August 2012

# Economic Impact Analysis of Proposed Regulations for Living Conditions for Organic Poultry

## Revised Phase 2 Report

Prepared for

**U.S. Department of Agriculture**
Agriculture Marketing Service
National Organic Program
1400 Independence Avenue SW
Room 2646 South Building
Washington, DC 20250

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# 1

# Introduction

In September 2011, the U.S. Department of Agriculture's (USDA's) Agricultural Marketing Service (AMS) contracted with Vukina et al. Consulting to conduct a regulatory impact analysis on proposed changes to living standards for organic poultry. Vukina et al. Consulting completed three major steps (or phases) to conduct work under this contract:

- **Phase 1:** Evaluate and Document a Baseline Scope of the Industry
- **Phase 2:** Conduct Economic Impact Analysis of the Proposed Rule
- **Phase 3:** Prepare the Economic Analysis for Inclusion in Proposed Regulations

This document contains the Phase 2 report, which is the economic impact analysis of the proposed rule. Relevant data and results summarized in this report are included in the economic impact analysis document delivered under Phase 3.

## 1.1 Background

USDA-AMS oversees the USDA National Organic Program (NOP). As part of the rulemaking process, AMS may conduct economic impact analyses of amendments to the national standards for production and handling of organic agricultural products. With potential changes in the requirements for living conditions for organic poultry, the NOP must consider the economic effects of these changes on the regulated industry.

The USDA NOP regulations at 7 CFR Part 205 set forth the national standards for production and handling of organic agricultural products. The NOP regulations were first published in 2000. In February 2010, AMS amended these regulations to include a substantial practice standard amendment regarding access to pasture for livestock. Livestock living conditions as they apply to poultry are regulated by § 205.238 (Livestock Health Care Practice Standard) and § 205.239 (Livestock Living Conditions).

The NOP regulations do not set specific stocking rates for either inside housing or the outside access areas, and further elaboration may be needed to ensure consistent regulatory implementation and enforcement. The NOP issued a general policy memo in October 2002 (NOP Policy Memo 11-5: reissued Jan. 31, 2011) affirming that outside access areas are required, but it did not specify size or other details.

In October 2002, an appeal decision found that outdoor access could be provided by a fenced, roofed, and floored outside area (a "porch" attached to a poultry house) for the operation involved in the appeal.

The NOP subsequently provided a memo regarding exemption to outside access for purposes of biosecurity (NOP Policy Memo 11-12, issued Nov. 2005, reissued Jan. 2011) To obtain organic certification, poultry producers must submit an Organic System Plan (OSP) describing outside access to a USDA accredited certification agency. The OSP is subsequently reviewed by the agents for consistency with the regulations, review the OSP for sufficiency, and conduct on-site inspections to verify compliance by organic operations. The National Organic Standards Board (NOSB), the NOP's federal advisory committee, made recommendations in April 2002, November 2009, and December 2011 on animal welfare issues. The NOSB also completed additional changes concerning appropriate living conditions for poultry at their December 2011 public meeting. On December 2, 2011, NOP submitted two options for regulations regarding outdoor access for poultry based on NOSB recommendations and independent animal welfare standards. These options are described in detail and included as Appendix A in this report., The NOP may pursue a regulatory amendment to § 205.239 in accordance with NOSB final recommendations, which would clarify requirements for outside access and other living conditions for poultry.

## 1.2 Objectives

The objective of this project was to provide an independent economic impact analysis of possible regulatory changes for the living conditions for organic poultry, including a justification of the methodology. The complete analysis estimates the costs and benefits of implementing the proposed rule, compared with alternatives (as per Executive Order 12866). Alternatives will include (1) no change to existing rule, (2) regulatory Option 2 and summarized in Table A-1, and (3) regulatory Option 3 summarized in Table A-2. All work was conducted to comply with the USDA Information Quality Activities Regulatory Guidelines. The objective of this Phase 2 report was to provide a description of the benefits of the regulation, the costs of complying with the regulatory options, and the estimated economic impacts of the regulatory options.

# 2

# *Benefits of the Regulation*

The methodological approach frequently used in economics to evaluate projects or policy proposals is referred to as benefit-cost analysis. The approach relies on measuring benefits and costs associated with the proposed project or policy, and if the benefits are larger than the costs, or if the so-called benefit-cost ratio is larger than 1, the project or policy passes the test and is potentially approved. In the case of public agencies, this type of analysis is used to consider whether the benefits outweigh the costs as part of their decision making. Alternatively, the benefit-cost relationship can be defined in terms of net benefits as the difference between total benefits (or sometimes called total willingness to pay) and total costs, and the project passes the test if net benefits are positive. As shown later, the category of net benefits consists of two parts: consumer surplus and producer surplus. This section deals with estimating the total benefits of the regulation, and the next section addresses the costs of the regulation. Frequently, because of the shortage of time or other resources, the investigators do not try to estimate the benefits independently within the confines of the study. Instead, they rely on the benefits transfer approach, which consists of a systematic review of the economic literature to see if benefits estimates can be transferred from other similar studies and somehow calibrated to fit the concrete needs. We use this approach in this study.

The research in estimating the benefits associated with improvements in animal welfare has identified a large discrepancy between stated preference and revealed preference approaches, where the value premiums are much larger in stated preference studies than in revealed preference studies. The differences in these two methods as applied to this project are as follows:

- **Stated preference** methods for eliciting benefits (or willingness to pay) typically associated with nontraded goods and services (such as environmental quality or animal welfare) are hypothetical in nature and rely on experiments or interview questions that ask people how much would they be willing to pay for, say, cage-free eggs.

- **Revealed preference** methods for eliciting benefits rely on actual market transactions to see how much are people actually paying for cage-free eggs or how much of the cage-free eggs they are actually buying at the posted prices.

The large value premiums observed in experiments and surveys are supported by the results of various animal welfare referendums. For example, a majority of voters in four states (Florida, Arizona, California, and Washington) have called for the elimination of gestation crates for sows and battery cages for layers or both (Norwood, 2011). If people vote to ban the sale of eggs and pork from animals grown in such “inhumane” conditions, one would expect that they would shun those products in grocery stores as well, but they typically do not. Several more or less plausible theories try to explain this obvious paradox (see, for example, Norwood [2011]). The most believable one seems to be the public good theory of animal welfare (e.g., McVittie, Moran, and Nevison, 2006) that states that once the animal welfare is supplied, everyone can benefit from it without making any payment to farmers or producers. The possibility for consumers to free ride on the private supply of animal welfare negates the incentives for individual producers to supply animal welfare beyond the level that ensures the private productivity benefits to them. This means that they cannot adequately capture the benefits of such efforts through the market, and animal welfare is typically undersupplied. In light of this explanation, when attempting to measure benefits associated with animal welfare improvements, there is room to consider both stated preference and revealed preference methods.

Because the most important part of the proposed regulations for living conditions for organic poultry relates to reducing stocking densities, both indoors and outdoors, ideally we wanted to find studies addressing this particular aspect of animal welfare improvement. The closest study we found is McVittie, Moran, and Nevison (2006), who conducted a choice experiment survey in the United Kingdom to elicit people's stated preferences for the provisions of the European Union's directive regarding minimum standards for broiler chicken welfare, which included, among other things, legislation on stocking density. In their study, the stock density attribute took the level of 38, 34, and 30 kg/m$^2$, which amounts to 7.78, 6.96, and 6.15 pounds per square foot.

The study looked at two scenarios. The results showed that the implicit price markup for the reduction in stocking density from 38 kg/m$^2$ to 34 kg/m$^2$ was £1.91/kg (or $1.39 per pound), whereas the implicit price markup for the reduction in density from 38 kg/m$^2$ to 30 kg/m$^2$ was £3.98/kg (or $2.89 per pound). If we take those estimated markups and apply them to the organic chicken prices in the U.K. supermarkets, we obtain the result that British consumers are willing to pay between 45% and 31% over and above the organic chicken prices to see a 4 kg/m$^2$ reduction in stock density. Notice that the estimated markups are larger for smaller birds and smaller for larger size chickens, hence the reversal of the order of the above percentages. In the second scenario, a percentage increase in organic chicken price for the 8 kg/m$^2$ reduction in density has been estimated in the 94% to 64% range.

The above results cannot be directly transferred into our benefit-cost analysis for at least three reasons. First, recall that our regulatory Option 2 in the case of broilers requires the stocking density of no more than 7 lbs/ft$^2$, and the regulatory Option 3 requires no more than 5 lbs/ft$^2$. Therefore, the 4kg/m$^2$ reduction in density (from 7.78 lb/ft$^2$ to 6.96 lb/ft$^2$) in the British experiment would barely satisfy our regulatory movement from Option 1 (do nothing) to Option 2, whereas the 8 kg/m$^2$ reduction (from 7.78 lb/ft$^2$ to 6.15 lb/ft$^2$) is not enough to meet our requirement for Option 3. Second, British consumers are probably somewhat different than U.S. consumers. They have different levels of real disposable income, and they are likely to have different sets of preferences. For example, there is ample casual evidence that European consumers are, on average, more concerned with animal welfare than their U.S. counterparts. Third, as will be shown later, the representative organic poultry producers in our study already satisfy the regulatory requirements related to stocking rates proposed in Option 2; hence, the estimated willingness to pay in the U.K. study for the reduction in animal density to below 7 lbs/ft$^2$ has been already priced in the U.S. organic poultry market, so no additional benefits are associated with this move. On the other hand, moving to Option 3 should generate some additional benefits on the order of 49% to 33% (the difference between the two U.K. study scenarios). However, as indicated earlier, the second stage reduction in animal density in the U.K. study is not enough to satisfy our Option 3; hence, these numbers have to be adjusted downward. Finally, both our regulatory options, in addition to stock density requirements, also contain several other provisions that consumers may positively value; hence, it is possible that the aggregate benefits of entire regulatory proposals could be somewhat larger than those associated with indoor and outdoor stocking densities.

In light of all these constraints, the British study can only serve as a rough approximation to the actual situation that we are analyzing. Their numbers clearly show that people value the improvements in animal welfare and that the hypothetical willingness to pay for increased animal space could be quite substantial. Even if we take the lower bounds of their obtained intervals as the upper bounds for our estimates of demand shifts, we can still see that the positive benefits effect could be in the low 30%range. In our equilibrium displacement model, the shifts in consumer preferences associated with the perceived improvement in animal welfare will be represented by an outward shift in the demand curve by 30%.

When it comes to layers, to the best of our knowledge, the literature does not contain any consumer preference studies of animal welfare (living conditions) that would mimic our regulatory proposals contained in Option 2 and Option 3. A large number of studies have been conducted in many different countries that looked into value premiums associated with cage-free eggs. A significantly higher willingness to pay has consistently been found for the presumably more animal friendly cage-free system. For example, Norwood and Lusk (2011) found a 70% increase over the average retail price for cage eggs, and Richards, Allender, and Fang (2011) found a 65% increase. Some studies look at peoples' preferences for allowing animals to have outdoor access. For example, Carlsson, Frykblom, and Lagerkvist (2005) found that people consider having outdoor access much more important for pigs than for chickens. However, the benefit estimates from these studies are not directly transferable to our problem because cage-free eggs and outdoor access are already part of our baseline situation as well as Option 2, and we do not know how people would respond to further improvements in living conditions and how this information would be communicated to consumers through the market channels. Therefore, we assumed that the benefits associated with Option 3 are similar across poultry species, such that in percentage terms, the demand shifts of 30% are the same for organically produced broilers and eggs.

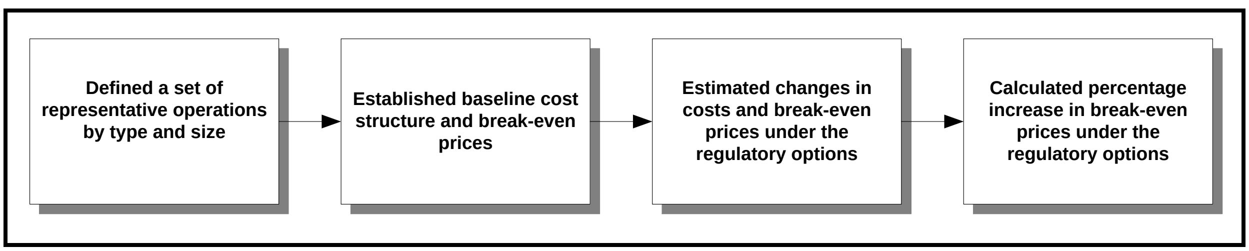
# Costs of the Regulation

In this section, we describe the methodological approach to estimating costs associated with the regulatory options, list the types of operations included in the analysis, present the baseline costs of production (updated from the Phase 1 report), present a summary of estimated regulatory costs under Option 2 and Option 3 for each size and type of farm included in the analysis, and present the total industry costs under Option 2 and Option 3 for each type of product. Detailed cost estimates associated with each regulatory option are provided in Appendix C.

## 3.1 Cost Estimation Methodology

Based on our previous experience constructing cost estimates for several regulations and modeling tools, we developed and implemented the methodology for estimating the increased costs that might be associated with the proposed regulations. To facilitate the regulatory flexibility analysis, we developed estimates of the costs for different size facilities. Figure 3-1 provides a general overview of the steps in estimating the costs of complying with the regulatory alternatives.

### Figure 3-1. Overview of Cost Estimation Steps




We developed a set of representative operations defined by size of operation and type of the organic poultry product handled. Development of representative operations is a method frequently used in conducting economic impact analyses because it facilitates estimation of industry costs with relatively limited data over a short time period. This method avoids the need to develop a specific cost estimate for each potentially affected entity, which would be a time-intensive and costly process and likely require an extensive industry survey beyond the scope of this task order.

As illustrated in Figure 3-1, the cost estimation methodology involves two steps. In the first step we established the baseline cost structure and the break-even price. The actual methodology for determining the break-even price is more precisely described below. In the second step, we analyzed whether any of the specific regulatory requirements in Option 2 and Option 3 will have an impact on the established baseline cost structure. All regulatory proposal items that could have an effect on the representative operation’s baseline costs were quantified to obtain the new (post-regulation) cost structure and the new break-even price. The comparison of the new (post-regulation) and old (baseline) break-even prices is finally expressed as a percentage increase in the break-even price relative to the baseline and represents the cost increase due to regulation. These percentages will subsequently be used to model the shifts in supply curves caused by regulation.

In line with this approach, we developed structured interview guides where the first group of questions was set up to uncover the basic cost structure of the enterprise and the second group of questions focused on the typical costs involved in complying with the proposed regulations. Separate interview guides were developed for broilers and layers and are included in Appendix B. When conducting industry interviews, we employed a method consistent with the limitations on the number of establishments (total of nine for all commodity groups and sizes) that may be contacted without requiring prior approval from the Office of Management and Budget (OMB).

In this section, we present the cost data by type and size of operation including the sources of data used to estimate the baseline costs and any assumptions applied to calculate total annual costs associated with the regulatory alternatives. In addition, we present aggregated cost estimates by type and size of operation for use in the economic model described in the next section and for inclusion in the report.

## 3.2 Types of Operations Included in the Regulatory Impact Analysis

For the purposes of studying the effects of proposed regulations on the cost of producing various organic poultry products, we focused our analysis on the following types of operations:

- organic layers:
  - small flock
  - mid-size flock
  - large flock
- organic broilers:
  - small flock (pasture)
  - large flock

We decided not to present the analysis of the impact of the proposed rules on large organic broiler producers under a contract with an integrator or a processor because the proposed regulations are not going to affect a contract operation and an independent producer in an appreciably different way. For broilers under a production contract, any possible changes to the cost structure caused by the regulatory requirements can be accommodated by renegotiating the existing production contract. Next, we do not present the analysis of the impact of the proposed rules on the cost of producing organic turkeys primarily because it appears that the proposed regulation will not significantly affect organic turkey producers who are predominantly small and seasonal producers.

Finally, we do not explicitly analyze the impact of the proposed rules on production of layer pullets. Small pullet operations will typically not be affected by the proposed regulations in either regulatory scenario. In contrast, large pullet producers will be affected in both regulatory scenarios related to the outdoor access after 16 weeks of age. To mitigate the impact of these proposed rules, the pullet growers indicated in interviews that they would shift the growing cycle so that the pullets would be moved into the laying facility by week 16. Subsequently, this would shift the costs of raising the pullets from 16 to 18 weeks where there is no egg production to the egg producer. This would result in the suppression of feed conversion as well as the increase in some utility costs during those 2 weeks. However, the price of pullets, if transferred 2 weeks earlier, will have to drop, thereby offsetting an increase in cost incurred by layer operations. Therefore, the net effect of regulation on organic egg production through the pullets segment of the market is likely to be zero.

