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MARKET POTENTIALS FOR FROZEN DOUGH

Economic Research Service
U.S. DEPARTMENT OF AGRICULTURE

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HIGHLIGHTS

The first known commercial production of frozen dough was in 1945. In 1965 there were 29 firms producing frozen dough in 40 plants throughout the United States. In addition to these firms, a number of grocery chains were producing frozen dough for baking in their own bakeries.

In the fall and winter of 1965, representatives of 26 of these 29 firms were interviewed to get information on use of frozen dough, on its sales potential, and on problems of the industry. Of the 18 firms reporting on annual sales, nearly half had annual sales of frozen dough of over a half million dollars each in 1964.

Of the firms surveyed, 25 of the 26 were making white frozen bread dough. White frozen dough accounted for over 50 percent of the sales of frozen dough of most of the firms interviewed.

Of three principal methods used for making bread dough (straight dough, sponge and dough, and continuous mix), the straight dough method was the most commonly used by producers of frozen dough. The time allowed for fermentation before freezing varied considerably among firms making frozen dough, but was generally not very long. According to those interviewed fermentation time was shortened to increase shelf life for the frozen dough, even though this reduced bread flavor.

The factor most often cited by managers as being critical in achieving high, uniform quality in frozen dough was use of high quality ingredients, especially of high protein flour.

An important factor affecting the growth in sales of frozen dough has been its lower price compared with already baked products. White frozen bread dough averaged about 18 percent lower than white bread in selected cities in the United States. Wholesale prices for white bread dough varied considerably among regions, with the degree of competition apparently a major determinant in these price differences.

A majority of the firm managers stated that they had very significant seasonal sales variation, with sales declining sharply in June, July, and August.

The major share of frozen dough sales of the 26 firms--83 percent--were from retail freezer cabinets in supermarkets with the remaining percentage being divided between restaurants and bakeries. Some grocery chains with on-premise bakeries produced frozen dough in a central plant for distribution to and bake-off in these bakeries. Other chains prepared dough and baked it in each bakery. Thus, the use of many different methods and combinations of methods of producing bakery products in on-premise bakeries, including the use of premixes, seems to be emerging.

Nearly 25 percent of the firms interviewed shipped frozen dough to markets from 1,000 to 2,000 miles from their plant. The most common range in distance was 100 to 500 miles. More than half of the firms were making interstate shipments of frozen dough.

Producers of frozen dough indicated that the greatest resistance to acceptance of frozen dough by the frozen food broker and supermarket buyer is due to poor handling practices in the marketing channels and low turnover rates.

Limited frozen storage and display facilities in the supermarket were other factors causing resistance to acceptance by supermarket buyers. The most important reasons cited by firms interviewed for lack of acceptance by consumers and bakeries were unfamiliarity with the product, lack of promotion, and improper handling.

Ten of the twenty-six firms interviewed were expecting to increase their production of frozen dough. Some reasons given for this expectation were greater acceptance of frozen doughs by consumers, improved quality, and expansion of market area. Four firms stated they would decrease production because of increased competition, declining demand, discontinued purchases of some varieties, and contraction of distribution area.

A separate telephone survey of seven grocery chains during the summer of 1966 revealed that frozen dough for bake-off operations has some economic advantages but, in some cases, these are offset by apparent technical disadvantages.

The major research needed for improving frozen dough, specified by the firms interviewed, was improvement of yeast performance after long periods of storage of frozen dough. The objectives of such research would be to extend shelf life under varied distribution conditions and to reduce preparation time in order to make the product more convenient to the user.

The majority of responses indicated a need for improving the performance characteristics of frozen doughs, if a continued growth in production is to be maintained.

MARKET POTENTIALS FOR FROZEN DOUGH

By Norman L. Rollag and Robert V. Enochian
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BACKGROUND

During the past 15 years, the per capita consumption of cereal and bakery products dropped 13 percent. The average retail price of these products rose nearly 46 percent (figure 1), and the average price of white bread rose 62 percent. In contrast, the entire food-at-home price index during this same period rose only 29 percent. Improved production and distribution of frozen bakery products have the potential of helping reduce cost and increase consumption of bakery products.

A study published by the Economic Research Service of the Department of Agriculture indicates that a large growth potential exists for frozen bakery products--both in the number of bakers using freezing and in the quantities of product frozen. The study also reports a growth in the distribution and selling of frozen bakery products through grocery stores and supermarkets. 1/

Frozen ready-baked products have been on the market for a number of years; the marketing of dough in frozen form is a more recent innovation. This study is concerned with the factors that affect the market potentials for frozen dough.

Frozen dough can be sold to the consumer or can be distributed to bakeries for proofing 2/and baking before sale. Frozen dough permits consumers to bake fresh bread and other items without having to prepare them from individual ingredients. By purchasing frozen dough, smaller bakeries may be able to achieve savings in overall production costs because they can benefit from the economy of large scale production of dough by centralized plants. Use of frozen doughs by bakeries located in grocery stores may be less costly than use of individual ingredients and, thus result in more in-store baking.

Objectives

The major objectives of the study reported here was to analyze factors that may affect the market potential for frozen unbaked dough by studying trends in production, costs of production and distribution, and acceptance by supermarket managers and consumers.

This study is part of a broad research program by the Economic Research Service, Department of Agriculture to analyze factors affecting the growth of the frozen bakery industry and its impact on the economy.

1/ Norman L. Rollag and Robert V. Enochian. The Freezing of Commercial Bakery Products; Current Practices, Problems, and Prospects, U. S. Dept. Agr. Mktg. Res. Rpt. 674, 1964.

2/ Proofing is the process whereby fermentation of dough by yeast results in expansion in its volume.

