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Present and Potential Use of
Egg Products
in the
Food Manufacturing
Industry

U. S. DEPARTMENT OF AGRICULTURE
Economic Research Service
Marketing Economics Division

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PREFACE

This study is part of a broad program designed to help increase sales and broaden the markets for farm products. The report contains information concerning the present status of various forms of egg products used by food manufacturing industries, and the economic and technical factors that affect their use in specific applications. It will provide guides to the egg products industry and to government laboratories for improving utilization of egg products.

The study was planned and developed by the Market Potentials Branch, Marketing Economics Division, Economic Research Service, in collaboration with the Poultry Laboratory, Western Utilization Research and Development Division, Agricultural Research Service. Selection and interviewing of firms, analysis of the data, and preliminary reporting of results was carried out under contract by Arthur D. Little, Inc.

The study was conducted under the general supervision of Marshall E. Miller, Chief, Market Potentials Branch and Philip B. Dwoskin, Leader, Food Uses Group, Market Potentials Branch.

Charles C. Slafer, Louis W. Stern, John H. Moriarity, Ralph H. Dudley, and John F. Karr, all of Arthur D. Little, Inc., participated in various phases of questionnaire development, interviewing, and report writing.

Leo Kline, Head, Egg Investigations, Poultry Laboratory, Western Utilization Research and Development Division, provided many valuable suggestions throughout the study.

CONTENTS

	<u>Page</u>
Summary and conclusions	ii
Background of the study	1
Objectives of study	1
Sampling methods and procedure of study	1
Description of firms surveyed	3
Limitations of the study	4
The baking industry	4
Summary	4
Egg product utilization	5
Suggested new or improved egg products	16
Egg procurement practices	17
Egg supplier services	18
The confectionery industry	18
Summary	18
Egg product utilization	19
Suggested new or improved egg products	24
Egg procurement practices	24
Egg supplier services	24
The premix industry	25
Summary	25
Egg product utilization	26
Suggested new or improved egg products	30
Egg procurement practices	31
Egg supplier services	32
Miscellaneous food industries	32
Summary	32
Egg product utilization	33
Suggested new or improved egg products	39
Egg procurement practices	39
Egg supplier services	40
Appendix A - Bakeries	41
Appendix B - Confectioners	50
Appendix C - Premix manufacturers	56
Appendix D - Miscellaneous food manufacturers	61

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SUMMARY AND CONCLUSIONS

A survey of the U. S. food manufacturing industry was made to determine to what extent egg products are used, the forms in which they are used, and the factors that affect the current and potential use of these products.

On a liquid equivalent basis bakeries, the largest users of eggs, purchased about 58 percent of their egg requirements in frozen form and 35 percent in dried form. ^{1/} Confectioners, with the exception of one very large firm that used large quantities of liquid egg whites, used frozen and dried egg albumen and substantial quantities of egg substitutes such as soy albumen, lecithin, and gelatin. Premix manufacturers used dried eggs almost exclusively. Food manufacturers in the miscellaneous group which included firms making baby food, meat and fish products, noodles, macaroni, ravioli, mayonnaise, salad dressing, and a variety of specialty products, used mostly frozen eggs and relatively large quantities of shell eggs.

In general, users of processed egg products in the food manufacturing industry were satisfied with the functional properties of egg products. Most manufacturers felt egg products do the job required of them as well as, and in most cases better than, egg substitutes on the market at the present time. Substitutes include coloring materials, emulsifiers, and thickeners. The most frequent reason given for using egg products was that the formulations called for a particular egg product and it was impossible to achieve the same end results with substitutes. Convenience in use and ease of handling also were frequently mentioned as reasons for preferring one egg product to another. Other factors considered important in the selection of a particular egg product or substitute over another were uniformity in results, longer shelf life, and lower price.

Although a number of firms have experimented with different egg products, most indicated they had made no changes in the use of eggs in the last 5 years. Where changes had been made, they most frequently involved a change from liquid or frozen eggs to dried eggs in the manufacture of cakes and cookies. The change to dried eggs was most apparent among the very large firms in the baking industry.

In recent years, bakers began using premixes mostly in making doughnuts. There has been considerable experimentation with various egg substitutes, but at the time of the survey, these substitutes had generally proved unsatisfactory.

Most food manufacturers did not change the amount or type of egg product in formulas to adjust for seasonal or short-term variations in egg prices. Nor did they change end product prices. Changes in formulations were instituted only after egg prices had experienced long-term permanent changes.

The most important suppliers of egg products to food manufacturers were independent egg processors. Other suppliers included farmers or farmers' co-operatives, brokers, wholesalers, and jobbers. National firms were about equal in importance to local firms as suppliers of egg products. A variety of purchase arrangements were employed by food manufacturers in procuring eggs. Spot purchases and firm contracts were the most widely used methods. However, contracting at a fixed price and buying ahead and storing were the methods most commonly used to help stabilize egg product costs. Hedging egg purchases in the futures market was used to a lesser extent. Respondents were generally satisfied with their purchase

^{1/} One pound of dried egg equals 3.7 pounds of liquid egg.

arrangements. In most instances, purchasers required the USDA stamp of approval on egg products. The practice of purchasing egg products by specification to meet specific needs is growing in importance. Suppliers' brands were also found to be used extensively when ordering certain egg products.

Food manufacturers were generally satisfied with the services being offered to them by their egg suppliers. Most firms were of the opinion that egg suppliers were doing a good job in furnishing them with commodity and price information and price-supply protection. They also rated egg suppliers favorably on delivery performance and on handling complaints. Food manufacturers were of the opinion that in general egg suppliers were not performing as well as other ingredient suppliers in the areas of special product service, research and development activities, and institutional advertising. It was frequently pointed out, however, that some large egg suppliers provide excellent services along these lines.

Based on the findings of this study, the use of dried egg products and premixes containing eggs can be expected to increase substantially in the future. Increases in the use of dried eggs will be largely at the expense of liquid and frozen eggs. The convenience aspect of dried eggs and premixes appeals strongly to food manufacturers. Resistance to the use of dried eggs and premixes is fast disappearing except in the case of the small retail baker.

Because of an increasing demand for egg products with unique characteristics and properties to fulfill special requirements (e.g., dark yolks) by food manufacturers, there may be a tendency toward establishing special arrangements to assure users an adequate supply of product with the desired characteristics at all times.

Changes in the use of egg ingredients present problems in procurement, plant handling, and quality control. Only after ingredient prices have experienced long-term increases are substitutions made or sought. When a less expensive and suitable egg substitute has been developed and used in formulations, it is not readily displaced. Because of this inflexibility it is essential that egg product prices be competitive with egg substitutes currently available as well as those in the development stage. Should egg prices increase over a period of years to a point where substitution does occur, then it would be difficult for egg products to regain their former position due to the reluctance of industrial users to change formulations.

Eggs are only one of a number of ingredients used by food manufacturers in a given end product and frequently account for a relatively small percentage of the total recipe or mix. But the cost of every ingredient, no matter how small it may be in relation to total ingredient cost, is carefully evaluated. Very large food manufacturers frequently spend many thousands of dollars for egg products annually. It is of importance then, that the egg industry do everything possible to maintain and improve the quality of egg products and keep prices at competitive levels.

Further, food manufacturers are becoming increasingly aware of the costs associated with the use of an ingredient as well as its price. With high wage rates prevailing in many areas, in-plant handling costs for individual ingredients are being carefully evaluated by many industrial egg users. Therefore, in addition to maintaining product costs at competitive levels it is also important for the egg industry to make its products convenient to handle. Dried eggs are an example of a higher priced ingredient gaining increased acceptance by food processors largely because of handling convenience and lower waste. Bulk handling of liquid eggs also is receiving increased emphasis as a means of reducing egg handling costs by large users. Ingredient handling costs will continue to become an even greater factor in egg or

egg substitute utilization as the trend toward automation in food manufacturing progresses.

Although food manufacturers were generally satisfied with egg products, a number of suggestions were made for improving the marketing and performance of egg products. These suggestions included efforts to improve the supply-price stability of egg products, quality standardization, packaging and containers, handling and convenience aspects, and functional properties.

PRESENT AND POTENTIAL USE OF EGG PRODUCTS IN THE
FOOD MANUFACTURING INDUSTRY

By Robert V. Enochian and Richard F. Saunders 2/

BACKGROUND OF THE STUDY

Although there has been a steady decline in total per capita egg consumption, production of processed eggs and their use by the food manufacturing industry have been increasing slowly since World War II. In the 1938-1940 period, approximately 18 eggs per capita were utilized annually as processed eggs in the United States. This increased to 24 eggs annually in the 1945-1949 period, 26 eggs per year in the 1950-1954 period, and 27 eggs per year in the 1955-1959 period. The peak consumption year was 1959, when the equivalent of 34 eggs per capita were processed. Some processed eggs are purchased by the Government for distribution to the needy and for use in school lunch programs, both here and abroad, and others are for export sales, but most of them processed in this country are used by the food manufacturing industry.

Since World War II, considerable progress has been made in improving liquid, frozen, and dried (egg solids) products. Research in egg processing technology, quality control, and functional properties conducted at the Department's Western Regional Research Laboratory has paved the way for greater egg product utilization, especially in the dried form. Simultaneously, however, improvements were also being made in egg substitutes. In some cases, these egg substitutes duplicate the functional properties of eggs and are often available to food manufacturers at substantially less cost. This potentially serious threat to the egg industry can be countered by finding more ways to satisfy the egg product needs of food manufacturers.

Objectives of Study

The study was designed primarily to ascertain (1) the present status of egg products in food remanufacturing, (2) to determine what changes might reasonably be expected in these uses within the next few years, and (3) to determine the economic and technical factors that affect the degree of utilization of individual egg products in specific applications.

To fulfill the objectives of the study, it was necessary to learn the product characteristics desired by the major users in addition to finding out current use patterns. The data in this report will provide researchers in the egg processing industry and in Government guides to future product and market development.

Sampling Methods and Procedure of Study

The basic method used in this study was a survey to obtain quantitative and related data from representatives of food manufacturing organizations using egg products or substitutes. Personal interviews were completed with representatives of 333 firms.

2/ Mr. Enochian is an agricultural economist with the Marketing Economics Division, Economic Research Service. Dr. Saunders, formerly an economist with Arthur D. Little, Inc., now is a professor at the University of Maine.

The survey was nationwide in scope, including firms in all the major geographical regions of the United States with the exception of the Mountain region. A somewhat higher proportion of the firms were located in the more heavily populated Middle Atlantic and East Northcentral metropolitan areas.

Seven to ten of the largest firms in each industry classification were selected. Other firms in each of the industries surveyed were chosen at random in 23 cities throughout the United States which have important bakery operations. The greatest concentration of firms interviewed were located in and surrounding the major metropolitan cities. Cities were selected to achieve suitable geographical distribution.

Table 1 gives the number of firms of each type by city. All interviews were conducted between May and October 1961. The largest firms in each of the industries surveyed were contacted by a team made up of an economist and a technician.

Table 1.--Number of firms interviewed for information on egg product utilization by type and location, 1961

Metropolitan area	Bakery	Confectionery	Premix	Other	Total
----- F i r m s -----					
New York-----	30	4	7	23	64
Chicago-----	28	9	8	19	64
Philadelphia-----	16	7	1	1	25
Baltimore-----	16	1	0	4	21
Boston-----	13	4	1	3	21
Los Angeles-----	13	2	3	1	19
Rochester, N. Y.-----	15	0	0	1	16
San Francisco-----	9	2	2	0	13
Minneapolis-St. Paul--	6	1	4	1	12
Pittsburgh-----	9	1	0	1	11
Providence, R. I.-----	10	0	0	0	10
Detroit-----	8	0	1	0	9
Kansas City, Mo.-----	7	1	0	0	8
Cincinnati, Ohio-----	7	0	0	0	7
Little Rock, Ark.-----	5	0	0	0	5
Buffalo, N. Y.-----	4	0	0	0	4
Jersey City, N. J.-----	0	0	1	3	4
Columbus, Ohio-----	4	0	0	0	4
Dayton, Ohio-----	3	0	0	0	3
Newark, N. J.-----	3	0	0	0	3
Atlanta, Ga.-----	1	2	0	0	3
Indianapolis, Ind.-----	1	0	0	2	3
Athens, Ga.-----	1	0	0	0	1
Norwalk, Conn.-----	1	0	0	0	1
Milwaukee, Wisc.-----	0	0	0	1	1
Austin, Minn.-----	0	0	0	1	1
Total-----	210	34	28	61	333

Description of Firms Surveyed

Firms selected for study included bakeries, confectioners, premix manufacturers, and other miscellaneous food manufacturers. Of 333 completed interviews, 210 were with bakeries, 34 with confectioners, 28 with premix manufacturers, and 61 with other food manufacturers.

The bakers interviewed represented a cross section of the industry covering wholesale, grocery chain, home service, and retail bakeries, as well as biscuit and cracker manufacturers. The miscellaneous foods group contains a variety of firms, including manufacturers of noodles, macaroni, and ravioli; salad dressing and mayonnaise; meat and fish products; baby food; and a variety of firms manufacturing specialty products. The specialty products included such items as turkey dressing, bird feed, egg drop soup, fried rice, egg rolls, breading material, binders, dietetic bread and cookies, salmon turnovers, chicken liver puffs, anchovy puffs and rolls, dried soups, blintzes, potato pancakes, potato dumplings, corn fritters, potato dry mix, waffles, lemon pie filling, crunch marshmallow, and frozen omelets.

Table 2 gives a summary description of the firms surveyed, including the number interviewed in each industry and industry subdivision. For a more detailed and complete description, including information on product lines and methods of distribution, see the appendix tables.

Table 2.--Number of firms interviewed about egg product utilization, by type of firm, and percentage of each type in specified size categories

Type of firm	Number of firms	Percentage of each type of firm that had --			
		Single plant operations	Annual gross sales exceed- ing \$5 million	Corporate ownership	Centralized purchasing
		<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Bakeries					
Wholesale-----	90	74	26	78	84
Grocery chain-----	15	53	53	87	73
Home service-----	8	63	50	63	75
Retail-----	86	84	8	53	91
Biscuit, cracker, cookie-----	11	64	46	100	82
Confectioners-----	34	82	35	94	91
Premix-----	28	67	35	88	75
Other foods					
Noodles, macaroni-----	27	68	15	81	90
Dressing, mayonnaise--	9	56	56	89	78
Meat and fish-----	8	38	62	100	88
Baby foods-----	5	20	100	100	83
Specialty products----	12	50	41	83	50

Limitations of the Study

Companies selected for study are not necessarily representative of all firms utilizing egg products. Interviewing was concentrated to some extent among the largest concerns in each industry to make every effort to include the most important egg users. Also, since bakeries are the most important users of egg products, firms were intentionally selected in those cities which contained a large number of important bakery firms. These cities may not be representative of all areas in which firms using egg products are located; therefore, caution should be used in making generalizations from the data obtained in this study.

THE BAKING INDUSTRY

Summary

The 210 bakery firms included in this study used a total 109.5 million pounds of eggs and egg substitutes in calendar year 1960. On the basis of purchased weight 79 percent of this total was frozen, 13 percent dried, 5 percent liquid, and 2 percent shell (table 3). The remaining 1 percent represented various egg substitutes, such as yellow and orange coloring, monoglycerides, emulsifiers, lecithin, vegetable gums, soy flour, and soy protein. Dried eggs and egg substitutes were used primarily by the semiperishable segment of the baking industry (biscuits, cracker, cookie).

Table 3.--Use of eggs and egg substitutes in various forms by food industries surveyed, United States, 1960

Industry	Number of firms	Average quantity used per firm	Percentage of eggs used in various forms ^{1/}					
			Shell	Liquid	Frozen	Dried	Substi- tute	All forms
		1,000 lbs.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Baking-----	210	521.3	2	5	79	13	1	100
Confectionery ^{2/}	34	176.4	0	63	26	4	7	100
Premix-----	28	282.4	0	0	^{3/}	99	1	100
Other ^{4/} -----	61	443.8	34	3	60	3	^{3/}	100

^{1/} Based on actual weights, not liquid equivalents.

^{2/} Mostly albumen.

^{3/} Less than 0.5 percent.

^{4/} Includes firms making baby foods, meat and fish products, noodles, macaroni, ravioli, mayonnaise, salad dressing, and a variety of specialty foods.

Except for large wholesale bakeries, many of which were in the process of switching from frozen to dried eggs in many of their formulations, dried egg usage in the perishable products segment of the industry was negligible. Retail bakeries were the principal users of shell and liquid eggs; however, frozen eggs accounted for more than 80 percent of total retail bakery consumption.

Although 85 percent of the bakers had made no changes in the types of egg products used in end products manufactured during the 5-year period prior to interview, a large number of them, particularly the larger wholesale and grocery chain

bakers, indicated at the time of interview that they were either in the process of changing from frozen to dried eggs or were considering making such a change. Their primary reason for switching was "convenience in handling" (convenience, in most cases, being interpreted as lower handling costs). Because of the widespread interest in dried eggs by bakers in general and the large amount of experimentation with them, an increasing shift to dried eggs is likely, as more bakers become aware of the improvements made in the functional properties of dried eggs and the economies associated with their use.