## 3.3 Baseline Cost Estimation

The cost of producing organic poultry and eggs differs substantially, and it is invariably much higher than the costs of producing poultry and eggs under conventional systems. There are several important reasons for this. The main driver is the cost of feed. Organic feed costs are substantially higher than feed costs in conventional systems. According to Dimitri and Oberholtzer (2008), organic feed costs can be up to 70% of the total cost of producing organic poultry and eggs. Secondly, the indoor stocking rate requirements for organic poultry are typically lower than for conventional systems and coupled with the outdoor access requirements increase the average cost of production per bird (or per dozen eggs). Third, the average mortality rates of organically produced animals are higher than their conventionally produced counterparts mainly because of the predators and diseases associated with outdoor access requirements. Finally, the labor input per unit of output is typically higher in organic production than in the conventional setting. However, there are some mitigating factors in the cost structure as well. The fixed cost component can be small or even negligible in cases of small pasture-based organic production. However, this is definitely not the case in some large state-of-the-art organic egg production facilities whose up-front investment costs are comparable to those of conventional units.

The baseline cost estimates presented in this section reflect stylized approximations of highly idiosyncratic individual real-life cases and are not intended to be used to assess an individual producer's profitability or cash flow. The baseline scenarios reflect the average situations for the most frequently observed production configurations in any given species space. The methodology employed is the same for all of the presented baseline budgets and relies on the standard enterprise budgeting techniques (Boehlje and Eidman, 1984). In presenting these budgets, we focus primarily on the cost aspects because these are most relevant in analyzing the economic impacts of various regulatory scenarios. The hypothetical values for total revenue are calculated based on the break-even price, which implicitly assumes the zero-profit condition.[1] The basic assumptions employed throughout can be summarized as follows:

- simple linear (straight line) depreciation of assets with zero salvage value
- annual opportunity cost of capital of 3%
- homogenous labor hired at $13.25 per hour

[1] The break-even price represent the sales price that the producer must charge for a product in order for the revenues to just cover the expenses.

- property tax rate of 0.8% of the value of the assets
- annual insurance costs of 0.5% of the value of the assets
- price variability for inputs according to the size of the flock

The tables in Appendix C present the relevant technological assumptions and parameters that are detailed for each of the individual budget scenarios. All budgets were prepared based on the existing literature (Anderson, 2009; Anderson, 2010; Anderson, 2011; Anderson, 2012; Bell and Weaver, 2002; Boehlje and Eidman, 1984; Conner, 2010; Cunningham, 2011; Golden, Arbona, and Anderson, 2012; Jones, Anderson, and Davis, 2001; Kuney et al., 1995; The Pennsylvania State University, 1999; Rhodes, Timmons, Nottingham, and Musser, 2011), personal communications with extensions specialist and industry leaders, and the authors' expert opinions and insights based on their research on the poultry industry.

Prices for land were constructed based on average real estate values for farm land per acre in 2011 (National Agricultural Statistics Service [NASS], 2011). Land prices were calculated as the average of the published land prices in the top four and five states for organic broiler and egg production, respectively. For broilers, prices for land in California, Iowa, Oregon, and Pennsylvania were averaged to obtain a land price of $4,800 per acre. For egg production, prices for land in New York, Massachusetts, Michigan, North Carolina, and California were averaged to obtain a land price of $5,675 per acre. The annual rental rate was obtained by multiplying the value of land with the 3% interest rate, resulting in annual rates of $140 per acre and $170 per acre for broilers and eggs, respectively.

Labor costs were estimated using data obtained on hourly wages for farming, fishing, and forestry occupations published by the Bureau of Labor Statistics for states with high concentrations of organic broiler and egg production. We calculated an average hourly wage rate using wage rates from eight states—California, Iowa, Massachusetts, Michigan, New York, North Carolina, Oregon, and Pennsylvania—resulting in an average hourly wage rate of $13.25. Organic certification costs were calculated as the average of California Certified Organic Farmers (CCOF) and Iowa Organic Certification Program posted fees for each organic production sales range category.

### 3.3.1 Sizes of Organic Egg and Broiler Operations

One of the important difficulties encountered in this study is the lack of precise data on the distribution of producers by firm size. Having this information is very important because the regulatory proposals we analyze clearly have significantly different impacts on producers depending on their size. Consequently, the combined impact of the proposed regulation on the organic industry (either eggs or broilers) as a whole will depend on the market shares that different size producers have in the total national production.

To solve this problem, we relied on the data obtained by the USDA-AMS survey of certified organic poultry and egg producers and operations in 2011 as reported by the certifying agencies. Corresponding to our baseline enterprise budget scenarios, we divided the egg industry into three segments: a small producer has fewer than 16,000 layers, a medium producer has between 16,000 and 100,000 layers, and a large producer has more than 100,000 layers. In the case of broilers, we used only two size segments: small and large. For organic broiler production, it does not matter how one defines the small producer category, because for anywhere between 3,000 and 100,000 birds, the percentage share of this size category is essentially the same.

To obtain the distribution by the defined size categories, we calculated the average producer's size for each certifying agency by dividing the number of birds by the number of producers that each individual certifying agency certified in 2011. Next, we calculated the percentage share of each certifying agency in the industry total (for each of the poultry industries separately), and we multiplied this percentage share with the average producer size for this certifying agency. Finally, we summed these numbers in each of the individual size categories to obtain the percentage shares of each size category (three for layers and two for broilers) in the industry total. As shown in Table 3-1, for layers, 30% of production is produced by "small" producers, 54% by "medium" producers, and 16% by "large" producers. For broilers, only 1% of production is produced by "small" producers and the remaining 99% is produced by "large" producers. Likewise, we summed the number of producers in each size category based on the average producer size of the certifying agency. For layers, 74% of producers are estimated to be small, 25% are estimated to be medium, and 1% are estimated to be large. For broilers, 68% of producers are estimated to be small and 32% are estimated to be large.

### Table 3-1. Estimated Number of Certified Organic Poultry and Egg Producers and Operations by Size, 2011

| Stock or Species | Number of Birds | Estimated Percentage of Production | Estimated Number of Producers[a] | Percentage of Producers |
|---|---|---|---|---|
| ***Layer hens (inventory)*** | **7,673,085** | **100%** | **580** | **100%** |
| Small (1,000 to 16,000 hens) | 2,301,925 | 30% | 430 | 74% |
| Midsize (16,000 to 100,000 hens) | 4,143,466 | 54% | 145 | 25% |
| Large (more than 100,000 hens) | 1,227,694 | 16% | 5 | 1% |
| ***Broilers (production)*** | **30,049,372** | **100%** | **288** | **100%** |
| Small (less than 100,000 birds per year) | 300,494 | 1% | 195 | 68% |
| Large (more than 100,000 birds per year) | 29,748,878 | 99% | 93 | 32% |

Source: Based on information collected by USDA-AMS from 36 USDA-accredited state and private organic certifiers.

[a]The number of producers for each size category is estimated by assigning all producers of each certifying agency to a size category based on the average production of operations under the certifying agency.

Given the lack of better data, this approach appears to be sensible because it only depends on an assumption that the distribution of producers by size within one certifying agency is not too wide such that the mean size is a good representation of the observed size. Practically, this means that a typical certifier does not certify very small and very large producers at the same time. To the extent that there is some specialization of certifying agencies such that, for any particular commodity, some of them specialize in certifying small producers and others specialize in certifying large producers, the obtained size distribution should be fairly reliable. This is most definitely true in case of organic broiler industry. However, when it comes to organic eggs industry, our own intuition and experience tells us that the above calculated market shares could easily underestimate the market share of large producers at the expense of small and medium size producers. Because of the lack of the actual data on the size distribution of organic poultry and eggs producers there is no meaningful way to test this result. Therefore, when conducting the economic impact analysis, we performed a sensitivity analysis altering the organic eggs market shares from 30% small, 54% medium, and 16% large to 10%, 40% , and 50% to see how importantly the results change with a different industry structure.

## 3.4 Regulatory Cost Estimation

Using the baseline enterprise budgets developed in the first step of the cost estimation methodological approach, in the second step we analyze the impact of the regulation on the baseline cost structure. We present the estimated costs of compliance for each regulatory option for organic egg producers and broiler producers. In each case, we present costs for representative farms of different sizes. In some cases, the representative organic producers are in compliance with the regulatory options; thus, there are no incremental costs due to the proposed regulation. In other cases, the impact of the regulation on costs can be substantial.

### 3.4.1 Organic Egg Production

Based on our information gathering, the representative typical organic egg producers regardless of size currently operate under the requirements proposed under Option 2; hence, the impact of proposed regulation on the break-even price is zero. In contrast, the regulatory proposal summarized in Option 3 will have a multiple effect on the cost structure of representative medium- and large-scale organic egg producers through:

- a one-time (fixed) cost associated with retrofitting the house to install more exit holes;
- an increased requirement for more outdoor access, which will be reflected in fencing costs and the increased cost of land;
- increased mortality and reduced feed conversion associated with a substantially increased outdoor area; and
- additional heating costs to maintain the indoor environment within the thermal neutral zone of the chickens.

However, when it comes to large producers, the most significant effect of the Option 3 regulation will be reflected in the requirement to significantly reduce the population density on the established farms in response to the proposed regulation regarding the indoor density with an enormous effect on the revenue reduction that could cause some of the large producers to exit the organic industry and convert their operations into conventional egg production. The combined effect of the Option 3 proposed regulation is estimated to be a 6.8% increase in the break-even price (i.e., the wholesale price received that covers all costs) for midsize producers and 96% increase in the break-even price relative to the baseline cost scenario for large producers. We describe the derivation of these estimates below.

***Small Operations (fewer than 16,000 hens).*** The summary of the regulatory impacts of different regulatory options vis-à-vis the baseline for small egg producers is represented in Table 3-2, and the detailed estimates for the regulatory impacts of Option 2 are presented in Table C-1 in Appendix C. As far as indoor housing requirements are concerned, a typical small organic egg producer should automatically satisfy all of the regulatory Option 2 requirements described in Table A-1. The same is true for the outdoor access requirement. As the result, the percentage increase in the break-even organic price relative to the baseline is 0%.

The detailed estimates for the regulatory impacts of Option 3 are presented in the far right column of Table C-1 in Appendix C. As with Option 2, when indoor housing requirements are concerned, the typical small organic egg producer should satisfy all of the regulatory Option 3 requirements described in Table A-2. In addition, small producers typically already provide outdoor access, which would meet Option 3 conditions. Hence, the percentage increase in the break-even organic price relative to the baseline is also 0%.

### Table 3-2. Estimated Costs of Producing Organic Eggs under Different Scenarios, Small Operations, 2011

| | Baseline | Option 2 | Option 3 |
|---|---|---|---|
| ***Production volume*** | | | |
| Birds per operation | 1,000 | 1,000 | 1,000 |
| Organic eggs (dozen) | 17,904 | 17,904 | 17,904 |
| Breaker market eggs (dozen) | 3,160 | 3,160 | 3,160 |
| ***Costs per farm*** | | | |
| Total fixed costs | $28,892 | $28,892 | $28,892 |
| Annualized fixed costs | $4,113 | $4,113 | $4,113 |
| Variable costs | $68,830 | $68,830 | $68,830 |
| Total annual costs | $72,944 | $72,944 | $72,944 |
| ***Breaker market eggs revenue adjustment*** [a] | $2,338 | $2,338 | $2,338 |
| ***Costs per dozen eggs*** | | | |
| Break-even revenue per bird | $70.61 | $70.61 | $70.61 |
| Break-even price per dozen organic eggs | $3.94 | $3.94 | $3.94 |
| Percentage increase over baseline | — | 0.0% | 0.0% |

[a] Breaker market egg price assumes $0.74 per dozen.

***Midsize Operations (between 16,000 and 100,000 hens).*** The detailed estimates for the regulatory impacts of Option 2 are presented in Table C-2 in Appendix C. To satisfy the organic certification requirements, most of the typical midsize producers are already operating under the indoor stocking rates outlined in Table A-1 and in some cases are exceeding these stocking rates. Currently they are operating using a combination of natural and artificial lighting to achieve the 16 hours of daylight for optimal performance in the older single-level houses. Outdoor access requirements under Option 2 are also being met. A typical organic egg producer is providing access at 2 $ft^2$ per hen based on approximately 10% of the hens using the verandas. Some producers have allowed for the outdoor space at the 2 $ft^2$ for 33% of the flock. As the result, the percentage increase in the break-even organic price relative to the baseline is 0%.

To satisfy Option 3 organic certification requirements, most of these companies would have to alter the indoor stocking rates to meet those outlined in Table A-2. This would require a reduction in flock size to meet the indoor stocking rate depending on the house type and equipment configuration. For a single-level house, the reduction in the flock size would be 12.5%. The reduction in flock size would cause a heat loss inside the building that will need to be replaced by additional heating requirement in winter months (120 days) in colder climates. Assuming laying hens generate heat of 40 BTU per hen per hour (Bell and Weaver, 2002) and 91,600 BTU per gallon of propane, valued at the price of $1.51 per gallon, the heat replacement cost amounts to $3,798 annually. In addition to the reduction in flock size, some modifications to the housing structures will be required. In particular, the number and size of exit doors are typically inadequate. Our estimates are based on the installation of 14 exit doors at a one-time expense of $400 per door. On an annual basis, this cost translates into a $644 increment plus the corresponding increases in insurance and property taxes.

In our interviews with producers we found out that medium-size organic egg producers would be able to expand outdoor access to meet Option 3 requirements of 2 $ft^2$ per hen housed. However, this would come at a cost of adding approximately 1 acre of land with its rental rate of $170 per year. The cost of additional fencing is assumed trivial and is not explicitly accounted for. Even though the hens would consume some nutrients on a more extensive system, typically what is seen is an increased feed consumption from 3.8 lb/dozen to 4.0 lb/dozen, or higher, due to the repartitioning of the nutrients consumed to support the foraging activity and the increased movement to reach resources. With current feed costs this would mean an added increase in per-dozen egg costs. Finally, larger outdoor access is likely to cause mortality to increase from 8.3% to 18% (Golden et al., 2012). The impact on reduced egg production was calculated under the assumption that mortality will be evenly distributed throughout the entire production cycle. Taking all these impacts jointly into consideration, as seen from the far right column in Table B-2, the projected increase in the break-even organic eggs price amounts to 6.7%.

The summary of the estimated costs of regulation and its relationship to the baseline cost scenario is presented in Table 3-3. As mentioned before, the typical midsize organic eggs producer appears to be automatically in compliance with the regulatory proposal contained in Option 2; hence, the increase in the average total cost and thus the break-even price relative to the baseline amounts to 0%. A negligible impact on the midsize producers is definitely associated with the types of production operations they are integrating into organic egg production. These are typically modified older facilities previously used for broiler breeder fertile egg production, which is typically smaller in size and has a single production unit on a farm. This allows for greater flexibility associated with indoor hen density and outdoor access. If they were to build new facilities, the impact of the new regulations, even under Option 2, would be greater and may be comparable to the impacts on large producers.

Several interesting results are worth highlighting with respect to the new cost structure under regulatory Option 3. First, the new indoor stocking rate requirement will force producers to reduce the number of hens, which will, in turn, reduce the some of the variable costs components (e.g., feed) and increase others (e.g., energy). Second, because of required investments in land and equipment, the annualized fixed costs go up but only moderately. Finally, the reduction in the number of birds placed reduces the quantity of eggs produced with the negative effect on both the average cost per dozen of eggs and on the total revenue. All effects combined result in a required increase in price necessary to break even.

