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TRANSPARENT PLASTIC CARTONS BOOST EGG SALES

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FOREWORD

This publication reports the results of a study conducted by the Department of Agricultural Economics, Maine Agricultural Experiment Station at the University of Maine. The research is part of the Northeastern Regional Poultry Marketing Project, NEM-11, and was financed in part by regional funds.

Shaw's Markets of Portland, Maine, furnished the stores for the experiments. Maine Egg Producers also of Portland supplied the eggs used in the study. The author wishes to express his sincere appreciation to the officials of these organizations and to the plant and store managers for their excellent cooperation. The author is indebted, also to Dr. L. B. Darrah and E. M. Moore of Cornell University for their assistance in obtaining the cartons used in the experiment.

Field work for the study was done by Robert Cruickshank, Guy Hunter, Jr., and Donald Lockhart. Mrs. Dirci Bussell tabulated the data and typed the manuscript.

SUMMARY

In merchandising tests conducted in three supermarkets located in Portland, Maine, sales of large, Grade A eggs were increased an average of 16 per cent using transparent plastic egg cartons. Total egg sales in the stores were increased 11 per cent. The experiment involved testing two types of egg cartons—a completely transparent carton made of clear plastic, and a windowed carton with partial visibility through the top of the carton. A standard 2 x 6, cardboard carton with no visibility—the one regularly used by the supermarkets—was used as a control throughout the tests. In two of the cooperating stores egg sales per 100 customers in the plastic carton exceeded those in the carton regularly used in the stores by 25 and 26 per cent. In the other store the sale of eggs in plastic cartons per 100 customers was less than sales in the regular carton by 7 per cent. Overall egg sales in the windowed cartons were slightly less than those in the regular solid top carton.

In another test involving price differentials for plastic cartons nearly half of the customers were willing to pay a premium amounting to as much as 5-cents a dozen for large eggs in plastic cartons above the price of eggs in regular cartons. When plastics were offered for sale at the same price as regulars, 56 per cent of the egg sales were in plastic; at a 3-cent premium plastic sales amounted to 45 per cent of all egg sales, and when the premium was raised to 5 cents, 48 per cent of the sales were plastic.

Personal interviews with some 631 housewives in six Maine cities give a clue as to why consumers prefer the plastic carton and why the supermarkets sold more eggs in plastic cartons than in the regular type carton. Over-half the housewives (52 per cent) said they liked the plastic carton because they could see the eggs they were buying—the size of the eggs, the shell color, and whether the eggs were cracked or dirty. Another one-third of the housewives selected the plastic carton because of its attractive and clean appearance. Others (5 per cent) felt the plastic carton was durable and provided good protection for the eggs; while some 4 per cent of the housewives would buy the plastic carton because it could be used for various things in the home.

The findings from this study indicate that consumers preferred eggs in transparent cartons which allow complete visibility of the entire contents of the package, and that the use of transparent cartons for displaying eggs in supermarkets resulted in increased egg sales in the short-run. Transparent cartons are available now at a cost which would permit retailers to use them for marketing a premium quality egg, and for promoting egg sales in their stores.

BULLETIN 547

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RICHARD SAUNDERS¹

INTRODUCTION

The trend in consumer packaging during recent years has been toward the use of transparent containers and packages for many products. Customers apparently like to see what they buy and like the attractive appearance of products displayed in transparent containers. Evidence that the customer wants to see the eggs in cartons was obtained by observing shoppers while they made their egg purchases in retail food stores. Many shoppers, it was found, hesitated before making their selection, some ran a hand over the top of the cartons, others picked up the cartons and looked through the ends at the eggs inside, and occasionally a shopper would tear the seal and open the cover in order to see the entire contents of the carton.

These observations, along with the trend toward the use of transparent containers for many other products, indicated that egg sales might be increased if customers were able to see the contents of an egg carton. A transparent plastic egg carton was, therefore, developed to give shoppers complete visibility of the eggs. The transparent carton was test marketed in several cities in central New York State and in Portland, Maine, during 1955.² This publication reports the findings of the Maine test.