With the exception of doughnut mixes, which were used by over one-fourth of the survey respondents, premixed ingredients containing eggs were used on a limited basis at the time of the survey. However, considerable interest was expressed in premixed products manufactured to bakers' specifications. Since resistance to premixed ingredients is declining rapidly, substantial increases in the consumption of commercially prepared premixed ingredients can be anticipated in the future. This shift will create a growing market for dried eggs among manufacturers of prepared dry-mixes for the bakery trade.

Generally, bakers were satisfied with the functional properties of egg products and with the services being rendered by egg suppliers. However, they made a number of suggestions for improving egg products and their procurement and use. Obtaining an adequate supply of dark-colored yolks appears to be a problem for many bakers, particularly in maintaining uniform color in products such as cakes. They would like to have the Food and Drug Administration approve the addition of artificial coloring to yolks, or have egg producers control yolk color via feed additives. The solubility of dried eggs also presents a problem to bakers using large quantities of the product. They would like to see a faster and more convenient method developed for rehydrating dried whole egg, albumen, and yolk.

In all probability, the baking industry will continue to be the largest industrial market for processed eggs. However, changes occurring in this market will have an impact on firms supplying ingredients to the baking industry. Small independent wholesale, retail, and home-service bakeries face increasing pressure from large multi-plant wholesale bakeries that have national distribution, as well as the bakeries of the large retail food chains. More and more, egg suppliers will find their markets concentrated among fewer and larger firms that demand a large volume of egg products of uniform quality and at stable and competitive prices. In addition, the trend toward commercial premixes and frozen baked goods make perishability and long distribution channels less important factors in limiting the scale of operations in baking and related industries. The impact of these changes on the egg industry will be felt with increasing severity in the years ahead and will require adjustments in production, processing, and marketing methods used by egg producers and processors.

Egg Product Utilization

Of the 210 bakery firms included in the study, 86 percent used some frozen eggs; 49 percent used dried eggs as such, or in the form of premixes; 26 percent used shell eggs; and 11 percent used liquid eggs in end products produced. Of all the bakeries studied, 16 percent used various egg substitutes, usually in combination with some other form of egg product (table 4).

Considerable variation was found in the extent to which different egg forms and substitutes were used among the various types of bakeries. For example, 45 percent of retail bakers used shell eggs some of the time and for some products.

Table 4.--Number of bakeries by type using eggs or egg substitutes in various forms, 1960

Type of bakery	Number of firms	Percentage of firms using various egg forms				
		Shell	Liquid	Frozen	Dried	Substitutes ^{1/}
		Percent	Percent	Percent	Percent	Percent
Wholesale-----	90	13	9	83	50	13
Grocery chain-----	15	13	13	100	60	7
Home service-----	8	0	0	75	25	12
Retail-----	86	45	16	91	43	15
Biscuit, cracker, cookie-----	11	9	0	55	91	64
All bakeries-----	210	26	11	86	49	16

^{1/} Substitutes used and frequency mentioned include yellow and orange coloring (18), monoglycerides (7), emulsifiers (5), lecithin (5), vegetable gums (4), soy flour (3), soy protein (3), agar-agar (3), cornstarch (3), gluten (2), Irish moss (1), pectin (1), and gelatin (1).

Dried eggs and egg substitutes were widely used by biscuit, cracker, and cookie manufacturers. Sixty percent of the grocery chain bakers were using some dried eggs along with other egg product forms.

The extent to which a particular egg product form was used exclusively, or in combination with other egg products or substitutes, is shown in table 5. Of the bakeries surveyed, 44 percent used frozen eggs exclusively. Another 25 percent of the bakeries used a combination of shell, liquid, or frozen eggs, whereas 4 percent used only shell eggs. While 2 percent of the firms used dried eggs exclusively, this type, in combination with other egg forms, was used by 14 percent of the bakeries. Egg substitutes in combination with various egg forms were used by an additional 8 percent of the bakeries.

Wholesale and grocery chain bakers made more use of dried eggs in conjunction with other egg forms than did the other types of bakeries. Over half of the biscuit-cracker-cookie manufacturers used egg substitutes along with various other egg products while another one-fifth used dried eggs exclusively (table 5). Most retail bake shops and home-service bakeries used frozen eggs, or frozen eggs in combination with shell or liquid eggs. Retail bakers indicated rarely using dried eggs or egg substitutes.

Quantities of various egg product forms used by the different types of bakers in 1960 are shown in table 6. Whereas 49 percent of all bakers used dried eggs (table 4), dried eggs amounted to only 13 percent of the total quantity by weight of eggs and egg substitutes used by these bakers. Frozen egg usage on a pound basis amounted to 79 percent of the total eggs and substitutes used by all bakeries in the study. Although 26 percent of the firms used shell eggs, shell eggs amounted to only 2 percent of the egg usage. Liquid egg usage among bakers was 5 percent of the total. Egg substitutes were used by 16 percent of the firms, but amounted to only 1 percent of the usage on a weight basis.

Table 5.--Percentage of bakeries using various combinations of egg forms and egg substitutes by type of firm, 1960

Egg form used	90	15	8	86	11	210
	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie	Bakers
	P e r c e n t					
Shell eggs only-----	4	0	0	6	0	4
Liquid eggs only-----	0	0	0	1	0	<u>1/</u>
Frozen eggs only-----	48	60	100	35	27	<u>44</u>
Dried eggs only-----	0	0	0	1	18	2
Shell, liquid, frozen, combinations-----	14	20	0	45	0	25
Dried eggs in combination with other egg forms-----	20	20	0	9	0	14
Egg substitutes in combination with various egg forms-----	9	0	0	3	55	8
Other-----	5	0	0	0	0	3
Total-----	100	100	100	100	100	100

1/ Less than 1 percent.

Table 6.--Eggs and egg substitutes used in various forms by bakeries, 1960

Type of bakery	Annual usage per firm	Percentage of each egg form used <u>1/</u>					
		Shell	Liquid	Frozen	Dried	Substi- tutes	All forms
	<u>1,000 lbs.</u>	Percent	Percent	Percent	Percent	Percent	Percent
Wholesale-----	675.1	1	3	77	19	<u>2/</u>	100
Grocery chain----	478.6	<u>2/</u>	1	99	<u>2/</u>	<u>2/</u>	100
Home service-----	402.3	0	0	100	<u>2/</u>	<u>2/</u>	100
Retail-----	403.1	7	10	83	<u>2/</u>	<u>2/</u>	100
Biscuit, cracker : cookie-----	331.8	<u>2/</u>	0	25	58	17	100
Average, all bakeries-----	521.3	2	5	79	13	1	100

1/ On an actual weight basis for all forms.

2/ Less than 0.5 percent.

Dried eggs accounted for less than half of 1 percent of total egg usage among grocery chain, retail, and home-service bakeries. Although 46 percent of these bakers indicated using some dried eggs, in many instances small quantities were used and often on an experimental basis. This same situation prevailed for egg substitutes.

Among wholesale bakers, frozen eggs accounted for 77 percent of total egg consumption, with shell and liquid eggs representing 1 percent and 3 percent of the total, respectively. Dried eggs accounted for the remaining 19 percent. Many wholesale bakers, especially the large ones, indicated they were either in the process of switching to dried eggs or were experimenting with them with the thought of using more in the future. Also, considerable experimentation with egg substitutes was found to be taking place among wholesale bakers, but at the time the survey was made, egg substitutes accounted for less than one-half of 1 percent of the total egg usage. On a liquid equivalent basis wholesale bakers were using nearly as many dried eggs as they were frozen eggs (47 million pounds of frozen compared to 43 million pounds of dried). Within the next 2 or 3 years, dried egg usage is likely to exceed frozen egg usage among wholesale bakers primarily because of greater convenience in use.

The percentage of bakers making end products in which various egg products and substitutes were used is shown in table 7. With few exceptions, all the various forms of eggs, as well as premixes containing eggs and egg substitutes, were used to some extent in all the products. The bakers interviewed varied the ingredients according to their individual preferences. Except for puff pastries, fruit pies, and dough, dried eggs were used in all the major classes of perishable baked goods. From 5 percent to 8 percent of the bakers producing a perishable type of baked goods used dried eggs. Of the biscuit and cracker bakers, 36 percent used dried eggs, 28 percent used egg substitutes, while another 36 percent used no eggs or egg substitutes in these products.

Table 7.--Percentage of bakers using various forms of egg products in specific end products, 1960

End product	Shell eggs	Liquid eggs	Frozen eggs	Dried eggs	Premixes containing eggs	Egg substi- tutes	None or no reply	Total
	P e r c e n t							
Bread and bread type:								
rolls-----	4	1	35	8	1	9	42	100
Sweet goods-----	4	5	63	7	3	9	9	100
Layer-type cake <u>1</u> /--	2	2	58	1	1	2	34	100
Sponge cake <u>2</u> /-----	4	4	73	4	1	2	12	100
Angel food cake-----	0	2	66	5	1	0	26	100
Cakes (all other) <u>3</u> /:	9	6	75	5	1	4	0	100
Doughnuts-----	2	2	26	8	29	5	28	100
Puff pastries-----	14	2	25	0	1	0	58	100
Cookies and brownies:	8	5	68	8	1	8	2	100
Fruit pies-----	0	0	3	0	0	3	94	100
Soft pies-----	9	5	54	5	0	4	23	100
Icings and toppings-:	5	7	68	5	0	15	0	100
Fillings and custards:	15	9	58	5	2	11	0	100
Dough-----	3	10	58	0	10	19	0	100
Biscuits and crackers:	0	0	0	36	0	28	36	100
Other-----	6	4	36	19	0	35	0	100

1/ Non-sponge cake on which lifting is accomplished by the use of baking powder.
2/ Cakes in which lifting is accomplished by mechanically whipping air into the batter.
3/ Includes pound cakes and all other cakes not included in the other categories.

Egg substitutes were used by bakers in most baked goods in varying degrees, the exceptions being angel food cake and puff pastries. End products in which egg substitutes were most widely used were biscuits, crackers, dough, icings and toppings, fillings and custards, bread, yeast-raised sweet goods, and cookies and brownies. They were used to a lesser extent in cakes, doughnuts, and pies.

Although only a small percentage of the bakers used premixes containing eggs at the time of the survey, premixes were being used in a wide variety of baked goods. The only bakery products not having premixes containing eggs were pies, icings, biscuits, and crackers. In 1960, 29 percent of bakers surveyed were using premixes for making doughnuts.

Shell, liquid, and frozen eggs were used in practically all types of baked goods except for biscuits and crackers. Frozen eggs were used to a much greater extent in all end products than either shell or liquid eggs.

It should be pointed out that the percentages in table 7 are based on the number of firms using a particular egg product in a given end product. Since a few of the very large bakeries which account for a high proportion of the volume of business, particularly in the cake line, use a substantial amount of dried eggs, these figures tend to underestimate the importance of dried eggs in many end products. The labor-saving advantage of premixes has greatly reduced resistance to the product among bakers. A number of bakers interviewed indicated a strong interest in having premixes made for them according to their own specifications.

Some interesting differences in the quantities of egg products used in various end products by different types of bakeries are shown in table 8. In general, retail and grocery chain bakers used more eggs in their products than wholesale and home-service bakers. However, there are a number of important exceptions to this. In many instances, information as to the quantity and cost of egg products used in particular end products was not obtained. A number of firms either refused to divulge their formulations or to take time to assemble the information. Because of this, averages denoting the level of egg product usage in various end products are frequently based upon a small number of reports and cannot be relied upon as being representative.

An indication as to the relative importance of eggs in various types of baked goods from both the standpoint of quantity and cost is provided in table 8. Eggs are an important ingredient in the manufacture of many bakery items. In sweet goods, for example, bakers used frozen plain whole eggs at the rate of 8 to 12 percent of the total ingredient weight of the mix. The cost of egg products as a percent of total ingredient cost for making sweet goods also ranged between 8 and 12 percent. In cakes, excluding angel food cake, the level of frozen plain whole egg usage varied between 14 and 27 percent on a weight basis, and from 12 to 40 percent on a cost basis. For wholesale bakers, frozen egg whites in angel food cake averaged 28 and 31 percent of the total weight and cost respectively, while they amounted to 45 and 47 percent for retail bakers. Wholesale bakers used frozen plain whole eggs in puff pastries at an average rate of 7 percent of ingredient weight, which amounted to 14 percent of total ingredient cost, as compared to retail bakers who reported using frozen plain whole eggs in puff pastries at 25 and 33 percent of weight and cost, respectively. In cookies, frozen plain whole eggs amounted to 5 to 12 percent of the total weight of the mix, and 5 to 14 percent of the total cost. Dried yolks were used by cookie manufacturers in the semiperishable bakery classification at an average level of 2 percent of weight and 5 percent of cost. In soft pies, frozen plain whole eggs averaged 18 to 24 percent of the ingredient weight, and 25 to 36 percent

Table 8.--Average weight and cost of eggs or egg substitutes as a percentage of total weight and cost of ingredients in specified bakery products, by type of bakery, 1960

End product and ingredient	Wholesale bakery		Grocery chain		Home service		Retail bakery		Biscuit, cookie, cracker	
	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost
	P e r c e n t									
Bread										
Frozen plain whole eggs-----	2	12	0	0	0	0	1	2	<u>2/</u>	<u>2/</u>
Frozen whites-----	1	2	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Dried fortified whole eggs with stabilizing solids-----	1	5	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Monoglycerides-----	1	<u>2/</u>	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Rolls										
Shell eggs-----	0	0	0	0	0	0	6	7	<u>2/</u>	<u>2/</u>
Frozen plain whole eggs	5	3	0	0	0	0	6	11	<u>2/</u>	<u>2/</u>
Frozen fortified whole eggs with stabilizing solids-----	1	3	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Frozen whites-----	1	<u>1/</u>	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Sweet goods										
Shell eggs-----	0	0	0	0	0	0	8	8	<u>2/</u>	<u>2/</u>
Liquid plain whole eggs	0	0	0	0	2	<u>1/</u>	5	7	<u>2/</u>	<u>2/</u>
Frozen plain whole eggs	10	9	12	10	3	5	8	13	<u>2/</u>	<u>2/</u>
Frozen fortified whole eggs with stabilizing solids-----	5	5	0	0	12	12	8	6	<u>2/</u>	<u>2/</u>
Frozen sugared yolks -	12	5	0	0	0	0	13	19	<u>2/</u>	<u>2/</u>
Frozen whites-----	0	0	0	0	0	0	8	18	<u>2/</u>	<u>2/</u>
Premix containing eggs	1	<u>1/</u>	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Monoglycerides-----	1	<u>1/</u>	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Starch-----	1	<u>1/</u>	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Non-sponge cake										
Shell eggs-----	0	0	0	0	0	0	10	16	<u>2/</u>	<u>2/</u>
Frozen plain whole eggs	14	12	16	13	20	25	20	31	<u>2/</u>	<u>2/</u>
Frozen fortified whole eggs with stabilizing solids-----	7	17	0	0	40	40	16	32	<u>2/</u>	<u>2/</u>
Frozen plain yolks---	0	0	0	0	0	0	5	10	<u>2/</u>	<u>2/</u>
Frozen sugared yolks--	0	0	0	0	0	0	9	13	<u>2/</u>	<u>2/</u>
Frozen whites-----	8	11	10	3	0	0	27	33	<u>2/</u>	<u>2/</u>
Sponge cake										
Shell eggs-----	0	0	0	0	0	0	29	40	<u>2/</u>	<u>2/</u>
Liquid plain whole eggs	0	0	0	0	0	0	21	<u>1/</u>	<u>2/</u>	<u>2/</u>
Frozen plain whole eggs	14	10	27	40	0	0	33	20	<u>2/</u>	<u>2/</u>
Frozen fortified whole eggs with stabilizing solids-----	22	44	0	0	0	0	48	63	<u>2/</u>	<u>2/</u>
Frozen plain yolks---	0	0	44	32	0	0	16	25	<u>2/</u>	<u>2/</u>
Frozen sugared yolks--	11	15	7	7	0	0	43	39	<u>2/</u>	<u>2/</u>
Frozen whites-----	26	24	20	50	0	0	0	0	<u>2/</u>	<u>2/</u>
Angel food cake										
Liquid egg whites----	0	0	0	0	0	0	45	<u>1/</u>	<u>2/</u>	<u>2/</u>
Frozen egg whites----	28	31	38	37	25	39	45	47	<u>2/</u>	<u>2/</u>
Doughnuts										
Frozen plain whole eggs	10	14	0	0	0	0	4	6	<u>2/</u>	<u>2/</u>

Table 8.--Average weight and cost of eggs or egg substitutes as a percentage of total weight and cost of ingredients in specified bakery products, by type of bakery, 1960