## Table 3-3. Estimated Costs of Producing Organic Eggs under Different Scenarios, Midsize Operations, 2011

| | Baseline | Option 2 | Option 3 |
|---|---|---|---|
| ***Production volume*** | | | |
| Birds per operation | 16,000 | 16,000 | 14,000 |
| Organic eggs (dozen) | 314,899 | 314,899 | 261,595 |
| Breaker market eggs (dozen) | 78,725 | 78,725 | 65,399 |
| ***Costs per farm*** | | | |
| Total fixed costs | $518,225 | $518,225 | $523,900 |
| Annualized fixed costs | $58,210 | $58,210 | $58,454 |
| Variable costs | $779,345 | $779,345 | $680,717 |
| Total annual costs | $837,555 | $837,555 | $739,172 |
| ***Breaker market eggs revenue adjustment*** [a] | $58,256 | $58,256 | $48,395 |
| ***Costs per dozen eggs*** | | | |
| Break-even revenue per bird | $48.71 | $48.71 | $49.34 |
| Break-even price per dozen organic eggs | $2.47 | $2.47 | $2.64 |
| Percentage increase over baseline | — | 0.0% | 6.7% |

[a] Breaker market egg price assumes $0.74 per dozen.

***Large Operations (more than 100,000 hens).*** The detailed estimates of the regulatory impacts of both regulatory options are presented in Table C-3 in Appendix C. When it comes to Option 2, the interviews with industry participants revealed that large producers are already operating under the indoor stocking rates as outlined in Table A-1. Their production facilities are operated using predominantly artificial lighting. Natural sunlight is provided by outdoor access. Outdoor access requirements under Option 2 are also being met. Large organic egg producers are providing outdoor access using verandas at 2 $ft^2$ per hen based on the flock utilization ranging from 10 to 33%. Most of the veranda areas are wire pens with covers to prevent wild birds and predators from having direct contact with the flock. This does not prevent indirect contact from occurring nor small rodents from entering the verandas. The construction of verandas ranges from concrete covered in a litter to soil with no vegetation. From the perspective of a typical large organic egg producer, compliance with the proposed Option 2 requirements will have no appreciable additional costs; hence, the percentage increase in the break-even organic price relative to the baseline as is 0%.

When it comes to Option 3, the most significant impact of the proposed regulation will be felt by large-scale egg producers. Based on our analyses, the representative large-scale egg producer could satisfy the proposed requirements outlined in Table A-2 only through a rather dramatic increase in costs. The typical production system is some type of multilevel housing either an aviary or an integrated multilevel slat system. In addition, many of the large producers have integrated their production into complexes that contain multiple houses along with feed milling and waste disposal facilities. Their ability to provide increased indoor and outdoor space, for which they are approved under the current standards, is limited. The limiting space requirements are related to both indoor and outdoor stocking rates. As clearly indicated in Table C-3 in Appendix C, even after a dramatic reduction in indoor population density, the outdoor space requirement under Option 3 still remains a binding constraint. In the example provided by our baseline scenario, the indoor stocking rate of 2 $ft^2$ per hen, calculated by floor perimeter of the building, would require the reduction in the number of hens from 100,000 to 13,500 hens because the typical house (60' x 450″) has the floor surface of 27,000 $ft^2$. This dramatic reduction in flock size has its consequence on the entire cost structure as seen in the most right-hand side column in Table C-3. A particularly important cost item becomes the cost of providing additional heat in a significantly depopulated house. After this 86.5% reduction in flock size, it is interesting to note that the outdoor space requirement of 2 $ft^2$. per bird proposed by Option 3 is still not met. To satisfy this requirement, the outdoor space has to be increased from the current 20,000 $ft^2$ (2 $ft^2$/bird for 10% of 100,000 birds) to 27,000 $ft^2$. From our interviews, this 35% increment in the outdoor space could be accommodated by most large producers at the proportionate 35% increase over and above the current annualized cost of verandas. The only other cost related to increased outdoor access is reflected in the reduced feed conversion from 3.8 to 4.0 per dozen eggs. According to our estimates, all these effects combined produce a large increase in the break-even price of 96%.

The summary of the estimated costs of regulation and its relationship to the baseline cost scenario for the representative large organic eggs producer is presented in Table 3-4. As seen from the table, the typical large organic eggs producer is automatically in compliance with the regulatory proposal contained in Option 2; hence, the increase in the average total cost and thus the break-even price relative to the baseline amounts to 0%. However, this is most definitely not the case for Option 3. The reduction in the number of birds and consequently the reduction in the number of eggs and the total revenue are staggering. At this point, it is important to emphasize that the time horizon of 5 years that we implicitly use in this analysis eliminates the need to consider the possibility of constructing an entirely new production complex that would satisfy the stringent stocking rates requirement envisioned in Option 3.

Moreover, based on our interviews with producers they unanimously ruled out the possibility of investing in the construction of new houses even in the long run and claimed that they would exit the organic industry instead. Few other points are worth clarifying. First, there is a small reduction in the annualized fixed costs due to the reduction in annual organic certification fees resulting from the reduction in revenue. Second, there is a dramatic reduction in total variable cost due to the reduction in the volume of output. This reduction in total variable cost is somewhat dampened by the need to use more energy to offset the heat loss inside the building resulting from lower population density, the phenomenon that was well explained in the section dealing with the midsize producers. All these effects combined produce a dramatic increase in break-even price of 96% over the baseline.

**Table 3-4. Estimated Costs of Producing Organic Eggs under Different Scenarios, Large Operations, 2011**

| | Baseline | Option 2 | Option 3 |
|---|---|---|---|
| ***Production volume*** | | | |
| Birds per operation | 100,000 | 100,000 | 13,500 |
| Organic eggs (dozen) | 1,968,120 | 1,968,120 | 265,696 |
| Breaker market eggs (dozen) | 492,030 | 492,030 | 66,424 |
| ***Costs per farm*** | | | |
| Total fixed costs | $3,986,200 | $3,986,200 | $3,986,200 |
| Annualized fixed costs | $418,234 | $418,234 | $414,184 |
| Variable costs | $4,661,742 | $4,661,742 | $882,758 |
| Total annual costs | $5,079,975 | $5,079,975 | $1,296,943 |
| ***Breaker market eggs revenue adjustment*** [a] | $364,102 | $364,102 | $49,154 |
| ***Costs per dozen eggs*** | | | |
| Break-even revenue per bird | $47.16 | $47.16 | $92.43 |
| Break-even price per dozen organic eggs | $2.40 | $2.40 | $4.70 |
| Percentage increase over baseline | — | 0.0% | 96.0% |

[a] Breaker market egg price assumes $0.74 per dozen.

### 3.4.2 Organic Broiler Production

Based on our information gathering, organic broiler producers regardless of size currently operate under the requirements proposed under Option 2. In contrast, the regulatory proposal summarized in Option 3 will have multiple effects on the cost structure of a representative large-scale organic broiler producer through

- a one-time (fixed) cost associated with retrofitting the house to install more exit holes;

- an increased requirement for more outdoor access ,which will be reflected in the increased cost of land; and
- increased mortality associated with a substantially increased outdoor area.

The combined effect of all three effects on the cost structure for large producers is estimated to be rather small at only a 2.25% increase in the break-even price relative to the baseline scenario. We describe the derivation of these estimates below.

***Small Operations (approximately 1,250 birds per year).*** As seen from Table C-4 in Appendix C, as far as indoor housing requirements are concerned, a typical small organic producer likely satisfies all of the regulatory Option 2 requirements described in Table A-1. The same is true for the outdoor access requirement. As the result, the percentage increase in the break-even organic price relative to the baseline is 0%.

The identical result is obtained under the Option 3 scenario. As far as indoor housing requirements are concerned, a typical small organic broiler producer should automatically satisfy all of the regulatory Option 3 requirements described in Table A-2. The same is true for the outdoor access requirement. Same as in Option 2, the percentage increase in the break-even organic price relative to the baseline is 0%.

Because most small organic broiler operations would be able to reasonably accommodate the regulatory requirements under either scenario, they would not experience any increase in costs. Therefore, the estimated break-even organic price per pound is the same under either scenario, as shown in Table 3-5, which summarizes the results for small organic broiler producers.

### Table 3-5. Estimated Costs of Producing Organic Broilers under Various Scenarios, Small Operations, 2011

| | Baseline | Option 2 | Option 3 |
|---|---|---|---|
| ***Production volume*** | | | |
| Birds per operation | 1,250 | 1,250 | 1,250 |
| Pounds per operation (live) | 4,770 | 4,770 | 4,770 |
| ***Costs per farm*** | | | |
| Total fixed costs | $6,725 | $6,725 | $6,725 |
| Annualized fixed costs | $1,406 | $1,406 | $1,406 |
| Variable costs | $15,886 | $15,886 | $15,886 |
| Total annual costs | $17,292 | $17,292 | $17,292 |
| ***Costs per pound*** | | | |
| Break-even price per pound (live)[a] | $3.07 | $3.07 | $3.07 |
| Break-even price per pound (dressed) | $3.63 | $3.63 | $3.63 |
| Percentage increase over baseline | | 0.0% | 0.0% |

[a] Break-even price per live pound based on an average dressed weight of 4.5 pounds per bird and $2.50 per bird processing fee.

***Large Operations (approximately 50,000 birds per flock).*** A typical large organic broiler operation is likely to already satisfy all regulatory Option 2 requirements. In particular, according to Option 2, broilers are required to have no more than 7 pounds of live weight per square foot of the indoor space. In a representative large operation used to estimate regulatory costs, 50,000 birds are housed in the 50,000 $ft^2$space (25,000 birds per house of 25,000 $ft^2$ floor space), with 5% mortality and 4.5 pounds of average weight resulting in 4.275 pounds of live weight per square foot. Also, a representative house is equipped with enough exit doors of the correct size to satisfy the requirements. Next, because the typical house has dirt floors (with shavings), ample scratch areas and dust baths are available. Further, the tunnel ventilation is assumed to be able to reduce the ammonia concentration below 25 ppm. Finally, ample natural light is available in houses of this type. Regarding the outdoor regulation requirements, a typical large organic broiler operation, the birds are allowed to go outside by 4 weeks of age when outside temperatures are over 50° F, and they are exposed to direct sun light. Because Option 2 requires that broilers must have 2.0 $ft^2$ per bird, for a minimum of 5% of the total flock population, this requirement is assumed to be automatically satisfied because 5% of 2.0 is 0.1 $ft^2$, whereas the typical operation of this type has 0.2 $ft^2$ per bird. Next, because the surface of the typical operation is soil, scratch areas and dust bathing are available to birds.

According to Option 3, the indoor housing stocking rate for broilers require no more than 5 pounds of live weight per square foot of the indoor space, and the representative operation has 4.275 pounds of live weight per square foot, which satisfies the requirement. Next, because the typical house has dirt floors (with shavings), ample scratch areas and dust baths are available. Further, the tunnel ventilation is assumed to be able to reduce the ammonia concentration below 25 ppm. Also, ample natural light is available in houses of this type, so no improvements are required. However, when it comes to exit doors, the typical production unit will not satisfy the Option 3 regulatory requirement of 6 feet of exit doors per 1,000 birds. For a typical house, this requirement amounts to 25 feet (or 300 inches) of doors per house and the house has only 192 (8 x 24) inches of doors. This means that there is still another 108 inches of doors missing per house, which translates into a requirement of 5 additional doors (108/24 = 4.5) per house, or 10 additional doors for the entire production unit. The one-time installation costs are estimated to be $120 per door plus 2 hour of labor per door, which is valued at a price of $50/hour. Hence the total cost of 10 additional doors is estimated at $2,200 and is reflected in the increased cost of equipment. The amortization (10 years) plus the opportunity cost of capital (3%) associated with this fixed cost amounts to $180 per year plus the associated additional charges for insurance and property taxes, all of which have been added to the cost of regulatory Option 3. No additional operating costs are associated with 10 additional exit doors. When it comes to outdoor access, the representative producer will not satisfy the outdoor stocking rate requirement of 5 pounds of live weight per square foot. The currently available outdoor space amounts to 10,000 square feet, and given the average live broiler weight of 4.5 pounds, the new regulation proposal would amount to an additional 35,000 square feet of outdoor space. To satisfy this requirement, we assume that the operator is in position to buy or lease an additional 1 acre of land and expand the outdoor access to satisfy this requirement. Using the price of land of $4,800 per acre and 3% discount rate, this amounts to an additional land rental cost of $144 per year. This amount has been added to the annual cost of land. However, it is widely believed that the increased outdoor space requirement will increase the mortality throughout the production cycle because larger outdoor areas will become more difficult to defend from predators and diseases. In our calculation this is reflected in an increase in mortality rate from 5% to 8% and the corresponding impact on the reduced feed consumption and the available pounds of live weight that can be sold. All other outdoor access requirements for Option 3 are automatically satisfied.

The summary of the cost of regulation estimation results for large broiler producers is presented in Table 3-6. Large organic broiler producers currently operate under indoor and outdoor husbandry practices that satisfy Option 2; therefore, there are no estimated cost increases due to this proposed regulation. Under Option 3, however, large organic broiler operations would need to make several changes to production operations to comply with the indoor stocking rates and outdoor access requirements. The combined effect of all adjustments needed to satisfy the regulatory requirements amounts to 2.25% increase in the break-even price relative to the baseline cost scenario.

**Table 3-6. Estimated Costs of Producing Organic Broilers under Various Scenarios, Large Operations, 2011**

| | Baseline | Option 2 | Option 3 |
|---|---|---|---|
| ***Production volume*** | | | |
| Birds per operation | 300,000 | 300,000 | 300,000 |
| Pounds per operation (live) | 1,282,500 | 1,282,500 | 1,242,000 |
| ***Costs per farm*** | | | |
| Total fixed costs | $589,600 | $589,600 | $594,400 |
| Annualized fixed costs | $59,303 | $59,303 | $59,689 |
| Variable costs | $1,274,588 | $1,274,588 | $1,261,200 |
| Total annual costs | $1,333,890 | $1,333,890 | $1,320,889 |
| ***Costs per pound*** | | | |
| Break-even price per pound (live) | $1.04 | $1.04 | $1.06 |
| Break-even price per pound (dressed)[a] | $0.81 | $0.81 | $0.83 |
| Percentage increase over baseline | | 0.0% | 2.3% |

[a] Break-even price per pound based on an average live weight of 4.5 pounds per bird and a dressing percentage of 78%.

## 3.5 Estimated Total Industry Costs

Using the per-farm estimated regulatory costs above and the estimates of production volumes and actual prices, we calculated the total estimated industry costs due to regulation under each of the regulatory options and contrast these numbers with the industry total revenue. Under some scenarios, the estimated total industry costs are zero because the representative operations are in compliance with the regulation.

Table 3-7 shows that the estimated total industry costs due to proposed regulation under Option 2 are $0. Table 3-8 presents estimated total industry costs under Option 3, for which the total annual regulatory costs are estimated to be $68.1 million for organic eggs and $2.4 million for organic broilers for a total of $70.5 million. These estimates represent 17% of estimated total industry revenue for organic eggs and 1% of estimated total revenue for organic broilers.

### Table 3-7. Total Estimated Annual Industry Costs of Regulations under Option 2 (Prior to Market Adjustments)

| | % of Production | Baseline No. of Units[a] (000s) | Units | 2011 Total Industry Revenue[a] ($000s) | Regulatory Cost per Unit | Total Industry Costs ($000s) |
|---|---|---|---|---|---|---|
| ***Total Organic Egg Production*** | **100%** | **148,858** | **Dozen eggs** | **$400,366** | **$0.00** | **$0** |
| Eggs, small operations | 30% | 44,657 | Dozen eggs | $120,110 | $0.00 | $0 |
| Eggs, midsize operations | 54% | 80,383 | Dozen eggs | $216,197 | $0.00 | $0 |
| Eggs, large operations | 16% | 23,817 | Dozen eggs | $64,058 | $0.00 | $0 |
| ***Total Organic Broiler Production*** | **100%** | **105,473** | **Pounds, dressed** | **$247,862** | **$0.00** | **$0** |
| Broilers, small operations | 1% | 1,055 | Pounds, dressed | $2,479 | $0.00 | $0 |
| Broilers, large operations | 99% | 104,419 | Pounds, dressed | $245,384 | $0.00 | $0 |
| ***Total*** | | | | **$648,228** | | **$0** |

[a] Source: Revenue derived from production estimates obtained by USDA-AMS from 36 USDA-accredited state and private organic certifiers (2011) and prices based on simple averages of monthly prices provided by Lawrence Haller, Chief Economist, USDA-AMS, Poultry Programs

[b] Total estimated dozens of organic eggs are based on laying hen counts published by USDA-NASS (2012a, 2012b) assuming 19.4 dozens of eggs per laying hen. Note that there is a small difference between this assumption and the assumption of 308 eggs per hen that we use in our medium and large producers budgets with 20% loss to the breaker market (20.5 dozens of organic eggs per hen) and 284 eggs per hen with 15% loss to the breaker market in small producer budget (21.1 dozens per hen).

