FLAXSEED AND THE BAKING INDUSTRY:
AN OVERVIEW

Jennifer Holstun
Dale Zetocha
Institute for Business and Industry Development

Larry Stearns
Tim Petry
Department of Agricultural Economics

North Dakota State University

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INTRODUCTION

Flaxseed production has declined steadily since 1973 mainly due to increased use of other oils (instead of linseed oil) and synthetic coatings in paints and varnishes. Decreases in production are offset by increasing imports, with a large percentage from Canada. In recent years most of the flaxseed grown in the United States has been raised in North Dakota, South Dakota, and Minnesota. In 1992, North Dakota produced 83 percent of the U.S. flaxseed.

Consumers are becoming more health conscious. Consuming flaxseed may provide potential health benefits. This report is a brief summary of the major findings from a study assessing baking industry trends and analyzing potential opportunities for flaxseed in the baking industry. Wholesale bakery companies were contacted by phone to determine the potential for increasing flaxseed usage in bakery products. Recommendations for educating and promoting flaxseed in bakery products also are included.

North Dakota State University and USDA have developed a golden flaxseed (Omega) variety, which is more eye appealing and mills more easily for baked products compared to the brown flaxseed. Omega flax is readily available in the U.S. and would provide an advantage over Canadian producers in the short-run. By promoting flaxseed in bakery products, flax producers in the state could benefit from increased production, acreage, and income.

Flaxseed is known to have some potential health benefits in food for human consumption. A detailed market analysis of the baking industry was conducted to identify potential markets for flaxseed. The objective is to assist the North Dakota Oilseed Council in increasing the utilization of flax and possibly enhancing price and acreage in North Dakota.

BAKING INDUSTRY TRENDS

The Food and Drug Administration's new labeling regulations, the USDA's Food Guide Pyramid and the increased awareness of healthful eating will continue to affect the baking industry. These trends are present in most bakery product categories. However, flavor still remains a top priority for consumers, and consumers will not sacrifice flavor for a more healthful product.

The baking industry is divided into four segments: retail, in-store, wholesale and foodservice. A weak economy the last few years has contributed to the decline in retail bakery sales. Consumers shop for bargains at wholesale clubs and purchase lower priced items during difficult economic times. In 1992, breads and bagels were the fastest growing items in retail bakeries. Retail bakery customers' main priority is flavor. As with retail bakeries, the foodservice baking segment experienced a significant drop in sales in 1992. Some foodservice units will discontinue "on-premise" baking in 1993 and return to retail bakers and intermediate wholesalers for products. Restaurants, however, are offering a wider selection of breads on their menus.

In-store bakeries also had declining sales in 1992 as consumers switched to on-shelf baking mixes. More healthful products are being sold at in-store bakeries, with many retailers reporting growth in European and multi-grain bread sales. In-store operators are exploring ways to increase sales without increasing the need for labor by offering branded products like Mrs. Field's cookies. Consumers continue to purchase muffins and cookies since these products are very portable (convenient). Thaw-and-sell items allow in-store bakeries to expand into broader product categories without adding staff or equipment.

Wholesale bakers are challenged because of faltering economy and costs associated with new labeling regulations. Wholesalers are still trying to satisfy consumers' taste expectations for healthful sweet goods. The most successful "healthful" products are those that traditionally contain low fat. In 1992, low-fat and fat-free cookies were 5.3 percent of the total cookie market. However, Nabisco claimed to have 70 percent of that market. Nabisco's position in this category centers on "making cookie customers out of people who aren't cookie customers." Some companies have not introduced fat-free products because they are unable to formulate a "good-tasting" product.

Continental Baking Company is the largest wholesale baking company in the United States. Continental's Wonder Bread is the leading bread product in the United States, and Wonder Light is the top selling reduced calorie bread. Beefsteak Rye is the leading rye bread sold in the United States, and Home Pride is the leading wheat bread. Continental's snack cakes, pie and donut business continues to focus on societal trends concerning health and fitness.

Private label sales are growing at the expense of branded items. Sourdough, French and Italian bread products are a growing interest for wholesale bakers since private label interest in these products is limited. Therefore, there is an opportunity to receive premium prices for these items. Private label accounts for 16 percent of the $7.3 billion cookie-cracker market.