End product and ingredient	Wholesale bakery		Grocery chain		Home service		Retail bakery		Biscuit, cookie, cracker	
	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost
----- Percent -----										
Doughnuts (continued)										
Frozen fortified whole eggs with stabilizing solids-----	1	1	0	0	0	0	5	<u>1/</u>	<u>2/</u>	<u>2/</u>
Frozen sugared yolks--	13	16	0	0	0	0	8	<u>1/</u>	<u>2/</u>	<u>2/</u>
Dried fortified whole eggs with stabilizing solids-----	5	15	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Dried plain yolks----	1	15	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Spray-dried albumen--	1	<u>1/</u>	0	0	0	0	1	<u>1/</u>	<u>2/</u>	<u>2/</u>
Premix containing eggs	1	24	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Special emulsifying fats-----	1	<u>1/</u>	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Puff Pastry										
Shell eggs-----	0	0	0	0	0	0	21	30	<u>2/</u>	<u>2/</u>
Frozen plain whole eggs	7	14	0	0	0	0	25	33	<u>2/</u>	<u>2/</u>
Frozen fortified whole eggs with stabilizing solids-----	0	0	0	0	0	0	5	10	<u>2/</u>	<u>2/</u>
Frozen plain yolks---	0	0	0	0	0	0	17	30	<u>2/</u>	<u>2/</u>
Frozen sugared yolks--	5	8	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Frozen whites-----	35	35	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Cookies										
Shell eggs-----	0	0	0	0	0	0	18	21	0	0
Liquid plain whole eggs	0	0	0	0	0	0	16	22	0	0
Frozen plain whole eggs	7	7	8	10	5	5	7	14	12	12
Frozen fortified whole eggs with stabilizing solids-----	0	0	0	0	12	12	6	6	0	0
Frozen plain yolks---	0	0	0	0	0	0	20	30	0	0
Frozen sugared yolks--	0	0	0	0	0	0	3	3	0	0
Frozen whites-----	6	7	60	60	0	0	17	13	0	0
Dried plain yolks----	0	0	0	0	0	0	0	0	12	5
Soy albumen-----	0	0	0	0	0	0	0	0	1	8
Soy lecithin-----	0	0	0	0	0	0	0	0	1	8
Yellow and orange color	0	0	0	0	0	0	0	0	1	8
Soft Pies										
Shell eggs-----	15	35	0	0	0	0	26	39	<u>2/</u>	<u>2/</u>
Liquid plain whole eggs	0	0	0	0	0	0	10	7	<u>2/</u>	<u>2/</u>
Liquid egg whites----	0	0	0	0	0	0	20	27	<u>2/</u>	<u>2/</u>
Frozen plain whole eggs	18	33	20	25	0	0	24	36	<u>2/</u>	<u>2/</u>
Frozen fortified whole eggs with stabilizing solids-----	17	32	0	0	0	0	13	23	<u>2/</u>	<u>2/</u>
Frozen plain yolks---	0	0	10	<u>1/</u>	0	0	26	43	<u>2/</u>	<u>2/</u>
Frozen sugared yolks--	18	25	10	15	0	0	11	14	<u>2/</u>	<u>2/</u>
Frozen whites-----	0	0	15	25	0	0	21	28	<u>2/</u>	<u>2/</u>
Cake (all other)										
Shell eggs-----	26	30	0	0	0	0	0	0	<u>2/</u>	<u>2/</u>
Liquid plain whole eggs	0	0	0	0	15	<u>1/</u>	16	21	<u>2/</u>	<u>2/</u>
Liquid egg whites----	0	0	0	0	0	0	14	16	<u>2/</u>	<u>2/</u>
Frozen plain whole eggs	12	13	18	23	7	7	14	25	<u>2/</u>	<u>2/</u>

-- Continued

Table 8.--Average weight and cost of eggs or egg substitutes as a percentage of total weight and cost of ingredients in specified bakery products, by type of bakery, 1960

End product and ingredient	Wholesale bakery		Grocery chain		Home service		Retail bakery		Biscuit, cookie, cracker	
	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost
<u>P e r c e n t</u>										
Cake (all other, continued)										
Frozen fortified whole eggs with stabilizing solids-----	17	30	0	0	0	0	15	20	2/	2/
Frozen plain yolks---	7	10	0	0	0	0	15	20	2/	2/
Frozen sugared yolks--	10	13	8	6	5	10	9	8	2/	2/
Frozen whites-----	0	0	18	22	0	0	26	22	2/	2/
Dried plain whole eggs	1	1/	0	0	0	0	0	0	2/	2/
Dried fortified whole eggs with stabilizing solids-----	1	2	0	0	0	0	0	0	2/	2/
Dried plain yolks---	1	1/	0	0	0	0	0	0	2/	2/
Premix containing eggs	1	2	0	0	0	0	0	0	2/	2/
Egg Bread										
Shell egg-----	3	10	0	0	0	0	2	5	2/	2/
Frozen plain whole eggs	8	14	0	0	0	0	9	12	2/	2/
Frozen fortified whole eggs with stabilizing solids-----	6	7	0	0	0	0	0	0	2/	2/
Frozen plain yolks---	5	15	0	0	0	0	0	0	2/	2/
Frozen sugared yolks--	0	0	0	0	0	0	10	20	2/	2/
Frozen egg whites----	2	5	0	0	0	0	0	0	2/	2/
Dough										
Liquid plain whole eggs	0	0	0	0	0	0	16	1/	2/	2/
Frozen plain whole eggs	18	15	0	0	0	0	8	17	2/	2/
Dried plain whole eggs	1	1/	0	0	0	0	0	0	2/	2/
Dried plain yolks----	1	1/	0	0	0	0	0	0	2/	2/
Spray-dried albumen --	1	1/	0	0	0	0	0	0	2/	2/
Fillings and custards										
Shell egg-----	25	30	0	0	0	0	42	45	2/	2/
Liquid plain whole eggs	0	0	0	0	0	0	37	37	2/	2/
Liquid egg whites----	0	0	0	0	0	0	80	1/	2/	2/
Frozen plain whole eggs	30	38	0	0	0	0	31	39	2/	2/
Frozen fortified whole eggs with stabilizing solids-----	5	24	0	0	0	0	0	0	2/	2/
Frozen plain yolks---	40	92	0	0	0	0	0	0	2/	2/
Frozen sugared yolks--	18	20	0	0	0	0	8	6	2/	2/
Frozen whites-----	9	20	0	0	0	0	0	0	2/	2/
Dried plain whole eggs	1	1/	0	0	0	0	0	0	2/	2/
Dried plain yolks----	1	1/	0	0	0	0	0	0	2/	2/
Icings and toppings										
Shell eggs-----	0	0	0	0	0	0	69	69	2/	2/
Liquid plain whole eggs	0	0	0	0	0	0	86	53	2/	2/
Liquid egg whites----	0	0	0	0	0	0	26	29	2/	2/
Frozen plain whole eggs	0	0	0	0	0	0	95	99	2/	2/
Frozen sugared yolks--	42	55	0	0	0	0	16	1/	2/	2/
Frozen whites-----	0	0	0	0	0	0	52	53	2/	2/
Agar-agar-----	0	0	0	0	0	0	1	30	2/	2/
Yellow and orange color	0	0	0	0	0	0	1/	1/	2/	2/

1/ Not available.

2/ Not applicable.

of the ingredient cost. Bakers used frozen plain whole eggs in fillings and custards at an average level of 30 percent of the weight of the mix and 40 percent of the ingredient cost. These data indicate that eggs are an important ingredient in many bakery products especially cakes of all types, custards, fillings, icings, and toppings.

It should be emphasized that the cost percentages contained in table 8 do not represent the cost of egg products as a percent of total end product cost where labor, packaging materials, and overhead costs are included. Rather, these figures are the percent of the total cost of all ingredients that go into the mix or recipe. When the cost of ingredients plus labor, overhead, etc., are considered, eggs account for a much smaller part of the total. Therefore, the price of any one ingredient in a given end product is of less importance to bakers than might be gathered from the data contained in table 8.

Generally, bakers were satisfied with the functional properties of egg products. Of the wholesale bakers, 99 percent were content with the functional properties of eggs as were 92 percent of the grocery chain bakers, 88 percent of the home-service bakers, 98 percent of the retail bakers, and 82 percent of the biscuit-cracker-cookie manufacturers.

Bakers' reasons for using different forms of eggs or substitutes generally fall into four categories: Quality, economy, convenience, and formula requirements (table 9). For all but dried eggs, reasons most frequently given for using eggs in baked goods denoted some aspect of quality. The most frequent response having a quality connotation was "gives best results."

Table 9.--Responses of bakers giving reasons' for using different forms of eggs or egg substitutes, in various bakery items, 1960

Egg form or substitute	Quality		Economy		Convenience ^{3/}		Formula requirements ^{5/}
	Gives best results	Other ^{1/}	Lower price or cost	Other ^{2/}	Convenience in handling	Other ^{4/}	
- - - - - R e s p o n s e s - - - - -							
Shell eggs-----	25	13	7	2	5	3	24
Liquid eggs-----	16	16	8	2	3	3	23
Frozen eggs-----	271	179	53	50	161	4	255
Dried eggs-----	12	5	13	6	27	0	11
Egg substitutes--	15	15	5	9	18	0	2
Total responses ^{6/} -	339	228	86	69	214	10	315

^{1/} Uniformity, richness, long shelf life, tasté, flavor, better volume, fresher, preferred by customers, better color, better performance, closer to natural, to control dough temperature, blends better.

^{2/} No spoilage, less storage space, refrigeration not needed, cut down on labor.

^{3/} In most cases, convenience factors can be interpreted to mean cost considerations.

^{4/} Cleaner, no defrosting problem.

^{5/} Includes "no substitute," and "no good substitute."

^{6/} Reasons given may total more than number of bakers because some of the egg forms listed include several different products and each product may be used for making more than one bakery item.

The second most frequent reason given for using shell, liquid, and frozen eggs was that the formula or recipe calls for a particular type of egg product, and since no satisfactory substitute was available, it was impossible to deviate from the formula.

Convenience in handling and use were frequently mentioned as reasons for using a particular egg form or substitute. Most often "convenience" was applied to frozen and dried eggs, although some bakers felt that since liquid eggs required no thawing or defrosting, they were more convenient to use than frozen eggs. It should be pointed out, however, that in most cases, convenience factors can be interpreted to mean cost considerations because of the labor-reducing implications of convenience.

Reasons having to do with economy were given by a somewhat smaller number of bakers. Included here were such things as lower price or cost, no spoilage, less storage space, refrigeration not needed, and less labor required. In conversations with bakers about their reasons for using a particular egg product it seemed they were somewhat reluctant to give lower price and cost as reasons for using a particular egg or substitute product. It was felt that some bakers were apt to give quality as the reason for use when the real reason may have been price or cost. Therefore, the importance of quality as a factor in influencing bakers' decisions to use one egg product or substitute in place of another, probably should be discounted to some degree.

The most important factors in the use of dried eggs are sanitation and ease in handling. Less storage space is required for dried eggs and there are no thawing or container disposal problems. According to some bakers, the combination of these factors results in lower overall costs when dried eggs are used and more than offsets their generally higher price. Despite many bakers' feelings that dried eggs are inferior to other egg forms, a number of them have found that by adding corn syrup solids to dried eggs they have been able to improve their emulsifying properties to a point where they duplicate the emulsifying action found in frozen, liquid, and shell eggs. More bakers are becoming aware of the improvements made in dried eggs and the savings associated with their use. A number of bakers, particularly the large wholesale and grocery chain bakers, were in the process of changing from frozen to dried eggs at the time of the survey.

While most bakers are of the opinion that no good substitutes have yet been found for eggs in most baked products, a few indicated that available substitutes give better results than eggs. For those bakeries using substitutes the most frequent reason given for their use was lower price. Other reasons given were the greater convenience of handling, storing, and using; longer shelf-life; and the lack of uniformity in egg products. The various reasons that bakers gave for using substitutes are given in appendix A, table 43. Although none of the bakers in the survey had switched from egg products to egg substitutes in the past 5 years, many indicated they were experimenting with egg substitutes in various end products, but as yet were not entirely satisfied with the results. These factors, coupled with the generally lower cost and greater convenience of egg substitutes, point up the necessity for research that will keep egg products superior in quality and competitive in cost with egg substitutes.

When bakers were asked to indicate what changes, if any, they had made in their use of specific egg products during the last 5 years 85 percent said no changes had been made. Five percent stated they had changed from using frozen to dried eggs; 2 percent had switched from dried to frozen eggs; and 1 percent had changed from liquid to frozen eggs. These changes are shown in table 10.

Table 10.--Percentage of bakeries by type that have changed egg forms during last 5 years, 1960

Description of change in egg form	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie	All bakeries
	P e r c e n t					
No change-----	85	73	88	90	64	85
From liquid to frozen eggs--	0	0	0	2	0	1
From dried to frozen eggs:	4	0	0	0	0	2
From frozen to dried eggs--	6	20	0	0	27	5
From eggs to premixes----	1	0	0	0	0	1/
More use of substitutes --:	0	0	0	1	0	1/
Started using eggs-----	0	0	0	0	9	1/
Unknown-----	4	7	12	7	0	6

1/ Less than 0.5 percent.

Although only 5 percent of the bakeries surveyed had switched to dried eggs, it should be noted that the firms making this change were the largest users -- the wholesale bakers, grocery chain bakers, and biscuit, cracker, and cookie manufacturers. Furthermore, a number of large firms indicated they were "in the process" of changing to dried eggs, while others said they were "considering" changing to dried eggs. For example, an executive in one of the largest wholesale cake bakeries in the country said they were in the process of shifting all formulas from a frozen to a dried egg basis simply for convenience in handling. Another cake baker with national distribution was using 60 percent of its egg requirements in dried form, whereas 5 years ago only frozen eggs were used. They plan eventually to use only dried eggs in their cake line. Similar comments were made by cookie manufacturers and sweet goods bakers.

Most bakers stated that they did not change the amount or type of egg products in formulas to cope with short-term price variations in these products. All grocery chain, home-service, and biscuit-cracker-cookie bakers, as well as most of the wholesale and retail bakers, stated they did not resort to using egg substitutes and extenders to keep end-product prices competitive, even when egg-product prices had increased substantially. In a few instances where changes occurred they usually involved substituting dried eggs for liquid or frozen eggs, or reducing the egg content slightly by replacing eggs with shortening or sugar.

In the majority of cases, bakers mentioned that prices of egg products never changed enough to force advances in end product prices. When asked whether the prices of egg products ever went low enough to allow price reductions in the finished product, all the biscuit-cracker-cookie manufacturers and most of the wholesale, retail, and home-service bakers answered no. On the other hand, 62 percent of the grocery chain bakers answered yes.

Bakers seldom have price specials on end products as a result of low egg-product prices. Grocery chain bakeries were an exception since they quite frequently have "sales" on angel food cake when the price of egg whites is low.

Substantial sales increases were reported by most wholesale and grocery chain bakers when price specials were run. One-third of the home-service bakers indicated no advance in sales volume when price specials were used, another third reported only slight increases, while the remaining third reported that substantial increases in sales volume resulted from price specials. Half of the retail bakers who ran price specials on end products when egg prices were low reported slight increases, 45 percent reported substantial sales increases, and the remaining 5 percent experienced no increased volume.

Suggested New or Improved Egg Products

Respondents were asked for any comments or suggestions based upon experiences they might have for improving egg products or substitutes. Listed below, in the order of frequency mentioned, are some suggestions offered by bakers for improving the various aspects of egg products and their usage.

1. Water content of frozen egg products should be standardized, with better quality controls and more intensive government inspection to eliminate excess amounts of water. Suggestions are reported substantially as recorded by interviewers and may not accurately reflect an existing problem. Water content of egg products is related to freshness of eggs and the method used for breaking. Egg whites from fresh eggs have higher moisture content than those from older eggs and machine breaking gets more of the white out of the shell than hand breaking. Thus frozen whole eggs that are produced from fresh eggs by machine breaking may have substantially higher moisture content than frozen whole eggs produced from older egg stock by hand breaking. Standard for water content in egg products should thus take these factors into account.
2. Development of disposable containers to replace the 30-lb. tin now used for frozen eggs or a container disposal service provided by egg suppliers, as well as a quicker and easier method of opening the 30-lb. tins. Fibreboard containers which hold 45 pounds are used for marketing eggs, but this is too large a quantity for the smaller baker.
3. The Food and Drug Administration should give its approval to standardizing yolk color by the addition of artificial coloring, or egg producers should control yolk color via feed additives.
4. The Federal Government's egg purchase program should be discontinued because it results in higher prices and is therefore an upsetting influence in the market, and not conducive to increased utilization of eggs.
5. Further improvements of dried eggs are needed to make them comparable to frozen eggs. The whipping properties and solubility of dried eggs must be improved or a faster and more convenient method devised for dissolving or rehydrating dried eggs. In addition, more efficient and rapid methods of defrosting frozen egg products and of eliminating bacterial contamination in liquid and frozen eggs should be developed.
6. Bakers were also asked if a demand existed for any type of egg product not currently being offered for sale. Their response included such things as low cholesterol eggs, sterile egg products, "fresher" liquid eggs, and more "flavorful" frozen eggs.

Egg Procurement Practices

Bakeries relied most heavily upon privately owned egg processing firms for their egg product supplies. Although wholesalers, jobbers, and farmers' cooperatives were used to a lesser extent, overall they were about equal in importance to independent processors as sources of supply.