[c] Total estimated ready-to-cook organic chicken based on organic broiler numbers from USDA-NASS (2010) and data obtained by USDA-AMS (2011), an average weight of 4.5 live pounds per bird and a dressing percentage of 78%.

## 3.6 Qualifications and Limitations

All baseline and cost-shifting scenarios are based on the assumption of a representative producer. To the extent that the entire industry (eggs or broilers) is fairly homogenous with respect to its cost structure within each size category, the representative agent approach is adequate. However, if the industry is technologically highly heterogeneous, then the representative agent approach is not going to capture all specific nuances and idiosyncrasies of different production processes, and a complete industry survey would be required. Even the representative agent approach was somewhat hindered by the constraint on the allowable number of producers that we could contact (the total of nine across all organic poultry segments).

### Table 3-8. Total Estimated Annual Industry Costs of Regulations under Option 3 (Prior to Market Adjustments)

| | % of Production | Baseline No. of Units[a] (000s) | Units | 2011 Total Industry Revenue[a] ($000s) | Regulatory Cost per Unit | Total Industry Costs ($000s) |
|---|---|---|---|---|---|---|
| ***Total Organic Egg Production[b]*** | **100%** | **148,858** | **Dozen eggs** | **$400,366** | **$0.09** | **$68,118** |
| Eggs, small operations | 30% | 44,657 | Dozen eggs | $120,110 | $0.00 | $0 |
| Eggs, midsize operations | 54% | 80,383 | Dozen eggs | $216,197 | $0.17 | $13,334 |
| Eggs, large operations | 16% | 23,817 | Dozen eggs | $64,058 | $2.30 | $54,784 |
| ***Total Organic Broiler Production[c]*** | **100%** | **105,473** | **Pounds, dressed** | **$247,862** | **$0.02** | **$2,448** |
| Broilers, small operations | 1% | 1,055 | Pounds, dressed | $2,479 | $0.00 | $0 |
| Broilers, large operations | 99% | 104,419 | Pounds, dressed | $245,384 | $0.02 | $2,448 |
| ***Total*** | | | | **$648,228** | | **$70,566** |

[a] Source: Revenue derived from production estimates obtained by USDA-AMS from 36 USDA-accredited state and private organic certifiers (2011) and prices based on simple averages of monthly prices provided by Lawrence Haller, Chief Economist, USDA-AMS, Poultry Programs

[b] Total estimated dozens of organic eggs are based on laying hen counts published by USDA-NASS (2012a, 2012b) assuming 19.4 dozens of eggs per laying hen.

[c] Total estimated ready-to-cook organic chicken based on organic broiler numbers from USDA-NASS (2010) and data obtained by USDA-AMS (2011), an average weight of 4.5 live pounds per bird, and a dressing percentage of 78%.

All cost-shift scenarios are based on the intermediate length of the run (5 years' horizon) where changes in variable cost through inputs and output adjustments are possible together with some changes in fixed cost through smaller adjustments in land, buildings, and equipment. However, potential entry and exit of firms, as well as the new construction of large-scale production facilities by existing firms as the result of regulation, is assumed away.

In light of the above, the proposed regulation regarding the indoor and outdoor stocking rates was analyzed by first adjusting the indoor stocking rates by reducing the number of animals until the condition is satisfied. In other words, we ignored an unlikely possibility that a producer would opt to construct a brand new housing facility to satisfy the indoor stocking rate constraint to keep the production at the original pre-regulation level. If and when, after this adjustment took place, the new proposed outdoor stocking rate is still binding, the producer was allowed to purchase additional land at the prevailing market land prices.

In some cases, the stocking rate regulation requirements represent a significant change, and based on the interview responses, we found out that the reduction in revenue associated with the required reduction in the number of animals and the corresponding increase in average total cost will force some firms to exit. However, exit of firms could not be addressed explicitly within the structure of the equilibrium displacement models but will only be addressed qualitatively.

## 3.7 Regulatory Feasibility

In conducting data collection and analyses for the regulatory options, we identified several concerns regarding the feasibility of complying with the requirements under Option 3. We describe these concerns for egg production and broiler production below.

### 3.7.1 Feasibility of Organic Egg Production under Option 3

The interviews with organic egg industry participants and other experts revealed important reservations about the proposed regulations as presented in the Option 3 scenario:

- The number and size of exit doors required per 1,000 hens appears to be excessive because their installation could sometimes jeopardize the physical integrity of the housing structure, rendering it unusable for continued production. The number of exit doors added depends on the ultimate determination of indoor stocking rates. The proposed regulation for increased outdoor space was indicated as excessive by all producers interviewed. The numbers of layers that actually go outside decreases as the flock size increases. Typically, most of the midsized and large producers indicated that less than 10% of the flock was outdoors at any point in time. Granted that these are anecdotal observations, they are consistent across regions and producer sizes. Also chickens are prey animals and are unlikely to venture very far away from the chicken house; hence significant areas of added space could be left unused. If there is a requirement for 50% forage cover, the costs for paddock expansion would more than double to provide the sufficient space. None of the mid- to large-size producers indicated that they would be capable of maintaining this type of forage cover within the outdoor access areas.

- Organic producers that have more than 50,000 hens are currently subject to the FDA Egg Safety Plan, and on July 9, 2012, producers having 3,000 to 49,999 hens will be under the same regulation. 21 CFR Part 118.4(b)(4) states that as part of an effective biosecurity program, producers must “[p]revent stray poultry, wild birds, cats, and other animals from entering poultry houses.” Based on the interpretation of the rule and the need for a rodent and pest control program (21 CFR Part 118.4(c)), there must be a prevention program to limit rodents in the building as well. Currently, the large producers use verandas and covered porches, which in essence does limit other animals’ access to poultry facilities. Introduction of rules that mandate greater outdoor access areas eliminates the use of covered verandas and porches. This eliminates the ability of midsize and large producers to restrict the access of wild animals and rodents to the flock of laying hens and ultimately increases the access to the poultry by wild birds and aerial predators. Under the proposed extensive outdoor access systems it would be impossible for the producers to meet the intent of the FDA Egg Safety Plan.

- Most of the large producers indicated that the Option 3 regulatory levels for both indoor and outdoor space would induce them to exit the organic industry and convert their operations to conventional production practices. In the interviews, they indicated that because of the capital investment in their operations they would not be able to produce organic eggs.

- Within the Clean Water Act (CWA) (1977), operations that confine poultry to a specific paddock for at least 45 days during any 12-month period are defined as animal feeding operations (AFO). An AFO can be a concentrated animal feeding operation (CAFO) based on the animal numbers or designated by the U.S. Environmental Protection Agency (EPA) regardless of its animal numbers if it is a significant contributor to surface water pollution. CAFOs can be defined as medium (9,000 to 29,999 laying hens with liquid manure system or 25,000 to 81,999 laying hens with dry manure system) or large (more than 30,000 laying hens with liquid manure system or more than 82,000 laying hens with dry manure system). Currently, most of the operations have dry manure handling operations and are compliant with the CAFO rules (EPA, 2008) because the bulk of the manure is produced in the houses. But if they were to increase their outside access as per Option 3, they need either vegetated land or a wet manure handling system, which might have some consequences for their AFO/CAFO classification with hard-to-quantify cost hikes related to land acquisition, permitting and nutrient management.

### 3.7.2 Feasibility of Organic Broiler Production under Option 3

The interviews with organic broiler industry participants and other experts revealed important reservations about the proposed regulations as presented in the Option 3 scenario:

- The number and size of exit doors appears to be excessive because their installation could sometimes jeopardize the physical integrity of the housing structure, rendering it unusable for the continued production.

- The proposed regulation for increased outdoor space appears to be excessive because broilers tend to concentrate around the sources of feed and are unlikely to venture very far away from the chicken house; hence, significant areas of added space could be left unused.

# 4

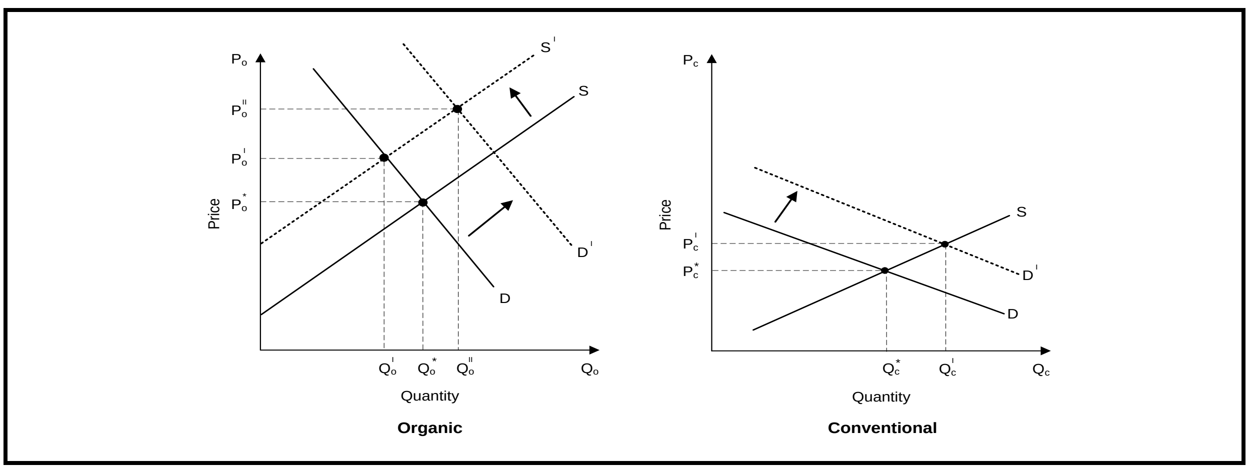
# Economic Impact Analysis

In this section, we present the economic impact analysis framework and methodology, the baseline data used for the model, the results of the model, and qualifications and limitations of the analysis. As explained above, we focus the economic impact analysis on the broiler and egg markets. Results are presented for regulatory Options 2 and 3.

## 4.1 Economic Impact Analysis Framework and Methodology

The economic impact methodology is based on the assumption of perfectly competitive markets for both organic and conventional poultry products. We also assumed that for each commodity group (broilers and eggs), the proposed regulation will affect the cost of producing organic poultry with no impact on the cost of production of conventional poultry. Finally, we assumed that organic and conventional poultry products are substitutes in consumption and in production. As shown in Figure 4-1, the proposed regulation is likely to increase the cost of production of the organic sector, thereby shifting its supply curve up. The equilibrium price for organic poultry will increase (from P* to P'), and the equilibrium quantity consumed would decrease (from Q* to Q'). If, however, the regulation affects the demand for organic poultry favorably (e.g., consumers' willingness to pay for organic products could increase based on the perception that the new organic product is somehow superior to the old organic product), the demand curve will shift to the right, causing a further increase in price to P″ and an increase in quantity from Q* to Q″, where Q″ could be larger or smaller than Q*, the original quantity prior to regulation.

**Figure 4-1. Economic Modeling Framework for the Proposed Regulations for Living Conditions for Organic Poultry**




In addition to the shifts in supply and demand of the organic sector due to direct effects of regulation, the quantity demanded of conventional poultry products could also change because of the changes in relative prices of organic and conventional poultry products. This effect is depicted in the right-hand panel of Figure 4-1. Maintaining the assumption that the proposed regulation will not affect the supply side of the conventional poultry industry and the assumption that organic and conventional poultry products are substitutes, the increase in the organic price (due to regulation) will cause the shift in demand for conventional poultry outward, causing both equilibrium price and quantity to increase.

The modeling framework is based on James and Alston (2002) in which they develop an equilibrium displacement model where the commodity of interest is available in two qualities.[1] As applied to the organic poultry standards, the two qualities are organic and conventional products. The model allows for substitution between the two qualities in both demand and supply. Therefore, the quantity demand and supplied of each product depends on its own price and the price of the other quality. Because the focus is on the effects of the regulation, other supply and demand shifters such as income, demographics, and prices of inputs are held constant. The model assumes linear supply and demand curves and that the organic and conventional products form a weakly separable group such that they can be modeled separately from other competing products.

We begin with a set of demand and supply relationships for the organic and conventional products as follows:

$$Q_O^{\mathrm{D}} = Q_O^D(P_O^D, P_C^D, Z_O)$$

$$Q_C^D = Q_C^D(P_C^D, P_O^D)$$

$$Q_O^S = Q_O^S\left(P_O^S, P_C^S, X_O\right)$$

$$Q_C^S = Q_C^S\left(P_C^S, P_O^S\right)$$

where Q represents quantity, P represents price, D superscripts denote demand, S superscripts denote supply, O subscripts represent the organic product, C subscripts represent the conventional product, $Z_O$ represents exogenous factors affecting demand for the organic product (e.g., changes in animal welfare standards that could possible affect consumer preferences), and $X_O$ represents exogenous factors affecting supply (e.g., increased costs due to regulation) for the organic product. The market-clearing conditions are the following:

$$Q_O = Q_O^D = Q_O^S$$

$$Q_C = Q_C^D = Q_C^S$$

[1] Equilibrium displacement models have been used to analyze the effects of numerous policies affecting the food and agricultural industries. Examples include Muth et al. (2002), Wohlgenant (2005), and Harrington and Dubman (2008).

$$P_O = P_O^D = P_O^S$$

$$P_C = P_C^D = P_C^S$$

Substituting the equilibrium values, totally differentiating the set of demand and supply equations, and transforming into elasticity form resulted in the following:

$$dln\, Q_O = \varepsilon_O^D\, dln\, P_O + \varepsilon_{O,C}^D\, dln\, P_C + \varepsilon_{O,Z}^D\, dln\, Z_O$$

$$dln\, Q_C = \varepsilon_C^D\, dln\, P_C + \varepsilon_{C,O}^D\, dln\, P_O$$

$$dln\, Q_O = \varepsilon_O^S\, dln\, P_O + \varepsilon_{O,C}^S\, dln\, P_C + \varepsilon_{O,X}^S\, dln\, X_O$$

$$dln\, Q_C = \varepsilon_C^S\, dln\, P_C + \varepsilon_{C,O}^S\, dln\, P_O$$

where $dln\,(\cdot)$ represents the percentage change in variable under consideration $(\cdot)$ and $\varepsilon$ represents the respective demand or supply elasticities.

Expressing these equations in matrix form and solving for $dln\, Q_O$, $dln\, P_O$, $dln\, Q_C$, and $dln\, P_C$ provide the system of equations for determining changes in market equilibrium values resulting from exogenous shifts in demand and supply such as would occur under the regulation. In this case, we express the proportionate shift in demand, $dln\, Z_O$, as the proportionate change in willingness to pay and the proportionate shift in supply, $dln\, X_O$, as the proportionate change in the costs of production resulting from the regulation. In this case, both changes are relative to the price of the organic product and thus $\varepsilon_{O,Z}^D = \varepsilon_O^D$ and $\varepsilon_{O,X}^S = \varepsilon_O^S$.

Although different size farms may have different supply responses, because we lacked data, we were not able to disaggregate the supply curves based on different size farms. However, we accounted for differences in regulatory costs across farm sizes by using weighted average costs of the regulation where the weights represent the production volume shares of each farm size.

Finally, after solving the model, we calculated changes in consumer surplus (CS) and producer surplus (PS) as follows:

$$\Delta CS = CS^1 - CS^0 = 0.5\,[(a^0 - P^0)Q^0 - (a^1 - P^1)Q^1]$$

$$\Delta PS = PS^1 - PS^0 = 0.5\,[(P^0 - b^0)Q^0 - (P^1 - b^1)Q^1]$$

where superscripts denote the baseline equilibrium (0) versus new equilibrium (1) values, “a” denotes the intercept of the linear demand curve, and “b” denotes the intercept of the linear supply curve. The intercept values are calculated based on the prices, quantities, and elasticity values associated with the baseline or new equilibrium.[2]

Consumer surplus and producer surplus are standard benefits measures used in welfare economics. Consumer surplus is a measure of benefits accruing to consumers net of the price they paid for the good. Geometrically, it represents the area under the demand function and above the price line bounded from the right by the equilibrium quantity. Producer surplus is a measure of benefits accruing to producers defined as the difference between the market price they receive for the product and the opportunity costs required to bring the product to the market. Geometrically, it represents the area above the supply curve and below the price line, bounded from the right by the equilibrium quantity. Summed together, consumer surplus and producer surplus give the net benefits (the difference between total willingness to pay and total costs).