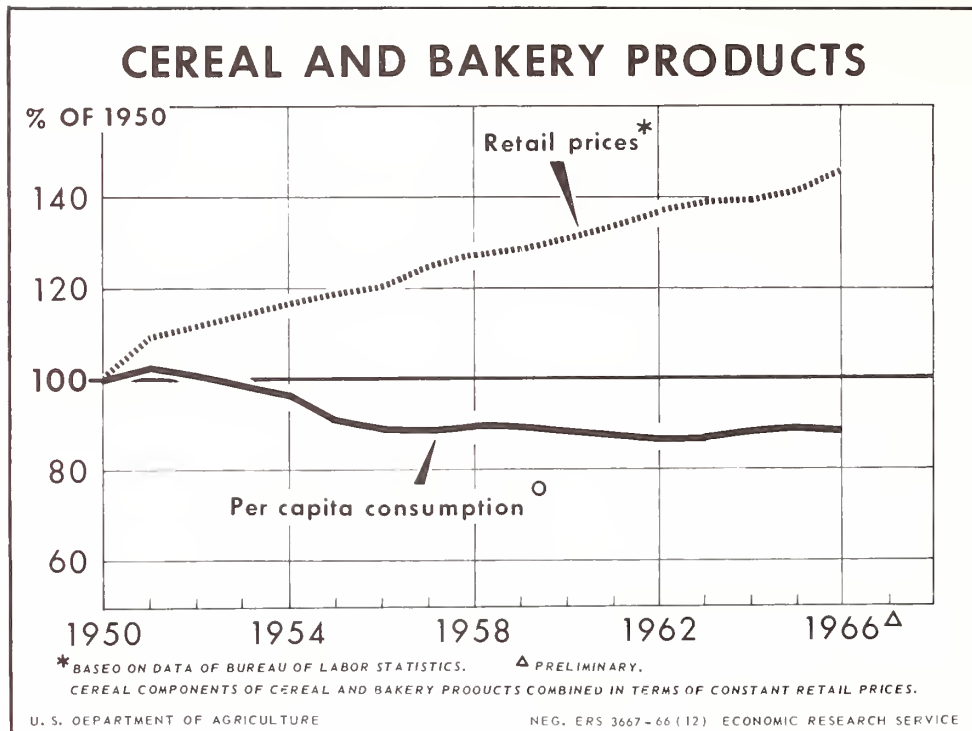


Figure 1

This report provides information that may be helpful to firms planning to initiate production of frozen dough or to expand or make adjustments in their current production, and to research organizations, such as the Utilization Research Laboratories of the Department of Agriculture that are seeking to improve the quality of frozen dough.

Procedure

The procedure followed in this study was to personally interview producers of frozen bread dough. A list of producers was developed from information gathered through industry publications, from producers of frozen dough, and from firms serving the baking industry.

In November and December 1965, personal interviews were conducted with representatives of 26 of 29 firms known to be producing frozen bread dough in 1965. Representatives of three of the firms (with plants in North Dakota, Massachusetts, and Texas) were unavailable for interview at the time the survey was conducted.

Representatives of three firms producing partly baked refrigerated and frozen bread were also interviewed.

In the summer of 1966 telephone calls were made to seven firms classified as grocery chains to ascertain advantages and disadvantages of using frozen

dough for bake-off in in-store bakeries. The results of these interviews are discussed in a separate section of this report.

Structure of the Industry

The frozen dough industry is characterized by wide differences in type of ownership, nature of business at time of initiating production of frozen dough, and procedure used in introducing frozen dough.

The 29 firms producing frozen dough in 1965 were operating a total of 40 plants scattered throughout the United States (fig. 2). Most of the plants were concentrated in heavily populated centers along the two coasts.

Of the 26 firms surveyed, 17 were one-plant firms (table 1). Of these, 10 were producing dough exclusively, while the other 7 were making frozen dough and other bakery items. The remaining 9 firms were multiplant baking firms which operated a total of 123 baking plants, 20 of which were making frozen dough. Thus, the 26 firms surveyed were operating 37 plants in which frozen dough was being manufactured.

At the time of the survey, 16 of the firms were corporations, 7 were subsidiaries of other corporations, and 3 were independent corporations franchised to use the brand name of another corporation for frozen dough (table 2).

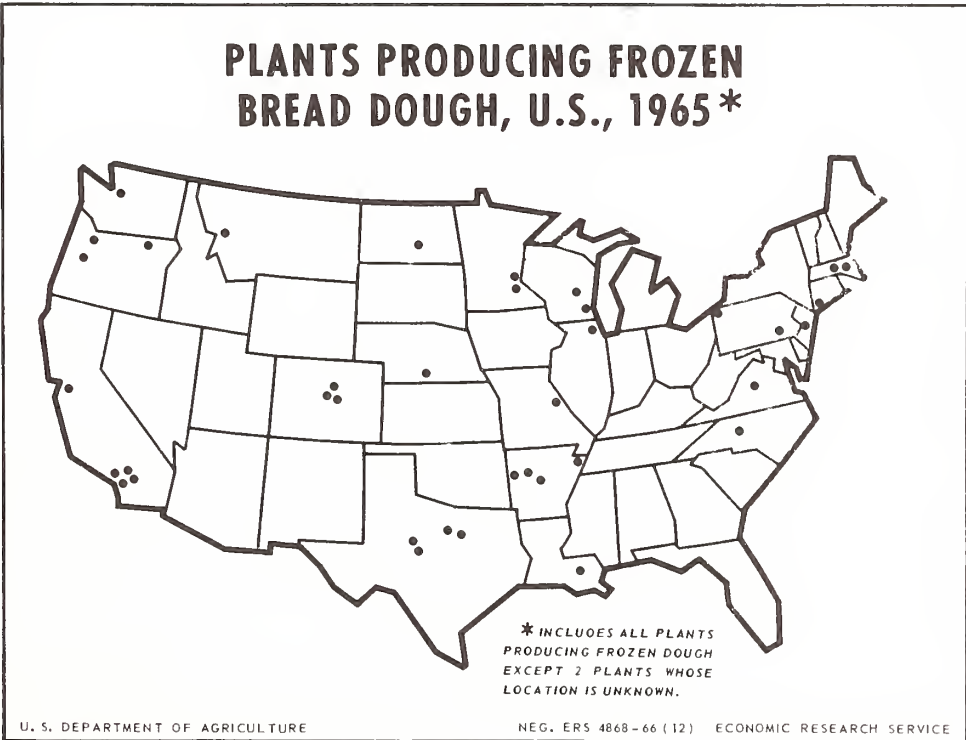


Figure 2

Table 1.--Distribution of surveyed firms producing only frozen dough and of those producing frozen dough and other products, by number of plants, number of firms, and percentage of firms, 1965

Firms producing frozen dough in--	Firms	
	Number	Percent
One plant making frozen dough only.....	10	38
One plant making frozen dough and other bakery products.....	7	26
Two plants making frozen dough and other bakery products.....	1	4
Three plants making frozen dough and other bakery products.....	1	4
One of four plants owned by firm.....	1	4
One of five plants owned by firm.....	2	8
One of nine plants owned by firm.....	1	4
Two of six plants owned by firm.....	1	4
Three of four plants owned by firm.....	1	4
Six of eighty-five plants owned by firm.....	1	4
Total.....	26	100

Table 2.--Nature of firm's business at time firm initiated production of frozen dough; firms classified according to type of ownership, 1965

Original business	Ownership			Total
	Corporation	Subsidiary	Franchise	
Baking.....	7	2	0	9
Grocery chain.....	3	0	0	3
Frozen food processor....	1	3	0	4
Machine manufacturer....	1	0	0	1
Frozen dough.....	4	2	3	9
Total.....	16	7	3	26

Nine of the firms originated as frozen dough manufacturers. Nine others were in the bakery business and started frozen dough production as a sideline and continued it as such. Four were frozen vegetable and fruit processors which, being involved in food processing and freezing, found it easy to start production of frozen dough. Production of frozen dough during the slack season made it possible for them to extend their processing operations. One firm originated as a manufacturer of machinery used in baking operations and later

adopted frozen dough production as a sideline. Three firms were grocery chains which initiated production of bakery goods and later began producing frozen dough, while continuing to operate as food stores.

