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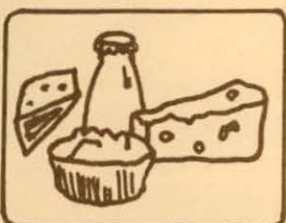
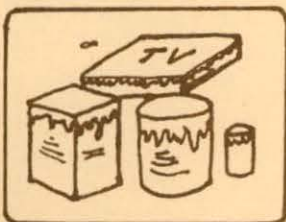
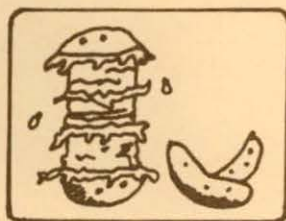
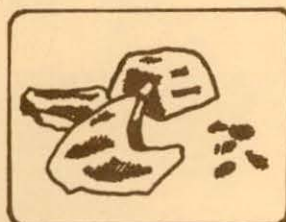
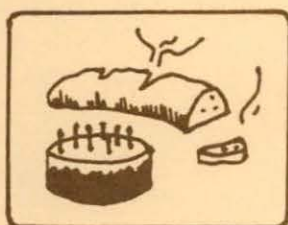
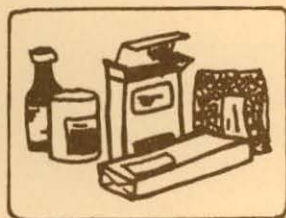
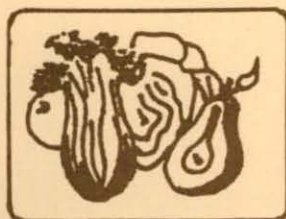
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LOSSES IN U.S. FOOD DISTRIBUTION SYSTEM



BAKERY LOSSES

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John W. Allen
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PREFACE

This is one of eight reports resulting from a study of losses and waste in food distribution. The National Science Foundation-Research Applied to National Needs (NSF-RANN) commissioned and provided primary funding for the analysis of the general magnitudes and locations of food losses occurring in the U.S. food distribution system. Additional resources were provided by Michigan State University's Agricultural Experiment Station and Cooperative Extension Service. Seven food product categories have been analyzed: fresh beef, produce, dairy products, dry grocery, frozen foods, bakery goods and foods sold through delicatessen departments. Foods within these categories constitute about 92 percent of supermarket dollar food sales. Dry grocery is the largest category, accounting for about 36 percent of supermarket food sales. It is followed by dairy products at about 15 percent, fresh beef at about 13 percent, and produce at about 9.8 percent of food sales. Frozen foods, "deli" department foods, and bakery goods accounted for 8.1, 5.2, and 4.7 percent respectively. It should be noted that with the exception of fresh beef, the categories are designated according to conventional food store departments. In the case of beef, it is the dominant product in the meat department.

This particular report contains: an introduction and orientation to bakery product distribution through supermarkets; a discussion of the general nature of bakery product losses; and findings of the magnitudes, causes and suggested remedies for bakery product losses. The following companion reports also derived from the NSF-RANN study complement this report.

- Losses in the U.S. Food Distribution System
- Produce Losses in the U.S. Food Distribution System
- Dairy Product Losses in the U.S. Food Distribution System
- Dry Grocery Losses in the U.S. Food Distribution System
- Fresh Beef Losses in the U.S. Food Distribution System
- Produce Losses in the U.S. Food Distribution System
- Delicatessen Food Losses in the U.S. Food Distribution System.

BAKERY LOSSES IN THE
U.S. FOOD DISTRIBUTION SYSTEM

CONTENTS

	<u>Page</u>
Introduction	1
The Nature of the Research	1
Bakery Products Distribution	3
The General Nature and Causes of Bakery Losses	5
Bakery Losses During Transportation, Wholesaling and Supermarketing Operations	8
Summary and Conclusions	11
Selected Bibliography	15

INTRODUCTION*

The reality of serious resource shortages coupled with stagnant productivity over the past decade has led to a renewed search for ways to improve efficiency in the U.S. economy. The productivity problem and resource shortages have been important factors in creating the nation's most serious economic problem -- inflation. Among the most visible symptoms of inflation are rising gasoline and heating fuel costs as well as food price increases. Rapid food price increases and the hardships they pose for society highlight the necessity to improve productivity and resource utilization in the food distribution system. Among the many resources used in the distribution foods -- labor, energy and capital, to name just a few -- food itself must be included as a vital resource. Thus, food firms need to develop and implement more "food efficient" distribution methods within an overall context of cost efficiency.