DESCRIPTION OF STUDY

Objectives

The objectives of this study were:

1. To determine consumers' preference for a completely transparent egg carton.
2. To determine the effect of transparent cartons on egg sales.
3. To determine the relative proportion of egg sales in the transparent carton when eggs in such cartons are offered at a premium.

¹ Assistant Economist, Maine Agricultural Experiment Station.

² Darrah, L. B., and Moore, E. M., "Egg Merchandising Studies In Supermarkets, Part V—Transparent Egg Cartons," A. E. 1012, Department of Agricultural Economics, Cornell University, April 1956.



FIGURE 1. Types of Cartons Used in the Study.

From top to bottom, molded pulp-board 3 x 4 carton; standard 2 x 6 paper carton commonly used in the test area; the new all-plastic, completely transparent carton; and the two-window carton which allowed nearly complete visibility of the carton's contents.

Types of Cartons Tested

The four types of egg cartons used for the preference study are shown in figure 1. One type of carton was a standard 2 x 6 paper carton commonly used in the area. The second was a 3 x 4 molded pulp-board carton. The third was a two-window carton which had about 40 per cent of the cover devoted to windows, while the fourth was all plastic and completely transparent which allowed visibility of the entire contents of the package.

In the test to determine the effect of transparent cartons on egg sales three of the four types of cartons shown in figure 1 were used—the all plastic, the windowed carton, and the 2 x 6 paper carton regularly used by the stores.

Research Methods Used

Consumer Survey

Consumers' preference for the various types of egg cartons was determined by the survey method. Personal interviews were held with 631 consumers selected at random and stratified by income. Approximately 100 interviews were obtained in each of the following six Maine cities: Portland, Lewiston-Auburn, Augusta, Waterville, Bangor, and Presque Isle.

Store Experiments

The effect of three different types of cartons on supermarket egg sales was measured by a controlled experiment which used a rotational design. That design recognized the importance of conducting the experiment under "normal store operating conditions" or the conditions under which the results of the experiment would later be applied. In addition to the factor of store operating conditions, it was necessary to plan the experiment in such a way that variables such as the type of carton, store and time could be accurately measured. Also required was a means of testing the significance of such differences as were observed. For this study, the latin-square design of experiment was adopted. The experiment was divided into three one-week periods giving a total of three replications. Each carton was rotated every two days in all stores so that at the end of the week, every carton had been tested during one of the two-day periods in all three stores. And at the end of three weeks each carton had been tested on each shopping day of the week in all three stores. The experimental design for this study is shown in the Appendix.

By so rotating each carton the effect of time differences and store differences is eliminated. Other variables known or suspected of influencing egg sales were controlled or measured. Location and size of the egg display in each store was determined initially with the aid of respective store managers. During the period of the experiment the displays remained in their original locations. The number of grades, sizes, quality and prices of eggs and competing products were kept constant by the fact that all stores were of the same chain supplied from a common source. Also, it was general company policy to keep these factors

constant between stores. Store differences and time differences are eliminated by the design of the experiment. Eggs in the test cartons were offered for sale as though they were a part of the regular line of eggs carried by the stores, and no promotion accompanied the sale of eggs.

Variations in sales obtained with the different cartons were tested for statistical significance using the analysis of variance method. The statistical analysis of this study is shown in the Appendix.

A matched-lot experiment was set up to determine the volume of eggs that could be sold in plastic cartons at various price premiums above the price of eggs in regular cartons. Eggs in plastic cartons were offered for sale beside the eggs in the regular cartons. The stores priced their eggs in regular cartons in the usual manner, and price premiums amounting to 3 and 5 cents per dozen above the price of eggs in regular cartons were charged for eggs in plastic cartons.

Limitations of Design

The rotational experimental design used in this study does not measure the long-time carry-over effects of the different types of cartons on egg sales in retail food stores. Therefore, the results of this study show only the short-run effects of different types of cartons on egg sales in retail food stores.

Time of Study

The consumer survey to determine consumers' preference for different types of egg cartons was conducted in June, 1955. The experiment to measure the effect of different types of cartons on egg sales was conducted in September and October, 1955. The test involving price differentials for plastic cartons was made in October, 1955.