The wholesale baked goods industry consists of three sectors: bread, cake, and related products; cookies and crackers; and frozen bakery items, excluding bread and rolls. In 1991, only bread, cake, and related items showed a gain in consumption, 1.2 percent to 88.3 pounds. Per capita trends of major bakery categories including crackers, cookies, rolls and breads from 1988 to 1993 are shown in Fig. 1. Per capita consumption for
cookies and crackers dropped 2 percent to 20.26 pounds and frozen baked items dropped 6.3 percent to 5.05 pounds in 1991. Per capita consumption of all bread increased from 49.87 pounds in 1990 to 50.50 pounds in 1991. Although fewer hamburger and hot dog rolls were bought due to a decrease in beef consumption, consumption of rolls rose 1.2 percent in 1991. Sweet yeast goods increased 1.3 percent to 4.04 pounds per capita. Per capita consumption of frozen bakery items declined in 1991 with only the frozen soft cake category gaining. Tighter food budgets and more healthful eating habits contributed to the decline in cookie consumption.

baked goods consumption decreased as consumers continued to switch to more convenient bakery goods requiring no thawing or baking. Supermarkets also have limited freezer space allocated to frozen baked products to provide more space for faster selling ice cream and other frozen desserts.

From 1992 to 1997, cookie and cracker shipments are expected to rise 2.3 percent yearly; and, while the bread and related products industry should increase 1.2 percent annually, the real value of product shipments of frozen bakery goods should decline 4.5 percent each year.

Price, convenience, and health concerns will continue to influence consumption changes in 1993. Real shipments of bread, cake, and related products are expected to rise less than 1 percent due to competition from pasta and lower growth in the consumption of baked sweet goods. Real shipments of conventional cookies and crackers are expected to grow less than 2 percent. Frozen bakery product shipments are expected to decline 1.5 percent due to producers’ inability to enter emerging retail markets, such as convenience stores, discount retailers, and vending machines.

In 1992, demands for lower-priced goods, greater convenience, improved taste, and lower-fat, lower-calorie products were reflected in changing consumption patterns, with increased bagel and croissant consumption. Per capita consumption trends of various bakery products over the last five years are shown in Fig. 2. The per capita consumption of all breads was projected at 51.19 pounds, variety bread at 22.78 pounds and white bread at 28.41 pounds. Variety bread consumption was divided into 6.85 pounds of hearth-type bread, 10.01 pounds of whole-wheat and cracked-wheat loaves, 2.18 pounds of rye bread and 3.74 pounds of all other variety bread. Consumption of white pan bread, the least expensive bread type, increased from 1991, reflecting the desire of many consumers to economize in response to the sluggish economy. White pan bread averaged $0.75 per pound, with whole wheat bread and French-type bread priced at $1.02 and $1.26, respectively. Cookie consumption also increased, largely due to the increased availability of low-fat varieties. Private label cookie sales increased, while sales of more expensive, national brand cookies declined. Frozen
In 1991, ingredient prices for wheat flour, dry milk and vegetable shortening decreased, while packaging expenditures and average hourly wages increased. In 1992, the Consumer Price Index for Cereal and Bakery Products reported the smallest year-to-year increase (3.9%) since 1987 (3.5%) and is similar to the increase in 1991 (4.1%). A 40 percent increase in flour costs since August of 1991 drove up retail bread prices. Prices rose between 5 and 7 percent in the Midwest, and 4 to 5 percent in the Northeast depending on the products and the market.

Consumers are becoming more aware of the values of eating complex carbohydrates, such as bread, pasta, crackers and other flour-based items. In the last 15 years, flour consumption has been increasing, with per capita flour consumption approaching 140 pounds (30 pounds more than it was 20 years ago). Increasing flour consumption will require all segments of the flour-based foods industry to focus more attention on end-use characteristics of wheat varieties. More new and novel ingredients for baking, like fat replacers and high-intensity sweeteners are available, as ingredient suppliers recognize baking as a viable market. New ingredients must provide flavor before bakers will include them in their products.

Traditionally, bakery goods have represented a small portion of the total international trade due to product perishability and different consumer preferences in other countries. However, bakery exports are growing rapidly. In 1991, cake and bread exports to Canada and Mexico accounted for $91.8 million of the total $114.4 million exports to all foreign destinations, due in part to the expansion of North American trade. For the first time, bread and cake exports rose to the value of cookie exports ($114.2 million). U.S. companies are more advanced than their Mexican counterparts in applying shelf-extending technology to various baked foods, leading to a possible valuable edge in Mexico.

Of the top 25 product categories consumers purchased in supermarkets, breakfast/snack/nutritional bars were ranked first with a 91 percent purchase rate; frozen French toast/pancakes/waffles were third (90%); bread products were sixth (89%); and frozen/ refrigerated dough products were No. 24 with an 87 percent purchase rate (Fig. 3).