The three firms classified as franchise organizations were using the same brand name for their products and were partially owned by the same corporation. In addition to providing quality control information and marketing and advertising assistance to the three franchise operations, the parent company furnished dough conditioners, formulas for new products, formulation procedures for doughs, and processing machinery. The costs of these services varied from no charge to as much as 1.5 percent of gross sales.

INDUSTRY GROWTH AND SALES

In recent years the frozen dough industry has had a rather significant increase in the number of firms entering production. This growth has been especially noticeable since the early 1960's.

Of the 26 firms surveyed, only one was in business in 1945. Another started in 1948, and a third in 1957. Five others started prior to 1961; the remaining 18 started after that year. Although the total number of firms producing frozen dough has increased steadily, many firms reportedly have entered and left the industry. Statistics on the number of such firms are not available. A large turnover in this, or any new industry indicates both an ease of entry into the industry and a lack of operator knowledge of production and marketing problems and their solution.

SALES VOLUME OF PRODUCERS OF FROZEN DOUGH

The size of firms surveyed was rather significant when measured by annual sales volume (table 3). Of 18 firms reporting their sales volume, nearly half had annual sales of frozen dough in excess of a half-million dollars in 1964.

Data on pounds of frozen dough sold were obtained from 6 firms for 1963 and for 12 firms for 1964. The 12 firms reporting 1963 sales averaged 2.1 million pounds per firm; the 6 reporting 1963 sales averaged 1.4 million pounds.

Most of the firms fell into one of two categories--firms specializing in the production of frozen dough and not producing other items, or firms whose production of frozen dough represented not more than a tenth of total sales (table 4). The firms with the largest dollar sales of frozen dough were mostly those selling nothing but frozen dough (table 5).

PRODUCTION AND DISTRIBUTION PRACTICES

Variety Information

Twenty-one different varieties of frozen dough were being manufactured at the time of the survey (table 6). Four varieties classified as "nonbread" dough were also being produced.

Table 3.--Distribution of firms by volumes of sales of frozen dough, 1964

Annual frozen dough sales	Firms	
	<u>Number</u>	<u>Percent</u>
Under \$10,000.....	1	5
\$10,000-\$24,999.....	1	5
\$25,000-\$99,999.....	3	14
\$100,000-\$499,999.....	5	22
\$500,000-\$999,999.....	5	22
One million and over.....	3	14
Figures not available.....	4	18
Total.....	22 ^{1/}	100

^{1/} Of the 26 firms surveyed, 4 were not producing frozen bread dough in 1964.

Table 4.--Distribution of firms by frozen dough sales as a proportion of total sales, 1965

Frozen dough sales as percent of total sales	Firms	
	<u>Number</u>	<u>Percent</u>
Less than 1.....	3	12
1-10.....	7	27
11-50.....	4	15
51-99.....	1	4
100.....	9	34
Not known.....	2	8
Total.....	26	100

Table 5.--Relationship between total sales volume in 1964 and percentage of sales represented by frozen dough, 1965

Total 1964 sales	Firms whose frozen dough sales as a percentage of all sales amounted to--					Quantity not known	Total
	Less than 1 percent	1-10 percent	11-50 percent	51-99 percent	100 percent		
Under \$10,000.....	--	1	--	--	--	--	1
\$10,000-\$24,999.....	1	--	--	--	--	--	1
\$25,000-\$99,999.....	--	2	--	--	1	--	3
\$100,000-\$499,999....	--	1	1	--	3	--	5
\$500,000-\$999,999....	--	1	1	--	3	--	5
\$1,000,000 and over..	--	--	1	1	1	--	3
Not available <u>1/</u>	2	2	1	--	1	2	8
Total.....	3	7	4	1	9	2	26

1/ 4 of these firms were not producing frozen dough in 1964.

Table 6.--Firms producing each variety of frozen dough, 1965

Varieties	Firms	
	Number	Percent
White.....	25	96
Whole wheat.....	12	46
Raisin.....	8	31
Raisin-cinnamon.....	6	23
Cheese.....	5	19
Rye.....	5	19
Cinnamon.....	4	15
French.....	2	8
Honey-wheat.....	2	8
Honey-raisin.....	1	4
Cracked wheat.....	1	4
Multigrain.....	1	4
Butter and egg.....	1	4
Potato.....	1	4
Wisconsin rye.....	1	4
Shepherd's.....	1	4
Petite loaves - all varieties <u>1/</u>	1	4
Bread - no description.....	1	4
Rolls, cloverleaf.....	1	4
Rolls, Parkerhouse.....	1	4
Muffins - blueberry.....	1	4

1/ 6-ounce loaves used by some restaurants.

White bread dough was the most popular variety, with all but one of the 26 firms making this variety. Nearly half of the firms made whole wheat dough and nearly a third made raisin bread dough. Only a fifth of the firms made cheese, rye, or raisin-cinnamon dough.

White frozen dough was not only the most frequently reported variety made, but for most firms was also the most important in terms of the proportion of total production (table 7). With the exception of frozen white whole wheat bread dough, less than 10 percent of any firm's production was attributed to a variety other than white.

Table 7.--Percentage of firms making different proportions of each variety of frozen dough, 1965

Variety	Total production of frozen dough						
	100 percent	50-99 percent	10-49 percent	Less than 10 percent	Volume un-known	Item not made	Total percent
	<u>Percent of firms</u>						
White.....	31	46	4	--	15	4	100
Whole wheat.....	--	--	15	23	8	54	100
Raisin.....	--	--	--	23	8	67	100
Raisin-cinnamon.....	--	--	--	15	8	77	100
Rye.....	--	--	--	15	4	81	100
Cheese.....	--	--	--	15	4	81	100
Cinnamon.....	--	--	--	11	4	85	100
Honey-wheat.....	--	--	--	4	0	96	100
French.....	--	--	--	4	4	92	100
Sweet dough.....	--	--	--	--	8	92	100
Danish.....	--	--	--	--	8	92	100

Nearly a third of the firms were making white bread dough exclusively (table 8). Most of the remaining firms were making white bread dough and one or more other varieties. Five firms were making white bread dough and five or more other dough items. Most of these five firms were selling to supermarkets with bake-off operations, although selling to the household market was their primary source of income.