Experimental Stores

Three stores were used in the experiment to measure the effect of different types of cartons on egg sales. The stores were large, self-service supermarkets, and members of the same retail food chain. Two of the stores were located in downtown Portland while the other store was in South Portland.

CONSUMERS' PREFERENCE

To determine which type of egg carton consumers preferred, an opinion survey was conducted in six Maine cities. For this survey, the four types of cartons were displayed before consumers in their homes. Consumers were asked to indicate which carton they would be most

likely to pick up and take home with them if the four types of cartons, containing eggs of like color, size, grade and price were placed side by side in the egg display case in a store. They were asked, also, to give their reason for this preference.

About 70 per cent of the consumers interviewed selected the plastic carton (table 1). Eleven per cent of them indicated a preference for the 3 x 4 pulpwood carton and six per cent said they preferred the two-window carton. Only 5 per cent of the 631 consumers interviewed said they would prefer to buy their eggs in a non-window 2 x 6 paper carton.

TABLE I
CONSUMERS' PREFERENCE FOR FOUR TYPES OF CARTONS
Six Maine Cities, June 1955

Type of carton	Number of consumers	Proportion of consumers
Plastic	448	71
3 x 4 paper	71	11
Window	35	6
2 x 6 paper	30	5
No preference	47	7
Total	631	100

In each of the six cities covered in the survey a majority of the consumers selected the plastic carton as the one in which they would prefer to buy their eggs. Preference for plastic ranged from 61 per cent of the consumers interviewed in Augusta to 82 per cent in Portland. The 3 x 4 paper carton received the second highest preference rating in each city surveyed.

The reason most frequently given for selecting the plastic carton was that it allowed visibility of all the eggs (table 2). Egg size, shell color, cracks, and cleanliness were the things consumers said they looked for when buying eggs. One-third of the consumers selected the plastic because of its attractive appearance. Another 5 per cent selected the plastic carton because of its durability, while 4 per cent of the housewives would buy eggs in the plastic carton because it can be used for various things in the home—refrigerator dish, ice-cube tray, container for buttons, screws, and so on. The reason most frequently given for *not* selecting the plastic carton was that it looked "fragile" and would not provide adequate protection for the eggs.

As previously noted, there was considerable preference for the 3 x 4 molded pulpboard carton. Many consumers selected this particular carton because of its shape which they felt was convenient to keep in the refrigerator. Many also liked the 3 x 4 because they had become accustomed to buying eggs in this type of carton. Consumers' objections

TABLE 2
 CONSUMERS' REASONS FOR PREFERRING THE PLASTIC CARTON
 Six Maine Cities, June 1955

Reason	Number of consumers	Proportion of consumers
Visibility	233	52
Attractiveness	148	33
Durability	22	5
Use in the home	18	4
Other reasons	27	6
Total	448	100

to the 3 x 4 carton were that it is hard to open and close, inconvenient to store in the refrigerator, unattractive and lacks visibility. Consumers who preferred the 2 x 6 paper carton did so mainly because of its sturdy appearance. Lack of visibility and plain appearance were the most frequent objections to this carton. Those who selected the window carton liked the visibility it provided along with its durable appearance. Reasons for not selecting this carton were the limited visibility provided by the windows and its lack of attractiveness compared to the plastic carton.

What the consumer says she will do and what she actually does under store conditions may be quite different. Therefore the next step was to measure the actual buying performance of customers when they were offered the same eggs in different types of cartons.

A matched-lot experiment which offered comparable eggs at the same price in the plastic carton and the regular 2 x 6 paper carton was set up in a Portland, Maine, supermarket to determine which type of carton the customer would actually choose in buying eggs. The two types of cartons were offered side-by-side in the display case—one row for each type of carton. The position of each type of carton in the display was changed at randomly selected intervals during the one week test period.