Projections indicate each American will consume about 60 pounds of bread annually by the end of the decade. Upscale ethnic and "healthful" bread products are the main contributors of this category. Multi-grain breads are the mainstay of so-called "healthful" bread products, while leading ethnic breads are bagels and pita bread. In-store bakeries are expected to "pick up the banner of ethnic and healthful breads and carry the day with it" throughout the first half of the decade, gaining 10 to 12 percent annually to reach $4.5 billion by 1995. In-store bakeries are better at marketing upscale ethnic or "healthful" products than large packaged bread bakeries. However, consumers are complaining that in-store products are expensive and more perishable than packaged products.

### Bakery Products’ Ranking in the Top 25 Supermarket Items Purchased by Consumers

| Rank | Product Description | Percent of Consumers Who Purchase
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<tbody>
<tr>
<td>1</td>
<td>Breakfast/ Snack/ Nutritional Bars</td>
<td>91%</td>
</tr>
<tr>
<td>3</td>
<td>Frozen French Toast/ Pancakes/Waffles</td>
<td>90%</td>
</tr>
<tr>
<td>6</td>
<td>Bread Products</td>
<td>89%</td>
</tr>
<tr>
<td>24</td>
<td>Frozen/ Refrigerated Dough Products</td>
<td>87%</td>
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Bagels and "high nutrition white bread" are becoming popular products in the bread market. Consumers perceive bagels as healthful, nutritious and versatile. More consumers are developing a taste for fresh bagels from the oven. In 1992, the Commerce Department estimated that approximately 5 billion bagels were sold nationwide. Frozen bagel sales only grew by 6 percent, better than other frozen bread products, but much less than the 34 percent growth rate recorded for supermarket sales of fresh bagels. The frozen bagel market accounts for $166 million.

Bagels are available in many varieties including raisin, sesame, poppy seed, onion, zucchini, vegetable blends and unusual fruits. Soft, mini and microwavable bagels are also available. Some varieties are more appealing to some ethnic groups than to others. A rise in births leads to an increase in egg bagel sales since parents buy them for their teething babies. Soft bagels are the fifth fastest selling bagel variety nationwide. Soft bagels attracted new consumers to the category, such as older consumers and those who prefer a less heavy-textured bread.

Bagels are among the better contributors to bakery profits since producing bagels requires a small amount of labor. The bagel ranks first in the baking industry in terms of growth and consumer acceptance. Bagels are mostly consumed at breakfast and for snacks, and the industry is looking to develop more uses for the product.

Even with the introduction of the Food Guide Pyramid and Dietary Guidelines, consumers have negative perceptions about bread specifically, although they view the grain food category positively. An effort to educate consumers that bread is a grain food is essential. Another effort should provide consumers with information regarding appropriate serving sizes. The key to growth in the bread market is to change the longstanding misconception that bread is fattening. The USDA’s Food Guide Pyramid can be used as an educational tool in the effort to educate the public about the importance of grains in the diet.
tool to accomplish this goal. The intensified efforts of wholesale bakers to educate consumers on the nutritional benefits of bread will encourage sustained sales growth.

Consumers' interest in nutrition along with a continued desire for high calorie desserts has the U.S. cookie industry moving in opposite directions to respond to these demands. Some observers believe the "healthful" trend will continue throughout the decade and beyond, and those cookie/cracker producers who do not embrace the healthful bandwagon could experience obsolete product lines. Bite-size cookies have grown to represent between 3 and 8 percent of the total cookie sales. These cookies meet consumer demands for "snackable" and portable foods and are appealing to both adults and children. The cookie industry is positioned for future success with its broad usage and continues to keep up with current consumer trends. However, the industry must recognize the competition from other snack foods.

In 1991, granola bar and snack (including yogurt, breakfast and health bars) producers reported sales of $328 million, a 14.2 percent sales increase from 1990, and the strongest showing in 7 years. The key to its "revival" was that manufacturers revitalized its healthful roots. The granola snacks market is divided into three categories: granola and yogurt bars represent 86.9 percent of the market; breakfast bars, 8.5 percent; and health bars and sticks, 4.6 percent. Of the $328 million market, granola and yogurt bars accounted for $285 million in sales; breakfast bars, $28 million; and health bars and sticks, $15 million. In 1991, granola and yogurt bars and health bars and sticks retail sales in large supermarkets increased, 19.6 percent and 48.5 percent, respectively.