Table 8.--Number and percentage of firms making different varieties of frozen dough, 1965

Varieties made	Firms	
	<u>Number</u>	<u>Percent</u>
White bread only.....	8	31
White bread and 1 other bread item.....	4	15
White bread and 2 other bread items.....	4	15
White bread and 3 other bread items.....	0	0
White bread and 4 other bread items.....	3	12
White bread and 5 or more other bread items.	5	19
Bread other than white, plus 1 or more nonbread items.....	2	8
Total.....	26	100

Since initiating production of frozen dough, 9 of the 26 firms had made a change in the relative proportion of varieties produced. Four firms had increased production of certain varieties, with the major part of the increase being in production of white dough. The remaining five firms had decreased production of certain varieties. Of these, three had decreased production of all varieties and the other two had decreased production of white and raisin bread dough and rolls.

Of the 26 firms surveyed, 5 had discontinued production of one or more varieties of frozen dough. In all, 12 different varieties had been discontinued by these firms. The reason most often given for discontinued production was low sales volume, which was attributed to poor product quality or to inadequate promotion.

Methods Used in the Manufacture of Frozen Dough

Three generally accepted methods used for making bread dough are the straight dough, sponge and dough ^{3/}, and continuous mix processes. ^{4/} In response to an

^{3/} For descriptions of the straight dough and sponge and dough methods, see E. J. Pyler, Baking Science and Technology, vol. 2, pp. 388-391, Siebel Pub. Co., Chicago, Ill., 1952.

^{4/} H. K. Parker, Continuous Bread Making Processes. Ch. 17 of Bakery Technology and Engineering, ed. S. A. Matz, Westport, Conn., AVI Pub. Co., 1960.

inquiry as to method being used in making frozen bread dough, the firms responded as follows:

<u>Method</u>	<u>No. of firms</u>
Straight dough.....	23
Sponge and dough.....	2
Continuous mix.....	0
No answer.....	1
Total.....	26

Although no firms used continuous mix, research by the American Institute of Baking indicates that frozen dough produced by this method gives greater storage life as well as better appearance, crust color, grain, texture, aroma, and flavor than dough produced by either of the other two methods. ^{5/} The sponge and dough method was shown to be least satisfactory, with noticeable deterioration of the dough following 2 weeks in storage. The straight dough method resulted in very good quality initially and the quality remained reasonably good throughout a 12-week storage period, but there was an abrupt change in characteristics at the 14th week.

Because of the uncertainty of the future demand for frozen dough, firms manufacturing only frozen dough are not likely to make major investment outlays such as would be required for a continuous mix operation. Also, some firms may not be convinced of advantages of continuous mix. Firms already manufacturing bread with the continuous mix process, however, could use this method of producing frozen dough, apparently with good results.

The fermentation time was considered to be a critical factor in the volume and flavor of bread baked from frozen dough. Eight of the producers felt it was so critical that they would not divulge the time period they were using. The remaining producers revealed the time periods they were using; these varied widely (table 9).

Many reasons were given by firm managers for using a certain fermentation time. Five gave "best results" as their reason for using a certain fermentation time, even though each used a different time period. Three said they used a certain fermentation time because it resulted in the "best flavor," although again each used a different time period. Others said fermentation time was based on the age of the flour or that it was determined by its effect on storage life of the dough.

Researchers at the American Institute of Baking used three different fermentation times for ascertaining the effect of fermentation time on quality of bread baked from frozen dough. ^{6/} Dough to be tested was frozen immediately after mixing, 20 minutes after mixing, and fully fermented. The fully fermented dough resulted in bread of better volume, appearance, grain, and texture. Dough not fully fermented resulted in bread of low volume, poor appearance, open and

^{5/} American Institute of Baking Laboratory. Frozen Bread Dough. Bul. 108, 400 E. Ontario, Chicago, Ill., Dec. 1964.

^{6/} Frozen Bread Dough, American Institute of Baking.

Table 9.--Number of firms reporting time allowed for fermentation before freezing, by type of dough process, 1965

Process used	Fermentation time						Total
	0 : min.	1-20 : min.	21-40 : min.	41-60 : min.	61 min. : and over	No : answer	
Straight dough....	5	4	3	4	2	5	23
Sponge and dough..	--	--	--	--	--	2	2
No answer.....	--	--	--	--	--	1	1
Total.....	5	4	3	4	2	8	26

coarse grain, and harsh texture. The results reported by the Institute differ from those reported by most producers who were using short fermentation times, presumably with satisfactory results. One possible explanation for this difference may be that the flour used in the dough processed by the Institute contained potassium bromate (an oxidizing agent) which apparently permits a longer fermentation time with good results for bread which is baked from frozen dough. Whether or not the flour used by the firms that were surveyed contained potassium bromate was not ascertained.

Many firms were producing white bread as well as frozen dough. These firms were asked to explain the major differences in the formulation of the two products. Some of the differences mentioned were that good quality frozen dough required (1) more sugar, milk, and yeast, (2) shorter fermentation time, (3) use of fewer additives except for yeast food, and (4) flour of higher protein content.

Producers of frozen dough indicated that high quality ingredients and high protein flour were the most critical factors in achieving a good product (table 10). Closely following in importance were method and speed of freezing and storage temperature. Many other factors were mentioned, but not as frequently. One manager indicated that keeping the temperature of the dough as low as possible during mixing extended the shelf life. Two other managers suggested that fast thawing was essential to a high quality finished product.

Two producers indicated that flattening the individual pieces of dough before they were frozen had some definite advantages. These included increasing the shelf life of the product and reducing the freezing and thawing time.

These findings suggest that the production of frozen dough is more an "art" than a "science." Industry practices vary widely. Each firm, apparently, is attempting to maximize different quality characteristics at the lowest possible cost without knowing the relative importance of these to the consumer. The resulting differences may be influential factors in the acceptance of frozen dough. Therefore, developing manufacturing standards and standardizing quality should be an important consideration by the industry in improving the acceptance of frozen dough.

