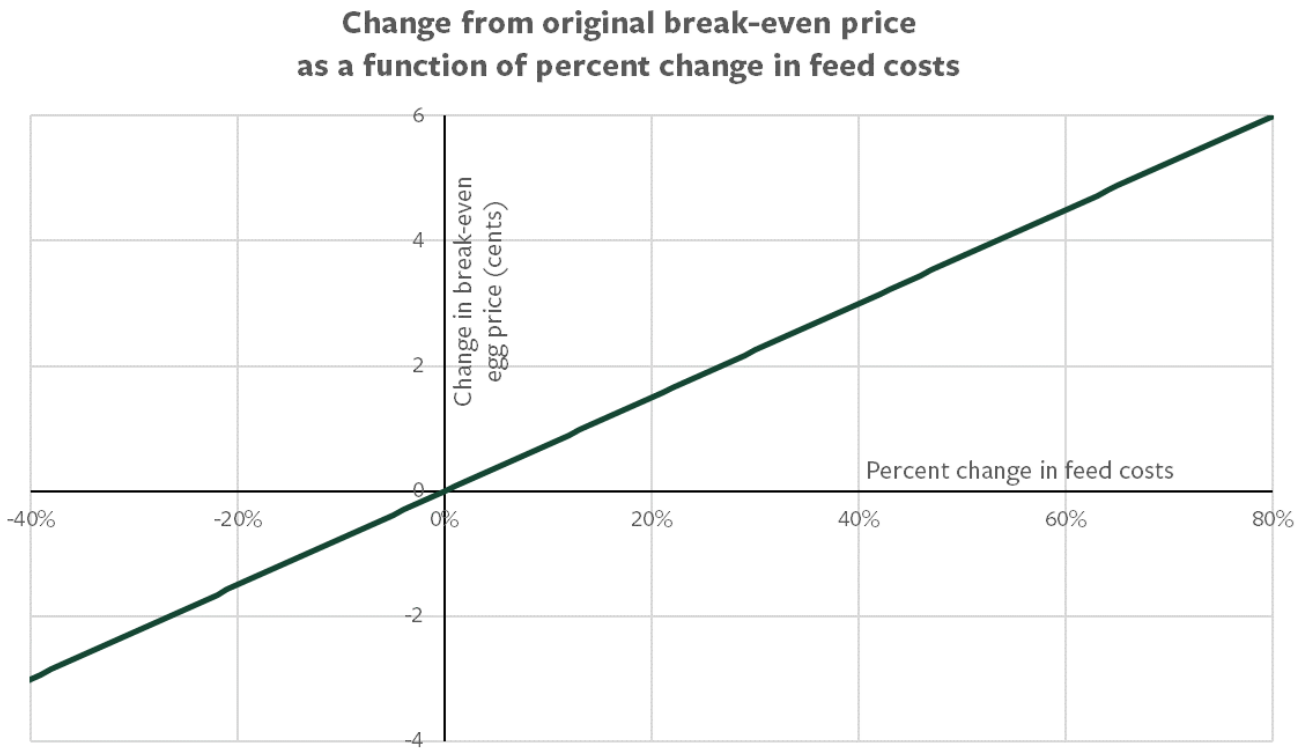

Figure 5: Graph of the change in break-even egg price (US cents) as a function of percent change in feed costs for Asia.