The granola snack market can also be monitored through mass-marketed products and health/energy bars. Mass-marketed products include granola and related snacks targeted toward mainstream consumers and primarily sold through traditional grocery stores, convenience stores, mass-merchandisers, candy counters and vending machines. Health/energy bars are defined as "products which move chiefly through health food outlets and have a more narrow 'healthful' positioning."

Manufacturers of mass-marketed granola products focused their new product varieties on being "healthful," convenient snacks, as well as breakfast snacks. Granola bars and snacks are available in many varieties such as the original crunchy, chewy and chocolate coated. In 1991, Quaker Oats was the sales and volume leader in this segment. However, in 1992, Kellogg's took the lead with its Nutri-Grain Cereal Bar. In 1991, Quaker Oats added a low-sodium Honey, Graham & Cinnamon Quaker Chewy Granola bar. General Mills concentrated more on convenience, with its Nature Valley Granola Bites. This product is sold in pouches and is the only bite-size granola snack on the market, according to the company.

Breakfast bars are gaining popularity since they can be eaten on the run. Kellogg's Nutri-Grain Cereal Bars focus on the emerging trend of breakfast bars and are advertised as the "Breakfast Bar On The Go" and as "Nutritious Breakfast Food Made Easy." The Nutri-Grain bar is available in four fruit flavors, consists of no preservatives, is low in sodium and is made with whole grain. Other breakfast bars on the market contain ingredients such as granola, dried fruits and nuts and come in a variety of flavors. One company offers a high energy fruit bar that is organically grown, according to its package.

The U.S. muffin market is growing at a rate of 10 percent per annum. Mini and fat-free muffins are gaining in popularity. Muffins' new found popularity is attributed to consumers' perceiving muffins as a "healthful" bakery product and to the successful introduction of mini-muffins by the three leading snack cake producers. Mini-muffins capitalize on the trend of miniaturization and on the popularity of muffins themselves. The fat-free muffins are becoming popular with fast food chains.

Fat-free or light baking mixes are focusing on those consumers 40 years of age or older, who are the most rapidly growing segment of the population, are the most concerned about nutrition and have the largest impact on the baking mix market. Light baking mixes achieved a "first-year market share" of 4 percent at the end of 1991. Lovin' Lites line of mixes is 93 to 100 percent fat-free. Supermarket sales of baking mixes revived in 1992 after experiencing declines over the last five years.

Consumers' increased attention to health combined with the continued demand for convenience has contributed to the increased sales in frozen breakfast products. Waffles and pancakes are perceived as "good-for-you" products that fulfill this consumer demand. New product varieties, such as fruit-filled, fruit-topped and mini-waffles, and heavy advertising by manufacturers have contributed to the growth of frozen waffles. Mrs. Smith's Frozen Foods expanded its popular line of Eggo frozen waffles by adding Special K Waffles and Eggo Minis. Mrs. Smith's Special K Waffles, the first fat-free waffles on the market, are cholesterol free, high in protein, contain no preservatives and have only 80 calories per serving. Mrs. Smith's offers 15 varieties of Eggo Waffles including Nutri-Grain waffles. The frozen waffle category is considered one of the fastest growing segments of the frozen food industry. Retailers are enthusiastic about the waffle segment which, for many, generates about half or more of their total frozen breakfast category volume.

The tonnage of frozen baked foods sold in 1992 increased by 4.5 percent from 1991, while dollar sales rose 6.4 percent over 1991. A challenge facing all frozen manufacturers is the continued rising costs of slotting and promotional fees paid to grocers. The fees, paid to gain access to freezer space in stores, inhibit frozen food companies from introducing new
products. The healthy baked goods sales have not been as strong as expected because of the sacrifice in flavor. More healthful products may realize their full sales potential when technological advancements improve flavor to the point where it is indistinguishable between regular and reduced fat products.

The market for preproofed frozen dough in the United States is on the rise for in-store bakeries. The growth rate in 1991 was up 25 percent from 1990. Cub Foods of Stillwater, Minnesota, offer frozen dough products, including white and whole wheat breads, turnovers, and cookie and muffin batters, directly to customers. Van den Bergh Food Company is introducing a new line of frozen dough products sold under the company’s Aldons brand. Van den Bergh also offers Mrs. Butterworth’s frozen bread dough.

Otis Spunkmeyer is the leading frozen cookie dough wholesaler in the country. This company, a regional gourmet cookie manufacturer throughout the ’80s, is now national producing 125 tons of frozen cookie dough each day. Otis Spunkmeyer’s customer base includes Marriott, 7-Eleven, American Airlines, as well as convenience stores, fast food units, supermarket in-store bakeries, delis, restaurants, military, school and employee feeding facilities.