Table 10.--Responses of manufacturers of frozen dough reporting critical factors for assuring baking success with frozen dough, 1965

Factors cited	Responses	
	Number	Percent
High quality ingredients (high protein flour):	15	27
Proper method and speed of freezing and correct storage temperature.....:	12	21
Good processing methods and machinery and skilled personnel.....:	8	14
Proper mixing time and temperature of dough.:	6	11
Correct fermentation time.....:	5	9
Increased shelf life; dating of product.....:	5	9
Low enough temperatures during distribution.:	5	9
Total.....:	56	100

Packaging

A major share of frozen dough of all varieties was made up in 1-pound units. Of 107 reports on packaging of products, 91 reported packaging to be in 1-pound units. The other units reported varied from 1-ounce rolls to 2-pound loaves sold mostly to the institutional trade.

The loaves of frozen dough were usually packaged in bags of clear plastic material. Number of loaves per package varied considerably. For the white dough, three loaves per package was the most common. Other popular doughs such as whole wheat, raisin, and cinnamon were usually packaged two units to a package. Some firms reported selling frozen white dough to institutions in packages containing 60 six-ounce loaves.

Research Needs of the Industry

When producers of frozen dough were asked about research needs for improving their products, they emphasized the technical phases of production and make-up of products (table 11). Special emphasis was given to the need for improving yeast performance to better withstand freezing and long periods of frozen storage. Some specific needs mentioned were extension of shelf life under variable temperatures during distribution, and reduction in proofing time to make products more convenient to use.

Table 11.--Suggested areas of research cited by producers of frozen dough, 1965

Areas of research	No. of times mentioned ^{1/}	Percent of total reponses
Improved product quality through--		
Improving yeast performance.....	23	35
Reducing proofing time.....	12	18
Determining effect of temperature and storage time on quality.....	5	8
Finding best procedures for processing, packaging, and freezing.....	5	8
Subtotal.....	45	68
Study of consumer acceptance.....	6	9
Development of new varieties of frozen dough.....	4	6
Elimination of the need for dough conditioners.....	2	3
Evaluation of costs of different methods of freezing.....	2	3
Other areas.....	7	10
Total.....	66	100

^{1/} Firms not limited to one response.

The Department of Agriculture's Western Regional Research Laboratory at Albany, Calif., has initiated a program of research to ascertain the variables affecting storage life and proofing time, and factors affecting quality of bakery products made from frozen dough. This research, plus studies of consumer use and acceptance of frozen dough being made by the Department's Statistical Reporting Service in Washington, D. C., will provide information to help guide the future development of the industry.

COMPONENTS OF RETAIL PRICES

A major factor in the growth in sales of frozen bread dough probably has been its lower retail price compared with that of baked bread. The retail price of white frozen bread dough averages about 18 percent lower per pound than of white bread in selected cities in the United States. The components of the

retail price for frozen white dough and for baked white bread are shown in figure 3. A price difference between frozen dough and baked bread has existed since frozen dough was introduced. The chief difference is in the baker-wholesaler price spread, which is smaller for frozen dough due to the fact that the proofing and baking operations are transferred from the baker to the housewife. When frozen dough was first being introduced, the price difference between it and white bread was even greater than now because of more special sales and introductory offers.

Comparison of average wholesale prices for frozen white dough reveals significant differences among regions of the United States (table 12). One might expect these price differences to be caused by differences in the cost of production, but this does not appear to be the case. The South, for example, is considered to be a low-cost production area, but the price quotations from this area show that it has the highest average price. The West, on the other hand, though considered to be a higher cost area, has lower wholesale prices than the other regions. Therefore it might be concluded that prices are influenced more by the degree of competition, which for frozen dough was greater in the West than the South. Because white bread is priced lower in the South than in the West and frozen dough is higher, it would appear that in the South frozen dough is more likely to be substituted for products other than white bread such as, for example, bread rolls.

Frozen white bread dough is generally priced lower than the other varieties of frozen dough. The major exception to this is whole-wheat dough, which is priced nearly the same as white dough.

Some firms expressed concern about the nature of competition in the industry. Much of this competition reportedly has been in the form of cutting prices below costs. This has resulted in several firms discontinuing the production of frozen dough.

SEASONAL VARIATION IN SALES

About 90 percent of the firms stated they had a very significant seasonal sales variation, with sales declining sharply during June, July, and August. Some firms had as much as a 50-percent decline in sales during these months.

The major reasons suggested for these decreases were the changes in family living habits during the summer months, such as less time spent in preparing hot meals, more outdoor cooking, and more time spent away from home.

Seasonal variation in sales has important cost implications for manufacturers of frozen dough. If firms cannot use their facilities to capacity throughout the year, fixed costs per unit are higher. A few processors of fruits and vegetables were using their plant facilities during their slack period for frozen dough production. The slack season for freezing fruits and vegetables generally corresponds to the peak period of demand for frozen dough. By producing frozen dough during this period of the year, these firms help meet peak demands, and thus help keep costs for the industry lower than they otherwise would be.

COMPONENTS OF THE RETAIL PRICE OF WHITE BREAD AND FROZEN WHITE BREAD DOUGH, MARCH 1966*

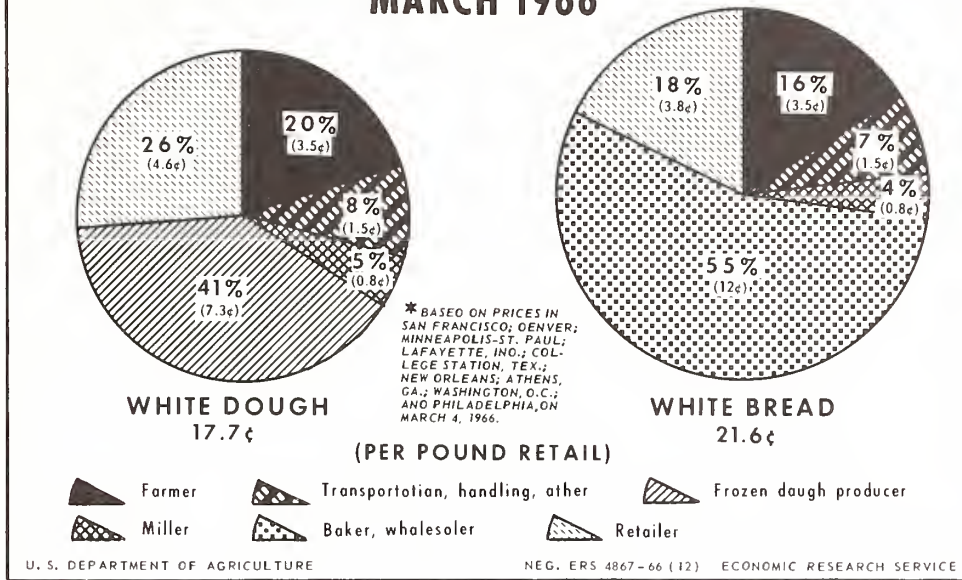


Figure 3

Table 12.--Average wholesale price per pound for frozen white bread dough, by size of sales unit, 1965