The model was programmed in Microsoft Excel to solve for the new equilibrium quantities and prices based on the estimated increases in willingness to pay and regulatory costs. The baseline values and regulatory values are presented in the next section.

## 4.2 Model Data

Baseline prices and quantities and estimated elasticity values required to operationalize the model are provided in Table 4-1. The sources of the prices and quantities are as follows:

- Organic broiler and egg prices: Simple average of monthly prices provided by Lawrence Haller, Chief Economist, USDA-AMS Poultry Programs
- Conventional broiler and egg prices: Simple average of monthly prices from USDA-AMS “Poultry Market News and Analysis”
- Organic broiler quantity: Organic broiler production from USDA-NASS (2010) multiplied by 4.5 pounds per bird and assuming a 78% yield based on the industry interviews.
- Conventional broiler quantity: Conventional broiler production from USDA Office of the Chief Economist (2012) multiplied by 5.27 pounds per live bird and assuming a 73.1% yield.
- Organic egg quantity: Total organic layer counts from information collected by USDA-AMS from 36 USDA-accredited state and private organic certifiers multiplied by 19.4 dozen eggs per layer per year.
- Conventional egg quantity: Total conventional layer counts from USDA-NASS (2010) multiplied by 24.25 dozen eggs per layer per year.

[2] For example, the intercept for the demand curve is calculated by first calculating the slope of the demand curve using the estimated demand elasticity and the market price and quantity and then back-solving for the intercept using the calculated slope estimate and the market price and quantity.

## Table 4-1. Baseline Prices and Quantities and Selected Elasticity Estimates Used in the Models (2011)

| Notation | Description | Broilers | Eggs |
|---|---|---|---|
| $Q_O$ | Quantity of organic product (1,000 pounds or 1,000 dozen) | 105,473 | 148,858 |
| $P_O$ | Price of organic product (per pound or per dozen) | \$2.35 | \$2.69 |
| $Q_C$ | Quantity of conventional product (1,000 pounds or 1,000 dozen) | 37,176,000 | 6,913,675 |
| $P_C$ | Price of conventional product | \$0.792 | \$1.072 |
| $\varepsilon_O^D$ | Own-price elasticity of demand for organic product | −1.0 | −0.9 |
| $\varepsilon_C^D$ | Own-price elasticity of demand for conventional product | −0.65 | −0.2 |
| $\varepsilon_{O,C}^D$ | Cross-price elasticity of demand for organic product with respect to conventional price | 0.3 | 0.2 |
| $\varepsilon_{C,O}^D$ | Cross-price elasticity of demand for conventional product with respect to organic price | 0.2 | 0.1 |
| $\varepsilon_O^S$ | Own-price elasticity of supply for organic product | 15 | 15 |
| $\varepsilon_C^S$ | Own-price elasticity of supply for conventional product | 10 | 10 |
| $\varepsilon_{O,C}^S$ | Cross-price elasticity of supply of organic product with respect to conventional price | −0.1 | −0.1 |
| $\varepsilon_{C,O}^S$ | Cross-price elasticity of supply of conventional product with respect to organic price | −0.1 | −0.1 |

In addition to the baseline prices and quantities, the equilibrium displacement model is parameterized based on a set of elasticities. In most cases, the needed elasticities are not estimated directly within a policy study but, instead, are "guestimated" using a combination of the empirical results from the existing literature, economic theory, and intuition (James and Alston, 2002). There are two types of elasticities: one reflecting the slope (curvature) of the respective demand functions and the other reflecting the slope of the supply functions.

Because we are dealing with two quality attributes (organic and conventional), for each commodity under consideration we defined four different demand elasticities as follows:

- Own-price elasticity of demand for the organic (conventional) product—percentage change in the quantity demanded of the organic (conventional) product associated with a 1% increase in the organic (conventional) product price.
- Cross-price elasticity of demand for the organic (conventional) product with respect to the conventional (organic) product—percentage change in the quantity of the organic

(conventional) product demanded as the result of a 1% increase in conventional (organic) price.

The demand function is said to be elastic for elasticities that are in absolute values larger than 1 and inelastic for elasticities in absolute values smaller than 1. The own-price elasticities of demand are negative for both organic and conventional foods, as predicted by the “law of demand,” which says that the increase in price of a good should cause a decline in the quantity demanded. Moreover, the own-price elasticities of demand for organic foods tend to be higher than for conventional foods, indicating the fact that the consumption of an organic food item is more sensitive to price changes than the consumption of the same nonorganic food item. The cross-price elasticities of demand for organic foods are positive, indicating the fact that organic and conventional foods are substitutes (e.g., an increase in price of conventional eggs will cause an increase in the quantity demanded of organic eggs, and likewise, an increase in the price of organic eggs will cause the consumption of conventional eggs to increase). The difference in magnitudes of the two cross-price elasticities is related to the sizes of budgets for organic versus conventional foods. Substitution between organic and conventional foods is larger in percentages of organic sales (as reflected in the cross-price elasticity of demand for organic food with respect to price of conventional food) than in percentages of conventional sales (as reflected in the cross-price elasticity of conventional food with respect to price of organic food).

Next, we turn to supply elasticities, which we define as follows:

- Own-price elasticity of supply for the organic (conventional) product—percentage change in quantity supplied of the organic (conventional) product associated with a 1% increase in the price of the organic (conventional) product.

- Cross-price elasticity of supply for the organic (conventional)—percentage change in quantity supplied of the organic (conventional) product associated with a 1% increase in the conventional (organic) price.

The own-price elasticities of supply are all positive, reflecting the fact that if the market price of a product increases, other things being equal, producers would be willing to produce and supply more. Cross-price elasticities are all negative, indicating that organic and nonorganic foods (eggs or broilers) are substitutes.

The literature on the conventional food demand estimation is rich; therefore, these elasticities are easier to find, whereas the literature on organic foods demand is quite sparse, and these elasticities are much harder to come by. The own-price demand elasticities for nonorganic eggs is generally inelastic and come in the −0.15 to −0.30 range (see Sumner et al. [2010] and the cited literature therein). For the purposes of this study, we assumed the value of −0.2. Based on Bunte et al. (2007), we assumed the value for the own-price elasticity of demand for organic eggs of −0.9, the cross-price elasticity of organic eggs with respect to nonorganic price of 0.2, and the cross-price elasticity of nonorganic eggs with respect to organic price of 0.1. The own-price elasticity estimates for conventional (nonorganic) broilers vary considerably from inelastic to highly elastic depending on the time period of the data, the estimation technique used, and the theoretically imposed properties of the estimated coefficients. We assumed the value of −0.65, which approximately fits in the middle of the estimated range from the literature and is also directly supported by Thurman (1987). For the own-price elasticity of demand for organic broilers, we assumed the value of −1, which satisfies the requirement that it is larger than the own-price elasticity for the nonorganic broilers and is also somewhat larger than the own-price elasticity for organic eggs. Given much larger substitution possibilities of broilers (with other meats) than those of eggs (with no close substitutes), it is reasonable to assume a higher own-price elasticity for organic broilers than organic eggs. Finally, we assumed the cross-price elasticity of organic broilers with respect to the nonorganic broiler price of 0.3, and the cross-price elasticity of nonorganic broilers with respect to the organic broiler price of 0.2.

The literature on conventional food supply elasticities is quite sparse and the literature on organic foods supply elasticities is nonexistent, so we need to rely heavily on economic theory. Relying on the result that the long-run supply curve of the perfectly competitive firm in the constant-cost industry should be horizontal at the break-even price (Nicholson, 2002, pp. 383–386), we assumed that the own-price elasticity of supply for nonorganic eggs is some large positive number. Sumner et al. (2010) used the values between 5 and 10, which seems to be a good starting point for our analysis as well. Given the fact that the organic industry has a substantial number of small producers who can enter and exit the industry relatively easily, we believe that this segment of the industry supply should be even more elastic; hence we used values between 10 and 15. The values for the egg and broiler industries are assumed to be the same (i.e., the long-run own-price elasticity of supply for conventional products is assumed to be 10 and the long-run own-price elasticity of supply for organic products is assumed to be 15). Finally, when it comes to cross-price elasticities of supply, relying on economic theory unfortunately does not provide any guidance, so we need to rely exclusively on simple economic intuition. We believe that organic and conventional poultry products are substitutes such that if the price of one goes down the supply of the other would increase and vice versa. Comparing the numbers for cross-price supply elasticities between premium and cask wines used by James and Alston (2002), we used similar numbers for cross-price elasticities between organic and conventional poultry. In particular, in both the eggs and broilers models, the cross-price elasticity of organic supply with respect to the nonorganic price and the cross-price elasticity of nonorganic supply with respect to the organic price are assumed to be −0.1.

Finally, the estimated demand shifts (change in consumers' willingness to pay for some good's attributes) described in Section 2 and supply shifts (changes in costs of producing the good in question) described in Section 3 are inserted into the model. The specific values used are identified in the model results section below.

## 4.3 Model Results and Sensitivity Analysis

Because Option 2 has no estimated costs associated, this section focuses on the results of modeling the effects of Option 3. Results are presented as follows:

- Table 4-2 shows the results for Options 3 in the egg market with supply shifts only.
- Table 4-3 shows the results for Option 3 in the broiler market with supply shifts only.
- Table 4-4 shows the results for Option 3 in the egg market with supply and demand shifts.

- Table 4-5 shows the results for Option 3 in the broiler market with supply and demand shifts.

Because the regulatory costs under Option 3 are substantially larger for organic eggs than for organic broilers, the economic impacts are substantially larger in all cases.

As shown in Table 4-2 for the egg market, the price per dozen organic eggs is estimated to increase substantially (approximately 48 cents per dozen), and the quantity is estimated to decrease substantially (approximately 24 million dozen). Because of increased costs of production for organic eggs, some producers will shift production from organic to conventional eggs, and because of increased market prices, some consumers will shift from organic to conventional eggs. Producer and consumer surplus are estimated to decrease substantially in the organic market and increase modestly in the conventional market.

As shown in Table 4-3 for the broiler market, the regulatory costs under Option 3 are substantially smaller than for the egg market, and the market impacts are relatively minor. The price per pound for broilers is estimated to increase slightly (approximately 5 cents per pound), and the quantity is estimated to decrease slightly (approximately 2 million pounds). Substitution from the organic to conventional market results in very slight increases in prices and quantities of conventional broilers. Consumer and producer surplus decrease somewhat in the organic broiler market and increase slightly in the conventional broiler market.

In comparing Table 4-4, which includes increased willingness to pay for organic eggs in addition to the Option 3 costs, to Table 4-2, prices are estimated to increase by an even greater amount (approximately 53 cents per dozen), but the quantity now increases moderately (approximately 14 million dozen) instead of decreasing. As before, a small substitution occurs from the organic egg to the conventional egg market. In contrast to Table 4-2, consumer and producer surplus in the organic market increase substantially instead of decreasing. In other words, if consumers are willing to pay more for organic eggs under Option 3, the entire cost of the regulation may be offset by increased consumer and producer surplus associated with the regulation. Thus, the benefits of the regulation would exceed the costs of the regulation. However, these results depend on the assumed value for the increase in willingness to pay because it is currently unknown.

Finally, in comparing Table 4-5, which includes increased willingness to pay for organic broilers in addition to the Option 3 costs, to Table 4-3, prices are estimated to increase by a greater amount (approximately 9 cents per pound), and the quantity is estimated to increase substantially (approximately 27 million pounds) instead of decreasing. A very slight substitution occurs from the organic broiler to the conventional broiler market. In contrast to Table 4-3, consumer and producer surplus in the organic market increase substantially instead of decreasing. As in the organic egg market, if consumers are willing to pay more for organic broilers under Option 3, the entire cost of the regulation may be offset by increased consumer and producer surplus associated with the regulation. In this case, because the estimated costs of the regulation are relatively small, the increase in consumer willingness to pay needed to offset the increased costs of the regulation is relatively small. The 30% increase in consumer willingness to pay results in extraordinarily large estimated increases in consumer and producer surplus.

As the final step in the analysis, we conducted several sensitivity analyses to determine whether the results would differ substantially if specific values were altered in the model. These included adjustments in the supply elasticities and in the weights assigned to the size categories in calculating the weighted average cost shift. For the supply elasticities, we know that the own-price elasticities are relatively elastic, but not how elastic, and we know the cross-price elasticities are negative but not the magnitude. First, we reran the supply shift only analysis changing the own-price elasticity of supply for organic broilers and eggs from 15 to 10 and for conventional broilers and eggs from 10 to 5. Second, we reran the supply shift only analysis changing the cross-price elasticities of supply in both markets from –0.1 to –1.0. Across both scenarios, changes in broiler prices and quantities were at most 0.1 percentage point, and changes in egg prices were at most 0.6 percentage point and in egg prices were at most 0.4 percentage point.

When we conducted the analysis changing the production weights from 30% for small, 54% for medium, and 16% for large to 10% for small, 40% for medium, and 50% for large organic egg producers, we obtained substantially different results. Using these weights, the weighted average cost shift changes from 19% to 52%. In this case, the model estimates that organic egg prices will increase by 48% and organic egg quantities will decrease by 43%; thus, consumer and producer surplus will decline substantially more than the previous estimates. However, in considering these results, it is important to note that the results of equilibrium displacement models become much more uncertain for larger shifts and generally have greater validity for small shifts that would not be expected to result in major changes in the structure of the market.

### Table 4-2. Estimated Regulatory Impacts on the Farm-Level Egg Market with Supply Shifts Only

| Variable | Baseline | With Regulation | Absolute Change | Percentage Change |
|---|---|---|---|---|
| **Regulatory Option 3: Weighted average supply shift = 19.0%[a]** | | | | |
| Organic price ($/dozen) | $2.690 | $3.172 | $0.482 | 17.9% |
| Organic quantity (1000 dozen) | 148,858 | 124,968 | −23,890 | −16.0% |
| Organic revenue ($ millions) | $400.4 | $396.4 | −$4.0 | −0.1% |
| Conventional price ($/dozen) | $1.072 | $1.076 | $0.004 | 0.4% |
| Conventional quantity (1000 dozen) | 6,913,675 | 7,032,646 | 118,971 | 1.7% |
| Conventional revenue ($ millions) | $7,411.5 | $7,567.1 | $155.6 | 2.1% |
| Producer surplus: organic ($1000s) | $13,348 | $9,407 | −$3,941 | −29.5% |
| Consumer surplus: organic ($1000s) | $222,460 | $156,784 | −$65,676 | −29.5% |
| Producer surplus: conventional ($1000s) | $370,573 | $383,436 | $12,863 | 3.5% |
| Consumer surplus: conventional ($1000s) | $18,528,649 | $19,171,819 | $643,170 | 3.5% |

[a]The weighted average supply shift under Option 3 was calculated as 0.3(0%) + 0.54(6.7%) + .16 (96%), where 0.3 represents the share of volume accounted for by small operations, 0.54 represents medium operations, and 0.16 represents large operations.

## Table 4-3. Estimated Regulatory Impacts on the Farm-Level Broiler Market with Supply Shifts Only

| Variable | Baseline | With Regulation | Absolute Change | Percentage Change |
|---|---|---|---|---|
| **Regulatory Option 3: Weighted average supply shift = 2.3%[a]** | | | | |
| Organic price ($/pound) | $2.350 | $2.400 | $0.050 | 2.1% |
| Organic quantity (1000 pounds) | 105,473 | 103,239 | −2,234 | −2.1% |
| Organic revenue ($ millions) | $247.9 | $247.8 | −$.1 | 0.0% |
| Conventional price ($/pound) | $0.792 | $0.792 | $0.000 | 0.0% |
| Conventional quantity (1000 pounds) | 37,176,000 | 37,320,289 | 144,289 | 0.4% |
| Conventional revenue ($ millions) | $29,443.4 | $29,557.7 | $114.3 | −0.4% |
| Producer surplus: organic ($1000s) | $8,262 | $7,916 | −$346 | −4.2% |
| Consumer surplus: organic ($1000s) | $123,931 | $118,736 | −$5,194 | −4.2% |
| Producer surplus: conventional ($1000s) | $1,472,170 | $1,483,619 | $11,450 | 0.8% |
| Consumer surplus: conventional ($1000s) | $22,648,763 | $22,824,915 | $176,152 | 0.8% |

[a]The weighted average supply shift under Option 3 was calculated as .01(0%) + 0.99(2.3%), where 0.01 represents the share of volume accounted for by small operations and 0.99 represents the share of volume accounted for by large operations.