Pillsbury is the nation’s leading manufacturer of refrigerated dough products. Refrigerated cookie dough sales increased 8 percent in 1990, while frozen cookie dough decreased 50 percent. The growth of refrigerated cookie dough centers around its implied freshness and greater convenience compared to the frozen dough.

**FLAX SURVEY RESULTS**

Bread and cake producers (both multi-unit and individual plants), frozen dough manufacturers, baking mix manufacturers and milling companies, and biscuit and cracker producers (both multi-units and individual plants) were surveyed to determine the baking industry’s awareness of flaxseed and its usage across the United States (see Figs. 4 & 5). Company names and telephone numbers were obtained through the *Milling & Baking News: Baking/Snack Directory & Buyers’ Guide 1993*. At least one company from each state listed was selected whenever possible. The 102 participants were located in the following states: Arizona, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Utah, Washington, Virginia, West Virginia, and Wisconsin.

Based on the participants’ responses to the survey, the baking industry does not seem to be aware of the potential health benefits of flaxseed (Fig. 6). Additionally, the respondents did not think consumers were very knowledgeable about the potential health benefits of flaxseed.

Over two-thirds (72%) of the respondents believed consumers would purchase flaxseed products if they were aware of its perceived health benefits. A majority (58%) of the respondents agreed or strongly agreed consumers might purchase a product containing flaxseed based on the product being new, trendy, or unique. Only 36 percent agreed or strongly agreed that consumers would purchase flaxseed products for ethnic or traditional use (Fig. 7).

Educating consumers about the potential benefits of flaxseed could increase the demand for products containing flaxseed. Respondents believed publishing articles in local newspapers would be the most effective method for educating the public. Educating the public directly can become very costly. Some respondents thought food processors and manufacturers should be educated first, since they may need to change formulations to incorporate flaxseed into their products (Fig. 8).
The majority of companies currently using flaxseed stated their usage has increased during the past five years and 68 percent expect it to increase over the next five years.

The most frequently suggested level of flaxseed usage in bakery products was between 1 and 3 percent. One-third of the respondents currently sell products containing flaxseed. The most common product containing flaxseed is multi-grain breads. Other products containing flaxseed were multi-grain hot cereals, health/breakfast bars, cookies, muffins, and multi-grain melba toast. Milling companies were the most common source of flaxseed.

The percentage of consumers who agreed or strongly agreed with the statements are as follows:

- Laxative Effect: 50%
- Lowers Cholesterol: 44%
- Reduces Colon Cancer: 40%
- Perceived Health Benefits: 72%
- New, Trendy, Unique: 58%
- Tastes Good: 44%
- Ethnic or Traditional Use: 36%

Fig. 6: Company Awareness of Potential Health Benefits of Flaxseed

Fig. 7: Views on Consumer Decisions to Purchase Products Containing Flaxseed

Fig. 8: Preference for Consumer Education Methods
Lack of consumer demand is the main reason for not using flaxseed of those companies currently not using flaxseed as an ingredient (Fig. 9). Flaxseed positioned in products with perceived health benefits and as a new, trendy or unique product may increase product demand. Increased demand and cost effectiveness may then draw other companies into the market. Based on respondents requesting more information about flaxseed, there seems to be a genuine interest of possible future market participation.

**Survey Respondents’ Ranking of the Top Incentives for Trying Flaxseed in Their Products**

- Consumer demand or market potential
- Flaxseed provides a cost savings and reacts the same as existing ingredient that will be replaced
- Need more information on health benefits of flaxseed (education)

Fig. 9: Incentives for Using Flaxseed

Many respondents believed opportunities exist for flaxseed as an ingredient in "healthful" bakery products (Fig. 10). Multi-grain breads (including rolls and buns) were given as the most common products to contain flaxseed, followed by muffins, bagels, cookies, and health/breakfast/granola bars.

**Survey Respondents’ Ranking of the Most Likely Opportunities for Using Flaxseed in Their Products**

- Breads, Rolls and Buns
- Muffins
- Bagels
- Cookies
- Health/Breakfast/Granola Bars
- Cereals (Granola/Hot), Cakes & Crackers
- Pastries
- Waffles & Pancake Mixes

Fig. 10: Potential for Flaxseed Use

**SUMMARY OF POTENTIAL OPPORTUNITIES FOR FLAXSEED IN BAKERY PRODUCTS**

Flax is an excellent crop for rotational use. Additional equipment is not required and fewer inputs are needed compared to wheat or barley. Flax can be planted on flex acres and a marketing loan is available for flax. The 1993 county-based loan rate ranges from $4.83 and $5.18 (1993 Crop Loan Rates: ND Notice LP-1495). Flax yields are generally lower than hard red spring wheat (HRSW), so to be competitive in a farming enterprise, the price must increase from current levels.