Both national and local egg suppliers were important sources of egg products for bakeries but local suppliers were the primary source of shell eggs for all segments of the baking industry interviewed. As far as liquid, frozen, and dried egg products are concerned, purchases were about equally divided among local and national suppliers. Except for shell eggs, grocery chain bakeries obtained most of their egg products from national suppliers. Other types of bakeries used national and local suppliers about equally, and only minor variations were noted in regard to specific egg products.

The USDA label was usually specified when purchasing all forms of egg products. Market grades were frequently specified in ordering frozen eggs, while suppliers' brands were important in purchases of both frozen and dried eggs.

Wholesale bakers relied most heavily on spot purchases, firm contracts, and firm contracts plus future purchases with delivery as needed in procuring egg products. For egg substitutes, they made spot purchases and had daily and weekly deliveries. Retail bakers also relied on spot purchases as needed in addition to firm contracts. Spot purchases, plus daily deliveries, were usually employed in purchasing shell or liquid eggs. Grocery chain bakeries relied on firm contracts for purchasing frozen and dried eggs, while spot purchases along with future purchases were used to obtain shell eggs and liquid egg whites. Home-service bakeries used spot purchases to fill their fresh or liquid egg requirements. However, contracts "plus or minus market" and firm contracts combined with spot purchases were used to obtain frozen egg products. In most instances, biscuit-cracker-cookie manufacturers resorted to daily deliveries when purchasing frozen eggs, firm contracts when purchasing dried eggs, and spot purchases when purchasing shell eggs.

Respondents indicated they were generally satisfied with purchase arrangements for egg products. Grocery chain bakers and biscuit-cracker-cookie manufacturers were satisfied with their egg purchasing arrangements. On the other hand, half of the home-service bakers indicated dissatisfaction with their egg purchasing arrangements, while only an occasional mention of dissatisfaction was noted among wholesale and retail bakers.

Contracting at a fixed price and buying ahead or storing were the methods most commonly used by bakers to stabilize their egg product costs. Rarely did bakers hedge egg purchases in the futures market.

A variety of items, other than eggs, were purchased from egg suppliers, including most frequently fruit, butter, baking powder, and shortening. Retail and wholesale bakers rely more heavily on egg suppliers for other ingredients than other types of bakeries. Detailed information on the egg procurement practices of bakery firms is contained in the appendix tables.

Egg Supplier Services

Services most frequently mentioned as being offered by egg suppliers were technical assistance, market and price information, formulas, and product research. However, a substantial number of bakers stated egg suppliers did not offer any services to the bakery trade. Also, as shown in table 11, some grocery chain bakers indicated they did not need the services of egg suppliers. For details of services offered to bakers by suppliers and services desired by bakers see the appendix tables.

Table 11.--Number of bakers giving specified rating for each egg supplier service, 1960

Rating	Commodity: price in- formation	Price supply protection	Delivery: perfor- mance	Handling com- plaints	Develop- ment of special products	Research and develop- ment	Institu- tional advertising
----- B a k e r s -----							
Excellent-----	10	6	31	26	8	10	2
Good-----	63	60	83	92	26	25	8
Fair-----	86	96	82	67	53	31	5
Poor-----	10	5	1	0	6	5	12
None provided---	4	9	0	0	16	31	109
None needed-----	3	4	0	0	42	8	0
Don't know-----	7	5	0	0	32	66	32
Certain suppliers provide-----	0	0	0	0	0	2	9
Total responses :	183	185	197	185	183	178	177

THE CONFECTIONERY INDUSTRY

Summary

Candy manufacturers constitute a sizable market for egg albumen (whites). In this study, 34 candy firms were interviewed, including most of the large, well-known manufacturers distributing brand candy on a national basis. These firms used a total of nearly 6 million pounds of egg albumen and egg substitutes in 1960. Of this total, 63 percent was in liquid form, 26 percent frozen, and 4 percent dried. These percentages are based on actual weights. Egg albumen substitutes (primarily gelatin, soybean lecithin, soy albumen, and coloring) accounted for the other 7 percent (table 3). All but two of the firms interviewed used dried egg albumen.

The majority of candy manufacturers interviewed preferred using dried egg albumen primarily to effect economies in terms of thawing and storage space. Nearly half of the firms preferred spray-dried to pan-dried albumen primarily because of lower price and more rapid solubility.

Egg albumen substitutes were used by almost half of the confectioners interviewed. Reasons given for using them were the lack of uniformity in performance of egg

albumen, and lower price. Soy albumen has replaced egg albumen in some companies because it whips into more stable foams. This change has been made even though it sacrifices the more effective aeration properties of egg albumen. Gelatin has largely replaced natural egg white in marshmallow because of its superior whipping and foam retention characteristics.

Of all the candy makers 80 percent indicated they had not made any change in the type of albumen used in their formulations during the past 5 years. However, considerable experimentation with egg albumen substitutes was found to be underway. This experimentation is motivated primarily by a desire to develop lower cost ingredients that will perform satisfactorily as a replacement for dried egg albumen. On the other hand, several candy makers reported they had recently changed from using egg albumen substitutes to dried egg albumen. There were no indications the candy industry would make any significant changes in egg albumen usage in the near future. Practically all the confectioners interviewed expressed satisfaction with the functional properties of egg albumen and their purchase arrangements with suppliers. Most candy manufacturers do not look to egg albumen suppliers for research and development assistance, since they perform this function themselves.

Egg Product Utilization

Of the confectioners included in the survey 91 percent used dried egg albumen, 15 percent used frozen, and one firm used liquid egg whites (table 12). Nearly half

Table 12.--Percentage of confectioners using egg albumen in various forms, or egg substitutes, 1960

Egg form	Percentage of firms using <u>1/</u>
	<u>Percent</u>
Liquid egg albumen-----	3
Frozen egg albumen-----	15
Dried egg albumen-----	91
Substitutes <u>2/</u> -----	47

1/ Based on interviews with 34 firms.

2/ Substitutes used and frequency mentioned include soy albumen (8), gelatin (7), soybean lecithin (6), yellow and orange coloring (6), pectin (5), soy protein (3), agar-agar (2), vegetable gums (1).

used egg albumen substitutes which included gelatin, soybean lecithin, soy albumen, yellow and orange coloring, and pectin. Egg albumen substitutes were used along with various egg albumen forms by half of the confectioners (table 13). Only 2 of the 34 firms interviewed used egg albumen substitutes exclusively. Dried egg albumen alone was used by 41 percent of the firms. None of the confectioners interviewed used shell, liquid, or frozen albumen only, but one firm used liquid and frozen albumen and several firms used frozen and dried albumen as well as substitutes.

Table 13.--Use of various combinations of egg forms and egg substitutes by confectioners, 1960

Egg form	Firms using	Percentage of firms using
	<u>Number</u>	<u>Percent</u>
Dried egg albumen only-----	14	41
Egg albumen substitutes only-----	2	6
Frozen and liquid egg albumen only-----	1	3
Egg albumen substitutes and frozen and dried egg albumen-----	17	50
Total-----	34	100

Relative quantities of egg albumen and substitute products used by the confectioners interviewed are shown in table 14. The quantity of liquid whites used amounted to 63 percent of the total egg albumen and substitute products used by all the confectioners included in the survey. In most firms usage of frozen and dried egg albumen was about equal when dried egg albumen is converted to a liquid weight equivalent. A total of 421,000 pounds of egg albumen substitutes were used by the candy manufacturers interviewed, representing 7 percent of the total egg albumen and substitute product usage.

Table 14.--Quantities of egg albumen and egg substitutes used in various forms by confectioners, 1960

Egg form	Estimated annual usage	Percentage distribution <u>1/</u>
	<u>1,000 pounds</u>	<u>Percent</u>
Liquid albumen-----	3,800	63
Frozen albumen-----	1,556	26
Dried albumen-----	220	4
Substitutes-----	421	7
Total-----	5,997	100

1/ Based on actual weight.

Except for hard candy and gum, dried egg albumen was used to some extent in all types of candy produced by the confectioners in the survey (table 15). The level of usage of dried albumen in all the various end products manufactured amounted to 1 percent of the total weight of the formulation. The cost of dried egg albumen varied from 2 percent to 10 percent of the total ingredient cost, depending upon the type of candy made (table 16).

Table 15.--Percentage of confectioners using various forms of egg albumen or egg substitutes in specified end products, 1960

End product	Egg albumen			Egg substitutes	None or no reply	Total
	Liquid	Frozen	Dried			
	----- P e r c e n t -----					
Nougats, nougatines-----	5	10	75	10	0	100
Cream-filled chocolates--	0	8	60	24	8	100
Hand-rolled creams-----	0	8	58	0	34	100
Bar-type candy-----	0	0	32	16	52	100
Fudge, penuche-----	0	6	50	13	31	100
Marshmallows-----	0	0	61	39	0	100
Kisses-----	0	0	30	20	50	100
Hard candy-----	0	0	0	6	94	100
Caramels-----	0	14	43	43	0	100
Chocolate coated candy---	0	0	12	25	63	100
Gum-----	0	0	0	50	50	100
Jellies-----	0	0	12	88	0	100
Coconut candies-----	0	0	29	0	71	100
Coated nuts-----	0	0	25	0	75	100
Coatings, icings-----	0	8	8	15	69	100
Other-----	0	0	0	31	69	100

Table 16.--Average weight and cost of various forms of egg albumen and egg substitutes as a percentage of total weight and cost of ingredients in specified candy products

Egg ingredient	Nougats and nougatines		Cream filled chocolate		Hand-rolled creams		Bar-type candy		Fudge, penuche		Marshmallow		Kisses		Caramels		Jellies	
	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C	W	C
	----- P e r c e n t -----																	
Spray-dried egg albumen-----	1	4	1	1/	1	4	1	4	1	2	1	1/	1	1/	1	1/	0	0
Pan-dried egg albumen (powdered)	1	1	1	2	1	1/	1	10	1	1/	1	4	1	1/	0	0	1	2
Pan-dried egg albumen (flakes)--	1	1/	1	3	1	6	1	5	1	1/	1	1/	1	1/	1	1/	0	0
Soy albumen-----	1	3	1	1	0	0	1	1/	1	1/	1	1/	0	0	0	0	0	0
Soybean lecithin---	0	0	1	1/	0	0	0	0	1	1/	0	0	0	0	1	1/	0	0
Pectin-----	1	1/	1	1/	0	0	0	0	0	0	1	1/	1	1/	0	0	1	1/
Yellow and orange coloring-----	0	0	1	1/	0	0	1	1/	0	0	1	1/	1	1/	0	0	1	1/

1/ Not available.

Egg substitutes, such as soy albumen, soybean lecithin, pectin, and yellow and orange coloring were also used in most end products. Exceptions to this were hand rolled creams, coconut candies, and coated nuts. As with dried egg albumen, egg substitutes represented 1 percent of the total formulation. In a few end products, egg substitutes were used more frequently than were egg products. These included chocolate coated candy, gum, jellies, and coatings and icings. The relatively few firms using frozen egg whites used them in nougats and nougatines, cream-filled chocolates, hand-rolled creams, fudge, penuche, and caramels. The significance of the data in table 16 is the lesser importance of eggs in candy products than in bakery products.

Reasons given by confectioners for using a particular egg albumen form or substitute, in order of frequency mentioned, are shown in table 17. Dried albumen is preferred to frozen by most candy manufacturers. Frozen albumen is difficult to handle because of thawing and storage space requirements, as well as being in packages too large for convenient use.

Table 17.--Number of confectioners giving specified reasons for using different egg or substitute products, 1960

Egg form or substitute	Quality		Economy		Convenience	Formula requirements ^{4/}
	Gives best results	Other ^{1/}	Lower price or cost	Other ^{2/}	in handling ^{3/}	
----- C o n f e c t i o n e r s -----						
Liquid-----	0	0	1	0	0	0
Frozen-----	1	3	0	2	0	1
Dried-----	15	22	9	4	18	17
Egg substitute-----	1	10	3	2	15	8
Total reasons ^{5/} -	17	35	13	8	33	26

^{1/} Uniformity, shelf life, taste, flavor, volume, fresher, performance, aeration, drying and moisture control, emulsification, body, and color.

^{2/} No spoilage, less storage space, refrigeration not needed.

^{3/} In most cases convenience factors can be interpreted to mean cost considerations.

^{4/} Includes "no substitute."

^{5/} Reasons given may total more than number of confectioners because of multiple replies.

Spray-dried albumen was preferred to pan-dried by nearly half of the firms because of its lower cost and superior solubility characteristics. Although pan-dried flakes and granules give more body to a product, they must be soaked for at least 6 hours, whereas spray-dried egg albumen dissolves in less than an hour.

Egg substitutes are used by some confectioners because they are more uniform in quality as well as cheaper and more stable in price than eggs. Soy albumen is used in place of egg albumen because of its stability in the whipping operation even though it means sacrificing the better aeration.

Pectin is used in jelly for its quick aeration while gelatin is replacing egg whites in marshmallows because of its superior whipping and moisture retention qualities. Egg white marshmallows must be coated immediately to prevent drying out, whereas gelatin marshmallows do not require immediate coating.

Eighty percent of the confectioners interviewed had made no changes in the type of albumen used in their formulations during the last 5 years (table 18). About 14 percent of the firms reported switching from egg albumen substitutes to dried egg albumen, while one firm had shifted from frozen egg whites to dried egg albumen in formulas because the dried form gave more body to its products.

Table 18.--Changes made by confectioners in the form of albumen used in the last 5 years 1/

Description of change	Firms	Percentage of firms
	<u>Number</u>	<u>Percent</u>
From dried egg albumen to gelatin <u>2/</u> ---	1	3
From egg albumen substitutes to dried egg albumen-----	5	14
From frozen to dried egg albumen <u>3/</u> ----	1	3
No change-----	27	80
Total-----	34	100

1/ Reported in 1960.

2/ Egg albumen replaced by gelatin in marshmallows because of longer life and less drying out.

3/ Adds more body.

Considerable experimentation with egg albumen substitutes is being conducted by the confectioners interviewed. This work is of a continuing nature, and is motivated by a desire to develop lower-cost ingredients that will perform satisfactorily in products currently utilizing spray-dried egg albumen.

Confectioners rarely change the amount or type of egg albumen in formulas in order to reflect variations in prices of egg albumen. In those instances where confectioners reported changing their formulas, it involved the substitution of soy albumen for dried egg albumen.

All of the confectioners interviewed indicated they did not raise end-product prices when egg albumen prices increased. Instead, they tended to replace egg albumen with substitutes and extenders to keep end-product prices competitive. All of the confectioners felt that egg albumen prices never fall low enough to allow price reductions in the finished products.

Since 97 percent of the firms indicated they were satisfied with the functional properties of egg albumen the basic reason for using egg albumen substitutes is their lower price. Other reasons were insignificant when compared to this aspect.

Suggested New or Improved Egg Products

A number of confectioners indicated that further improvements in the solubility rate of dried egg albumen is needed. More uniformity of dried egg albumen was also suggested. One shortcoming of soy albumen mentioned was its poor aeration when compared with egg albumen.

When confectioners were asked if there is a need for any new or improved egg product not currently offered for sale, 87 percent said they could think of nothing new that would be potentially useful. Suggestions made by the remaining 13 percent included better flavor, better aeration properties, and the development of candies, including Easter eggs containing whole eggs.

Egg Procurement Practices

Confectioners purchased egg albumen primarily from independent egg processors but broker and wholesale sources were also used to some extent. Farmers' co-operatives, local and terminal assemblers, and bakery supply jobbers were frequently mentioned as suppliers of egg products to candy manufacturers. Suppliers who distributed egg products nationally, however, are by far the most important source of egg albumen to candy manufacturers.

The USDA label, specific grades, and suppliers' brands were specified in an equal number of instances when purchasing frozen and dried egg whites. Spot purchases and firm contracts were used most frequently by confectioners to obtain egg whites. Egg substitutes were obtained through spot purchases along with contracts and futures purchases. About 80 percent of the confectioners interviewed were satisfied with their egg albumen purchase arrangements.

Of the 34 confectioners interviewed 47 percent stated they hedged their purchases to stabilize egg product costs, while 27 percent indicated they repurchased and stored these products.

A number of confectioners utilized egg product suppliers as sources for other miscellaneous products. More than 50 percent listed either margarine, nuts, or gelatin as other materials obtained from egg product suppliers. Further details regarding egg procurement are given in the appendix tables.

Egg Supplier Services

When confectioners were asked what specific services egg suppliers offered, half of them stated that they did not require egg supplier services or that they were not aware of any services available from these sources. In those cases in which specific services were mentioned as being available, technical assistance, formulas, and market information were most frequently indicated (table 19). For further information about egg supplier services see the appendix tables.