## Table 4-4. Estimated Regulatory Impacts on the Farm-Level Egg Market with Supply and Demand Shifts

| Variable | Baseline | With Regulation | Absolute Change | Percentage Change |
|---|---|---|---|---|
| **Regulatory Option 3: Weighted average supply shift = 19.0%[a] and demand shift = 30%** | | | | |
| Organic price ($/dozen) | $2.690 | $3.217 | $0.527 | 19.6% |
| Organic quantity (1000 dozen) | 148,858 | 162,893 | 14,035 | 9.4% |
| Organic revenue ($ millions) | $400.4 | $524.0 | $123.6 | 30.9% |
| Conventional price ($/dozen) | $1.072 | $1.076 | $0.004 | 0.4% |
| Conventional quantity (1000 dozen) | 6,913,675 | 7,043,930 | 130,255 | 1.9% |
| Conventional revenue ($ millions) | $7,411.5 | $7,579.3 | $167.8 | 2.3% |
| Producer surplus: organic ($1000s) | $13,348 | $15,983 | $2,636 | 19.7% |
| Consumer surplus: organic ($1000s) | $222,460 | $266,388 | $43,928 | 19.7% |
| Producer surplus: conventional ($1000s) | $370,573 | $384,668 | $14,095 | 3.8% |
| Consumer surplus: conventional ($1000s) | $18,528,649 | $19,233,391 | $704,742 | 3.8% |

[a]The weighted average supply shift under Option 3 was calculated as 0.3(0%) + 0.54(6.7%) + .16 (96%), where 0.3 represents the share of volume accounted for by small operations, 0.54 represents medium operations, and 0.16 represents large operations.

**Table 4-5. Estimated Regulatory Impacts on the Farm-Level Broiler Market with Demand and Supply Shifts**

| Variable | Baseline | With Regulation | Absolute Change | Percentage Change |
|---|---|---|---|---|
| **Regulatory Option 3: Weighted average supply shift = 2.3%[a] and demand shift = 30%** | | | | |
| Organic price ($/pound) | $2.350 | $2.444 | $0.094 | 4.0% |
| Organic quantity (1000 pounds) | 105,473 | 132,919 | 27,446 | 26.0% |
| Organic revenue ($ millions) | $247.9 | $324.8 | $76.9 | 31.0% |
| Conventional price ($/pound) | $0.792 | $0.793 | $0.001 | 0.2% |
| Conventional quantity (1000 pounds) | 37,176,000 | 37,447,026 | 271,026 | 0.7% |
| Conventional revenue ($ millions) | $29,443.4 | $29,695.5 | $252.1 | 0.1% |
| Producer surplus: organic ($1000s) | $8,262 | $13,121 | $4,859 | 58.8% |
| Consumer surplus: organic ($1000s) | $123,931 | $196,819 | $72,889 | 58.8% |
| Producer surplus: conventional ($1000s) | $1,472,170 | $1,493,713 | $21,543 | 1.5% |
| Consumer surplus: conventional ($1000s) | $22,648,763 | $22,980,201 | $331,438 | 1.5% |

[a]The weighted average supply shift under Option 3 was calculated as .01(0%) + 0.99(2.3%), where 0.01 represents the share of volume accounted for by small operations and 0.99 represents the share of volume accounted for by large operations.

## 4.4 Qualifications and Limitations

The modeling approach applied above is subject to several qualifications and limitations:

- The equilibrium displacement modeling approach assumes perfect competition, linear supply and demand curves, and weak separability of the set of products included in the model. If any of these assumptions are inappropriate, the results of the model may not be accurate.
- For substantial (large discrete) supply or demand shifts, the accuracy of the model becomes a concern. In particular, for small changes, the assumption of linear supply and demand curves may provide relatively accurate results even if the true functions are nonlinear. However, if the shifts in demand or supply are large, the results may be substantially different than what would actually occur.
- The model results are affected by the assumed elasticity estimates drawn from the literature and economic theory, and data are not available to estimate more precise values.
- Specific estimates of increased willingness to pay by consumers is unknown without conducting a market experiment and thus were assumed based on the literature on increased willingness to pay for increased animal welfare.
- The model is based on 2011 as the baseline year and thus assumes that 2011 was a typical year for the industry in terms of market prices and quantities; this implies costs of production and consumer demand in 2011 were typical. Related to the above problem of large discrete changes is the problem of entry and exit of firms that cannot be dealt with within the structure

of equilibrium displacement models. As mentioned before, large organic eggs producers explicitly told us that, if faced with Option 3 regulation, they will exit the organic industry and become conventional egg producers. In our modeling approach, the implicit assumption is that they will not exit but instead would respond to regulation with a substantial reduction in output. However, if they actually exit the organic production and continue supplying the same number of eggs, this time to the conventional market, the conventional eggs market price would likely collapse because of the large increase in quantity supplied and inelastic demand causing problems for the conventional eggs industry that are very hard to forecast. At the same time, the exodus of large organic egg producers would cause a temporary sharp increase in organic price because of the severe reduction in quantity supplied. In the long run, this would attract new producers into the organic industry and the price would settle down exactly to where it was before (long-run equilibrium price) unless some other changes to technology or production factors occur.

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# Appendix A: Regulatory Options 2 and 3, 5-Year Implementation Period

## Table A-1. Regulatory Option 2, 5-Year Implementation Period

| | Layers | Pullets | Broilers | Turkeys |
|---|---|---|---|---|
| ***Indoor housing*** | | | | |
| Stocking rates[a] | | | | |
| Single-level house | 1.5 square feet per bird | N/A | Maximum 7.0 lbs per square foot | Maximum 7.5 lbs per square foot |
| Raised roost type house | 1.2 square feet per bird | N/A | N/A | N/A |
| Multitier houses | 1.0 square feet per bird | N/A | N/A | N/A |
| Ventilation | Ammonia < 25 ppm | Ammonia < 25 ppm | Ammonia < 25 ppm | Ammonia < 25 ppm |
| Perches | 6″ per bird | N/A | N/A | N/A |
| Scratch areas, dust baths | Yes | Yes | Yes | Yes |
| Houses with slats | Minimum 15% of floor space | Minimum 15% of floor space | N/A | N/A |
| Exit doors | 16″ W x 14″ H | N/A | 24″ W x 18″ H | 60″ x 40″ H |
| Natural light | Yes | Yes | Yes | Yes |
| Artificial light | Maximum 16 hours | Maximum 16 hours | Maximum 16 hours | Maximum 16 hours |
| ***Outdoor access*** | | | | |
| Age[b] | N/A | 16 weeks | 4 weeks | 12 weeks |
| Direct sun | Yes | Yes | Yes | Yes |
| Solid roofs | Allowed | Allowed | Allowed | Allowed |
| Stocking rates | | | | |
| Percentage of flock | 5%, minimum | N/A | 5%, minimum | N/A |
| Minimum space | 2.0 square feet per bird | N/A | 2.0 square feet per bird | 7.5 lbs per square foot |
| Scratch areas, dust baths | Soil/suitable substrate | Soil/suitable substrate | Soil/suitable substrate | Soil/suitable substrate |
| Mobile pen units | Minimum 2.0 square feet per bird | N/A | Minimum 2.0 square feet per bird | N/A |

[a] In Option 3 stocking rates, particularly for layers, are the same regardless of housing type.

[b] Age of outdoor access when temperatures exceed 50° Fahrenheit.

## Table A-2. Regulatory Option 3, 5-Year Implementation Period

| | Layers | Pullets | Broilers | Turkeys |
|---|---|---|---|---|
| ***Indoor housing*** | | | | |
| Stocking rates[a] | 2.0 square feet per bird (based on floor perimeter of building) | 3.0 lbs per square foot | Maximum 5.0 lbs per square foot | Maximum 5.3 lbs per square foot |
| Ventilation | Ammonia < 25 ppm | Ammonia < 25 ppm | Ammonia < 25 ppm | Ammonia < 25 ppm |
| Perches | 6″ per bird, min. 35 cm elevation | at 4 weeks of age | N/A | N/A |
| Scratch areas, dust baths | Minimum 30% of floor space | Minimum 30% of floor space | Minimum 30% of floor space | Minimum 30% of floor space |
| Houses with slats | Allowed | Allowed | Allowed | Allowed |
| Exit doors | Min 6′/1000 birds x 14″ H | Min 6′/1000 birds x 14″ H | Min 6′/1000 birds x 14″ H | Min 6′/1000 birds x 2.5’ H |
| Natural light | Yes | Yes | Yes | Yes |
| Artificial light | Max 16 hours | Max 16 hours | Max 16 hours | Max 16 hours |
| ***Outdoor access*** | | | | |
| Age[b] | N/A | 16 weeks | 4 weeks | 12 weeks |
| Direct sun | Yes | Yes | Yes | Yes |
| Solid roofs | No | No | No | No |
| Shades in warm weather | Yes | Yes | Yes | Yes |
| Stocking rates | Minimum 2.0 square feet per bird | N/A | Maximum 5.0 lbs per square foot | Maximum 3.5 lbs per square foot |
| Scratch areas, dust baths | In soil | In soil | In soil | In soil |
| Vegetation cover | 50%, year round | 50%, year round | 50%, year round | 50%, year round |
| Mobile pen units | Minimum 2.0 square feet per bird | N/A | Minimum 2.0 square feet per bird | N/A |

[a] In Option 3 stocking rates, particularly for layers, are the same regardless of housing type.

[b] Age of outdoor access when temperatures exceed 50° Fahrenheit.

# *Appendix B: Living Conditions for Organic Poultry – Cost Data Collection Interview Guides*

**Living Conditions for Organic Poultry – Cost Data Collection Interview Guide**

## ORGANIC POULTRY PRODUCTION – BROILERS

A. Description of the production facility: (In case you have multiple production facilities, please answer all questions for the most typical/representative production facility that you own or contract with. If you have both conventional and organic production programs, please answer all questions only for your organic side of production.)

1. What is the scale of your operation? (in number of birds – annual average)

2. Where is your production operation located? (State and County)

3. How do you best describe the housing facility on your farm:
   (a) Single level house
   (b) Two-level house (total square footage)
   (c) Portable house (total square footage)
   (d) Other (describe)

4. What type of configuration in regard to animal welfare standards is your indoor facility equipped with:
   (a) House with dirt floors
   (b) House with concrete flooring and bedding
   (c) Scratch areas and dust baths (% of the available floor space)
   (d) Exit doors (number and dimensions)
   (e) Natural light (hours per day)
   (f) Type of ventilation (curtains, power-forced, cool cells)
   (g) Type of heating (propane, natural gas)

5. How do you best describe the outdoor configuration of your facility:
   (a) Covered porches or runs with concrete surface with sawdust or wood chips (sq.ft.)
   (b) Covered porches with scratch area and dust bathing in soil (total square footage)
   (c) Mobile outdoor pen units (number and size)
   (d) Pastures with permanent vegetative cover (how big is the area)
   (e) Roofs or no solid roofs (except for shade structures)

6. Stocking rates
   (a) Indoor stocking rates
   (b) Outdoor stocking rates

7. Production performance indicators
   (a) Dominant breed of birds
   (b) Average live weight of finished birds
   (c) Number of days needed to reach the target weight

B. Capital Expenditure

8. How much land is effectively used by your organic poultry operation

9. What is the replacement value of all your buildings, structures and equipment currently used in organic poultry production

C. Operating costs

10. Feed
    (a) Average feed utilization
    (b) Average price paid for feed
    (c) The cost of feed per live weight

11. Labor
    (a) Average labor requirement
    (b) Average wage rate paid to hired labor
    (c) Contract grower payment

12. Other operating expenses
    (a) Utilities such as electricity, gas, water, etc. (per live pound)
    (b) Chick cost (per live pound)
    (c) Medications, vaccination and other veterinary services (per live pound)
    (d) Repairs, maintenance, harvesting, misc. (per live pound)

D. Revenue

13. What is the average price you received per live pound sold?

14. Did you have any other revenue stream from your organic poultry business, for example the sales of organic waste or similar?

E. Cost of regulatory compliance

The following set of questions will help us to determine whether the existing production facility already satisfies the requirements for the regulatory option 2. We assume that everybody automatically satisfies option 1 because otherwise would not be certified as organic.

15. Questions below are related to the indoor housing facility type and configuration and need to be checked for accuracy against answers given in 4 and 5:
    (a) Do you have no more than 7 pounds of live weight per square foot?
    (b) Is your ventilation capable to reduce ammonia to less than 25 ppm?
    (c) Do you have exit doors distributed around the building for birds to go outside which are at least 2 feet wide and 18 inches high?
    (d) Does your housing facility have natural light such that you can read on a sunny day with the lights turned off?
    (e) With artificial light, do you have 8 hour dark period, that is, a maximum of 16 hours of artificial light?

16. For each of the answers to any of the above questions is “NO,” please give us your best-guess estimate of how much it would cost you to satisfy the missing requirement(s) in terms of:
    (_)
    (a) One time fixed or investment cost (in $)
    (b) Recurring or operating cost (in $ per live pound)

17. Questions below are related to <u>outdoor access</u> and need to be checked for accuracy against answers given in 6.
    (a) Do you have outdoor access of at least 2.0 sq. foot per bird, for a minimum of 5% of the total flock population?
    (b) Are you chickens allowed to go outside by the age of 4 weeks?
    (c) Are your scratch and dust bathing areas in soil?
    (d) In case your surface of the run is concrete do you have a well maintained substrate such as sawdust or wood chips?
    (e) Do your birds have the exposure to direct sunlight (could have solid roofs)?
    (f) In case you have mobile outdoor pen units, do they have at least 2 sq. foot per bird and are they moved to provide vegetative cover at all times?

18. For each of the answers to any of the above questions is "NO," please give us your best-guess estimate of how much it would cost you to satisfy the missing requirement(s) in terms of: (_)
    (a) One time fixed or investment cost (in $)
    (b) Recurring or operating cost (in $ per year or per hen or per dozen eggs)

The following set of questions will help us to determine whether the existing production facility already satisfies the requirements for the regulatory <u>option 3</u>.

19. Questions below are related to the <u>indoor housing facility</u> type and configuration and need to be checked for accuracy against answers given in 4 and 5:
    (a) Is your current stocking rate maximum 5 pounds of live weight per sq. ft.?
    (b) If your house has slatted floors, do you have scratch and dust bathing areas that are at least 30% of the available floor space?
    (c) Do you have outdoor exit door of minimum 6 linear feet per 1,000 birds and 14 inches high?

20. If the answer to any of the above questions is "NO," please give us your best-guess estimate of how much it would cost you to satisfy the missing requirement(s) in terms of: (_)
    (a) One time fixed or investment cost (in $)
    (b) Recurring or operating cost (in $ per year or per hen or per dozen eggs)

21. Questions below are related to <u>outdoor access</u> and need to be checked for accuracy against answers given in 6.
    (a) Is your outdoor stocking rate no more than 5 live pounds per square foot?
    (b) Do you birds have exposure to direct sun light?
    (c) Does your outdoor area have 50% cover in vegetation, year round?
    (d) Does your outdoor area have scratch areas and dust bathing in soil?
    (e) Do you have shade areas in warm weather but no other solid roofs?

22. If the answer to any of the above questions (a)–(e) is "NO," please give us your best-guess estimate of how much it would cost you to satisfy the missing requirement(s) in terms of: (___)
    (a) One time fixed or investment cost (in $)
    (b) Recurring or operating cost (in $ per year or per hen or per dozen eggs)

**Living Conditions for Organic Poultry – Cost Data Collection Interview Guide**

**ORGANIC EGG PRODUCTION – LAYERS**

A. Description of the production facility: (In case you have multiple production facilities, please answer all questions for the most typical/representative production facility that you own or contract with. If you have both conventional and organic production programs, please answer all questions only for your organic side of production.)