North Dakota produced 83 percent of the U.S. flaxseed in 1992. Most of the North Dakota production is in the north central and northeastern regions. To estimate a competitive price for flaxseed with HRSW, a 5-year average flaxseed price and yield in the north central and northeastern regions of North Dakota were used. Production costs for these regions were established using North Dakota State University Extension Service Crop Budget Generator. Gross income for both enterprises were determined, as well as the price necessary for flaxseed to equal net income for nonprogram wheat. A 12.3 percent increase in flax price from $3.45 to $6.12 is required to provide the same net cash flow as nonprogram wheat.

Based on the survey results and trends in the overall baking industry, multi-grain breads, bagels, muffins, cookies, health bars, and frozen waffles show the greatest potential for flaxseed as an ingredient. As consumers continue to demand greater convenience, improved taste, and lower-fat foods, bakers will search for more healthful ingredients in their products. Flaxseed could be perceived as a contributor to wholesome multi-grain products if it enhances or does not adversely affect the product's taste.

As the Food Pyramid suggests, consumers should eat 6 to 11 servings of grain products each day. Estimates project that by the end of the decade, each American will be consuming 60 pounds of bread a year. The main contributors of this category are multi-grain breads and bagels. Bread is also traditionally recognized as a high fiber product and is accepted in different varieties. Flaxseed is already utilized in multi-grain breads. Bagels are becoming popular items in the bread market. Bagels are available in many varieties and consumers perceive bagels as healthful, nutritious and versatile.

Muffins, cookies and health/breakfast/granola bars continue to serve consumer's demand for convenience. More healthful cookie varieties are available on the market as company's develop a "good-tasting" product. The granola snack (including health/breakfast bars) market was revived after manufacturers switched back to its healthful roots. Breakfast bars are also popular since they can be eaten on the run. Many
varieties are available. Fat-free muffins are gaining popularity which can be attributed to consumers' perceiving muffins as a healthful bakery product.

![Nutrition Pyramid Diagram]

Consumers' increased attention to health and the continued demand for convenience have contributed to the increased sales in frozen breakfast products, especially frozen waffles. New product varieties, including multi-grain, and heavy advertising by manufacturers have contributed to the growth in frozen waffles. The frozen waffle category is considered one of the fastest growing segments of the frozen food industry. Retailers are enthusiastic about the waffle segment which, for many, generates one-half or more than one-half of their total frozen breakfast category volume.

RECOMMENDATIONS

Consumer (general public) awareness of flaxseed and its benefits is low, but the "health food" conscious people know about and use flaxseed and flaxseed oil extensively. However, through education and promotion, the level of awareness may escalate and increase the demand for flaxseed in selected bakery items. The following recommendations suggest methods for promoting and educating consumers about flaxseed. Education/promotion is listed as a "universal" recommendation since it is an essential part of all recommendations mentioned below.

Recommendation: Conduct complete nutritional analyses of brown and Omega flaxseed varieties.

Suggestions/Concerns:
- Conducting/publishing nutritional analysis may enable positioning flaxseed as a healthful ingredient. Some research has been done, but appropriate scientists should determine what is needed in addition to what is currently available.
- A nutritional analysis of flaxseed should be performed before (pure) and after incorporating flaxseed into products and baking. The percentage of flaxseed added to products also has merit.
- A reliable analysis of the Omega variety will allow comparison with grains or seeds with somewhat similar characteristics including oats, oat bran, psyllium, and other brans. Other possibilities include "ornamental" seeds such as canola, sesame, poppy, and other more common grains. Flaxseed could potentially be positioned as a lower cost alternative with equal or better nutritional qualities (niche markets).
- If the Omega variety offers nutritional properties above those in sesame seed, this may lead to a potential substitute for sesame seed. For example, flaxseed and sesame fatty acids differ; flax contains 55 percent Omega-3, sesame almost none. The public may not like the appearance or flavor of flaxseed on buns/rolls since the flaxseed is larger and somewhat darker than the sesame seed.
- If companies are spending time and effort on nutritional analysis to comply with the new labeling guidelines, some reluctance to incorporate new ingredients may exist. However, the information gathered from these studies would help entice industry to use flaxseed as an ingredient.