At the present time, however, the nature of food losses in the distribution system is often not well understood. Neither the magnitudes nor the locations of food losses have been adequately documented. Even definitions of the terms differ greatly. Nonetheless, until the magnitudes and locations of the losses are established, opportunities to take action to reduce them are severely limited. This report presents preliminary estimates of bakery product losses in the U.S. food distribution system.

The Nature of the Research

"Bakery losses" is a term subject to many interpretations. The purposes and nature of this study dictated the use of a number of different "bakery losses"

*In addition to the principal authors, major contributions to this report were made by Cynthia M. Seik, Graduate Assistant, Department of Marketing and Transportation Administration, Michigan State University.

terms and concepts: (1) economic value of physical losses, (2) total economic costs associated with losses; (3) shrinkage, and (4) losses resulting in reductions of either the quantity or quality of bakery products available for human consumption. Although different "bakery loss" concepts with disparate data were used, the study tended toward a single focus: an effort to develop estimates or proxies for the quantities of bakery products lost for human consumption. The project covered bakery product distribution activities ranging from the bakery shipping dock, extending through transportation and wholesaling activities, and ending in all cases with supermarket retailing operations.

The specific objectives of the study were:

- To identify the general magnitudes and locations of major bakery losses during distribution activities based upon a thorough inventory of available information.
- To determine the approaches currently used to control bakery losses, and to assess the strengths and weaknesses of these approaches.
- To identify bakery loss issues which may need additional research in order to reduce losses.

Research procedures employed to achieve these objectives involved a four-step process:

- An initial, broad-based survey of published information was conducted. Sources of information included: (a) university, United States Department of Agriculture and private industry-sponsored symposia on food losses and related topics; and (c) trade publications.
- A select panel composed of representatives from industry, trade associations, and government met at Michigan State University to review and comment upon the preliminary findings. They also contributed to the identification of comprehensive resource materials.

- The analysis and synthesis of selected published data was conducted in order to develop a comprehensive picture of bakery losses.
- A limited number of in-depth interviews were carried out with selected industry authorities to provide additional information, and to ascertain the reasonableness of findings.

BAKERY PRODUCTS DISTRIBUTION

In 1977, Americans spent about \$4.6 billion in supermarkets for purchases of perishable bakery goods which accounted for about 4.7 percent of supermarket food sales (6). For the purposes of this study, perishable goods included: fresh bread and rolls, pastries and pies, donuts, cakes, fresh cookies, birthday and special order cakes, muffins, and cupcakes (7). The less perishable manufactured bakery products sold in the dry grocery department, such as national and regional brand cookies and crackers were not covered in this research project.

The distribution channels for bakery goods differ depending upon location of manufacturing, and ownership of the bakeries. There are four main classifications of bakeries.

- Central Bakeries. The integrated retailer's central bakery is owned and operated by the retailing firm. Products are delivered to supermarkets in one of two ways. They are either shipped directly to supermarkets, or first transported to the retailer's distribution center where they are assembled with other foods for shipment to supermarkets.

- Commercial/Wholesale Bakeries. In this case the bakery's products are marketed principally at the wholesale level to other businesses, including supermarket companies. Once again, as in the case of central bakeries, products may either be delivered directly to supermarket stores from wholesale bakeries; or to stores via the supermarket firm's distribution center.

● Independent Retail Bakeries. Products are sold primarily through the bakery's own retail outlets. They are of interest for this study since some of these kinds of bakeries also sell to supermarket stores. In such cases, the delivery systems parallel those of the commercial or wholesale bakeries.

● On-Premise Supermarket Bakeries. These in-store bakeries are classified into "on-premise" and "bakeoff" operations. An "on-premise" or "scratch" bakery is one in which all products are mixed, formed, baked and finished for sale within the supermarket. By contrast, "bakeoff" operations consist of forming, baking and finishing products for sale from frozen ingredients that have been mixed, partly formed and frozen at a central bakery (15).

