Egg Demand and the Impact
of the American Egg Board:
Executive Summary

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The American Egg Board (AEB), commonly known as the *egg checkoff,* was established in August, 1976 and now has a long history of programs to increase demand for eggs. Since the programs are funded through a mandatory producer assessment on egg production, it is imperative that the industry knows the effectiveness of the dollars spent. Has AEB successfully impacted the demand for fresh eggs? That is the focal issue addressed in this study. Obvious questions include defining demand, measuring the program efforts, identifying major demand drivers, separating AEB's impact from other drivers, and making sure that conclusions and inferences have a scientific base. While the full report will present details in all aspects of the evaluation of the programs, in this Executive Summary we will highlight some of the details but concentrate on the major conclusions.

Eggs have always been a staple food in the human diet and there will be a demand for eggs even in the absence of programs to enhance demand. Most industries experience structural changes, changes in consumption habits, changes in perceptions and knowledge, mis-information, innovations in food uses, fads, food scares, and many others factors that can change the consumption levels and patterns. All commodity checkoff programs are intended in one or more ways to have a positive role in enhancing and/or protecting the demand for the commodity. This role is almost always via the industry having a *voice* with the messages about their products. For many food groups, the product attributes are difficult to determine through consumption alone. For example, a consumer usually cannot determine the nutrient content of an egg just through consumption. If nutrient content is important, that consumer needs to search out that attribute through other means. Information via the egg checkoff can be one of those sources. Households may express concerns about certain food issues but still not change their buying behavior. As such, one needs to first determine what is and is not important to a consumer and equally determine if that expressed concern really translates into different buying behavior. The challenge for commodity checkoff programs is to identify potential demand drivers and then determine their real impacts on demand. For example, I may express real concern about too much sugar yet not change my consumption behavior at all.

In the evaluation and this summary, we will use established statistical methods, and specifically econometric models, to address the above issues. Such models are particularly useful for showing the numerical impact of a demand driver once the actual driver is known and measured. For example, I may indicate that I have cholesterol or other health problems then with the appropriate statistical methods determine if I actually changed my egg consumption levels. Those dimensions of driving the demand for eggs are part of the overall evaluation of the AEB programs.

A Quick Look into the Egg Market

Figure 1 provides a view of the total egg production starting in 2007. Each bar shows the total annual production to range from 90 to over 100 billion eggs annually. The growth in production since 2010 is most apparent except of the 2015 decline at-least partially associated with the Avian Influenza crisis. There was nearly a 14% production increase from 2007 to 2016.

One cannot just look at the total eggs since eggs have three distinct utilization categories. Over the years included in Figure 1, 14% of all eggs were for hatching purposes and 27% went to broken or eggs mostly for food manufacturing and the baking industry. As such, conditions in the food manufacturing sector should dictate much of the need for broken eggs and are likely linked to other inputs in fairly fixed proportions. Hatching eggs are directly tied to the need for normal growth and replacement of laying hens and poultry in general. We are left with 59% of the eggs considered as shell eggs for direct consumption at-home and/or restaurants and fast food outlets. It is this market that most of the AEB program target.

Current data do not give us a precise number for the at-home versus away-from home use of eggs. However, we can approximate that number using the USDA data in Figure 1 and the household data used in the actual models discussed later. For the years 2007 through 2015 in the pie chart, the monthly per capita shell egg consumption was calculated to be 14.9 eggs on average. Reported household egg purchases per person for the same period were 11.3 eggs per month. The 3.61 difference suggests that 75.8% of shell eggs are consumed at-home (recognizing this is not a hard number.) Recent USDA numbers point to nearly 51% of food expenditures are at-home. That is based on all foods expenditures and prices are likely much higher in the away-from-home market thus inflating the away-from-home numbers.

Figure 1. Annual egg production and utilization.

Again using the household data and at-home consumption, nearly 91% of the households consumed some eggs within a month period. There is a very high level of market penetration for eggs or stated differently, only 9% reported no egg purchases. This zero consumption level has major implications for the appropriate models to use.

Over the same years in Figure 1, the average retail price was $1.89 per dozen eggs. Price spikes in 2015 approached $2.46 per dozen for a short period that were mostly associated with the 2015 Avian Influenza problems. Both 2015 and 2016 were very volatile periods for the shell egg market.