Table 19.--Number of confectioners giving specified rating for each egg supplier service, 1960

Rating	Commodity price information	Price supply protection	Delivery performance	Handling complaints	Development of special products	Research and development	Institutional advertising
----- C o n f e c t i o n e r s -----							
Excellent-----	2	1	8	3	1	1	0
Good-----	14	9	17	19	5	2	0
Fair-----	11	13	8	6	6	4	1
Poor-----	0	0	0	0	1	3	2
None provided----	1	0	0	0	4	7	14
None needed-----	2	4	0	0	6	3	0
Don't know-----	0	0	0	0	6	5	9
Certain suppliers provide-----	0	0	0	0	0	2	0
Total responses :	30	27	33	28	29	27	26

THE PREMIX INDUSTRY

Summary

As would be expected premix manufacturers making formulations which included eggs were found to use dried eggs almost exclusively. Annual usage of eggs and egg substitutes by all of the 28 premix manufacturers interviewed was 7.9 million pounds, of which 99 percent was dried eggs. Egg substitutes, including vegetable gums, soy lecithin, soy flour, emulsifiers, agar-agar, pectin, Irish moss, starch, monoglycerides, soy protein, coloring, and gluten accounted for nearly all of the remaining 1 percent of total egg and substitute usage (table 3). Dried eggs in combination with egg substitutes were used by 43 percent of the firms surveyed, while another 36 percent used dried eggs only. The egg forms used by the large majority of firms in the remaining 21 percent were not disclosed by the individuals interviewed.

All of the 28 premix manufacturers made premixes for institutional and commercial use and seven of the firms made premixes for both commercial and home consumption. All used some eggs in their premixes.

The level of dried egg usage in premixes varied between 1 percent and 13 percent of the total quantity of the mix, depending upon the type and quality of the mix and with the particular egg product used.

According to premix manufacturers, eggs are used because there is no available substitute that will give better or equal results. Egg yolks often are used instead of whole eggs because smaller quantities can be used to achieve the same results. Some manufacturers prefer to use plain yolks because they feel they are a good base egg ingredient upon which to build a formula, while others prefer sugared yolks because of their greater stability, longer shelf life, and slightly better performance. Egg substitutes were generally considered inferior to eggs and, therefore, were not widely used.

Only one premix manufacturer indicated a change had been made in the type of egg products used during the past 5 years. This change involved the use of soy and oat flours in lieu of dried egg yolks in cake mixes and was prompted by the comparatively high price of egg yolks. The majority of firms, however, did not change amounts or types of egg products in their formulas to cope with variations in egg prices. When changes were effected, they involved altering the egg content in mixes slightly and this was done only after eggs had experienced long-term price increases. No important changes in the type of egg products used by premix manufacturers appear to be imminent. However, the use of premixes will no doubt continue to increase, especially in the industrial and institutional fields, which means an expanding market for dried eggs.

Egg Product Utilization

Of the 28 premix firms interviewed, 86 percent used dried eggs, 11 percent used some frozen eggs, and one firm used a small quantity of liquid eggs. None of the firms in this industry group used shell eggs. About a third of the companies used egg substitutes (table 20).

Table 20.--Premix manufacturers using eggs and substitutes in various forms, 1960 ^{1/}

Egg form	Firms using	Percentage of firms using
	<u>Number</u>	<u>Percent</u>
Liquid-----	1	4
Frozen-----	3	11
Dried-----	24	86
Substitutes ^{2/} -----	10	36

^{1/} Based on interviews with 28 firms.

^{2/} Substitutes used and fequency mentioned include vegetable gums (7), soy lecithin (6), soy flour (5), emulsifiers (4), agar-agar (4), pectin (3), Irish moss (3), starch (3), monoglycerides (3), soy protein (2), yellow and orange coloring (2), and gluten (1).

Dried eggs, in combination with egg substitutes, were utilized by 43 percent of the firms studied, while another 36 percent used dried eggs exclusively (table 21).

Table 21.--Premix manufacturers using various combinations of egg forms, 1960

Combinations of egg forms	Firms using	Percentage of firms
	<u>Number</u>	<u>Percent</u>
Dried eggs only-----	10	36
Dried eggs and other egg forms ^{1/} -----	1	3
Dried eggs and egg substitutes-----	12	43
Unknown combinations-----	5	18
Total-----	28	100

^{1/} Frozen sugared yolks for lemon pie filling mix.

One premix firm used frozen sugared yolks for lemon pie filling in addition to the usual dried egg products such as dried plain whole egg and spray-dried albumen. Dried eggs accounted for almost all of the total egg product consumption, with egg substitutes representing most of the balance (table 22).

Table 22.--Quantities of eggs and substitutes used in various forms by premix manufacturers, 1960

Egg form	Quantity	Percentage distribution
	<u>1,000 pounds</u>	<u>Percent</u>
Liquid-----	1/	1/
Frozen-----	31	2/
Dried-----	7,774	99
Substitutes-----	101	1
Total-----	7,906	100

1/ Less than 1,000 pounds.

2/ Less than 0.5 percent.

Because dried eggs are the major egg products used in the manufacture of prepared dry mixes, the popularity of various types of dried eggs used in a number of specific mixes is pointed out in table 23. Spray-dried plain yolks were mentioned 69 times by the 28 premix manufacturers interviewed, and was used most consistently in doughnut mix. Spray-dried albumen and dried plain whole egg were mentioned 59 and 54 times, respectively. Spray-dried albumen was used most widely in meringue and white cake mix, while dried plain whole egg was preferred for spice cake and gingerbread cake mixes. It appears that egg substitutes are also employed quite frequently by premix manufacturers, with the most popular usage being for meringue.

All of the 28 prepared dry-mix manufacturers included in the study made premixes for commercial and institutional food service consumption, with seven of these firms producing premixes for both home and commercial consumption. All premix manufacturers used some eggs in their products. Two of the seven firms making premixes for home consumption recommended the use of additional eggs by the housewife. Use of additional eggs in premixes for commercial use was recommended by 8 of the 28 manufacturers.

Dried egg usage in premixes varied from 1 to 13 percent of the total weight of the mix, depending upon the particular egg product used and the kind and quality of mix made (table 24). The cost of dried eggs as a percentage of the total ingredient cost for the mix varied from 2 to 20 percent for the different premixes and egg products.

Dried eggs are required in prepared dry mixes where moisture cannot be tolerated. According to premix manufacturers, eggs are used since no substitute is currently available that will give equal or better results in providing richness,

Table 23.--Number of premix manufacturers using egg products and egg substitutes in specified dry mixes, 1960

Dry mix	: Frozen eggs 1/		: Egg substitutes		: Dried plain whole eggs		: Spray-dried plain yolks		: Dried sugared yolks		: Dried whole egg solids fortified with milk		: Pan-dried flake albumen	
	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost
----- F i r m s -----														
White cake mix-----	0	3	6	5	9	0	0	1	0	0	0	0	0	1
Spice cake mix-----	0	4	7	7	5	0	0	1	0	0	0	0	1	
Angel food cake mix----	0	3	3	3	6	0	0	1	0	0	0	0	1	
Chiffon cake mix-----	0	2	2	3	3	0	0	1	0	0	0	0	0	
Yellow cake mix-----	0	4	3	7	3	0	0	1	0	0	0	0	1	
Chocolate cake mix-----	0	5	5	6	5	0	0	1	0	0	0	0	0	
Cake mix (other)-----	0	4	0	0	0	0	0	1	0	0	0	0	0	
Cookie mix-----	0	0	2	2	0	0	0	1	0	0	0	0	0	
Brownie mix-----	0	2	2	2	3	0	0	1	0	0	0	0	0	
Gingerbread mix-----	0	1	6	4	3	0	2	1	0	0	0	0	0	
Biscuit mix-----	0	1	1	0	0	0	0	1	0	0	0	0	0	
Waffle mix-----	0	2	0	5	0	0	1	0	0	1	0	0	0	
Doughnut mix-----	1	2	2	10	4	1	0	1	0	0	0	0	0	
Pancake mix-----	0	2	2	5	1	0	0	1	0	0	0	0	0	
Muffin mix-----	1	3	4	2	0	0	1	0	1	0	0	0	0	
Sweet dough mix-----	0	2	2	2	1	1	0	1	0	0	0	0	0	
Meringue mix-----	0	6	0	0	12	0	0	1	0	0	1	0	1	
Lemon pie filling mix--	1	0	1	0	1	0	0	1	0	0	0	0	0	
Marshmallow mix-----	0	3	0	0	2	0	0	1	0	0	0	0	1	
Dessert powders and pudding mixes-----	0	1	0	3	1	0	0	1	0	0	0	0	0	
Ice cream mix-----	0	1	0	0	0	0	0	1	0	0	0	0	0	
Hot chocolate drink mix-	0	2	0	0	0	0	0	1	0	0	0	0	0	
Yeast raised sweet goods mix-----	0	0	0	1	0	0	0	1	0	0	0	0	0	
Other mixes-----	0	1	6	2	0	0	0	1	0	0	0	0	1	
Total responses 2/--	3	54	54	69	59	2	4	7						

1/ Frozen plain yolks are used in doughnut mix, frozen plain whole eggs in muffin mix, and frozen sugared yolks in lemon pie filling mix.

2/ Responses given may total more than number of premix manufacturers because of multiple replies.

Table 24.--Average weight and cost of eggs and substitutes as a percentage of total weight and cost of ingredients in specified premixes, 1960

Type of mix	: Dried plain whole eggs		: Dried plain yolks		: Spray-dried albumen		: Soy albumen		: Vegetable gums	
	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost	Weight	Cost
----- P e r c e n t -----										
All cake-----	3	3	2	7	1/	1/	1/	1/	1/	1/
Waffle-----	1/	1/	11	8	1/	1/	1/	1/	1/	1/
Doughnut-----	2	7	10	17	1/	1/	1/	1/	1/	1/
Pancake-----	5	9	2	10	1/	1/	1/	1/	1/	1/
Muffin-----	5	15	1	10	1/	1/	1/	1/	1/	1/
Sweet dough-----	13	20	2	2	1/	1/	1/	1/	1/	1/
Meringue-----	1/	1/	1/	1/	1	36	1	6	1	4

1/ Not applicable.

taste, flavor, volume, color, body, texture, aeration, and long shelf life (table 25). Premix manufacturers reported that changes are constantly being made in formulations, but these changes often involve variations in the amount of eggs used in premixes rather than substitutions.

Table 25.--Number of premix manufacturers giving specified reasons for using different forms of egg or substitute products, 1960

Egg form or substitute	Quality		Lower price or cost	Convenience in handling	Formula requirements
	Gives best results	Other ^{1/}			
----- P r e m i x m a n u f a c t u r e r s -----					
Dried eggs-----	30	36	23	7	40
Egg substitutes-----	2	0	2	0	3
Total responses ^{4/} --	32	36	25	7	43

^{1/} Richness, taste, flavor, volume, color, body, texture, aeration, and shelf life.

^{2/} In most cases convenience factors can be interpreted to mean cost considerations.

^{3/} Includes "no substitute."

^{4/} Reasons given may total more than number of premix manufacturers because of multiple replies.

Dried plain yolks are more often used than dried whole eggs in formulas because smaller quantities are required to achieve the same results. Some premix manufacturers prefer dried plain yolks because they believe they are a good base egg ingredient upon which to build a formula, while others prefer dried sugared yolks because they feel they give greater stability, longer shelf life, and a slightly better quality to the end product. "Feed grade" dried plain whole eggs were being used by one firm in the manufacture of dog biscuit mix.

Premix manufacturers generally consider egg substitutes inferior to eggs and, therefore, do not use them to any great extent. When soy or oat flour were used as egg substitutes in combination with lecithin, which serves as an emulsifier, they were reported to supply almost the same amount of protein as eggs. Agar-agar and Irish moss were used by one firm in hot chocolate drink mix, and in several dietary drink mixes, to hold the ingredients in suspension when mixed.

Of the 28 premix firms only one indicated that a change had been made in the type of egg products used during the past 5 years (table 26). This involved the substitution of soy and oat flours for dried egg yolks in cake mixes and was prompted by the comparatively high price of yolks. Eighteen firms stated no changes had been made. The remaining nine firms in the study would not reveal information on changes in formulations.

Four premix manufacturers had experimented with various substitutes for eggs but were generally dissatisfied with the final results. Important changes in egg usage are not expected to occur in the near future among premix manufacturers. However, the use of premixes will probably continue to increase, especially in the commercial and institutional food service fields, creating an expanding market for dried eggs.

Table 26.--Changes in use of egg products by premix manufacturers during the 5-year period 1956-1960

Description of change	Firms	Percentage of firms
	<u>Number</u>	<u>Percent</u>
From dried eggs to egg substitutes--	1	4
No change-----	18	64
Unknown-----	9	32
Total-----	28	100

The majority of premix manufacturers stated they did not change the amount or type of egg products in formulas to reflect variations in prices of egg products. In those instances where changes were made, they usually involved reducing the egg content in doughnut mixes after egg product prices had experienced long-term increases.

Most premix manufacturers indicated they could not recall egg product prices ever being high enough to result in price increases for finished products.

Six of the 50 responses from premix manufacturers indicated they resorted to egg substitutes and extenders to keep end-product prices competitive after egg product prices increased substantially.

About 39 percent stated egg product prices fall low enough on occasion to allow price reductions in premixes. This action usually results in higher sales for these products.

Most of the premix manufacturers indicated that they do not employ price specials. A majority of these were small manufacturers. A few indicated that they ran price specials on all or most products. Doughnut mix and meringue mix were singled out as products on which they run price specials.

Two of the six manufacturers who ran price specials indicated that there was a substantial increase in sales as a result of these price specials. The others mentioned only a slight increase in sales.

Almost all of the premix manufacturers said they were satisfied with the functional properties of egg products. When egg substitutes were used, the primary reason given was lower price.

Suggested New or Improved Egg Products

Suggestions for improvements in egg products mentioned by premix manufacturers were:

1. Improve color, flavor, and stability of dried egg yolks.
2. New uses for egg albumen that will increase its value in order to reduce the price of egg yolks relative to albumen.

3. Reduce rehydrating time for spray-dried egg products.
4. Improve flavor of lecithin which is less expensive than eggs, but does not give the flavor in cakes that eggs do.
5. Solve Salmonella problem in egg products.
6. Develop an additive for angel food egg albumen, or change drying methods to improve the flow characteristics when used in automatic packaging equipment.
7. Standardize the proportion of white to yolk in whole egg products.

However, most of the premix manufacturers indicated that they either saw no potential for new egg products or did not know of any such products for which the potential would be high. Some felt there might be such products but did not give any suggestions.

Egg Procurement Practices

Manufacturers and processors of egg products and egg substitutes were the major suppliers of these products for the premix manufacturers interviewed. The only other suppliers of any consequence were brokers who represented about 10 percent of the suppliers of dried eggs.

Operations of egg suppliers servicing the premix manufacturers were national in scope. Only one of the premix firms interviewed was a member of a purchasing cooperative.

When purchasing dried egg products, premix manufacturers specified the USDA label, market grades, and supplier brands -- all in about equal frequency.

Firm contracts, either bid or negotiated, spot purchases, or a combination of the two, were used extensively by premix manufacturers to purchase dried eggs. Other selected ingredients, used to a lesser degree by premix manufacturers, were largely purchased as needed.

All of the premix manufacturers interviewed indicated they were satisfied with their arrangements for purchasing egg products. Although 65 percent of the premix firms interviewed contracted to purchase eggs at a fixed price, 25 percent of the firms purchased and stored eggs in advance of requirements as a means of stabilizing egg product costs. None of the firms engaged in hedging operations in the futures market to stabilize raw material costs.

Less than 20 percent of the premix manufacturers purchased each of their other ingredients from egg suppliers. An exception to this was the mold inhibitors which they purchased to a considerable extent from their egg suppliers. Other items purchased less frequently from egg suppliers included shortening, puff pastes, milk powder, sugar, flour, and oils. Further details of the egg procurement practices of premix manufacturers are contained in the appendix tables.

Egg Supplier Services

Technical assistance, market and price information, formula assistance, and product research were the services most frequently mentioned as being offered by egg suppliers. A few firms, however, had their own technical staff and did not require these services. According to six premix manufacturers, additional services should be offered to egg suppliers. These firms indicated a need for more product research, improved formulas, technical assistance, and market outlook information (table 27). Further details on egg supplier services can be found in the appendix tables.

Table 27.--Number of premix manufacturers giving specified rating for each egg supplier service, 1960

Rating	Commodity price information	Price supply protection	Delivery performance	Handling complaints	Development of special products	Research and development	Institutional advertising	All services
----- Dry mix manufacturers -----								
Excellent-----	4	3	7	2	2	1	0	19
Good-----	6	8	8	12	3	7	2	46
Fair-----	10	9	10	8	5	6	2	50
Poor-----	2	1	0	0	3	3	2	11
None provided-	0	3	0	0	2	3	14	22
None needed---	2	1	0	0	6	2	0	11
Don't know----	1	0	0	0	2	2	4	9
Total responses-	25	25	25	22	23	24	24	168

MISCELLANEOUS FOOD INDUSTRIES

Summary

Egg products were used in a wide variety of products made by the 61 manufacturers of miscellaneous foods included in this study. (See appendix D for list of end products in which eggs or substitutes were utilized by miscellaneous food manufacturers.) Egg and egg substitute usage among these 61 firms amounted to 27 million pounds annually. Of this figure 60 percent represented frozen eggs, and 34 percent was in shell form. Liquid and dried eggs each amounted to 3 percent of the total egg usage, and substitute products amounted to less than 0.5 percent of the total (table 3).