Education/Promotion:
- Provide results of nutritional analysis to the medical community and bakeries to encourage flaxseed in diets for health reasons.

Recommendation: Conduct shelf-life studies to clarify potential peroxidation perceptions.

Suggestions/Concerns:
- Potential peroxidation may be perceived as more of a problem than it actually is. Documentation may dismiss any misperceptions.
- Determine the appropriate percentage of flaxseed to use in products that would not adversely affect the structure of the product. Some bakers are already successful at incorporating flaxseed into various products (breads, muffins, cookies). Use their expertise and experience to expand market potential and to investigate other product possibilities. Flaxseed is probably limited to 12 percent incorporation on a...
dry material basis. The product will determine what kind of flour (flaxseed flour versus low fat flaxseed flour) and the percentage of flaxseed flour to use. As more ground flaxseed (flaxseed flour/meal) is added to a product, the denser the product will be since some of the flour would be replaced.

- Peroxidation has been perceived as a potential problem in flaxseed flour because of its high lipid and polyunsaturated fat content. Shelf-life testing would provide guidelines for increasing shelf-life through packaging, storing, as well as the possible use of antioxidants to control peroxidation. A study was conducted at North Dakota State University on the effects of using antioxidants. Results found little problem with storage of flaxseed flour alone (without antioxidants) or with using two antioxidants alone or combined. Refrigerating or freezing some products may also avoid the risk of peroxidation.

- If peroxidation is a problem, use of whole flaxseed or only freshly ground flaxseed flour should be encouraged. Although the whole seed would offer a “nutty” flavor, it may not have as much nutritional value since less nutrients would be digested compared to ground flaxseed. Some companies may use defatted flaxseed flour since it has less potential for flavor problems over time.

- Determine the stability of flaxseed products before and after storage under normal (room temperature) to freezing temperatures to determine temperatures when problems occur, if any. Industry may require 6 to 9 months for shelf-life. Tests must include storage under room (shelf) temperatures to frozen goods storage. If flaxseed requires refrigeration or freezer storage, this may be a disadvantage since most manufacturers do not have freezing or refrigerating capabilities for ingredients.

- Sensory evaluations also should be performed to determine consumers relative acceptability of brown and golden Omega flaxseed products.

- As more in-store bakeries are located in supermarkets, product quality becomes the deciding factor for purchases of these items. Flaxseed could be used to differentiate bread products with nutritional advantages as long as quality is maintained.

**Universal Recommendation:** Provide quality educational/promotional materials for flaxseed.

**Suggestions/Concerns:**

- It would be extremely beneficial if the North Dakota Oilseed Council would collaborate with industry and the medical profession. The flaxseed industry should consider eliciting the support of the medical profession to promote healthful aspects or sponsor more research (feeding) studies, but should be aware of the tremendous investment required. The baking industry may be persuaded to promote new products containing flaxseed if products are already available or may share development costs of new product which in turn, promotes flaxseed. Companies have more ingredients to analyze than time allows, so by providing health and nutritional information on flaxseed, companies may be more willing to evaluate flaxseed. For manufacturers to accept flaxseed as an ingredient, flaxseed must demonstrate advantages in manufacturing, marketability, and/or shelf-life.

- The North Dakota Oilseed Council (NDOC) has very limited funds. If they support the needed research as described above, not enough funds may be left for promotion. After a while, maybe if enough research is completed, more funds can be allocated to continuous promotion/education efforts. The NDOC also may consider enlisting help from Roman Meal, General Mills, and Manitowoc Bakeries including experience and help from Canada. Fargo, North Dakota, could be a nucleus from which publicity could spread nationwide.

- Consider hiring a part-time marketing/technical person to interact with industry and promote flaxseed as a long range goal. These efforts involve a considerable amount of time and currently most efforts have been volunteered by Jack Carter. The individual should be hired after nutritional, shelf-life, and sensory evaluation studies are completed since that information would be valuable in promoting use of flaxseed as an ingredient to industry. Costs of developing educational/promotional materials and employing a part-time marketing/technical person should be prioritized within the resources of the NDOC.

- Provide sufficient technical information to make an informed decision to incorporate flaxseed into products.

- Consider consistently printing letters to industry contacts on commodity group stationery. Print and distribute high quality brochures that discuss the benefits of consuming flaxseed and include pictures of products that contain flaxseed.