Since the egg checkoff is eventually paid by egg producers, it is important to express the egg value at the producer level. Shell eggs are basically the same product between the first handler and the final distribution point. The value difference is directly a product of the retail-farm price spread. The average retail price of $1.89 translates to $1.07 at the farm level or farm value is typically 56% of the retail price. Obviously, this will vary geographically and over time but not substantially except for the unusual events of 2015/2016.

Measures of the AEB Programs

To determine the impact of AEB's programs, one must first have reliable measures of the programs. Many of the evaluations of commodity programs have used the actual Board expenditures as the best indicator of the efforts. While that is still a valid and useful measure, having an alternative measure is useful for adding more confidence to any conclusions drawn. With progress on consumer survey methods, better online communication, and advance data
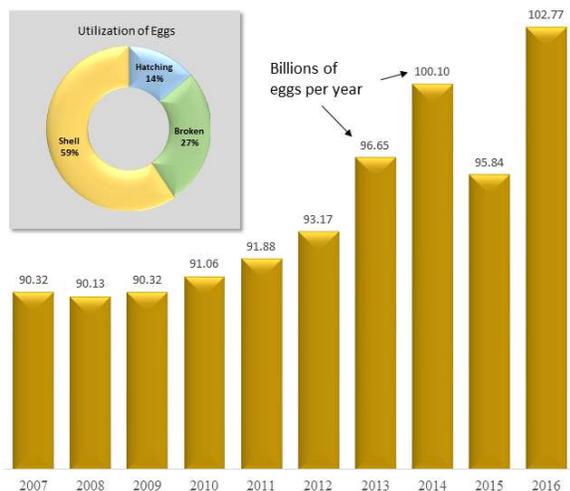
management systems, households are now being asked questions about their awareness of advertising and promotion programs. Scaled awareness scores provide a direct link between the program and the household actually seeing and/or hearing the media efforts. The advantage is the direct link while a disadvantage is the measure is binary, either aware or not aware. Dollars spent on advertising and promotions give a direct measure of the AEB's program intensity, but when those dollars are included in the models one must assume potential

Figure 2. AEB checkoff annual expenditures.

consumers were exposed to the messages. In contrast, awareness tell us if the household was exposed. In the subsequent analyses both are used to measure any generic message's impact on demand.
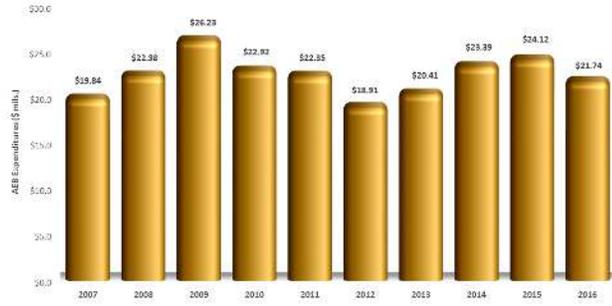
Figure 2 shows household awareness of egg advertising and promotions while Figure 3 gives the actual expenditures. With the household data, individual awareness data were used. The annual numbers are shown just to see the larger trends. On average, awareness slightly increased over the years giving an average of 48% of the households being aware of the egg advertising and promotions. Annual expenditures were approximately $22 million per year for a total of $222.3 million over the 2007 through 2017 periods. With both measures, the fundamental task was to determine if either had a statistically significant impact on egg demand.

In addition to the household awareness, households also indicated the media source (i.e., TV, social media, etc.) and message source, which were both incorporated into the analyses.