The firms making miscellaneous foods were classified into manufacturers of noodles, macaroni, and ravioli; salad dressing and mayonnaise; meat and fish products; baby foods; and other specialty food items.

Noodle manufacturers used frozen whole eggs in preference to egg yolks because whole eggs are cheaper. However, some yolks were used in order to obtain the desired color. A number of noodle manufacturers reported difficulty in obtaining dark colored egg yolks in sufficient quantity throughout the year to meet their needs.

One noodle manufacturer said he had recently switched from frozen to dried eggs because dried eggs are better adapted to use with automatic machines.

In producing ravioli, frozen egg whites were preferred to dried egg albumen because of their reported better binding qualities.

A substantial number of prepared meat and fish manufacturers used shell eggs based solely on a company policy to use "natural" products as ingredients in their products. Dried whole eggs were used to a limited extent in breading material because of convenience in handling. The use of soy albumen and vegetable gums as binders was reported as a common trade practice.

Companies making dessert powders reported dried whole eggs do not provide the required stability and shelf life; thus, the frozen form was used.

A few of the 61 miscellaneous food manufacturers surveyed had made changes in egg product usage during the last 5 years, but for the most part they were satisfied with the functional properties of eggs. Those manufacturers who were dissatisfied usually related this to the poor emulsification properties of dried eggs. They also expressed a desire for dried eggs with improved flavor and higher protein content.

Egg Product Utilization

Frozen eggs were used most extensively by the firms in this category. Of the companies in this group, 60 percent used frozen eggs (table 28). Dried eggs were used by 30 percent of the firms; 25 percent used some shell eggs; 5 percent used liquid eggs; and 9 percent used egg substitutes. Egg substitutes reported most frequently were starch, vegetable gums, soy lecithin, and yellow and orange coloring.

Table 28.--Miscellaneous food manufacturers using eggs or egg substitutes in various forms, by kind of product made, 1960

Product made	Number of firms interviewed	Percentage of firms using eggs in various forms					
		Shell	Liquid	Frozen	Dried	Substitutes ^{1/}	None
		Percent	Percent	Percent	Percent	Percent	Percent
Noodles, macaroni, ravioli-----	27	15	11	67	22	0	0
Salad dressing, mayonnaise-----	9	22	0	89	11	33	0
Meat and fish products-----	8	62	0	25	0	0	12
Baby food-----	5	0	0	100	20	0	0
Specialty food items	12	33	0	25	83	17	0
Total-----	61	25	5	60	30	9	2

^{1/} Substitutes used and frequency mentioned include starch (5), vegetable gums (2), soybean lecithin (2), yellow and orange coloring (2), monoglycerides (1), pectin (1), and soy albumen (1).

Because of the varied products made by these firms, some differences existed among firm types with regard to the relative proportion of the various egg product forms used. Meat and fish processors used shell eggs rather extensively, plus some frozen eggs, but did not use dried eggs. On the other hand, specialty food manufacturers were making wide use of dried eggs along with some shell and frozen eggs. ^{3/} Except for salad dressing, mayonnaise, and specialty food manufacturers, egg substitutes were not used by other processed food manufacturers. ^{4/}

The extent to which the different egg product forms were used singly, or in combination with other egg products and substitutes is shown in table 29. Among 61 firms in this group, 43 percent used only frozen eggs. Twenty percent of the firms used shell eggs only, 2 percent used liquid only, and 5 percent used various combinations of shell, liquid, and frozen eggs. Although 8 percent of the firms used only dried eggs, 13 percent used them in conjunction with other egg forms. Egg substitutes, in combination with various egg forms, were used by 7 percent of the food manufacturers in this group; the remaining 2 percent did not use any eggs or substitutes in the products they manufactured.

Table 29.--Percentage of firms, by type, using various egg forms, 1960

Egg form used	:Noodles, :macaroni, :ravioli	: Dressing, :mayonnaise	: Meat and : fish : products	: Baby : food	:Specialty : food :products	: All : firms
	-----Percent-----					
Shell eggs only-----	15	10	63	0	17	20
Liquid eggs only-----	4	0	0	0	0	2
Frozen eggs only-----	59	50	25	80	8	43
Shell, liquid, frozen combinations-----	4	10	0	0	8	5
Dried eggs only-----	7	0	0	0	25	8
Dried eggs and other egg forms-----	11	0	0	20	34	13
Egg substitutes and various egg forms-----	0	30	0	0	8	7
None-----	0	0	12	0	0	2
Total-----	100	100	100	100	100	100

Frozen eggs were the principal egg form used by manufacturers of noodles, macaroni, ravioli, salad dressing, mayonnaise, and baby foods. Shell eggs were used by most firms processing meat and fish products. Most specialty food product manufacturers, on the other hand, used dried eggs either alone or in conjunction with other egg forms. Limited use of egg substitutes was reported by manufacturers of salad dressing, mayonnaise, and specialty foods.

^{3/} Specialty food manufacturers includes firms making turkey dressing, breading material, binders, dietetic breads and cookies, Chinese foods, French pastry, hors d'oeuvre, dried soups, blintzes, bird food, and frozen baked goods.

^{4/} See table 28 for substitutes.

The relative quantities of egg products and substitutes used by the different types of food manufacturers are shown in table 30. The total used by the 61 firms amounted to 60 percent in the form of frozen eggs, 34 percent in shell eggs, 3 percent in liquid and 3 percent in dried eggs. The quantity of egg substitutes used represented less than 0.5 percent of the total.

Table 30.--Eggs and egg substitutes used in various forms in miscellaneous food products, 1960

Product	Annual usage by firms	Percentage of egg usage in various forms ^{1/}					
		Shell	Liquid	Frozen	Dried	Substi- tutes	All forms
	: 1,000 lbs.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Noodles, macaroni, ravioli--:	5,603	7	14	74	5	0	100
Salad dressing, mayonnaise--:	16,148	55	0	45	<u>2/</u>	<u>2/</u>	100
Meat and fish products-----:	877	9	0	91	0	0	100
Baby food-----:	2,114	0	0	92	8	0	100
Specialty foods-----:	2,331	1	0	83	15	1	100
Total-----:	27,073	34	3	60	3	<u>2/</u>	100

^{1/} Based on actual weights, not liquid equivalent.

^{2/} Less than 0.5 percent.

Frozen eggs were the principal form used by all types of miscellaneous food manufacturers except for firms manufacturing salad dressing and mayonnaise which used more shell eggs than frozen eggs. Noodle, macaroni, and ravioli manufacturers used a relatively small amount of shell, liquid, and dried eggs. Baby food manufacturers and firms making specialty foods used only small amounts of dried eggs.

The extent to which different egg products were used by miscellaneous food processors in making various finished products is given in table 31. Egg substitutes were used by a fairly high percentage of firms making soups, salad dressings, processed sea foods, binders, and seasonings. Dried eggs were used widely in pet foods, stuffing and breading materials, and to some extent in desserts, baby foods, noodles, macaroni, and miscellaneous specialty food products. Except for processed meat and fish products, and to a lesser extent in salad dressing and mayonnaise, shell eggs were not widely used. Frozen eggs were used by a high percentage of the firms in making a variety of end products. Liquid eggs were reportedly used on a limited basis in manufacturing noodles and processed meat and poultry products.

Egg product usage and relative cost in the various types of processed foods is shown in table 32. In general, eggs were an important ingredient in the manufacture of these food items from the standpoint of both quantity and cost. In the manufacture of noodles, shell eggs averaged 16 percent of the total weight of the formulation and 32 percent of its cost. The rate of usage was somewhat lower for firms using liquid and frozen eggs in noodles. These averaged 10 to 13 percent of the ingredient weight and 20 to 23 percent of cost. Where dried plain whole eggs were used in noodles, eggs amounted to 6 percent of the weight and 28 percent of cost.

Table 31.--Percentage of manufacturers of miscellaneous food products that used egg products or egg substitutes in various forms, 1960

End product	Shell eggs	Liquid eggs	Frozen eggs	Dried eggs	Egg substitutes	Total
	-----Percent-----					
Baby foods-----	0	0	80	20	0	100
Soups-----	10	0	30	0	60	100
Noodles-----	12	9	63	16	0	100
Macaroni-----	13	0	74	13	0	100
Salad dressing, mayonnaise--	4	0	42	4	<u>1/</u> 50	100
Processed meat and poultry--	45	11	22	0	22	100
Processed fish and sea foods:	50	0	0	0	50	100
Desserts-----	0	0	38	24	38	100
Pet food-----	0	0	0	100	0	100
Stuffings and breadings----	0	0	50	50	0	100
Binders-----	0	0	0	0	100	100
Seasonings-----	0	0	0	0	100	100
Miscellaneous specialties---	14	0	45	32	9	100
Other-----	60	0	40	0	0	100

1/ Mostly starch used for thickening in salad dressing.

Table 32.--Average weight and cost of egg or egg substitutes as a percentage of total weight and cost of ingredients in specified foods, 1960

Egg or egg substitute products	Noodles		Mayon- naise		Salad dressing		Meat and fish products		Baby food egg yolk		Misc. specialty products	
	Wgt.	Cost	Wgt.	Cost	Wgt.	Cost	Wgt.	Cost	Wgt.	Cost	Wgt.	Cost
	-----Percent-----											
Shell eggs-----	16	32	7	<u>1/</u>	5	<u>1/</u>	0	0	0	0	2	<u>1/</u>
Liquid whole eggs-----	10	20	0	0	0	0	0	0	0	0	0	0
Frozen plain whole eggs--	13	23	0	0	0	0	27	22	0	0	0	0
Frozen plain yolks-----	10	22	0	0	0	0	0	0	46	31	0	0
Frozen fortified whole eggs and stabilizer solids-----	0	0	7	14	5	9	0	0	0	0	0	0
Frozen salted yolk-----	0	0	5	10	4	11	0	0	0	0	0	0
Dried plain whole eggs---	6	28	0	0	0	0	0	0	0	0	0	0
Dried plain yolks-----	3	20	0	0	0	0	0	0	0	0	0	0
Starch-----	0	0	0	0	1	2	0	0	0	0	0	0

1/ Not available.

Frozen eggs were being used in salad dressing and mayonnaise at about the 5 percent weight level and ranged from 9 to 14 percent of the ingredient cost for these two products.

Meat and fish processors used frozen plain whole eggs at an average rate of 27 percent on a weight basis and 22 percent on a cost basis.

Baby food manufacturers interviewed used frozen plain yolks in the manufacture of egg yolk for babies at an average rate of 46 percent of formulation weight and 31 percent of formula cost.

Reasons given by miscellaneous food processors for using a particular egg product or egg substitute are summarized in table 33. Government standards of identity that require the use of eggs at specific levels in a number of the products made by firms in this group account for the relatively large number of responses under the heading "formula requirements." Convenience in handling was an important consideration in the use of dried eggs, whereas quality and economy were frequently given as reasons for using frozen eggs. Shell eggs were used primarily for quality reasons.

Table 33.--Number of miscellaneous food manufacturers giving specified reasons for using different forms of egg or substitute products, 1960

Egg form or substitute	Quality		Economy		Convenience	Formula
	Gives best results	Other ^{1/}	Lower price or cost	Other ^{2/}	in handling ^{3/}	requirements ^{4/}
-----Miscellaneous food manufacturers-----						
Shell-----	2	1	0	0	0	18
Liquid-----	0	0	0	0	0	6
Frozen-----	1	11	8	3	8	30
Dried-----	0	1	1	1	4	10
Egg substitutes---	0	2	2	0	1	0
Total responses						
^{5/--}	3	15	11	4	13	64

^{1/} Richness, freshness, color, emulsification, shelf life.

^{2/} No spoilage, less storage space, cut down on labor.

^{3/} In most cases, convenience factors can be interpreted to mean cost considerations.

^{4/} Includes "no substitute."

^{5/} Reasons given may total more than number of miscellaneous food manufacturers because of multiple replies.

Egg yolks were used in noodles to obtain high color. Several noodle manufacturers reported difficulty in obtaining dark colored egg yolks in sufficient quantities to meet their needs.

Frozen whole eggs, in preference to egg yolks, were used as much as possible by noodle manufacturers since whole eggs were less expensive than yolks. However, some yolks were needed to obtain the desired color.

Frozen egg whites were preferred to dried albumen in making ravioli because of their superior binding quality.

Firms making dessert powders reported dried whole eggs do not provide the necessary stability and shelf life and, therefore, used the frozen form.

A number of meat and fish processors indicated they used shell eggs because it was company policy to use "natural products" as ingredients in their products.

A frozen omelet producer reported it necessary to use shell eggs due to problems resulting from the freezing and thawing of reconstituted dried eggs when used for this purpose.

Convenience in handling was primarily responsible for the use of dried plain whole eggs in breeding material.

Use of soy albumen and vegetable gums in binders was reported to be a common trade practice. Lecithin was used in fats for its superior emulsifying properties.

Three of the 61 miscellaneous food manufacturers had made a change in egg product utilization during the last 5 years (table 34). Two companies making noodles, macaroni, and ravioli had switched from frozen to dried eggs after the installation of new automatic machinery. The only other change in egg usage involved a meat processor who discontinued using eggs but did not switch to a substitute ingredient. Federal standards regulating the use of egg products in salad dressings, mayonnaise, baby foods, and specialty food products prevented manufacturers of these products from changing egg product utilization. The use of dried eggs among miscellaneous food processors will tend to increase as production and manufacture of these foods becomes more automated.

Table 34.--Percentage of miscellaneous food manufacturers by type that have changed egg forms during last 5 years, 1960

Description of change	: Noodles, : Dressing, : Meat and: : Specialty: : macaroni, : Dressing, : fish :Baby : food : : ravioli :mayonnaise : products:food : products:					All firms
	-----Percent-----					
No change-----	89	100	88	100	100	93
From frozen to dried-----	7	0	0	0	0	3
Discontinued using eggs - no: substitutes used to replace:	0	0	12	0	0	2
Unknown-----	4	0	0	0	0	2
Total-----	100	100	100	100	100	100

Almost all manufacturers in this category stated that they did not change the amount or type of egg products in formulas to reflect variations in prices in these products. Standards of product identity established by the Food and Drug Administration were reported as the main reason these manufacturers did not vary their formulas to any great extent. In those instances in which formula changes were made, they involved the substitution of frozen whole eggs for frozen yolks, and dried whites for frozen whites. One manufacturer of salad dressing and mayonnaise indicated he was constantly attempting to reduce the use of egg yolks because of their high price as compared to yellow and orange coloring.

In almost all cases the miscellaneous food manufacturers included in this study stated that prices of egg products never go high enough to require increases in prices of their end products. In those instances in which product prices were affected, the end products most frequently mentioned were egg yolk for babies, noodles, mayonnaise,

and salad dressing. The egg products used in these foods include frozen plain yolks, frozen plain whole eggs, and frozen salted yolks.

With the exception of two salad dressing and mayonnaise manufacturers, none of the firms in this group indicated that egg product prices ever went low enough to allow price reductions in finished products that were large enough to have a substantial increase on sales.

Manufacturers in this group were generally satisfied with the functional properties of egg products. Only 7 percent of the noodle, macaroni, and ravioli manufacturers, and 10 percent of the specialty products manufacturers, expressed dissatisfaction with any functional properties. Specifically mentioned was their dissatisfaction with emulsification properties.

Suggested New or Improved Egg Products

Some noodle, macaroni, and ravioli manufacturers said they would prefer yolks that have a deeper yellow color. A few salad dressing and mayonnaise manufacturers made similar suggestions and also added that more effective emulsifying agents would be helpful. Baby food manufacturers also indicated difficulties in obtaining dark colored yolks in sufficient quantities. In addition, some of these manufacturers stated that bacteria is a problem with regard to egg products.

Very few miscellaneous food manufacturers felt there were any new egg products which might have a large market potential, or if they knew of any they were unwilling to specify. New or improved egg products that were mentioned include:

1. Dried eggs with improved flavor.
2. Dried eggs with better emulsification properties.
3. Dried eggs with higher protein content.
4. Darker colored yolks available throughout the entire year.
5. Development of a frozen ham and egg sandwich for institutional and consumer markets.
6. Less expensive dried eggs.

Egg Procurement Practices

Independent egg processors were the most important source of egg products for the miscellaneous food manufacturers included in the study. Although all types of egg suppliers were mentioned as being used to some degree, most were relatively unimportant as suppliers of eggs to this group.

Eggs were purchased from both local and national suppliers. Specialty products manufacturers purchased most of their dried eggs from firms whose operations were national in scope, while they obtained their supplies of egg substitutes from local firms.

Over 50 percent of the noodle, macaroni, and ravioli manufacturers specified either suppliers' brands or market grades. Salad dressing and mayonnaise manufacturers asked for a specific market grade or suppliers' brand when ordering shell, liquid, and frozen egg products. Baby food manufacturers asked for specific market grades or followed specifications from their head offices when purchasing frozen

egg yolks. Specialty food manufacturers specified market grades and suppliers' brands when purchasing frozen and dried egg products.

For the most part food processors in this group used contracts at fixed prices in order to stabilize their egg product costs. Relatively few of the firms interviewed engaged in hedging; some bought ahead and stored egg products.