Ten years ago, according to a USDA study, wholesale and central bakeries accounted for 97 percent of bakery sales (15). However, growth of in-store bakeries has been substantial during the 1970s. In a recent survey of 359 supermarket firms, 55 percent reported operating some kind of in-store bakery. More specifically, among supermarket chains, 75 percent reported having on-premise bakery operations; whereas, the comparable figure for independent supermarket operators was 48 percent (11). Thus, it seems likely that wholesale and central bakeries are less dominant today though no data were available which permitted a direct comparison.

It should be noted that distribution channels for bakery products distributed through supermarkets generally are relatively direct as compared with those for many other kinds of foods. In the case of on-premise supermarket bakeries, there are no wholesaling or transportation functions to be performed on finished goods. In several of the alternative distribution systems, the transportation linkage goes directly from the bakery to the supermarkets. Transportation and wholesaling losses for bakery products are relatively low, and it is reasoned that the

simplicity of the distribution system so often encountered is an important factor with respect to these low levels of losses.

THE GENERAL NATURE AND CAUSES OF BAKERY LOSSES

A characteristic of almost all fresh bakery products is their high perishability. Many baked goods are assigned a one- or two-day shelf life. Length of shelf life depends upon several factors: company policy, nature of the particular bakery products, and degree of packaging protection given the product (especially whether the product is wrapped or unwrapped). Table 1 shows the typical shelf life for a number of bakery products.

Table 1. Typical Shelf Life of Bakery Products

Product	Unwrapped	Wrapped
	(days)	(days)
Bread	1	1- 3
Hard Rolls	1	1- 2
Soft Rolls	1	2- 3
Brown and Serve Rolls	-	5- 7
Sweet Rolls	1	2- 3
Donuts	1	1- 2
Cake	1- 3	1- 7
Pie	1- 2	1- 2
Cookies	5-10	5-10

Source: See (16).

Current trends occurring in the industry may be influencing losses associated with perishability. For instance, unwrapped bakery products are uncommon with the exception of items baked in on-premise bakeries; these items often are displayed unwrapped. Thus, the recent growth of scratch and bakeoff bakeries may be leading to an increasing proportion of bakery products with the relatively short shelf lives of the unwrapped items.

Another trend which may be adversely affecting losses is the rising popularity of "variety breads" as indicated by substantial increases in the sales of items such as rye, pumpernickel, whole wheat, butter twists, etc. In some markets, even those traditionally considered to be "white bread markets," where variety breads formerly comprised only 5 percent of sales, variety breads have increased to 25 percent of sales and more (8). The impact of this trend on losses is not completely clear, but industry executives believe that high demand, relatively fast-moving bakery products incur fewer losses than slower-moving products such as variety breads. In this way, the growth of variety breads which has resulted in a larger number of bread items on supermarket shelves may be a negative influence upon losses. The increasingly segmented market for breads has created the difficult task of managing adequate inventory levels for a larger number of products, resulting in a situation where losses on each kind of bread may be increasing somewhat. Thus, it is hypothesized that consumer preferences for a broader variety of bakery products is perhaps leading to increased losses.

With respect to the effects of packaging on bakery product losses, Harris and Karmas reported that approximately 80 percent of all bread is packaged in low-density polyethylene bags (9). Their report noted that the caloric value of bread, as well as the biological integrity of bread protein probably is not affected by the kind of packaging used in the industry; and that vitamins added to the bread, with the possible exception of riboflavin, are generally thought to have adequate stability under normal food industry distribution conditions.

The bakery subsector reference to losses, regardless of cause, is "stales". Stales, then, refer to losses resulting from out-of-date products caused by: over-ordering at retail; physical product damage during shipping and rough handling by customers and store personnel; inadequate inventory management caused by such practices as failure to service displays with product, the result being, product

left unsold in the backroom; unanticipated slow shopping demand which is influenced by weather patterns; and finally, in the case of commercial bakeries engaged in automatic stocking of supermarket shelves, overstocking by delivery persons (16).

Stale bakery products are treated in a number of ways: the price of stales may be marked down and sold within the retail store; returned to the bakery for credit, which is common practice among commercial bakeries; sold at a price discount to employees or to institutions; distributed through "day-old" bakery outlets at discounted prices; sold to companies for reprocessing into bread crumbs, croutons and so forth; sold for animal feed; or destroyed. Many firms use a combination of these methods.