Egg Demand Models

Two data sources were used to quantify the demand for eggs, one being the household data

Figure 3. Awareness of egg advertising and promotions.

based on Russell's data and the second being store audit data from Nielsen. The household data provide a rich set of information about the potential consumers including demographics, household behavior, and insight into the households preferences and knowledge about eggs, and the volume of eggs purchased. Recall from above, 9% of the households did not buy eggs so we know a lot about those who did and did not purchase eggs.
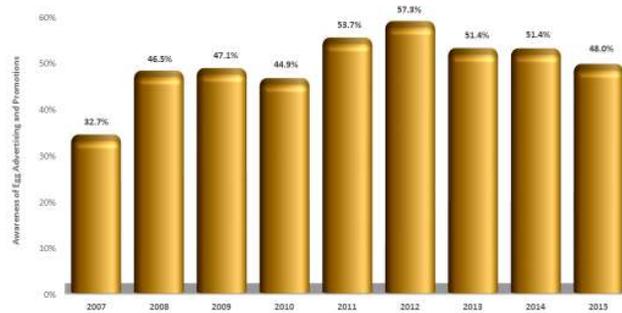
The Nielsen data were aggregated across buyers with egg sales (both volume and price) reported for grocery stores with at least $2 million in annual sales. The Nielsen data are not as rich in consumer information but do show sales by weeks or months and includes information even through part of 2017.

These data sets and accompanying models provide two independent ways to measure the impact of AEB's programs. The impacts from separate and different types of data would never be exactly the same but if the approaches are accurate, they should give similar signals about the program's impact on

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egg demand. Note that the models are not presented in this summary except to emphasize that the impacts of awareness in the household model and expenditures in the monthly model were both positive and statistically highly significant. There is strong statistical evidence of the positive impact of the egg checkoff on the U.S. demand for eggs.

AEB Impact and ROI

Two econometric models not reported in this Executive Summary provide the foundation for estimating the Return-on-Investment (ROI) to the American Egg Board programs. The household model shows awareness of egg advertising and promotions to have a highly statistically significant positive impact on the household demand for eggs. With the Store Audit Model that includes AEB's program expenditures, the generic egg advertising and promotion programs have a statistically significant positive impact on monthly retail demand for eggs purchased through larger grocery chains.

Figure 4 shows these impacts for both methods of analyzing egg demand. Over the years from 2007 through 2015 and across all of the variables included in the household model, the average monthly per capita at-home demand is estimated to be 11.31 eggs with the existing awareness of egg media messages. Without the awareness, household average egg demand drops to 10.71 eggs per capita per month. This is equivalent to .60 per month per capita more than without the advertising and promotions and translates into a 5.3% increase in demand over what would have been without the awareness.

The darker right bars in Figure 4 show the results for the Store Audit Model (or Nielsen data). While this model has less detail about the household, it does include the direct impact of the AEB expenditures contrasted with the media awareness in the household model. Since the store audit data do not cover all outlets, one would naturally expect the average per capita numbers to be lower than the households representing the total population. As seen with these right bars, eggs per capita/month are 8.27 with the actual AEB dollars and 7.73 eggs without those dollars. The difference is .54 more eggs through the larger grocery stores with the presence of the AEB programs. This gain via the store audit model indicates that demand would have been around 6% less in the absence of the AEB programs.

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Major conclusions with this two-fold approach are that the media efforts have a positive and statistically significant impact on egg demand. Furthermore with two totally independent approaches using different data, media measures and models, the impacts on egg demand are shown to be extremely close over the same time periods. Confidence in the conclusions about the effectiveness of the AEB efforts are reinforced with the statistics and closeness of the two econometric approaches to the question of program effectiveness.

We can now take the results from Figure 4 and calculate the ROI for the American Egg Board (see Table 1). The first half of this table is for the household model and the second half for the Store Audit Model. The same eggs per capita in
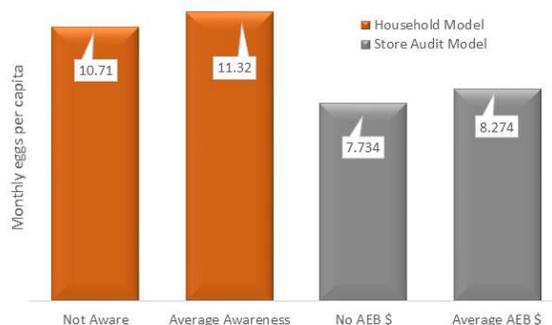
Figure 4. Monthly per capita eggs with and without AEB.

Figure 4 are again shown with the first row of the two-sections of Table 1. Monthly per capita egg demand is converted to annual average eggs and then to retail and farm level values based on the retail and farm level average prices for the periods. Note in the table that the retail store price of $2.05 per dozen eggs is about 8% higher than the average price ($1.89) over the same period.