Area	Price per pound sold in units of --			Average price per pound, all units
	1 lb.	: 1 lb. 1/4 oz. : or : 19-20 oz. : : 1 lb. 1/2 oz. :		
-----Cents-----				
Northeast.....	11.6	9.6	19.1	13.4
North Central.....	13.6	10.4	--	12.0
South.....	14.1	--	--	14.1
West.....	13.1	--	10.5	11.8
Average price...	13.1	10.0	14.8	12.8

CHANNELS FOR SELLING

Frozen dough products were sold through three types of outlets--grocery stores, bakeries, and institutions--with 83 percent of the production of the 26 firms interviewed going through grocery stores (fig. 4). The frozen dough going to institutional and bakery outlets is baked at the outlets before it is sold to consumers. Some chainstores, with in-store bakeries, produce frozen dough in their own centrally located plants for bake-off in these bakeries. Conversations with manufacturers revealed that many of them believe there will be a growth in sales of frozen dough for bake-off in on-premise bakeries. This is discussed in a later section.

Channels being used for distribution were classified as direct to retailer, through broker, to retailer, or through frozen food distributors to retailers. The quantities being sold to grocery stores through each of these channels were nearly equally divided. Most of the frozen dough going to the bakery and institutional trades was distributed through brokers (fig. 4).

COLD STORAGE FACILITIES

Nearly half of the firms surveyed were using some type of private-lease or public cold storage facilities for storing frozen dough. Private-lease facilities are under management of the firm which uses them. Public cold storage facilities are owned and managed by firms specializing in frozen food storage and distribution. The proportion of production going through these facilities for the 12 firms using such facilities ranged from 1 percent for 2 firms to 100 percent for 3 firms.

Main reasons given for using private-lease or public cold storage facilities were (1) lack of plant storage space, (2) greater convenience, and (3) too small a market to justify owning facilities. Most firms using such facilities had either a limitation of capital or too small an output to justify privately owned facilities.

A few firm managers elaborated further as to why they preferred private-lease over public cold storage facilities. They felt that the private-lease arrangement gave them better control over their products. Convenience and lower cost were also mentioned as major factors. They said that often there was improper handling and poor rotation of their firms' products in public cold storage facilities. Some whose firms had used public cold storage facilities said their products had been held at temperatures above freezing, which resulted in deterioration of the products.

BARRIERS TO ACCEPTANCE OF FROZEN DOUGH

Processors of frozen dough are selling their products in much more distant markets than most wholesale bakeries which, according to a report on distribution, sell in markets up to 300 miles from their plants. ^{7/} Nearly 25 percent of the

^{7/} Distribution: The Challenge of the Sixties. Report to the American Bakers Association. Arthur D. Little, Inc. Cambridge, Dec. 1960

CHANNELS OF DISTRIBUTION OF FROZEN DOUGH, 1965

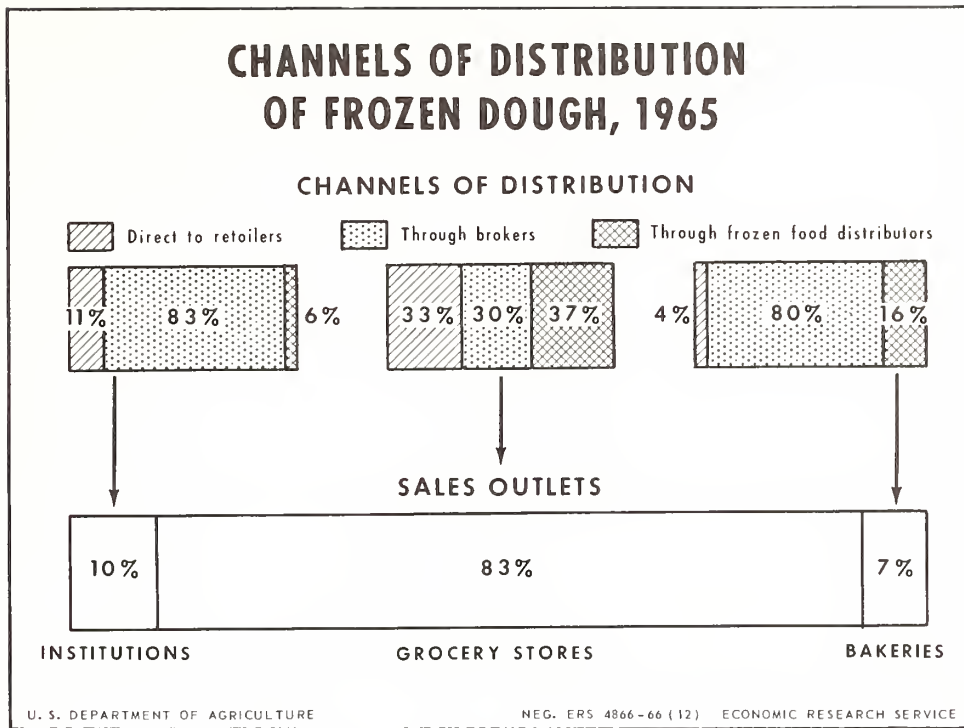


Figure 4

producers of frozen dough distributed products from 1,000 to 2,000 miles from point of production. For about a third of the firms, the distribution radius was from 100 to 500 miles (table 13). Seven firms were distributing only within their own state, 15 were distributing on a regional or multistate basis, and 4 were distributing nationwide.

Shipping frozen dough over great distances adds significantly to the cost. Unless there is an effective sales organization, the further the distance from the plant, the greater will be the problem of quality control. Some firm managers said that they had reduced their market area because they had discovered that an expanded sales area produced quality problems as well as greater competition. One manager stated that market expansion increases the need for better package design and for changes in transportation procedures to reduce costs and increase the efficiency of distribution.

One-third of the managers indicated that there was about equal consumer resistance to frozen bread dough in both urban and rural markets. Another 25 percent said there was much less resistance in rural and suburban areas than in urban areas. Some of these said use of frozen dough had replaced breadmaking by housewives, primarily in rural areas. The managers interviewed also felt that many of the rural and suburban wives had more free time than urban housewives and were looking for new ways of varying the family menu. Several firms indicated a greater resistance to sales in warmer climates.