Noodle, macaroni, and ravioli manufacturers relied principally on spot purchases when buying egg products, although they also utilized firm contracts to some extent. Meat and fish processors and specialty food manufacturers also relied heavily on spot purchases. On the other hand most salad dressing, mayonnaise, and baby food manufacturers utilized firm contracts, when establishing their purchase arrangements. Only three firms expressed any dissatisfactions with their egg purchase arrangements.

Most firms in this group did not rely on egg suppliers for other ingredients. A few baby food manufacturers purchased meat and fish from suppliers of egg products, and specialty products manufacturers purchased some other ingredients from egg suppliers. Further details of purchase arrangements by this group of firms are given in the appendix tables.

Egg Supplier Services

In contrast to the other types of industrial egg users included in the study, food manufacturers in this group frequently mentioned product research and product testing as a service provided by egg suppliers. As was the case for other types of industrial users, firms in this group frequently mentioned technical assistance and market information as being available from egg suppliers.

Many of the firms did not believe that any additional services by egg suppliers were needed (table 35). Details of the egg supplier services provided to this group of firms are given in the appendix tables.

Table 35.--Number of miscellaneous food manufacturers giving specified rating for each egg supplier service, 1960

Rating	Commodity price information	Price supply protection	Delivery performance	Handling complaints	Development of special products	Research and development	Institutional advertising	All services
-----Miscellaneous food manufacturers-----								
Excellent-----	4	2	10	5	3	1	0	25
Good-----	2	2	6	7	1	2	0	20
Fair-----	40	41	37	38	36	19	0	211
Poor-----	1	0	0	1	0	4	0	6
None provided--	1	3	0	0	3	10	44	61
None needed----	3	1	0	0	4	4	0	12
Don't know-----	1	0	0	0	3	11	6	21
Certain suppliers provide-----	0	0	0	0	1	1	1	3
Total responses:	52	49	53	51	51	52	51	359

APPENDIX A--BAKERIES

Table 36.--Geographical location of bakery firms in sample

Geographical location	Number of bakery firms by type					
	Wholesale	Grocery chain	Home service	Retail	Biscuit, crackers, cookie	All bakeries
New England-----	8	2	0	15	0	25
Middle Atlantic-----	30	5	2	37	2	76
East North Central-----	28	3	1	12	6	50
West North Central-----	3	3	2	5	0	13
South Atlantic-----	9	1	1	7	0	18
East South Central-----	1	0	0	0	0	1
West North Central-----	1	0	0	3	1	5
Mountain-----	0	0	0	0	0	0
Pacific-----	10	1	2	7	2	22
Total-----	90	15	8	86	11	210

Table 37.-- Methods of distribution used by bakery firms in sample

Method of distribution	Percentage of bakery firms by type				
	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie
Retail store at plant-----	40	7	50	75	18
Retail store away from plant-----	9	7	25	41	9
Bake shop counters in supermarkets--	12	0	0	13	0
Own label through grocery stores---	68	13	25	8	91
Food chains under their label-----	23	0	12	2	36
Restaurants and institutions-----	80	7	38	40	73
House to house (in own trucks)-----	9	7	75	1	9
House to house (independent operators)-----	13	13	50	5	9
Retail through their own chain of food stores-----	2	87	0	5	0
Bake for own use-----	7	13	0	22	0
Sell to other bakers-----	52	0	25	7	27

Table 38.--Number of plants operated by bakery firms in sample

Number of plants operated	Percentage of bakery firms by type				
	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie
1 plant-----	74	53	63	84	64
2 plants-----	4	0	12	6	9
3 plants-----	7	0	25	1	9
4 plants-----	1	13	0	0	0
5 plants-----	3	0	0	2	0
7 plants-----	0	7	0	0	0
8 plants-----	0	7	0	1	0
9 plants-----	0	0	0	1	0
10 plants-----	0	7	0	0	0
12 plants-----	0	0	0	0	9
15 plants and over-----	10	0	0	2	0
Not ascertained-----	1	13	0	3	9
Total-----	100	100	100	100	100

Table 39.--Annual gross sales of bakery firms in sample

Annual gross sales (thousand dollars)	Percentage of firms by type					
	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie	All
Less than 50-----	2	0	0	10	0	5
50 - 249-----	16	0	12	36	0	22
250 - 999-----	32	13	0	27	27	27
1,000 - 4,999-----	23	27	38	14	18	20
5,000 and over-----	26	53	50	8	46	23
Not ascertained-----	1	7	0	5	9	3
Total-----	100	100	100	100	100	100

Table 40.--Extent of purchasing by main offices of bakery firms in sample

Extent of purchasing	Percentage of firms by type				
	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie
All-----	40	33	25	19	27
Some-----	3	27	25	3	9
Not applicable ^{1/} -----	48	40	50	72	55
Not ascertained-----	9	0	0	6	9
Total-----	100	100	100	100	100

^{1/} One-plant firms.

Table 41.--Number of multiplant bakery firms in sample that use standard formulas and that allow their plants options in types and quantities of egg forms used

Type of bakery firm	Formulas		Options in egg usage	
	Standard	Not standard	With options	No option
Wholesale-----	17	4	8	13
Grocery chain-----	5	1	4	3
Home service-----	3	0	0	3
Retail-----	10	1	1	9
Biscuit, cracker, cookie-----	2	1	0	3
Total-----	37	7	13	31

Table 42.--Bakery firms in sample manufacturing various end products

End product	Percentage of firms by type				
	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie
Bread-----	54	93	88	74	9
Rolls and buns-----	57	93	88	77	9
Sweet goods-----	56	93	88	90	9
Cakes (all types)-----	59	93	100	93	9
Layer-type cake <u>1/</u> -----	53	93	88	87	9
Sponge cake-----	50	93	71	83	9
Angelfood cake-----	42	86	86	79	0
Doughnuts-----	46	86	75	67	9
Puff pastry-----	34	71	50	81	0
Cookies-----	32	79	88	86	100
Fruit pies-----	46	86	62	86	9
Soft pies-----	48	77	50	80	0
Frozen pies-----	10	17	0	14	0
Frozen cakes-----	6	17	0	13	0
Frozen dough-----	2	8	0	3	0
Other frozen items-----	3	0	0	8	0
Other products-----	25	31	38	9	45
Icings-----	31	46	62	63	9

1/ Non-sponge cake in which lifting is accomplished by use of baking powder.

Table 43.--Reasons given by bakery firms for using egg substitutes

Reason	Percentage of bakery firms by type				
	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie
Not applicable <u>1</u> /-----	59	69	50	66	56
Lower price-----	33	8	33	21	11
Quality-----	5	0	0	2	0
Lack of uniformity in products-----	2	0	0	0	0
Convenience-----	0	8	0	1	0
Longer shelf life-----	0	8	0	0	0
Eggs not required for products made-----	1	0	0	0	0
Other reasons-----	0	7	17	5	33
Don't know-----	0	0	0	5	0
Total-----	100	100	100	100	100
Number of responses-----	66	13	6	62	9

1/ No substitute used.

Table 44.--Type of supplier used by bakery firms for procuring specific egg products

Egg product or egg substitute	Suppliers																	
	Farmers: coop- erative	Farmer : or dealer	Local as- sembler : or dealer	Terminal: assem- bler	Process- sor	Broker: : saler	Whole- supply:	Bakery: Other:	Total	Farmers: coop- erative	Farmer : or dealer	Local as- sembler : or dealer	Terminal: assem- bler	Process- sor	Broker: : saler	Whole- supply:	Bakery: Other:	Total
Fresh or liquid:																		
Shell eggs-----	4	9	3	0	4	3	15	3	2	43								
Liquid plain whole eggs-----	1	0	0	0	7	1	6	3	0	18								
Liquid whole eggs fortified with yolks-----	0	0	0	0	0	1	1	0	0	2								
Liquid sugared whole eggs-----	0	0	0	0	0	0	1	0	0	1								
Liquid plain yolks-----	0	0	0	0	3	0	0	0	0	3								
Liquid sugared yolks-----	0	0	0	0	3	0	1	0	0	4								
Liquid egg whites-----	0	0	0	0	4	0	2	0	0	6								
Frozen:																		
Frozen plain whole eggs-----	5	0	2	1	69	18	23	18	1	137								
Frozen salted whole eggs-----	0	0	0	0	0	1	0	0	0	1								
Frozen fortified whole eggs and stabilizer solids-----	1	0	1	0	19	6	4	2	1	34								
Frozen plain yolks-----	2	0	0	1	8	3	2	2	1	19								
Frozen sugared yolks-----	4	0	0	0	37	8	5	5	0	59								
Frozen salted yolks-----	0	0	0	0	2	2	0	0	0	4								
Frozen whites-----	8	1	1	1	65	15	28	14	2	135								
Dried:																		
Dried plain whole eggs-----	1	0	0	0	8	1	1	2	0	13								
Dried desugared whole eggs enzyme or yeast stabilizer-----	0	0	0	0	1	0	0	0	0	1								
Dried sugared whole eggs-----	0	0	0	0	2	1	1	0	0	4								
Dried whole eggs fortified with yolks-----	0	0	0	0	1	2	2	0	0	5								
Dried fortified whole eggs and stabilizer solids-----	0	0	0	0	1	0	0	1	0	2								
Dried plain yolks-----	0	0	0	0	3	0	4	3	0	10								
Dried sugared yolks-----	0	0	0	0	1	0	0	1	0	2								
Spray-dried albumen (pword)-----	0	0	0	0	8	0	2	1	0	11								
Pan-dried albumen (pword)-----	2	0	0	0	6	0	2	2	0	12								
Fluff-dried albumen-----	0	0	0	0	2	0	2	0	0	4								
Premixes containing eggs-----	0	0	0	0	24	4	0	4	0	32								

Table 44.--Type of supplier used by bakery firms for procuring specific egg products--Continued

Egg product or egg substitute	Suppliers										
	Farmers' : coop-erative :	Farmer : or dealer :	Local As-sembler : or dealer :	Terminal : assembler :	Process- sor :	Broker- saler :	Whole- saler :	Bakery : supply :	Other : jobber :	Total	
Other:											
Soy albumen-----	0	0	0	0	2	0	0	0	0	2	
Gluten-----	0	0	0	0	2	0	0	0	0	2	
Agar-agar-----	0	0	0	0	0	2	0	0	0	2	
Vegetable gums-----	0	0	0	0	4	0	0	0	0	4	
Monoglycerides-----	1	0	0	0	12	0	2	0	0	15	
Soybean lecithin-----	0	0	0	0	0	4	0	0	2	6	
Pectin-----	0	0	0	0	2	0	2	0	0	4	
Special emulsifying fats-----	0	0	0	0	2	0	0	0	0	2	
Starch-----	0	0	0	0	8	2	2	0	0	12	
Yellow and orange coloring-----	0	0	0	0	2	4	0	4	0	10	
Flour based premixes-----	0	0	0	0	8	0	2	2	0	12	
Gelatin-----	0	0	0	0	0	0	2	0	0	2	
Shortening-----	0	0	0	0	2	0	0	0	0	2	

Table 45.--Satisfaction of bakery firms with purchase arrangements for egg products and egg substitutes

Type of firm	Number of responses	
	Satisfied	Dissatisfied
Wholesale-----	188	29
Grocery chain-----	33	0
Home service-----	10	11
Retail-----	141	15
Biscuit, cracker, cookie-----	18	0
All-----	390	55

Table 46.--Methods used by bakery firms to stabilize egg product cost

Type of firm	Percentage of firms using each method					Total
	Futures market	Contract at fixed price	Buy ahead and store	None		
Wholesale-----	6	54	27	13		100
Grocery chain-----	0	42	27	31		100
Home service-----	0	75	25	0		100
Retail-----	4	26	15	55		100
Biscuit, cracker, cookie-----	0	55	20	25		100

Table 47.--Other items purchased by bakery firms from egg product and egg substitute suppliers

Items	Number of responses by type of firm				
	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie
Yeast-----	28	4	2	50	3
Cheese-----	0	0	0	13	0
Butter-----	2	2	0	34	2
Margarine-----	10	0	0	16	0
Baking powder-----	9	0	1	26	0
Nuts-----	3	6	1	3	0
Fruit-----	29	3	3	42	2
Shortening-----	20	0	2	34	1
Puff paste-----	4	0	0	0	0
Mold inhibitor-----	1	0	0	0	0
Malt-----	4	0	1	8	0
Lard-----	0	0	0	6	0
Chicken, fowl-----	0	0	0	2	0

Table 47.-- Other items purchased by bakery firms from egg product and egg substitute suppliers-Continued

Items	Number of responses by type of firm				
	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie
Milk powder-----	5	0	2	4	2
Flavoring-----	4	0	0	7	5
Equipment-----	2	0	0	5	0
Jams, jellies-----	7	0	3	1	0
Flour-----	0	0	0	0	0
Whipping material-----	0	0	0	4	0
Other-----	5	3	2	9	9
Total-----	133	18	17	264	24

Table 48.--Services offered by egg suppliers to bakery firms

Service offered	Percentage of responses by type of firm				
	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie
Technical assistance-----	15	36	11	9	31
Special services-----	5	7	0	3	7
Formulas and formulations-----	8	7	0	8	7
Help with production problems-----	2	0	0	4	0
Product research-----	6	7	11	7	0
Market and price information-----	10	7	11	2	12
Performance analyses-----	2	0	0	2	0
Credit-----	2	0	0	0	0
New products-----	1	0	0	2	0
Demonstrations-----	5	0	0	4	0
Recipes-----	1	0	0	7	0
Prompt reliable delivery-----	1	0	22	0	6
Product testing-----	2	0	0	2	0
Price protection-----	2	0	0	1	0
Point-of-purchase displays-----	0	0	0	1	0
None-----	15	0	11	21	6
Do not need service-----	12	29	11	12	6
Have own technical staff-----	1	0	0	0	0
Don't know-----	11	7	23	14	25
Other-----	0	0	0	1	0
Total-----	100	100	100	100	100
Number of responses	101	14	9	122	16

Table 49.--Additional service desired by bakeries

Service desired	Percentage of responses by type of firm				
	Wholesale	Grocery chain	Home service	Retail	Biscuit, cracker, cookie
Consumer research-----	2	0	9	4	9
Product research-----	10	18	18	13	9
Formula assistance-----	2	9	0	4	9
Technical assistance-----	7	9	0	7	0
Recipes-----	7	0	0	7	0
Package disposal-----	2	9	0	0	0
Accurate quality standards--	4	0	0	2	0
Blending and mixing-----	2	0	0	0	0
Storage-----	2	0	0	0	0
Improved packaging-----	0	9	0	2	0
Bacteria counts-----	2	0	0	2	0
Market outlook-----	2	0	0	0	0
Uniform quality at good price-----	2	0	0	7	0
None, not needed-----	54	46	73	52	73
Have own technical staff----	2	0	0	0	0
Total-----	100	100	100	100	100
Number of responses-----	48	11	11	46	11

APPENDIX B--CONFECTIONERS

Table 50.--Geographical location of confectioners in sample

Geographical location	Number of firms
New England-----	4
Middle Atlantic-----	12
East North Central-----	9
West North Central-----	2
South Atlantic-----	3
East South Central-----	0
West South Central-----	0
Mountain-----	0
Pacific-----	4
Total-----	34

Table 51.--Methods of distribution used by confectioners in sample

Method of distribution	Percentage of firms utilizing
Retail store at plant-----	15
Retail store located away from plant-----	12
Candy counters located in supermarkets-----	18
Candy counters located in restaurants, gift shops, and hotels-----	9
Direct to candy, drug, and tobacco stores (own label):	56
Direct to store, restaurant, and concessionary chains: (private label)-----	53
Through candy, drug, tobacco, and grocery jobbers----	76
Retail through their own chain of confectionery stores-----	9

Table 52.--Number of plants operated by confectioners in sample

Number of plants operated	Percentage of firms
1 plant-----	82
2 plants-----	12
3 plants-----	3
6 plants-----	3
Total-----	100

Table 53.--Annual gross sales of confectioners in sample

Annual gross sales (thousand dollars)	Number of firms
50 - 249-----	2
250 - 999-----	9
1,000 - 4,999-----	11
5,000 and over-----	12
Total-----	34

Table 54.--Extent of centralized purchasing by confectioners in sample

Extent of centralized purchasing	Percentage of firms
Some-----	9
All-----	23
One-plant firms-----	68
Total-----	100

Table 55.--Number of multiplant confectionery firms in sample that use standard formulas and that allow their plants options in types and quantities of egg forms used

Category	Number of firms	
	Standard formulas	Egg form options
Having-----	5	1
Not having-----	0	5

Table 56.--Confectioners in sample producing selected products

Product	Percentage of firms
Cream-filled chocolates-----	74
Nougats, nougatines-----	62
Marshmallows-----	59
Bar-type candy-----	56
Hard candy-----	53
Fudge, penuche-----	47
Hand-rolled creams-----	35
Kisses-----	29
Chocolate coated candy-----	24
Jellies-----	24
Peanuts and roasted nuts-----	24
Coconut candies-----	21
Caramels-----	18
Coated nuts-----	15
Nut brittle-----	15
Gum-----	12
Other products-----	38