Although stales generally represent a significant economic loss, they do not necessarily represent a large loss of food for human consumption. Some retailers and commercial bakeries have large-scale price mark-down and day-old bread store operations as a means of distributing product for human consumption. In the cases of discount programs, day-old bread store outlets, and reprocessing into other food products for human consumption, losses of bakery products for human consumption are very small. However, in some instances, companies have elected merchandising policies which limit the disposition of stales to animal feed uses or to complete destruction in the belief that selling such products, either in the supermarket at discount prices or through day-old bread stores, is to sell inferior products. It is reasoned that since most stales result from out-of-date codes, to sell consumers older products even at substantially reduced prices is a disservice to them; and, thus, such practices are counter to company policy of marketing high quality products exclusively. Moreover, some industry executives believe that consumers would not differentiate the lesser quality products being sold at discount prices from products being sold at regular prices. As a consequence, the consumers' images of the supermarket and of the product would be lowered.

One of the most substantial difficulties in analyzing bakery product losses is to determine the proportion of stale bakery products sold through channels eventually leading to human consumption, versus the proportion of stales discarded and used as animal feed. While this study is primarily concerned with losses of bakery products for human consumption, it has been necessary to include information defining total losses, irrespective of cause. Additional field research is essential to gain a more precise picture of losses for human consumption.

BAKERY LOSSES DURING TRANSPORTATION, WHOLESALE AND SUPERMARKETING OPERATIONS

As was indicated above, transportation and wholesaling systems for bakery products are often relatively direct; and in the case of on-premise supermarket bakeries, these functions play only minimal roles. Thus, loss rates were observed to be quite small in transportation and wholesaling activities. A number of Midwestern industry sources estimated that bakery losses during transportation and wholesaling normally ranged from .05 to .15 percent of the value of goods entering the distribution system. It was reported that most losses during these activities result from rough handling. However, it should be noted that in the bakery distribution system, improper and rough handling is not considered to be the major cause of losses as it is in the other food categories studied.

Bakery losses in supermarkets are much greater than those in transportation and wholesaling. Several sources of information were available to shed light on this issue. A 1959 report indicated that about 5 percent of the bread produced by wholesale and commercial bakeries was returned as stales (3). In more recent studies, stale rates were reported from a low of 1.8 percent to as high as 10 percent of dollar sales (1,14). It should be noted that these stale rates, as well as rates of losses for human consumption, vary substantially among firms depending

upon: merchandizing policies, the training level of personnel, management expertise within the bakery department, and even such factors as the time of week -- one study indicated that the number of stales increased on weekends (12).

In still another study which compared the operations of two supermarket "service" bakeries with two "self-service" bakeries, it was found that in all four stores "high demand" products, i.e., bread and rolls, had the largest percentages of stales. In the service bakeries, bread and rolls comprised 63 and 72 percent of total stales, respectively; and 51 and 59 percent of total sales, respectively. In the self-serve bakeries, bread and rolls were 68 and 82 percent of stales, and 70 and 78 percent of sales. Total stale products in all four stores varied from 7.1 to 15.7 percent of total bakery sales (16). It should be noted that these figures are contrary to the conventional industry belief that the relatively faster-moving, high demand products are associated with lower stale rates.

A number of Midwestern industry executives reported during field studies that retail stale rates ranged from about 9.0 to 12.5 percent. One firm had a planned, target stale rate of 10 percent. In this case, merchandising policies designed to minimize out-of-stocks, generally resulted in stale rates close to the 10 percent target. Thus, to prevent out-of-stocks on critical staple items such as breads, relatively high stale rates resulted which were viewed as acceptable and necessary trade-offs.

Economic losses accompanying bakery stale rates varied with the particular method used for disposing of the stales. For example, one supermarket organization made extensive use of day-old bread stores and reduced a 9 percent stale rate to a 7 percent economic loss; however, the loss of food for human consumption was reduced to only about 1 percent. This illustrates that while losses of food for human consumption can be kept relatively low, economic losses tend to remain fairly close to the stale rate. In those situations where stales were either discarded or used

for animal feed, economic losses were only slightly larger, but losses for human consumption increased substantially.