Table 13.--Firms producing frozen dough classified by distance to furthest distribution point, 1965

Distance (miles)	Firms	
	Number	Percent
99 and under.....	5	20
100-499.....	8	32
500-999.....	3	12
1,000-1,999.....	6	24
2,000 and over.....	3	12
Total.....	25 ^{1/}	100

^{1/} No answer received from one firm.

Among the reasons given by firms for shipping to particular markets were high concentration of population, location of firm when production of frozen dough was started, franchise specifications, distance of plant from market, availability of backhaul business, market testing results, and incidence of retail yeast sales. High retail yeast sales in an area suggest the possibility of getting housewives to substitute use of frozen bread dough for breadmaking in the home.

Producers were asked to cite reasons for lack of acceptance of frozen dough at various stages in the marketing channel (table 14). The reasons most often cited for poor acceptance by frozen food brokers were temperatures above freezing at some stage of marketing, and low rate of turnover. These same reasons were most important for poor acceptance by supermarkets. Inadequate freezer facilities, both in terms of space and temperatures, in the supermarkets, especially in the older stores, also was cited as an important deterrent to acceptance of frozen doughs. These factors also influence acceptance by consumers because poor handling results in poor quality, and this reduces repeat consumer purchases.

Poor results obtained by consumers in using frozen dough were attributed by frozen dough manufacturers to improper temperatures during storage and distribution. Processors thought the major obstacle to use of frozen doughs by retail bakers was unfamiliarity with the product.

METHODS FOR INCREASING ACCEPTANCE OF FROZEN DOUGH

Another phase of the discussion with producers of frozen dough centered around what might be done to obtain greater acceptance of frozen dough by consumers. Representatives of 11 of the 26 firms interviewed had some ideas about what might be done. These included (1) greater education of supermarket managers

Table 14.--Reasons given by producers of frozen dough for poor acceptance of frozen dough by handlers and users, 1965

Reason	Frozen- food broker	Super- market buyer	Retail baker	Consumer
	-Number-			
Improper handling of product <u>2/</u> ...	5	6	0	12
Inadequate promotion.....	2	6	0	14
Inadequate freezer facilities.....	2	9	1	2
Low turnover and return.....	4	8	0	0
Not familiar with frozen dough....	1	0	6	4
Other answers.....	2	0	4	2
No answers or not applicable.....	9	5	10	2
Total.....	25	34	21	36

1/ 6 firm managers indicated good acceptance by frozen-food brokers, super-market buyers, and consumers. Another 7 managers indicated good acceptance by retail bakers.

2/ Improper handling included allowing frozen dough to thaw during shipment and storage, failure to maintain proper inventory control, keeping facilities at improper temperature, allowing dough to thaw during recycling of freezer, and--on the part of the consumer--failure to follow directions for storing or baking and use of wrong pan size for baking.

and consumers on correct storage temperatures and correct preparation procedures (including use of proper pan size), (2) reduction in transportation rates to coincide more closely with the value of the product, (3) improvement of quality control by dating of product or having a device on the package for indicating the temperatures at which the product has been kept, (4) increase in product variety, (5) increase in advertising and promotional programs and improvement of merchandising techniques, and (6) reduction in the preparation time required of the housewife.

The future growth in sales may well depend on how successful the industry is in solving these problems.

THE POTENTIAL FOR FROZEN DOUGH IN BAKE-OFF OPERATIONS

The future growth in production of frozen dough could be greatly influenced by the growth of on-premise bakeries.

On-premise baking in supermarkets has been increasing in recent years. This has been due to a number of factors, including (1) consumer demand for one-stop shopping, (2) the effect of aroma and eye-appeal in increasing purchases of bakery items and increasing total store sales, (3) competition among supermarkets, (4) effectiveness of in-store baking in reducing distribution costs and problems, and (5) more purchases of bakery products because of growth in consumer incomes.

Until recently, all on-premise baking included the making up of the dough. The central make-up of doughs and the freezing of these doughs for distribution to on-premise bakeries for baking is a recent innovation, and is often referred to by the trade as a modified bake-off operation.

Theoretically, some savings are possible by using the modified system largely because of the economies of large scale production in a central plant. Savings are also made possible by (1) the economies in purchasing ingredients in large quantities, (2) lower labor costs in the modified bakery than in the complete on-premise bakery because of the employment of less skilled personnel, and (3) lower capital investment in each individual on-premise bakery.

During the summer of 1966, telephone interviews were conducted with seven firms classified as grocery chains or as businesses servicing bakery operations. The purpose of this survey was to discuss some of the advantages and disadvantages of the complete on-premise bakery as compared with the modified system.

Firm representatives generally indicated that, although the modified system had a number of theoretical advantages, in actual practices these advantages were frequently offset by a number of disadvantages. The following disadvantages were mentioned: (1) Storage and shipping costs for frozen dough are too high in relation to value of the product, (2) a modified bake-off operation requires more supervision from the store manager than a regular on-premise bakery when the operators of the bakery are not bakers, or, if a trained baker is used, the high salary he commands may reduce the theoretical advantage of lower labor costs, (3) it is difficult to schedule the operation to have a full line of freshly baked products available when the store opens, (4) the capacity of frozen storage and distribution facilities in most stores is inadequate to handle a full line of products, (5) facilities are not generally available for keeping the products frozen during shipment and storage, (6) storage life of some frozen doughs is too short, (7) packaging materials and procedures are often inadequate for handling and shipment of frozen doughs, (8) delivery schedules from the central plant are often uncertain, and (9) because of the wide range of possibilities for allocating overhead costs to the baking operation, it is difficult for management to ascertain the profitability of bake-off operations. Some of these disadvantages cited by managers would seem to apply equally to regular on-premise bakeries.

In general, the firm managers interviewed said they felt that on-premise baking would continue to grow and that the future of the modified bake-off operation would depend on the solution of a number of technical problems. One manager suggested that, to get maximum efficiency in on-premise bakeries, normally only those items that have a high turnover should be made, such as bread, doughnuts, and fried items. He felt that other items could be made at lower cost from frozen doughs produced in a central plant, or from prepared dry mixes. Another manager suggested that more consideration should be given to complementing

the on-premise operation by having frozen bakery goods available in the freezer cabinet. These suggestions indicate that a number of different on-premise operations will evolve. Undoubtedly, the method that will be used by a given store will be decided upon after consideration of the various technical advantages and costs involved.