Now turning to the household model part of Table 1, farm-level sales gains are estimated to be $201 million more than would have been in the absence of the awareness of the egg media. Over the estimation periods, AEB spent on average $22.28 million annually. Dividing the gains by that average gives a ROI of **9.04**. Based on the household approach, each AEB dollar generated an additional nine dollars in farm level sales value. Next turn to the lower portion of Table 1 with the Store Audit results. Equivalent gains expressed at the farm level stand at $196.7 million for the same period as the household estimates. Recall that these gains are based on actual AEB expenditures and not awareness. Again dividing by the average AEB annual expenditures of $22.28 million gives a return of **8.83**.

Table 1. Estimated ROI to the American Egg Board.

Average 2007-2015		Average	Not Aware	Difference
Awareness Model (Russell Data):				
Average Shell Eggs	Capita/mth	11.315	10.714	0.601
Average Pop	Mils.	312.979	312.979	
Annual Shell Eggs	Mils.	42495.413	40238.485	2256.928
Retail Price	$/doz.	$1.89	$1.89	
Farm Price	$/doz.	$1.07	$1.07	
Retail Level Annual	$ Mils.	$6,686.08	$6,330.98	$355.10
Farm Level Annual	$ Mils.	$3,790.91	$3,589.57	$201.33
AEB Avg. Exp.	$ Mils.	$22.28	-	
Retail ROI		-	-	15.94
Farm ROI		-	-	**9.04**

		Actual AEB	No Dollars	
Store Audit Model: (Nielsen data)				
Average Shell Eggs	Capita/mth	8.274	7.734	0.540
Average Pop	Mils.	312.979	312.979	
Annual Shell Eggs	Mils.	31075.184	29048.206	2026.978
Retail Price	$/doz.	$2.05	$2.05	
Farm Price	$/doz.	$1.16	$1.16	
Retail Exp.	$ Mils.	$5,318.93	$4,971.99	$346.94
Farm Level	$ Mils.	$3,015.75	$2,819.04	$196.71
AEB Avg. Exp.	$ Mils.	$22.28	0	$22.28
Retail ROI		-	-	15.57
Farm ROI		-	-	8.83
Coverage				
Store Audit Coverage Percentage		-	-	73.1%

The full report will include all of the statistical details referred to in this summary. A profound conclusion is that the two ROIs are numerically almost the same and there was nothing in the two approaches that would have forced such close values. One has to conclude that the broadest inference about the effectiveness of the generic promotions of eggs to be near the 1:9 level.

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Other Egg Demand Drivers

In this summary, details about the many other demand drivers are not discussed except to provide a list of the variables included. For each non-media driver, the impacts on eggs per capita per month are included in the full report. Then after all are discussed, they are ranked in terms of their relative impacts on the demand for eggs. Those impacts are presented from the most to least influence on the demand for shell eggs.

The following list summarizes the additional variables in the household model:

Demographic:	Growth and Prices	Behavior and Perceptions
• Age		• Egg Nutrition
• Ethnicity	Health	• Egg Value
• Education	• Cholesterol	• Egg Concerns
• Employment	• Exercise	• Lifestyle/Attitudes
• Gender	• Dieting	• Food Ingredients
• Martial	• Medicine	• Food Knowledge
• Children		
• Family Size		

Policy Implications

The models were used first and foremost to draw inferences about the economic impact of the American Egg Board's programs on the demand for shell eggs. Using two approaches, the results are clear that the impacts have been both positive and statistically significant. Yet the models extend far beyond just measuring the impact on demand. They can be used to explore alternative media policies, expenditures and messaging. Many of the non-media measures give considerable insight into what is and is not important in moving the demand for eggs. Each of the non-media demand drivers suggests direction for planning and targeting households with messages about eggs. As will be seen in the full report, there are variables that may be statistically significant but numerically unimportant while others are of considerable importance numerically. That is, the demand for eggs changes in meaningful ways.

Using the estimated impacts to date, we now have a reference point for judging changes in the future as new innovative programs are explored. With additional household data for subsequent years and updated models, one can compare any new gains relative to the model's baseline from this report.

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incredible!

American Egg Board