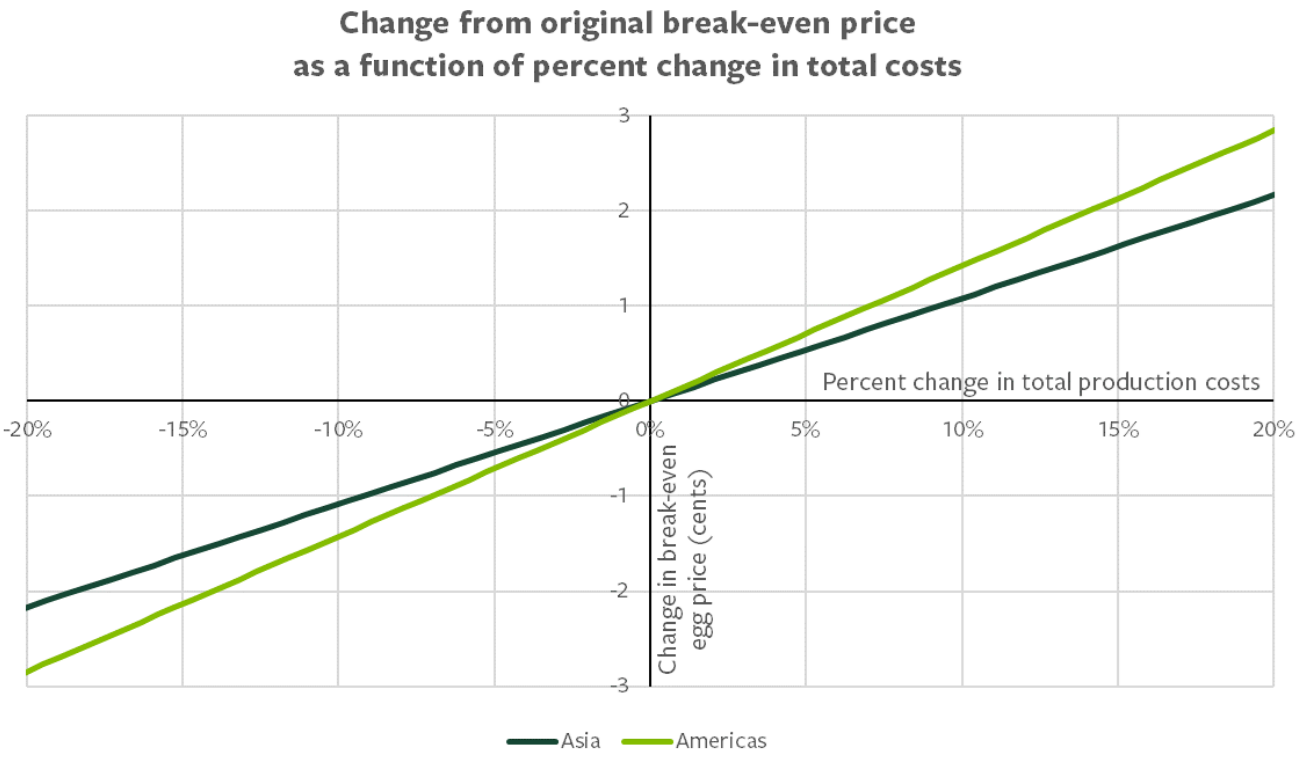

Figure 6: Change in break-even egg price (US cents) as a function of percent change in total production cost.

Variations in feed costs change the break-even egg price substantially (Figure 4). As feed costs increase, the break-even price also goes up. In Figure 4, the line crosses the x-axis where the feed cost is just above 18 USD per hen annually at the original break-even price. (The original break-even egg price calculation is described in Appendix B.) If the feed costs in this example increase by about 5 USD (from 18 to 23 per hen), then the egg price must increase by about 2 cents for the producer to continue to break even.

In Figure 5, the x-axis is adjusted from Figure 4 to show the percent change in feed costs, rather than the raw feed cost. This shows that if feed costs go up by 40%, the change in egg price must increase by about 3 cents for a producer to break even.

Egg producers are likely to face fluctuations in all costs, not just feed costs. Figure 6 shows the change in break-even egg price as the total costs change in each region.

A total production cost increase of 10% requires an increase in the break-even egg price of 1.08 cents in Asia and 1.43 cents in Americas. The break-even egg price must offset these cost increases when keeping other revenue and profits fixed.

The break-even price is very important, because it is the required minimum earned egg price for a producer to remain operational (not losing money). Once this break-even egg price is calculated and the changes to the break-even price to offset increased costs are understood, the producer can make informed decisions about setting prices to cover fluctuating costs. Ultimately, producers are in a better position to keep their business sustainable through financial planning.

Discussion and conclusions

Producers are much more likely to build a new cage-free barn, or retrofit an old one, if they have a committed buyer and a binding purchasing agreement. Companies have several options—including contracts, letters of intent, purchasing agreements and other binding documents—that commit the buyer to purchase the eggs once the producer makes the investment. This commitment may need to be agreed to in advance, well before the producer begins to build or renovate a barn, and may continue for several years, until the producer achieves a reasonable return on investment. Without an agreement in place, producers may not be willing to begin or expand their cage-free egg operations.

Feed costs are the highest operating cost of egg production. Poultry feed is composed of grains such as soy and corn, and the availability of these crops is subject to the weather and disruptions in the supply chain. Feed costs are sometimes unstable. This is true for both cage and cage-free egg production. If the price of feed changes, producers can easily go from being profitable to losing money, so contracts and agreements must have stipulations for feed cost increases that are outside of the producers' control. Producers can assist companies in negotiating a fair price by being open and transparent about their operating and investment costs and documenting feed cost changes. Total profit is very sensitive to small fluctuations around the break-even egg price.