Stale rates are highly variable among bakery products. Table 2 presents typical stale rates for one Midwestern chain.

Table 2. Typical "Stale" Rates

Product	Stale Rate
	(percent)
Variety Breads	8-18
White Breads	4- 9
Sweet Goods	8
High Quality, Branded Commercial Bakery Items	6.5

The causes of bakery losses are somewhat more limited in scope than are the causes for losses in many other food categories. For example, one firm indicated that approximately 70 percent of stales resulted from a combination of over-ordering and unpredictably slow shopping demand. Another 25 percent of the stales resulted from inadequate servicing of displays. The remaining 5 percent of stales resulted from other causes, such as crushing or otherwise damaging products either by store personnel or shoppers.

Several remedies for reducing in-store losses of bakery products have been suggested. In many instances supermarket bakery departments suffer from a lack of effective management. This situation has its origin in traditional practices. Historically, the bakery department has been served by direct store delivery vendors who, to a large extent, cared for the products and assumed the direct economic losses resulting from stales. However, as the role of retailer-owned central bakeries has expanded and as in-store bakeries have grown in popularity, the economic losses for retailers and the potential for economic gain from close

management have increased. Thus, a frequently heard suggestion for reducing stales and improving overall performance of the bakery department was to move toward greater professionalism of in-store management. In some instances this meant creating the position of bakery department manager.

Another key suggestion for reducing bakery losses was to improve store ordering mechanisms. Many industry spokesmen believe that this could be accomplished through improved sales information and perhaps greater use of computerized ordering systems. It appears that UPC Scanning data would have invaluable applications in this area. Suggestions were made also to develop improved policies and practices for merchandising the bakery shelf by store personnel. Finally, the growth of certain frozen baked goods may displace some bakery items and in turn reduce losses. This seems especially likely for the relatively less-demanded items such as decorated cakes where expiration of code dates on fresh products can be a serious economic problem.

SUMMARY AND CONCLUSIONS

Table 3 presents a summary of bakery losses in the distribution system. These figures are based upon a combination of secondary data and industry sources.

It is important to realize the limitations of these estimates. First, it should be noted that the ranges of losses are extremely broad. They reflect two fundamental issues: (1) There are substantial variations in practices and performance being achieved by firms in the bakery distribution system; (2) The low end of the range tends to reflect methods for handling stales which make such products available for human consumption; whereas, at the high end of the range stale products are more often lost as food for human consumption. Furthermore, it is difficult to determine average or typical proportions of stale bakery products which are purchased for human consumption versus those which are lost for human

consumption. It is for these reasons that the ranges of losses are very broad and that more definitive estimates of losses are not provided. With these thoughts in mind, it is clear that average losses cannot be assumed to be at the center of the given range estimates.

Table 3. Estimated Ranges of 1977 Bakery Losses in the Distribution System¹

Distribution Activity	Losses ²	Value of Losses ³
	(percent)	(millions of dollars)
Transportation and Wholesaling	.05 - .15	1.35 - 6.29
Retailing	1.00 - 12.33	37.03 - 517.23
Systems Losses	1.05 - 12.48	38.92 - 523.52

¹Losses cited are estimated values of physical quantities of food lost for human consumption. It should be noted that many bakery products, perhaps 10 to 15 percent of what enters supermarket distribution, are not sold in supermarkets, but are eventually sold in day-old bakery stores or reprocessed into other products. Thus, losses from human consumption can be relatively small. Costs of recoup, salvage operations, and numerous indirect costs associated with losses and damage are not included.

²Percentage losses are based upon dollar values of losses in each phase of distribution as a percentage of the wholesale value of products entering the distribution system. Wholesale values of products entering the system are estimated to have ranged from \$3709.04 million to \$4194.40 million. This range accommodates the given loss rates and supermarket bakery sales of \$4599.12 million (6).

³Losses in transportation and wholesaling activities are valued at wholesale prices and losses at retail are valued at retail prices. The retail gross margin is 20.2 percent (6).