INDUSTRY OUTLOOK

In the final analysis, the growth of an industry is dependent on the decisions of management for expansion. These decisions, in turn, depend on management's evaluation of the demand for its product. Expansion can be through entry of new producers or through expansion in the output of present producers, either by development of new products or by increased sales of present products. A knowledge of producers' expectations can be helpful in projecting the future growth of the industry.

Expected Changes in Product Mix, Production, and Plant Facilities

Firm managers were asked whether they were planning any changes in product mix. Over half indicated they expected to make some change, as shown below:

	<u>No. of firms</u>
No change expected.....	10
Some change expected.....	14
No answer.....	<u>2</u>
Total.....	26

The following changes were mentioned:

	<u>No. of times mentioned</u>
Addition of more varieties.....	11
Development of new varieties suitable for bake-off operation..	3
Development of new varieties for institutional trade.....	2
General sales increase requiring new products.....	2

These expectations portray an interest in diversification of products as well as in serving new types of outlets.

Managers of all firms were asked to indicate whether they anticipated any changes in the annual quantities of frozen dough produced. Of the 26 firm managers interviewed, 7 did not respond, and 5 stated they expected no change. Managers anticipating no changes gave as reasons saturation of the market and lack of funds for promotion and advertising. The 14 managers anticipating changes in their level of production of frozen dough reported as follows:

<u>Amount of change</u>	<u>Firms expecting increase</u>	<u>Firms expecting decrease</u>
1-10 percent.....	4	2
11-25 percent.....	1	--
26-50 percent.....	2	--
51 percent and over.....	3	--
No percentage given.....	--	2
Total.....	10	4

The four firms with an expected 1 to 10 percent increase in production had average sales of frozen dough of just under \$200,000 in 1964, while the two firms with an expected decrease had average sales in excess of \$1 million. The three firms with an expected 51 percent or more increase had average sales in 1964 of over \$800,000. On balance, these expectations indicate that some growth can be expected in the industry.

Managers of firms with an expected increase in production gave the following reasons for their expectations: (1) Expansion of distribution to more distant markets, (2) greater acceptance of frozen dough by consumers, (3) improved products, (4) increased demand by different types of sales outlets, and (5) replacement of competitive products in their own retail chain stores with frozen doughs.

Managers of firms with an expected decrease in sales gave the following reasons: (1) Increased competition from others, (2) declining demand, (3) discontinuation of some varieties, and (4) need to contract distribution area in order to reduce costs.

All managers contacted were asked whether they anticipated construction of new plants or expansion of facilities at present locations. Ten of the firms anticipated some expansion. Of these, 7 were planning expansion of present facilities by increasing freezing capacity while 3 indicated that serious consideration was being given to building plants in other locations.

Projected Growth

Expectations for the future are frequently based on past trends. Based on statements by frozen dough manufacturers and trends in other industries, it can be assumed that the following factors will have an important effect on the future growth of the industry: (1) The price of frozen dough in comparison with the prices of competing products, including fresh and frozen bakery products, refrigerated doughs, and premixes; (2) continued acceptance of frozen doughs by consumers; (3) availability of storage and display space for frozen goods; and (4) extent and effectiveness of promotion and advertising programs.

Information in sufficient detail on the effect of these variables and their possible interactions was not available to develop a mathematical projection of the future growth of the industry. However, each manager was asked for his judgment of the general outlook for the frozen dough industry, which provides

another basis for judging industry growth. Of the 26 managers interviewed, 15 were generally optimistic, 7 were pessimistic, and 4 had no opinion on the outlook for the industry.

Those who said the outlook was favorable gave the following reasons:

- (1) Growth has been slow, but steady;
- (2) we have only scratched the surface;
- (3) the greatest percentage of future bakery product sales will be in frozen form;
- and (4) retail price for frozen dough is lower than for fresh baked bread.

The responses indicating possible limitations to growth of the frozen dough industry in the United States included the following: (1) Each major market area can support only one firm, (2) freezing costs are too high, (3) more freezer space with better freezer management is needed at the retail level, and (4) competition is so keen that some firms will go out of business.

The responses which showed no future for frozen dough included the following:

- (1) Frozen dough is opposite to the concept of convenience which has become so important to the consumer,
- (2) frozen dough is just a "fad" item, and
- (3) frozen dough sales have been declining.

CONCLUSIONS

With the trend toward less time being spent in food preparation in the home, research studies should be directed toward developments that will reduce proofing time of frozen doughs without reducing quality.

Temperatures that frozen doughs experience during marketing are not ideal and frequently cause deterioration of product quality. Anything that can be done to better enable frozen doughs to withstand less than ideal temperatures, with acceptable end-product results, will help to increase consumer acceptance.

Improvements can also be made in marketing of frozen doughs. These improvements may be accomplished through educational programs, dating of products, and the use of devices to indicate the temperature history of frozen doughs. Many users have had poor results with frozen doughs because they used pans of the wrong size, or followed poor procedures for proofing or baking because of unclear instructions or lack of instructions.

Innovations which would result in lower costs for freezing, storage, and distribution would make frozen doughs more competitive.

Frozen bread dough can be used as a base for making many other bakery items. This could have potential for bake-off operations as well as for use in the home. The growth in this use of frozen bread dough could be directly related to the promotional and educational efforts of the producers. Quality control procedures for such things as prescribed storage temperatures, and length of storage period by firms handling frozen dough would result in improved quality at time of purchase. Also, the housewife needs information on how long to store frozen dough at home and at what temperatures to store it.

Official Business

Promotion of frozen dough has been limited. More promotion at time of entry of a product into a market could increase initial purchases and repeat sales of products.

Freezer space at all stages of marketing is costly and limited. The increased popularity of frozen foods has made competition for space very keen. Although more freezer space is now available, competition with other products will continue to affect the future growth in sales of frozen doughs, especially through the retail store.

Because of increasing labor costs in away-from-home eating places, these places seem to offer a large potential outlet for frozen dough.

With increased emphasis on one-stop shopping, there is a growing demand for freshly baked, high quality bakery products in supermarkets. One way of offering these products is to have on-premise bakeries in supermarkets. The on-premise type of bakery seems to be gaining in importance although the shortage of qualified bakers in some markets is a critical problem. The on-premise bakery is a potentially large outlet for frozen dough, providing solutions are found to the problems now impeding this growth.

These findings suggest that the future growth of the frozen dough industry is problematical. The factors mentioned here are important in making an economic evaluation of future success of the industry.