1. What is the scale of your operation? (in number of hens – annual average)

2. Where is your production operation located? (State and County)

3. How do you best describe the housing facility on your farm:
   (a) Single level house (total square footage)
   (b) Raised roost type house (total square footage)
   (c) Multi-tier house or aviary (total square footage)
   (d) Portable house (total square footage)
   (e) Other (describe)

4. What type of configuration in regard to animal welfare standards is your indoor facility equipped with:
   (a) House with slatted or mesh flooring
   (b) House with concrete flooring and bedding
   (c) Scratch areas and dust baths (% of the available floor space)
   (d) Perches (in inches per bird)
   (e) Exit doors (number and dimensions)
   (f) Natural light (hours per day)
   (g) Type of ventilation (curtains, power-forced, cool cells)

5. How do you best describe the outdoor configuration of your facility:
   (a) Covered porches or runs with concrete surface with sawdust or wood chips (total square footage or % of flock)
   (b) Covered porches with scratch area and dust bathing in soil (total square footage)
   (c) Mobile outdoor pen units (number and size)
   (d) Direct sunlight with solid roof (how big is the area)
   (e) No solid roofs (except for shade structures) with soil which is 50% covered in vegetation year round (how big is the area)
   (f) Nets covered outdoor pens (total square footage)

6. Stocking rates
   (a) Indoor stocking rates (in sq. ft. per bird)
   (b) Outdoor stocking rates (in sq. ft. per bird)
   (c) Hen-to-nest-box ratio

7. Production performance indicators
   (a) Dominant breed of hens (brown egg or white egg)
   (b) Number of weeks that hens are kept in production
   (c) Total number of eggs produced (in dozens, weekly)

B. Capital Expenditure

8. How much land is effectively used by your organic poultry operation (in acres)?

9. What is the replacement value of all your buildings, structures and equipment currently used in organic poultry production (in $, best guess estimate)?

C. Operating costs

10. Feed
    (a) Average feed utilization (in pounds per dozen eggs, or in pounds per hen)
    (b) Average price paid for feed ($/Lb)

11. Labor
    (a) Average labor requirement (in hours per week, or per month, or per dozen eggs, or per hen)
    (b) Average wage rate paid to hired labor ($/hour)
12. Other operating expenses
    (a) Utilities such as electricity, gas, water, etc. (monthly or yearly)
    (b) Packing and shipping (annual or per dozen eggs)
    (c) Medications, vaccination and other veterinary services (annual or per hen)
    (d) Repairs, maintenance, misc. (annual or per dozen eggs)

D. Revenue

13. What is the average price you received for your eggs in 2011 ($/dozen)?

14. Did you have any other revenue stream from your organic poultry business, for example the sales of spent hens, organic waste or similar? ($ per bird, or $ per cubic yard)?

E. Cost of regulatory compliance

The following set of questions will help us to determine whether the existing production facility already satisfies the requirements for the regulatory option 2. We assume that everybody automatically satisfies option 1 because otherwise would not be certified as organic.

15. Questions below are related to the indoor housing facility type and configuration and need to be checked for accuracy against answers given in 4 and 5:
    (a) If yours is a single level house, do you have at least 1.5 sq. feet per bird? (Y or N)
    (b) If yours is a raised roost type house, do you have at least 1.2 sq. feet per bird?
    (c) If yours is a multi-tier house, do you have at least 1 sq. foot per bird and your overhead perches & platforms provide space for at least 55% of the hens to perch?
    (d) Is your ventilation capable to reduce ammonia to less than 25 ppm?
    (e) Do you have perches of at least 6 inches per bird (you can count rails in front of nest boxes)?
    (f) Do you have scratch areas and dust baths? If you house has slatted flooring, are your dust bathing areas a minimum of 15% of available space?
    (g) Do you have exit doors distributed around the building for birds to go outside which are at least 16 inches wide and 14 inches high?
    (h) Does your housing facility have natural light such that you can read on a sunny day with the lights turned off?

(i) With artificial light, do you have 8 hour dark period, that is, a maximum of 16 hours of artificial light?

16. For each of the answers to any of the above questions (a)–(i) is "NO," please give us your best-guess estimate of how much it would cost you to satisfy the missing requirement(s) in terms of: (___)
    (a) One time fixed or investment cost (in $)
    (b) Recurring or operating cost (in $ per year or per hen or per dozen eggs)

17. Questions below are related to outdoor access and need to be checked for accuracy against answers given in 6.
    (a) Do you have outdoor access of at least 2.0 sq. foot per bird, for a minimum of 5% of the total flock population? (Y or N)
    (b) Are your scratch and dust bathing areas in soil?
    (c) In case your surface of the run is concrete do you have a well maintained substrate such as sawdust or wood chips?
    (d) Do your birds have the exposure to direct sunlight (could have solid roofs)?
    (e) In case you have mobile outdoor pen units, do they have at least 2 sq. foot per bird and are they moved to provide vegetative cover at all times?

18. For each of the answers to any of the above questions (a)–(e) is "NO," please give us your best-guess estimate of how much it would cost you to satisfy the missing requirement(s) in terms of: (___)
    (a) One time fixed or investment cost (in $)
    (b) Recurring or operating cost (in $ per year or per hen or per dozen eggs)

The following set of questions will help us to determine whether the existing production facility already satisfies the requirements for the regulatory option 3.

19. Questions below are related to the indoor housing facility type and configuration and need to be checked for accuracy against answers given in 4 and 5:
    (a) Do you have a minimum 2.0 sq. ft. per bird calculated by floor perimeter of the building, excluding nest boxes and perch areas? (Y or N)
    (b) Do you have perches at least 6 linear inches per bird with at least 35 cm (13.75 inches) elevation?
    (c) If your house has slatted floors, do you have scratch and dust bathing areas that are at least 30% of the available floor space?
    (d) Do you have outdoor exit door of minimum 6 linear feet per 1,000 birds and 14 inches high?

20. If the answer to any of the above questions (a)–(d) is "NO," please give us your best-guess estimate of how much it would cost you to satisfy the missing requirement(s) in terms of: (___)
    (a) One time fixed or investment cost (in $)
    (b) Recurring or operating cost (in $ per year or per hen or per dozen eggs)

21. Questions below are related to outdoor access and need to be checked for accuracy against answers given in 6.
    (a) Do your outdoor stocking rates allow a minimum of 2.0 sq. foot per bird? (Y or N)
    (b) Do you birds have exposure to direct sun light?
    (c) Does your outdoor area have 50% cover in vegetation, year round?

(d) Does your outdoor area have scratch areas and dust bathing in soil?
(e) Do you have shade areas in warm weather but no other solid roofs?

22. If the answer to any of the above questions (a)–(e) is "NO," please give us your best-guess estimate of how much it would cost you to satisfy the missing requirement(s) in terms of: (___)
    (a) One time fixed or investment cost (in $)
    (b) Recurring or operating cost (in $ per year or per hen or per dozen eggs)

# *Appendix C: Organic Poultry and Egg Enterprise Budgets*

**Appendix Table C-1**
**Baseline Enterprise Budget for Small Organic Layer Operation**

**Assumptions:**
Type of production: Small flock, commercial breed (Commercial brown)
Production configuration: static house with veranda and rotation of paddocks with forage cover
Production cycle: Year round production, 1 flock (12 months)
Indoor stocking rate: 1.2 to 1.5 sq ft/bird
Outdoor stocking rate: 43 sq ft/bird
Birds placed each cycle: 1000 or less
Mortality rate: 22%
Eggs produced per hen: 284 (85% of eggs can be marketed as organic eggs, remaining 15% goes into breaker market)
Feed conversion: 3.125 lbs per dozen eggs
Pullets purchased at 17 wks

| | | | | | | | | **ESTIMATED REGULATORY COST** | |
|---|---|---|---|---|---|---|---|---|---|
| **Costs** | | | | | | | | **Option 2** | **Option 3** |
| **Fixed Costs** | | **Total Fixed Costs** | | | | **Annual Fixed Costs** | | | |
| | **Quantity** | **Price** | **Value** | **Useful Life (years)** | **Depreciation** | **Interest (3%)** | **Annual cost** | **Annual cost** | **Annual cost** |
| House | 1 | $ 9,000 | $ 9,000 | $ 20 | $ 450 | $ 135 | $ 585 | $ 585 | $ 585 |
| Paddocks | 4 | $ 1,120 | $ 4,480 | $ 5 | $ 896 | $ 67 | $ 963 | $ 963 | $ 963 |
| Composter | 1 | $ 500 | $ 500 | $ 10 | $ 50 | $ 8 | $ 58 | $ 58 | $ 58 |
| Waterers | 50 | $ 32 | $ 1,600 | $ 10 | $ 160 | $ 24 | $ 184 | $ 184 | $ 184 |
| Feeders | 50 | $ 16 | $ 800 | $ 3 | $ 267 | $ 12 | $ 279 | $ 279 | $ 279 |
| Roosts | 583 | $ 0 | $ 187 | $ 4 | $ 47 | $ 3 | $ 49 | $ 49 | $ 49 |
| Nests | 10 | $ 165 | $ 1,650 | $ 5 | $ 330 | $ 25 | $ 355 | $ 355 | $ 355 |
| Cooler | 1 | $ 5,000 | $ 5,000 | $ 10 | $ 500 | $ 75 | $ 575 | $ 575 | $ 575 |
| Dolly | | | | | | | $ 20 | $ 20 | $ 20 |
| Pasture land (acre) | 1 | $ 5,675 | $ 5,675 | | | | $ 170 | $ 170 | $ 170 |
| Organic certification | | | | | | | $ 500 | $ 500 | $ 500 |
| Insurance (0.5%) | | | | | | | $ 144 | $ 144 | $ 144 |
| Property tax (0.8%) | | | | | | | $ 231 | $ 231 | $ 231 |
| **TOTAL FIXED COST** | | | **$ 28,892** | | **$ 2,699** | **$ 348** | **$ 4,113** | **$ 4,113** | **$ 4,113** |

| **Variable Costs** | **Cost Per Unit** | **Units** | **Quantity** | **Total Cost** | **Total Cost** | **Total Cost** |
|---|---|---|---|---|---|---|
| Pullet | $ 9.83 | per pullet | 1,000 | $ 9,830 | $ 9,830 | $ 9,830 |
| Wood chips | $ 150.00 | total | 1 | $ 150 | $ 150 | $ 150 |
| Utilities | $ 100.00 | per month | 12 | $ 1,200 | $ 1,200 | $ 1,200 |
| Feed | $ 710.00 | per ton | 33 | $ 23,367 | $ 23,367 | $ 23,367 |
| Labor* | $ 13.25 | per hour | 2,128 | $ 28,196 | $ 28,196 | $ 28,196 |
| Processing and packaging fee | $ 0.27 | per dozen | 21,063 | $ 5,687 | $ 5,687 | $ 5,687 |
| Miscellaneous | $ 400.00 | per total | 1 | $ 400 | $ 400 | $ 400 |
| **TOTAL VARIABLE COST** | | | | **$ 68,830** | **$ 68,830** | **$ 68,830** |
| **TOTAL COST** | | | | **$ 72,944** | **$ 72,944** | **$ 72,944** |
| **Total cost per bird placed** | | | | **$ 72.94** | **$ 72.94** | **$ 72.94** |
| **Total cost per dozen eggs** | | | | **$ 3.46** | **$ 3.46** | **$ 3.46** |

**Break-even price calculation**

| | **Price Per Unit** | **Units** | **Quantity** | **Result** | **Result** | **Result** |
|---|---|---|---|---|---|---|
| Eggs produced** | | dozens | 21,063 | | | |
| Breaker market revenue | $ 0.74 | $ | 3,160 | $ 2,338 | $ 2,338 | $ 2,338 |
| Organic eggs market revenue | | $ | 17,904 | $ 70,606 | $ 70,606 | $ 70,606 |
| **Break-even organic price** | | $/dozen | | **$ 3.944** | **$ 3.944** | **$ 3.944** |
| **Percent increase in break-even organic price** | | | | | **0.00%** | **0.00%** |

*Labor amount assumes 2.66 hours/hen for the life of flock 15 periods pro-rated to 12 months
** Mortality is assumed evenly distributed such that average mortality throughout the production cycle is one half of the terminal mortality.

**Appendix Table C-2**
**Baseline Enterprise Budget for Mid-size Organic Layer Operation**

**Assumptions:**
Type of operation: Mid-siz flock, commercial breed (Commercial brown)
Production configuration: Single level houses with verandas
Production cycle: Year round production, 1 flock = 15 months (costs are on a 12 months)
Indoor stocking density 1.5 to 2.0 sq ft/bird (1.75 sq ft/hen)
Outdoor stocking density of 2 sq ft/10% of hens housed providing veranda area
Birds placed each cycle: 16,000 or more. Option 3 requires reduction by **0.875**
Mortality rate: 8.3%; increases to **0.91**
Eggs produced per hen: 308 (80% of eggs can be marketed as organic eggs; remaining 20% goes into breaker market)
Feed conversion: 3.8 lbs per dozer **4.0** in Option 3
Pullets purchased at 17 wks

| **Costs** | | | | | | | | **ESTIMATED REGULATORY COST** Option 2 | Option 3 |
|---|---|---|---|---|---|---|---|---|---|
| **Fixed Costs** | **Total Fixed Costs** | | | | **Annual Fixed Costs** | | | | |
| | **Quantity** | **Price** | **Value** | **Useful Life/Rent (years)** | **Depreciation** | **Interest (3%)** | **Annual cost** | **Annual cost** | **Annual cost** |
| House | 1 | $ 176,800 | $ 176,800 | 20 | $ 8,840 | $ 2,652 | $ 11,492 | $ 11,492 | $ 11,492 |
| Composter | 1 | $ 2,500 | $ 2,500 | 10 | $ 250 | $ 38 | $ 288 | $ 288 | $ 288 |
| Equipment Total | 1 | $ 295,750 | $ 295,750 | 10 | $ 29,575 | $ 4,436 | $ 34,011 | $ 34,011 | $ 34,655 |
| Generator | 1 | $ 21,000 | $ 21,000 | 10 | $ 2,100 | $ 315 | $ 2,415 | $ 2,415 | $ 2,415 |
| Cooler | 1 | $ 16,500 | $ 16,500 | 10 | $ 1,650 | $ 248 | $ 1,898 | $ 1,898 | $ 1,898 |
| Veranda (land only) | 1 | $ 5,675.00 | $ 5,675 | | | | $ 170 | $ 170 | $ 340 |
| Organic certification | | | | | | | $ 1,200 | $ 1,200 | $ 1,200 |
| Insurance | | | | | | | $ 2,591 | $ 2,591 | $ 2,623 |
| Property tax | | | | | | | $ 4,146 | $ 4,146 | $ 4,198 |
| TOTAL FIXED COST | | | **$ 518,225** | | **$ 42,415** | **$ 7,688** | **$ 58,210** | **$ 58,210** | **$ 59,108** |

| **Variable Costs** | **Cost Per Unit** | **Units** | **Quantity** | Other costs | **Total Cost** | Total Cost | Total Cost |
|---|---|---|---|---|---|---|---|
| Pullets | $ 6.00 | per pullet | 16,000 | | $ 96,000 | $ 96,000 | $ 84,000 |
| Wood chips | $ 2,100.00 | Truckload | 1 | | $ 2,100 | $ 2,100 | $ 2,100 |
| Utilities* | $ 667.00 | per month | 12 | | $ 8,004 | $ 8,004 | $ 11,802 |
| Feed | $ 574.00 | per ton | 748 | | $ 429,286 | $ 429,286 | $ 375,388 |
| Labor** | $ 13.25 | per hour | 5,963 | | $ 79,005 | $ 79,005 | $ 69,129 |
| Processing and packaging fee | $ 0.40 | per dozen | 393,624 | | $ 157,450 | $ 157,450 | $ 130,797 |
| Manure cleanout*** | $ 5,000.00 | per flock | 1 | | $ 5,000 | $ 5,000 | $ 5,000 |
| Miscellaneous | $ 2,500.00 | per total | 1 | | $ 2,500 | $ 2,500 | $ 2,500 |
| **TOTAL VARIABLE COST** | | | | | **$ 779,345** | $ 779,345 | $ 680,717 |
| **TOTAL COST** | | | | | **$ 837,555** | **$ 837,555** | **$ 739,825** |
| **Total cost per bird placed** | | | | | **$ 52.35** | **$ 52.35** | **$ 52.84** |
| **Total cost per dozen eggs** | | | | | **$ 2.13** | **$ 2.13** | **$ 2.26** |

| **Break-even price calculation** | **Price Per Unit** | **Units** | **Quantity** | **Result** | **Result** | **Result** |
|---|---|---|---|---|---|---|
| Eggs produced | | dozen | 393,624 | 393,624 | 393,624 | 326,993 |
| Breaker market revenue | $ 0.74 | $ | 78,725 | $ 58,256 | $ 58,256 | 48,395 |
| Organic market revenue | | $ | 314,899 | $ 779,299 | $ 779,299 | 691,430 |
| **Break-even organic price** | | $/dozen | | **$ 2.475** | **$ 2.475** | **2.643** |
| **Percent increase in break-even organic price** | | | | | **0.00%** | **6.80%** |