Second, although aggregate U.S. dollar losses are substantial, it should be noted that by comparison, individual incidents resulting in losses are relatively small. Whereas the aggregate systems-wide losses are estimated to range from approximately \$39 million to \$524 million, the majority of individual loss

situations would probably be measured in cents! In part, because individual losses tend to be small, and also because they occur in hundreds of thousands of trucks, thousands of distribution centers, and 33 thousand supermarkets across the nation, it is highly unlikely that losses can be significantly reduced by single or simplistic actions. It appears likely that the most significant loss reductions of bakery products will involve improved management practices at the store level.

The final portion of this report presents three separate summaries. The first lists major causal factors for bakery losses occurring during distribution. This list identifies and generalizes the causes for losses at a basic level. The letters in parentheses to the right of each factor in the summary provide a coding system. The codes are used along with the specific causes for the losses which are listed next.

The second summary identifies specific causes for losses in the contexts of the phases and functions of the distribution system. The major causal factor codes indicate the related underlying causes.

The third summary provides a preliminary list of potential remedies for loss reductions. It is not intended to indicate that such remedies are either technologically or economically feasible, but only that there are numerous opportunities which warrant careful consideration and analysis. And indeed, this is the initial requisite step for reducing losses and improving the effectiveness of the distribution system.

Major Causal Factors for Bakery Losses

- Out-of-Date (O)
- Slow Demand (D)
- Handling (H)
- Packaging Materials (P)

Specific Causes for Bakery Losses

- During Transportation and Wholesaling Operations
 - * Product damaged during handling (H)
 - Loading and unloading of delivery trucks
 - Movement and temporary storage in the distribution center
 - * Defective wrapper or wrapper damaged in distribution (P)
- During Supermarket Operations
 - * Slow moving items (O)
 - * Unforeseen demand conditions (O,D)
 - * Inadequate ordering policies and procedures (O)
 - * Rough or careless handling by customers (H)
 - * Product damaged during in-store handling (H)

Remedies for Bakery Losses

- Reducing Out-of-Dates and Coping with Slow Demand
 - * Move to greater professionalism of in-store management
 - * Move toward the bakery department manager concept
 - * Improve ordering with better sales information and perhaps computerization
 - * Develop improved policies and practices for merchandising the bakery itself
- Improved Handling Practices and Packaging Materials
 - * Develop improved handling policies and practices at wholesale and retail
 - * Upgrade employee training

SELECTED BIBLIOGRAPHY

1. Bakery Production and Marketing. "In Crestwood Sales Shops." April, 1976.
2. Bakery Production and Marketing. "Marketing Trends, 1976." June, 1976.
3. Bechtel, W. G. "The Future of Frozen Bakery Products." Quick Frozen Foods, October, 1959.
4. Chain Store Age/Supermarkets. "An Automated Future." August, 1978.
5. Chain Store Age/Supermarkets. "Bakery." May, 1976.
6. Chain Store Age/Supermarkets. "Bakery Foods: 1977 Performance--\$1 Million Supermarkets." July, 1978.
7. Chain Store Age/Supermarkets. "Major Bakery Boon: Aggressive Merchandising Displays." May, 1976.
8. Chain Store Age/Supermarkets. "1975 Supermarket Survey--Department Performance." July, 1976.
9. Harris, Robert S. and Karmas, Endel. Nutritional Evaluation of Food Processing. The AVI Publishing Company, Westport, Connecticut, 1975.
10. National Commission on Food Marketing. Organization and Competition in the Milling and Baking Industries. Technical Study No. 5, U.S. Government Printing Office, June, 1966.
11. Supermarket News. "Bake-off Wins 2-to-1 Over Scratch Setups in FMI Poll." July 4, 1977.
12. Supermarketing. "Bakery." July, 1975.
13. Supermarketing. "29th Annual Consumer Expenditure Study." September, 1976.
14. Supermarketing. "53% of Bakeries Located at Last Stop." July, 1974.
15. United States Department of Agriculture. An Evaluation of On-Premise and Bakeoff Bakery Departments in Retail Food Stores, by Martin L. Doordan and Marvin D. Volz. Marketing Research Report No. 834, Washington, D.C., December, 1968.
16. United States Department of Agriculture. Service and Self-Service Bakery Departments in Retail Food Stores, by George A. Kisacky. Agriculture Research Service Publication 52-4, Washington, D.C., May, 1965.