The costs, revenue and break-even egg prices reported in this report are specific to the producers who responded in 2021 and should not be overgeneralized. Costs will vary by year and region and may differ from those reported herein.

Circumstances for egg producers will vary, and purchasing agreements, contracts and the prices paid for eggs may need to be negotiated separately for each individual case.

Cage-free eggs cost more. To fulfill their animal welfare commitments, companies will need to provide a greater budget for their purchasing departments to buy cage-free eggs. Many companies do this by finding cost savings elsewhere, changing their recipes to use fewer eggs, or with creative marketing strategies to pass the increased costs on to consumers. When these increases are passed on to the customer, they are marginal, because consumers purchase relatively small quantities in one grocery shopping trip, in one product or at one restaurant meal. Surveys consistently show that most consumers care about animal welfare[1] and are willing to pay more for cage-free eggs.[2] For grocery retailers offering cage-free eggs, the retail markup should be kept to a minimum. Some grocers are not marking up the cage-free eggs at all, considering animal welfare as a common social good, instead marking up luxury goods such as wine and chocolates. However, companies can use cage-free as a selling attribute with marketing to socially conscious consumers.

Compared to larger producers, small producers generally have greater overhead costs and reduced economy of scale. For example, per-hen labor costs and egg distribution are typically much lower on large farms. The survey from the Americas that had to be removed from this dataset had only 150 hens and over 17 times the per-hen labor costs of the next-largest farm. The producers completing the survey were small to medium-sized farms, but the same concepts apply to large producers. Larger

1. Sinclair M., Lee N.Y.P., Hötzel MJ, et. al. 2022. International perceptions of animals and the importance of their welfare. Frontiers in Animal Science 3:960379.
2. Sinclair M., Lee N.Y.P., Hötzel MJ. 2022. Consumer attitudes toward egg production systems and hen welfare across the world. Frontiers in Animal Science 3:995430.

farms can produce more eggs in each barn. This is usually done with a commercial aviary system, which has several tiers and automated feed and water distribution, egg collection and manure removal. Aviary systems usually have a higher stocking density and the capacity to handle a high volume of eggs. In combination with egg processors, they may produce eggs for the liquid and powdered egg market. In an aviary system, one person can operate a house with thousands of hens. The trade-off is that these systems employ fewer people, and if job creation is important to a buyer, consideration should be given to supporting small farms.

While the egg price may be higher, support for small farms may have other social benefits, such as food security, poverty alleviation and rural community support. Small farms may also combine their egg production with other agriculture initiatives aimed at reducing their environmental impact. These attributes may be valuable to a company, and small farmers may be the preferred providers. When small farms are well organized—through a cooperative, for example—they can form a network with the capacity to provide commercial buyers. Companies should be prepared to pay more for cage-free eggs that come from small farms, which need additional support, and to work with them on payment structures and distribution channels. Small farms may find ways to lower their costs by reusing water, selling manure or other methods.

This analysis is based on the voluntary information provided by a limited number of producers in response to our survey. Record-keeping is not always strictly implemented, and some producers filled out the surveys from memory or by giving estimates to certain questions, which could affect the accuracy of this analysis. In the individual reports that we assembled for each producer, we alerted the producers who appeared to be operating at a loss and provided them with a basic budgeting tool in Excel so they could complete their own analysis, using well-documented costs and revenues from their own bookkeeping. In those reports, we also described how to set egg prices to reduce or eliminate that loss.

Companies must play an active role in shaping the supply chain to improve animal welfare. They can do this by working with their suppliers to grow the availability of cage-free eggs by agreeing to a transition timeline, or road map, where producers convert or build one cage-free barn at a time, gradually reaching 100% cage-free production. Egg buyers must communicate their goals for cage-free production to producers. Egg producers often don't know there is a local demand for cage-free eggs, and they need support through the transition. Public-facing communications (such as sustainability reports or policies on websites) are important for demonstrating the demand to egg producers. However, public-facing commitments that are limited and state that purchasing policies "are subject to availability of supply" ignore companies' own culpability in the state of the supply chain. Buyers shape the conditions for animals on farms with their purchasing decisions. Food companies can use this as a force for change, by leveraging their buying power and established business relationships to proactively work with their suppliers to establish the supply they need. Communicating cage-free commitments and working collaboratively with egg producers is vital for bringing about animal welfare improvements.