* Utilities cost in Options 3 scenario includes an added cost of propane use in winter months (120 days) to offset the heat loss due to lower bird density.
Propane cost equals $1.51/gallon based on 5-week average wholesale price on October 31, 2011, US Energy Information Administration:
www.eia.gov/dnav-pet-pet_pri_wfr_dcus_nus_w.htm
** Labor cost assumes 0.486 hours/hen for the life of flock (15 months) pro-rated to 12 months
*** Manure cleanout includes labor and equipment

**Appendix Table C-3**
**Baseline Enterprise Budget for Large Organic Layer Operation**

**Assumptions:**
Type of operation: Large flock, commercial breed (Commercial brown)
Production configuration: Aviary houses (60' x 450' of floor perimeter) with verandas
Production cycle: Year round production, 1 flock = 15 months (costs are on a 12 months)
Indoor stocking density: 1.2 to 1.5 sq ft/bird (1.25 sq ft/hen)
Outdoor stocking density: 2 sq ft/10% of hens housed providing veranda area
Birds placed each cycle: 100,000 or more. Option 3 requires reduction by 86.5% **0.135**
Mortality rate: 8.3%
Eggs produced per hen: 308 per hen housed (80% of eggs can be marketed as organic eggs; remaining 20% goes into breaker market)
Feed conversion: 3.8 lbs per dozen; increases to **4.0** in Option 3
Pullets purchased at 17 weeks

| | | | | | | | | ESTIMATED REGULATORY COST | |
|---|---|---|---|---|---|---|---|---|---|
| **Costs** | | | | | | | | **Option 2** | **Option 3** |
| **Fixed Costs** | | **Total Fixed Costs** | | | | **Annual Fixed Costs** | | | |
| | **Quantity** | **Price** | **Value** | **Useful Life (years)** | **Depreciation** | **Interest (3%)** | **Annual cost** | **Annual cost** | **Annual cost** |
| House | 1 | $ 2,000,000 | $ 2,000,000 | $ 20 | $ 100,000 | $ 30,000 | $ 130,000 | $ 130,000 | $ 130,000 |
| Composter | 1 | $ 100,000 | $ 100,000 | $ 10 | $ 10,000 | $ 1,500 | $ 11,500 | $ 11,500 | $ 11,500 |
| Equipment Total | 1 | $ 1,500,000 | $ 1,500,000 | $ 10 | $ 150,000 | $ 22,500 | $ 172,500 | $ 172,500 | $ 172,500 |
| Generator | 1 | $ 210,000 | $ 210,000 | $ 10 | $ 21,000 | $ 3,150 | $ 24,150 | $ 24,150 | $ 24,150 |
| Cooler | 1 | $ 165,000 | $ 165,000 | $ 10 | $ 16,500 | $ 2,475 | $ 18,975 | $ 18,975 | $ 18,975 |
| Veranda (land plus fencing and cover) | 1 | $ 11,200.00 | $ 11,200 | $ 10 | $ 1,120 | $ 168 | $ 1,288 | $ 1,288 | $ 1,739 |
| Organic certification | | | | | | | $ 8,000 | $ 8,000 | $ 3,500 |
| Insurance (0.5%) | | | | | | | $ 19,931 | $ 19,931 | $ 19,931 |
| Property tax (0.8%) | | | | | | | $ 31,890 | $ 31,890 | $ 31,890 |
| **TOTAL FIXED COST** | | | **$ 3,986,200** | | **$ 298,620** | **$ 59,793** | **$ 418,234** | **$ 418,234** | **$ 414,184** |

| **Variable Costs** | **Cost Per Unit** | **Units** | **Quantity** | **Total Cost** | **Total Cost** | **Total Cost** |
|---|---|---|---|---|---|---|
| Pullets | $ 6.00 | per pullet | 100,000 | $ 600,000 | $ 600,000 | $ 81,000 |
| Wood chips | $ 2,100.00 | Truckload | 10 | $ 21,000 | $ 21,000 | $ 21,000 |
| Utilities* | $ 6,670.00 | per month | 12 | $ 80,040 | $ 80,040 | $ 244,307 |
| Feed | $ 574.00 | per ton | 4,674 | $ 2,683,040 | $ 2,683,040 | $ 381,274 |
| Labor** | $ 13.25 | per hour | 17,253 | $ 228,602 | $ 228,602 | $ 2,329 |
| Processing and packaging fee | $ 0.40 | per dozen | 2,460,150 | $ 984,060 | $ 984,060 | $ 132,848 |
| Manure cleanout*** | $ 50,000.00 | per flock | 1 | $ 50,000 | $ 50,000 | $ 10,000 |
| Miscellaneous | $ 15,000.00 | per total | 1 | $ 15,000 | $ 15,000 | $ 10,000 |
| **TOTAL VARIABLE COST** | | | | **$ 4,661,742** | **$ 4,661,742** | **$ 882,758** |
| **TOTAL COST** | | | | **$ 5,079,975** | **$ 5,079,975** | **$ 1,296,943** |
| **Total cost per bird placed** | | | | **$ 50.80** | **$ 50.80** | **$ 96.07** |
| **Total cost per dozen eggs** | | | | **$ 2.065** | **$ 2.065** | **$ 3.91** |

| **Break-even price calculation** | | | | | | |
|---|---|---|---|---|---|---|
| | **Price Per Unit** | **Units** | **Quantity** | **Result** | **Result** | **Result** |
| Eggs produced | | dozen | 2,460,150 | 2,460,150 | 2,460,150 | 332,120 |
| Breaker market revenue | $ 0.74 | $ | 492,030 | $ 364,102 | $ 364,102 | $ 49,154 |
| Organic market revenue | | $ | 1,968,120 | $ 4,715,873 | 4,715,873 | 1,247,789 |
| **Break-even organic price** | | $/dozen | | **$ 2.396** | **$ 2.396** | **$ 4.696** |
| **Percent increase in break-even organic price** | | | | | **0.00%** | **96.00%** |

* Utilities cost in Options 3 scenario includes an added cost of propane use in winter months (120 days) to offset the heat loss due to lower bird density.
** Labor cost assumes 0.486 hours/hen for the life of flock (15 months) pro-rated to 12 months
*** Manure cleanout includes labor and equipment

**Appendix Table C-4**
**Baseline Enterprise Budget for Small Organic Broiler Operations**

**Assumptions:**
Type of operation: Small flock, commercial breed (Cornish-Cross or White Rock-Cross)
Production configuration: Pasture with pens
Production cycle: Seasonal production (spring, summer and fall), 4 batches per year
Birds placed each year: 1250, equally spaced in 4 pens
Growout period: 8 weeks (56 days)
Mortality rate: 15%
Dressed weight: 4.5 pounds
Feed conversion: 15 lbs per bird
Birds are marketed directly to customers, no labels

| | | | | | | | | ESTIMATED REGULATORY COST | |
|---|---|---|---|---|---|---|---|---|---|
| **Costs** | | | | | | | | **Option 2** | **Option 3** |
| **Fixed Costs** | **Total Fixed Costs** | | | **Annual Fixed Costs** | | | | | |
| | **Quantity** | **Price** | **Value** | **Years** | **Depreciation** | **Interest (3%)** | **Annual cost** | **Annual cost** | **Annual cost** |
| Brooder House | 1 | $ 5,000 | $ 5,000 | 20 | $ 250 | $ 75 | $ 325 | $ 325 | $ 325 |
| Pens | 4 | $ 200 | $ 800 | 5 | $ 160 | $ 12 | $ 172 | $ 172 | $ 172 |
| Composter | 1 | $ 500 | $ 500 | 10 | $ 50 | $ 8 | $ 58 | $ 58 | $ 58 |
| Waterers+feeders | 5 | $ 60 | $ 300 | 3 | $ 100 | $ 5 | $ 105 | $ 105 | $ 105 |
| Brooder | 1 | $ 125 | $ 125 | 7 | $ 18 | $ 2 | $ 20 | $ 20 | $ 20 |
| Dolly | | | | | | | $ 20 | $ 20 | $ 20 |
| Pasture land | 1 acre | | | | | | $ 120 | $ 120 | $ 120 |
| Organic certification | | | | | | | $ 500 | $ 500 | $ 500 |
| Insurance | | | | | | | $ 34 | $ 34 | $ 34 |
| Property tax | | | | | | | $ 54 | $ 54 | $ 54 |
| **TOTAL FIXED COST** | | | **$ 6,725** | | | | **$ 1,406** | **$ 1,406** | **$ 1,406** |

| **Variable Costs** | **Cost Per Unit** | **Units** | **Quantity** | | | |
|---|---|---|---|---|---|---|
| Chicks | $ 1.00 | per chick | 1,250 | $ 1,250 | $ 1,250 | $ 1,250 |
| Wood chips | $ 150.00 | total | 1 | $ 150 | $ 150 | $ 150 |
| Utilities | $ 50.00 | total | 1 | $ 50 | $ 50 | $ 50 |
| Feed | $ 0.35 | per ton | 18,750 | $ 6,563 | $ 6,563 | $ 6,563 |
| Labor | | | | | | |
| brooder labor* | $ 13.25 | per hour | 28 | $ 371 | $ 371 | $ 371 |
| field labor** | $ 13.25 | per hour | 336 | $ 4,452 | $ 4,452 | $ 4,452 |
| Processing fee | $ 2.50 | per bird | 1,060 | $ 2,650 | $ 2,650 | $ 2,650 |
| Miscellaneous | $ 400.00 | per total | 1 | $ 400 | $ 400 | $ 400 |
| **TOTAL VARIABLE COST** | | | | **$ 15,886** | **$ 15,886** | **$ 15,886** |
| **TOTAL COST** | | | | **$ 17,292** | **$ 17,292** | **$ 17,292** |
| **Total cost per live pound** | | | | **$ 3.617** | **$ 3.625** | **$ 3.625** |

| **Break-even price calculation** | **Result** | **Result** | **Result** |
|---|---|---|---|
| Birds for sale | 1,063 | 1,063 | 1,063 |
| Pounds for sale | 4,781 | 4,781 | 4,781 |
| Break-even revenue | 17,292 | 17,292 | 17,292 |
| **Break-even price per pound of live weight** | **$ 3.617** | **$ 3.625** | **$ 3.625** |
| **Percent increase in break-even price** | | **0.00** | **0.00** |

*Brooder labor assumes 0.5 hours per day times 14 days times 4 batches
**Field labor assumes 0.5 hours per day per pen times 4 pens times 42 days times 4 batches

**Appendix Table C-5**
**Baseline Enterprise Budget and Regulatory Costs Estimates for Large Organic Broiler Operations**

**Baseline Budget Assumptions:**
Type of operation: Large flock, commercial breed
Production configuration: Two 50' x 500' (50,000 sq.ft) single level house with tunnel ventillation, dirt floors and natural light
Outdoor access: Soil 50% covered in vegetation year round, 20% of the indoor space (total of 10,000 sq.ft.)
8 exit doors distributed around the building (24"W x 18"H each)
Production cycle: 6 flocks per year
Indoor stocking rate: 1 sq.ft per bird (for 50,000 birds)
Outdoor stocking rate: 0.2 sq.ft per bird
Growout period: 6 weeks (42 days)
Mortality rate: 5%; Increases to 8% in Option 3
Feed conversion: 1.9 (8.5 pounds of feed for 4.5 pound bird)
Average live weight of finished birds: 4.5 pounds

| **BASELINE BUDGET** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **ESTIMATED REGULATORY COST** | | |
| **Costs** | | | | | | | | | **Option 2** | **Option 3** |
| **Fixed Costs** | | **Total Fixed Costs** | | | **Annual Fixed Costs** | | | | | |
| | **Quantity** | **Price** | **Value** | **Years** | **Depreciation** | **Interest (3%)** | **Annual cost** | | **Annual cost** | **Annual cost** |
| Tunnel house | 2 | $ 180,000 | $ 360,000 | 20 | $ 18,000 | $ 5,400 | $ 23,400 | | $ 23,400 | $ 23,400 |
| Equipment | 2 | $ 110,000 | $ 220,000 | 10 | $ 22,000 | $ 3,300 | $ 25,300 | | $ 25,300 | $ 25,480 |
| Land | 2 | $ 4,800.00 | $ 9,600 | | | | $ 288 | | $ 288 | $ 432 |
| Insurance | | | | | | | $ 2,948 | | $ 2,948 | $ 2,959 |
| Property tax | | | | | | | $ 4,717 | | $ 4,717 | $ 4,735 |
| Organic certification | | | | | | | $ 2,650 | | $ 2,650 | $ 2,650 |
| TOTAL FIXED COST | | | **$ 589,600** | | | | **$ 59,303** | | **$ 59,303** | **$ 59,656** |
| | | | | | | | | | | |
| **Variable Costs** | **Cost Per Unit** | **Units** | **Quantity** | | | | | | | |
| Labor | $ 13.25 | per hour | 1,200 | | | | $ 15,900 | | $ 15,900 | $ 15,900 |
| Feed* | $ 0.35 | per pound | 2,486,250 | | | | $ 870,188 | | $ 870,188 | $ 856,800 |
| Chicks | $ 1.00 | per chick | 300,000 | | | | $ 300,000 | | $ 300,000 | $ 300,000 |
| Medication, vaccination | $ 0.20 | per chick | 300,000 | | | | $ 60,000 | | $ 60,000 | $ 60,000 |
| Harvesting and transport | $ 0.03 | per chick | 300,000 | | | | $ 7,500 | | $ 7,500 | $ 7,500 |
| Utilities | $ 2,500.00 | per flock | 6 | | | | $ 15,000 | | $ 15,000 | $ 15,000 |
| Repairs and maintenance | $ 2,000.00 | per house | 2 | | | | $ 4,000 | | $ 4,000 | $ 4,000 |
| Miscellaneous | $ 2,000.00 | per total | 1 | | | | $ 2,000 | | $ 2,000 | $ 2,000 |
| **TOTAL VARIABLE COST** | | | | | | | **$ 1,274,588** | | **$ 1,274,588** | **$ 1,261,200** |
| **TOTAL COST** | | | | | | | **$ 1,333,890** | | **$ 1,333,890** | **$ 1,320,856** |
| **Total cost per square foot** | | | | | | | **$ 26.6778** | | **$ 26.6778** | **$ 26.4171** |
| **Total cost per pound of live weight** | | | | | | | **$ 1.0401** | | **$ 1.0401** | **$ 1.0635** |
| | | | | | | | | | | |
| **Break-even price calculation** | | | | | | | **Result** | | **Result** | **Result** |
| Live pounds sold*** | | | | | | | 1,282,500 | | 1,282,500 | 1,242,000 |
| Break-even revenue | | | | | | | $1,333,890 | | $1,333,890 | $1,320,856 |
| **Break-even price per pound of live weight** | | | | | | | **$1.0401** | | **$1.0401** | **$1.0635** |
| **Percent increase in break-even price** | | | | | | | | | **0.00%** | **2.25%** |

* Labor cost assumes 200 hours per flock
**Feed cost assumes $700 per ton, 8.5 lbs of feed per bird and 5% mortality evenly distributed
***Producers sells live birds to a processor.