Table 57.--Reasons given by confectioners for using egg substitutes

Reason	Percentage of responses
Price, cost, economics-----	34
Don't use egg substitutes-----	21
Uniformity-----	6
Convenience, storage, handling-----	6
Shelf life, stands up better-----	6
Quality, body-----	3
Other reasons-----	6
Don't know-----	18
Total-----	100
Number of responses-----	33

Table 58.--Type of supplier used by confectioners for procuring various egg products

Egg product or egg substitute	Suppliers								
	Farmers' cooperative	Local as- sembler or dealer	Terminal assembler	Processor or manu- facturer	Broker	Whole- saler	Bakery supply jobber	Other	Total
	-----Confectioners-----								
Liquid egg whites:	0	0	0	1	0	0	0	0	1
Frozen whites----	0	0	0	4	0	1	0	0	5
Dried:									
Spray-dried									
albumen-----	2	0	0	20	6	2	0	2	32
Pan-dried albu- men powdered--	0	2	2	8	4	2	0	0	18
Pan-dried albu- men flakes----	0	0	0	4	2	2	2	0	10
Pan-dried albu- men granules--	0	0	0	2	0	0	0	0	2
Other:									
Soy albumen----	0	0	0	6	0	2	0	0	8
Agar-agar-----	0	0	0	2	0	2	0	0	4
Yellow & orange coloring-----	0	2	0	0	0	0	0	0	2
Gelatin-----	0	0	0	2	0	0	0	0	2
Other non-egg products-----	2	0	0	0	0	0	0	0	2

Table 59.--Other items purchased by confectioners from egg product and egg substitute suppliers

Item	Number of responses
Margarine-----	5
Nuts-----	4
Fruit-----	2
Shortening-----	2
Lard-----	2
Milk powder-----	2
Sugar-----	2
Gelatin-----	5
Vegetable oils-----	2
<hr/>	
Total-----	26

Table 60.--Services offered by egg suppliers to confectioners

Service offered	Percentage of responses
Technical assistance-----	16
Special services-----	6
Formulas and formulations-----	13
Product research-----	3
Market & price information-----	9
Performance analyses-----	3
None-----	16
Do not need service-----	28
Don't know-----	6
<hr/>	
Total	100
<hr/>	
Number of responses-----	32

Table 61.--Additional services desired by confectioners

Service desired	Percentage of responses
Product research-----	20
Formual assistance-----	5
Technical assistance-----	10
Recipes-----	5
Accurate quality standards-----	5
None, not needed-----	55
Total-----	100
Number of responses-----	20

APPENDIX C--PREMIX MANUFACTURERS

Table 62.--Geographical location of premix manufacturers in sample

Geographical location	Number of firms
New England-----	1
Middle Atlantic-----	9
East North Central-----	9
West North Central-----	4
South Atlantic-----	0
East South Central-----	0
West North Central-----	0
Mountain-----	0
Pacific-----	5
Total-----	28

Table 63.--Methods of distribution used by premix manufacturers in sample

Method of distribution	Percentage of firms utilizing
Direct to bakeries, institutions, or other food processors-----	75
Through brokers-----	43
Through jobbers-----	54
Through company-owned branch warehouses-----	18
Direct to wholesale grocers or grocery chains: (own label)-----	43
Direct to wholesale grocers or grocery chains: (private label)-----	29
Other-----	7

Table 64.--Number of plants operated by premix manufacturers in sample

Number of plants operated	Percentage of firms
1 plant-----	67
2 plants-----	7
3 plants-----	7
5 plants-----	4
6 plants-----	4
7 plants-----	4
15 plants and over-----	7
Total-----	100

Table 65.--Annual gross sales of premix manufacturers in sample

Annual gross sales (thousand dollars)	Number of firms
Less than 50 -----	1
50 - 249 -----	4
250 - 999 -----	4
1,000 - 4,999 -----	8
5,000 - and over-----	10
Not ascertained-----	1
Total-----	28

Table 66.--Extent of centralized purchasing by premix manufacturers in sample

Extent of centralized purchasing	Percentage of firms
Some-----	11
All-----	29
One-plant firm-----	46
Not ascertained-----	14

Table 67.--Standardization of formulas in multi-plant premix firms and options in types and quantities of egg products used

Category	Number of firms	
	Standard formulas	Egg form options
Having-----	5	0
Not having-----	1	6

Table 68.--Reasons given by premix manufacturers for using egg substitutes

Reasons	Percentage of responses
Don't use egg substitutes-----	52
Price, cost, economics-----	40
Quality, body-----	4
Uniformity-----	4
Total-----	100
Number of responses-----	46

Table 69.--Type of supplier used by premix manufacturers for procuring egg products

Egg product or substitute	Suppliers					Total
	Local dealer	Processor or manufacturer	Broker	Other		
	----- <u>Dry-mix manufacturers</u> -----					
Liquid egg whites-----	0	1	0	0		1
Frozen:						
Frozen plain whole egg-----	0	1	0	0		1
Frozen plain yolk-----	0	2	0	0		2
Frozen sugared yolk-----	0	0	1	0		1
Dried:						
Dried plain whole egg-----	0	10	1	0		11
Dried desugared whole egg-enzyme or yeast stabilizer--	0	1	0	0		1
Dried fortified whole egg and stabilizer solids-----	0	1	0	0		1
Dried plain yolk-----	0	17	2	0		19
Dried sugar yolk-----	0	0	1	0		1
Spray-dried albumen-----	0	40	4	0		44
Pan-dried albumen powdered---	0	2	0	0		2
Pan-dried albumen flakes-----	0	4	0	0		4
Fluff-dried albumen-----	0	2	0	0		2
Dried eggs plus other ingredients-----	0	2	0	0		2
Other:						
Soy albumen-----	0	0	2	0		2
Agar-agar-----	0	2	0	0		2
Vegetable gums-----	2	2	0	0		4
Soybean lecithin-----	0	4	0	0		4
Pectin-----	0	2	0	0		2
Starch-----	0	6	0	0		6
Yellow and orange coloring---	0	2	0	0		2
Flour based premixes-----	0	2	0	0		2
Not ascertained-----	0	0	0	8		8

Table 70.--Other items purchased by prepared dry-mix manufacturers from egg product and egg substitute suppliers

Items	Number of responses
Shortening-----	5
Puff paste-----	2
Milk powder-----	3
Sugar-----	4
Flour-----	4
Oils-----	4
Other-----	5
Total-----	27

Table 71.--Services offered by egg suppliers to premix manufacturers

Services offered	Percentage of responses
Technical assistance-----	39
Special services-----	3
Formulas and formulations-----	14
Product research-----	10
Market and price information-----	16
None-----	6
Do not need service-----	6
Have own technical staff-----	3
Don't know-----	3
Total-----	100
Number of responses-----	31

Table 72.--Additional services desired by premix manufacturers

Service desired	Percentage of responses
Product research-----	8
Formula assistance-----	8
Technical assistance-----	17
Market outlook-----	17
None, not needed-----	50
Total-----	100
Number of responses-----	12

APPENDIX D -- MISCELLANEOUS FOOD MANUFACTURERS

Miscellaneous food manufacturers interviewed made the following products in which eggs or egg substitutes were used:

1. Prepared meat and fish processors.

Special meat sausage
Frozen beef patties
Canned ham and eggs
Brockworst
Schav
Pate de foie gras
Fish cakes
Gefilte fish
Smoked salmon
Frozen prepared dinners

French pastry, hors d'oeuvres:
Anchovy puffs and rolls
Cheese puffs and straws
Chicken liver puffs
Lobster puffs
Scallop rolls
Shrimp puffs
Salmon turnovers
Potato whirls
Frankfort bits

2. Baby and junior foods.

Egg yolks
Egg yolks and bacon
Custards
Puddings

Protein dinners
Desserts
Junior breakfasts
Cereal and egg
Ham and egg

3. Soups.

Egg noodle soup
Egg drop soup

Dried soup mix
Consomme

4. Miscellaneous specialty foods.

Puddings
Fried rice
Egg rolls
Dietetic bread
Dietetic cookies
Blintzes
Potato pancakes
Potato dumplings
Potato dry mix

Corn fritters
Waffles
Frozen omelettes
Breeding material
Turkey dressing
Seasonings
Pet foods
Bird feed mixtures

5. Other.

Egg noodles
Matzoh
Ravioli

Salad dressing
Mayonnaise
Macaroni

Table 73.--Geographical location of miscellaneous food manufacturers in sample

Geographical location	Number of firms by type					
	Noodles,	Dressing,	Meat and	Baby food	Specialty	All
	macaroni, ravioli	mayonnaise	fish	products	products	firms
New England-----	2	0	0	0	0	2
Middle Atlantic-----	13	2	5	2	1	23
East North Central---	10	4	2	2	8	26
West North Central---	1	3	0	1	3	8
South Atlantic-----	0	0	1	0	0	1
East South Central---	0	0	0	0	0	0
West North Central---	0	0	0	0	0	0
Mountain-----	0	0	0	0	0	0
Pacific-----	1	0	0	0	0	1
Total-----	27	9	8	5	12	61

Table 74.--Methods of distribution used by miscellaneous food manufacturers in sample

Method of distribution	Percentage of firms by type of product ^{1/}					
	Noodles,	Dressing,	Meat and	Baby food	Specialty	All
	macaroni, ravioli	mayonnaise	fish	products	products	firms
Direct to super- markets and food chains (own label)---	70	56	75	80	83	72
Through food whole- salers (own label)---	41	56	63	60	50	49
Through brokers-----	41	56	50	0	83	49
Through jobbers-----	26	56	25	20	58	36
Direct to super- markets and food chains (private label)-----	11	44	25	0	25	20
Through food whole- salers (private label)-----	4	11	13	20	17	10
Other-----	30	22	38	60	25	31
Number of firms in sample-----	27	9	8	5	12	61

^{1/} Percentages total to more than 100 because many firms used more than one method in distributing their products.

Table 75.--Number of plants operated by miscellaneous food manufacturers in sample

Number of plants operated	Percentage of firms by type of product				
	Noodles, macaroni, ravioli	Dressing, mayonnaise	Meat and fish	Baby food	Specialty products
1 plant-----	68	56	38	20	50
2 plants-----	7	11	12	0	42
3 plants-----	7	0	0	20	8
4 plants-----	0	22	13	0	0
5 plants-----	4	0	0	20	0
6 plants-----	4	11	0	0	0
7 plants-----	3	0	0	0	0
10 plants-----	0	0	0	20	0
15 and over-----	7	0	25	0	0
Not ascertained----	0	0	12	20	0
Total-----	100	100	100	100	100

Table 76.--Annual gross sales of miscellaneous food manufacturers in sample

Type of firm	Percentage of firms by volume of sales (1,000 dollars)					Total
	Less than 50	50 to 249	250 to 999	1,000 to 4,999	5,000 and over	
Noodles, macaroni, ravioli-----	0	26	26	33	15	100
Dressing, mayonnaise--	0	0	0	44	56	100
Meat and fish-----	0	13	0	25	62	100
Baby food-----	0	0	0	0	100	100
Specialty products----	0	0	17	42	41	100

Table 77.--Extent of centralized purchasing by miscellaneous food manufacturers in sample

Type of firm	Percentage of firms purchasing in various proportions				Total
	Some	All	Not applicable 1/	Not ascertained	
Noodles, macaroni, ravioli-----	4	7	85	4	100
Dressing, mayonnaise--	22	22	56	0	100
Meat and fish-----	0	38	50	12	100
Baby food-----	50	25	25	0	100
Specialty products----	0	33	50	17	100

1/ One-plant firms.

Table 78.--Number of multiplant miscellaneous food firms in sample that use standard formulas and that allow their plants options in types and quantities of egg forms used

Type of firm	Formulas		Options in egg usage	
	Standard	Not standard	With options	No options
Noodles, macaroni, ravioli-----	3	2	1	3
Dressing, mayonnaise--	3	1	0	4
Meat and fish-----	2	1	0	2
Baby food-----	3	0	0	3
Specialty products----	5	0	0	4
Total-----	16	4	1	16

Table 79.--Type of supplier used by miscellaneous food manufacturers for procuring egg products

Egg product or substitute	Suppliers							
	Farmer's cooperative	Terminal assembler	Industry: pur-chasing cooperative	Processor: or manufacturer	Whole-Broker	Whole-saler	Other	Total
-----Prepared food manufacturers-----								
<u>Fresh or liquid</u>								
Shell eggs-----	2	1	0	2	0	5	0	12
Liquid, plain whole egg-----	0	0	0	1	0	0	0	1
Liquid plain yolk.	0	1	0	0	0	0	0	1
<u>Frozen</u>								
Frozen plain whole egg-----	0	0	0	9	1	0	2	12
Frozen salt whole egg-----	0	1	0	2	0	0	0	3
Frozen fortified whole egg and stabilizer solids-----	0	0	0	1	0	0	0	1
Frozen plain yolk.	0	1	0	14	1	0	0	16
Frozen sugared yolk-----	0	0	0	1	0	0	0	1
Frozen salt yolk-	0	0	0	11	0	1	1	13
Frozen whites----	0	0	0	3	0	0	0	3

-- continued

Table 79.--Type of supplier used by miscellaneous food manufacturers for procuring egg products

	Suppliers							
	Farmer's cooper- ative	Terminal assem- bler	chasing coopera- tive	Processor or manu- facturer	Broker	Whole- saler	Other	Total
Dried	-----Prepared food manufacturers-----							
Dried plain whole- egg-----	0	2	1	1	0	0	0	4
Dried plain yolk--	0	0	0	3	0	0	0	3
Spray-dried albu- men-----	0	0	0	6	0	0	0	6
Pan-dried albumen (granules)-----	0	0	0	4	0	0	2	6
Fluff-dried albu- men-----	0	0	0	2	0	0	0	2
Other								
Soy albumen-----	2	0	0	0	0	0	0	2
Vegetable gum-----	2	0	0	0	0	0	0	2
Soybean lecithin--	0	0	0	2	0	0	0	2
Starch-----	0	2	0	2	0	2	0	6
Yellow and orange coloring-----	0	2	0	0	0	0	0	2

Table 80.--Satisfaction of miscellaneous food manufacturing firms with purchase arrangements for egg products and egg substitutes

Type of firm	Number of responses	
	Satisfied	Dissatisfied
Noodles, macaroni, ravioli-----	14	2
Dressing, mayonnaise-----	3	0
Meat and fish-----	3	1
Baby food-----	3	0
Specialty products-----	24	0
All-----	47	3

Table 81.--Methods used by miscellaneous food manufacturers to stabilize egg product cost

Type of food manufacturer ^{1/}	Percentage of firms using each method		
	Futures market	Contract at fixed price	Buy ahead and store
Noodle, macaroni, ravioli (29)-----	3	65	24
Dressing, mayonnaise (18)-----	0	56	33
Meat and fish (14)-----	0	14	14
Baby food (6)-----	33	67	33
Specialty foods (18)-----	0	40	22
All (85)-----	4	49	25

^{1/} Numbers in parentheses indicate the number of responses.

Table 82.--Other items purchased by miscellaneous food manufacturers from egg product and egg substitute suppliers

Item	Number of responses by type of firm				
	Noodles, macaroni, ravioli	Dressing, mayonnaise	Meat and fish	Baby Food	Specialty products
Cheese-----	1	0	0	0	0
Shortening-----	1	0	0	0	0
Chicken-----	0	0	0	0	1
Flavoring-----	1	1	0	0	0
Meat and fish-----	0	0	0	6	0
Salt-----	0	0	0	1	0
Oils-----	1	1	0	0	2
Sugar-----	0	0	0	0	2
Flour-----	0	0	0	0	1
Total-----	4	2	0	7	6

Table 83.--Services offered by egg suppliers to miscellaneous food manufacturers

Service offered	Percentage of responses by type of firm				
	Noodles, macaroni, ravioli	Dressing, mayonnaise	Meat and fish	Baby food	Specialty products
Technical assistance---	4	30	40	50	25
Special services-----	4	0	0	0	0
Product research-----	23	10	0	0	34
Market and price information-----	8	0	0	25	0
Performance analysis---	4	0	0	0	0
Storage-----	4	0	0	0	0
Prompt, reliable delivery-----	4	0	0	0	0
Product testing-----	0	20	0	0	0
None-----	11	10	0	0	0
Do not need service---	11	10	40	25	25
Have own technical staff-----	4	10	0	0	8
Don't know-----	23	10	20	0	8
Total-----	100	100	100	100	100
Number of responses---	26	10	5	4	12

Table 84.--Additional services desired by miscellaneous food manufacturers

Service desired	Percentage of responses by type of firm				
	Noodles, macaroni, ravioli	Dressing, mayonnaise	Meat and fish	Baby food	Specialty products
Consumer research----	0	0	0	0	25
Product research-----	0	0	0	0	25
Technical assistance---	33	0	0	0	0
Package disposal-----	17	14	0	0	0
Accurate quality standards-----	0	29	0	0	0
Market outlook-----	0	0	0	0	25
None, not needed-----	50	57	100	50	25
Have own research staff-----	0	0	0	50	0
Total-----	100	100	100	100	100
Number of responses---	6	7	1	2	4