Fifty-six per cent of the customers purchased eggs in the plastic carton (table 3). The regular carton used in this test was a 2 x 6 paper carton and had been used by the store for many years. Customers were

TABLE 3
 EGG SALES BY TYPE OF CARTON
 One Maine Supermarket, Fall, 1955

Type of carton	Dozen	Per cent of total
Plastic	117	56
Regular (2 x 6 paper)	91	44
Total	208	100

Note: All eggs were of the same size and quality (large, grade A), and were sold at the same price, 67 cents per dozen, in both cartons.

satisfied with the eggs they had been buying in this carton, and a large proportion of the customers were reluctant to change to a new type of carton. Therefore the preference for the regular carton was considerably greater than in the opinion survey.

EFFECT OF TRANSPARENT CARTONS ON EGG SALES

A preference by consumers for eggs in plastic cartons does not necessarily mean they will purchase more eggs when offered in a plastic carton. Therefore, the question which yet remained to be answered was, "What effect would the use of transparent cartons have on the volume of egg sales?"

A latin-square experimental test was conducted in three large supermarkets in Portland, Maine, during the three-week period, September 19 to October 8, 1955. In this test involving large, grade A eggs the regular carton, the windowed carton and the plastic carton were used. Each week was divided into three time periods with Monday and Tuesday being used as one time period, Wednesday and Thursday as the second, and Friday and Saturday the third. With this design it was possible to complete one test in one week and to complete the experiment with two replications in three weeks.

Each of the cooperating stores was supplied with cartoned eggs from the same source. Regular deliveries of eggs were made to these stores on Tuesday and Thursday by the supplier, with additional deliveries made by University of Maine personnel as needed. Such an arrangement made it possible to control quality and inventories at all times.

The sale of regular non-window cartons was used as a standard with sales averaging .77 dozen per 100 customers (table 4). With the plastic carton, large grade A egg sales averaged .89 dozen per 100 customers, or 16 per cent above sales in the regular carton. Sales in the window carton averaged .70 dozen per 100 customers, or 9 per cent below sales in the regular carton.

With the use of transparent cartons for large eggs, total egg sales

TABLE 4
EFFECT OF PLASTIC CARTONS ON EGG SALES
Three Maine Supermarkets, Fall, 1955

Type of carton	Egg sales (large)	Egg sales per 100 customers	
		Dozen	Per cent of standard*
	Dozen		
Regular	730	.77	100
Plastic	848	.89	116
Window	672	.70	91

* Regular carton used as standard.

including jumbos, extra large, and mediums were 11 per cent greater than when the regular cartons were used. With the window carton total egg sales were essentially the same as with the regular carton.

As would be expected, the effect of the plastic carton on egg sales varied somewhat among the three cooperating stores. In two of the stores egg sales per 100 customers in the plastic carton exceeded those in the carton regularly used by 25 and 26 per cent (table 5). In the other store sales in plastics were less than those in the regular carton by 7 per cent. This particular store was different from the other stores in that it had a large demand for half-dozens. The fact that half-dozens were not available in plastic, but were available in the regular cartons accounts for the relatively poor showing of plastic cartons in this particular store. Sales in the window carton generally were less than those in the regular carton. The window carton provided limited visibility, and was less attractive than the plastic carton.

TABLE 5
EFFECT OF PLASTIC CARTONS ON EGG SALES BY STORES
Three Maine Supermarkets, Fall, 1955

Type of carton	Store			All stores
	1	2	3	
	Egg sales per 100 customers as a per cent of standard*			
Regular	100	100	100	100
Plastic	125	126	93	91
Window	100	84	79	116

* Regular carton used as standard.