Companies must play an active role in shaping the supply chain to improve animal welfare. They can do this by working with their suppliers to grow the availability of cage-free eggs by agreeing to a transition timeline, or road map, where producers convert or build one cage-free barn at a time, gradually reaching 100% cage-free production.

Appendix A: Additional survey results

Table A.1: Operating costs expressed in percents showing the lowest reported, calculated average and highest reported values for each region (USD).

Production cost percentages	Americas			Asia		
	Low	Avg	High	Low	Avg	High
Feed	43.9%	52.6%	56.7%	54.7%	69.3%	83.4%
Pullets	15.5%	17.7%	22.9%	4.7%	15.4%	21.2%
Labor	5.7%	12.2%	16.9%	0.9%	5.3%	9.9%
Electricity	*0.1%*	*1.0%*	*2.9%*	*0.0%*	*2.3%*	*8.8%*
Bedding	*0.1%*	*1.4%*	*2.9%*	*0.0%*	*2.7%*	*16.1%*
Veterinary costs	*0.0%*	*2.2%*	*6.8%*	*0.0%*	*2.9%*	*6.4%*
Egg handling / packaging	*0.1%*	*5.5%*	*13.5%*	*0.0%*	*0.3%*	*1.4%*
Other costs	*0.7%*	*3.9%*	*10.8%*	*0.0%*	*1.7%*	*9.1%*
Transport	*0.0%*	*3.5%*	*7.6%*	*0.0%*	*0.2%*	*1.0%*

Table A.2: Lowest, calculated average and highest costs, revenue and profit for each region (USD).

	Americas			Asia		
	Low	Avg	High	Low	Avg	High
Per-hen production costs	26.61	38.26	49.15	17.16	26.92	41.97
Per-hen revenue	21.50	45.16	70.98	7.97	18.25	31.63
Per-hen profit	-5.93	6.90	31.61	-30.69	-8.67	12.02

Table A.3: Lowest, calculated average and highest investment costs for each region (USD).

Investment costs	Americas			Asia		
	Low	Avg	High	Low	Avg	High
Housing structure	0.00	10.45	25.80	0.60	5.67	10.29
Inventory (equipment)	0.00	2.56	4.87	0.00	0.42	1.54
TOTAL	**0.00**	**59,877.66**	**134,850.01**	**2,000.00**	**21,512.03**	**73,262.00**
per hen	0.00	13.01	30.66	0.60	6.09	11.84

Appendix B: Details of the model

To investigate the effects of varying operating costs and expenses, such as increased profits when egg price rises above the break-even value, a model producer budget was created for each region based on their respective average production costs and farm/barn parameters that affect revenue (hens per barn, productivity and value of spent hen sales).

The initial production costs for the model budget (Table B.1) were calculated using the average production cost percentages (Table A.1) multiplied by the average total cost per hen (Table 3). Average production cost percentages were chosen because the costs (total or itemized) for producers in a region could vary by a factor of 2. Using averaged percentages was more reflective of the burden each producer paid for an itemized cost as a proportion to their total costs. The average values affecting revenue for each region were used for the model budget (Table 2).

Calculations for Figure 3 were based on the initial budget (Table B.1), that was then used to calculate the break-even egg price. The calculated break-even egg prices in this model for the Americas and Asia were found to be 13.82 cents and 9.94 cents, respectively. In Figure 3, the egg price is then incremented along the x-axis from this break-even value holding all other budget items fixed, and the new profit was calculated.

Calculations for Figure 4 were also based on this initial budget. In this case, the feed cost was incremented away from the starting value, and the new break-even egg price was calculated holding all other budget items fixed. The x-axis in Figure 4 was then adjusted to create the next two figures, which show the percent change from initial feed cost (Figure 5) and percent change in total costs (Figure 6).

Table B.1: Model budget annual per hen production costs for each region (USD).

Production costs	Americas	Asia
Feed	20.14	18.64
Pullets	6.78	4.14
Labor	4.65	1.42
Electricity	*0.37*	*0.61*
Bedding	*0.55*	*0.73*
Veterinary costs	*0.83*	*0.77*
Egg handling /	*2.11*	*0.08*
Other costs	*1.47*	*0.46*
Transport	*1.35*	*0.06*

Our mission

Advancing the welfare of animals in more than 50 countries, Humane Society International works around the globe to promote the human-animal bond, rescue and protect dogs and cats, improve farm animal welfare, protect wildlife, promote animal-free testing and research, respond to disasters and confront cruelty to animals in all of its forms.

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