PRICE PREMIUMS ON PLASTIC EGG CARTONS

The cost of a plastic carton was expected to be from 2-cents to 5-cents above the price of the regular egg carton.³ Therefore tests were conducted to determine what proportion of the customers would be willing to pay a premium for eggs in plastic cartons. During a one-week period immediately following the test to determine the effect of plastic cartons on egg sales, large grade A eggs were offered for sale in plastic cartons in one of the cooperating stores used in the previous test. The eggs in plastic cartons were displayed beside comparable eggs in the regular carton, and premiums of 3-cents and 5-cents above the price of regulars were charged for eggs in the plastic cartons. At a 3-cent premium, 45 per cent of the large egg sales were in the plastic carton (table 6). When the premium was increased to 5-cents, plastic-carton sales were

³ Since the test was made, transparent plastic egg cartons have become available in commercial quantities at a cost of approximately 4½ cents each—about 2 cents more than the regular 2 x 6 cardboard cartons.

essentially unaffected, accounting for 48 per cent of the sales. This indicates that a sizeable proportion of the customers were willing to pay an additional 5-cents to buy eggs in a plastic carton even after the plastic cartons had been available in the store at the regular price for a period of three weeks immediately preceding this test.

TABLE 6
EGG SALES IN PLASTIC CARTONS AT PRICE PREMIUMS
One Maine Supermarket, Fall, 1955

Premium*	Total large egg sales	Plastic sales	
	Dozen	Dozen	Per cent of total
3¢	195	88	45
5¢	134	64	48

* Regular large were priced at 69¢ per dozen.

APPENDIX

Experimental Design

To measure the effect of three types of cartons on supermarket egg sales a 3 x 3 latin-square design of experiment was used. The experiment was conducted over a three-week period. Each week was divided into three time periods, with Monday and Tuesday being used as one time period, Wednesday and Thursday as the second, and Friday and Saturday the third. With this design it was possible to complete one test in one week and the experiment with two replications in three weeks. (Appendix table I).

TABLE I
3 x 3 LATIN-SQUARE DESIGN USED IN EGG CARTON EXPERIMENT
Three Maine Supermarkets
September 19 - October 8, 1955

Periods	Stores		
	1	2	3
Test 1:			
I (Monday, Tuesday)	C	A	B
II (Wednesday, Thursday)	A	B	C
III (Friday, Saturday)	B	C	A
Test 2:			
IV (Monday, Tuesday)	B	C	A
V (Wednesday, Thursday)	C	A	B
VI (Friday, Saturday)	A	B	C
Test 3:			
VII (Monday, Tuesday)	A	B	C
VIII (Wednesday, Thursday)	B	C	A
IX (Friday, Saturday)	C	A	B

A, Standard carton; B, Plastic carton; C, Window carton.

Statistical Analysis

The analysis of variance was based on the combined results of the three tests. The F (variance ratio) of 39.84 indicates that the cartons tested in this experiment were significant at the 1 per cent level. (Appendix table II).

TABLE II
 MEAN SQUARES OF VARIANCE OF EGG SALES
 Test 1, 2 and 3 Combined
 Three Maine Supermarkets
 September 19 - October 8, 1955

Source of variance	D.F.	Sum of squares	Mean square	F (variance ratio)*
Tests	2	1,119	560	0.46
Time	2	56,872	28,436	23.52
Stores	2	169,707	84,854	70.19
Cartons	2	96,336	48,168	39.84
Error	18	21,765	1,209	

* F ratio to be compared with $F .99 (2,18) = 6.01$.

The analysis of variance presented above makes no provision for determining statistically significant differences between treatments (cartons). These differences were calculated by subdividing the sums of squares for the three cartons and testing each against the experimental error of the experiment. This makes it possible to determine which cartons are significantly different from the others. F values of .661 and .139 indicate that the differences in sales obtained with the plastic and window cartons as compared to the regular carton were not statistically significant at the 5 per cent level (Appendix table III). Sales with plastic cartons were significantly different from sales with the window carton, as indicated by an F value of 49.45.

TABLE III
 ORTHOGONAL COMPARISONS OF CARTONS AND
 MEAN SQUARES FOR TESTING SIGNIFICANCE
 Tests 1, 2 and 3 Combined
 Three Maine Supermarkets
 September 19 - October 8, 1955

Item	D.F.	Mean squares	F (variance ratio)*
Regular vs. Plastic	1	799	0.661
Regular vs. Window	1	168	0.139
Plastic vs. Window	1	59,789	49.45
Error	18	1,209	

*F ratios to be compared with $F .95 (1,18) = 4.41$.