- Describe and promote specific uses for flaxseed through the media, newspapers, and magazines. One strategy may be to promote in the local (North Dakota) press, and local bakeries first.

- Provide recipe modifications and sample products to baking companies to encourage trial bakers using flaxseed as an ingredient. Some large companies may
perform a test baking if the NDOC provides the ingredients. Define reasons manufacturers should use this ingredient in their products. Flaxseed contains a large amount of oil, but if a claim is made that flaxseed would reduce other ingredients such as oil, the claim must be documented before approaching industry. Also, recipes for different products should be made available to the public, whether through distribution in baking ingredient sections in supermarkets or at retail baking outlets with in-store samples.

- Provide in-store samples of products containing flaxseed as an ingredient for consumers to taste.
- Distribute high-quality materials and/or baking mixes to wholesale and retail baking outlets and supermarkets. Distribution could be coupled with in-store product samples to reach potential consumers.

Recommendation: Capitalize on the Food Guide Pyramid.

Suggestions/Concerns:

- Position flaxseed as an ingredient in cereal-based grain products, continuing to highlight benefits such as high in fiber and Omega-3 rather than as low in fat.
- The healthful bread trend will continue with the educational and merchandising programs based on the Food Guide Pyramid.
- The most successful "healthful" products mimic foods traditionally low in fat. This may provide an opportunity where defatted flaxseed flour could be used as an ingredient.
- Bakers are still responding to strong consumer demands for indulgence foods and also are providing products that mirror lifestyles focusing on nutrition, convenience and economy.
- Be aware of the new labeling regulations regarding health claims. For example, health claims stating that Omega-3 fatty acids prevent coronary heart disease cannot be made. However, this may change with further research. Using flaxseed as an ingredient provides an opportunity for product differentiation (even if health claims cannot be made).
- Consumer attitudes and perceptions about bread include the following: 73 percent believe it satisfies hunger, 33 percent state it is a good source of fiber, but 59 percent believe bread is fattening.
- Rising competition from pasta as a bread substitute, lower cookie consumption and continued decreases in frozen baked goods may limit growth in the industry. Frozen dough containing flaxseed flour is one option and should meet shelf-life requirements.

Recommendation: Position the Omega (golden) variety specifically for food use.

Suggestions/Concerns:

- This recommendation is contingent on completing the nutrition, shelf-life, and sensory evaluation studies. The results will be important in how flaxseed is positioned.
- The golden seed resembles a large sesame seed and may be a potential substitute for sesame seed.
- The golden seed may be more eye appealing than the brown flaxseed and could overshadow the perception of flaxseed resembling insect fragments.
- Omega flax is available in the U.S. and would provide an advantage over Canadian flax in the short run.
- Omega flaxseed also should be positioned as a baking ingredient for product differentiation rather than as a lower-cost substitute. However, it may be cost-effective compared to sesame, canola, amaranth, and other seeds, while at the same time adding nutritional value to the product.

Recommendation: Encourage more medical and related studies to prove/disprove health benefits.

Suggestions/Concerns:

- More medical studies and public reports would help bring flaxseed's potential health benefits to the public's attention, and, if proven, increase the demand for flaxseed.
- Action on this recommendation is essential, as there are few human studies available. Human testing has to be longer term, since changes in cholesterol levels due to dietary changes take several months to realize. Any long term human feeding studies would be extremely helpful to industry acceptance.
- The possibility that flaxseed consumption will not affect cholesterol levels exists.
- The support of the medical profession is necessary to encourage flaxseed use in diets for health reasons.
- If nutritional and medical tests determine flaxseed has healthful benefits, using flaxseed as a substitute or as
an additional ingredient in baking can be recommended.

Recommendation: Promote flaxseed as an ingredient in products that are increasing in popularity (bagels, multi-grain breads, breakfast/health bars, muffins, cookies, waffles) to capitalize on product popularity and to increase flaxseed use.

Suggestions/Concerns:

- When approaching industry, target sample products containing flaxseed to their product line. For example, present a mini loaf of bread with flaxseed as an ingredient to bread companies.

- Based on the survey results of wholesale baking companies, respondents suggested flaxseed use in breads, rolls and buns; with muffins, bagels, cookies and health/breakfast/granola bars following in popularity.

- Targeting health food companies to incorporate flaxseed into products may be appropriate since health food companies are more receptive to new ideas. Some health food companies (such as Shakley) may develop a granola bar with flaxseed as an ingredient in its laboratory. Another technique for visibility is to set up a booth at the annual Natural Products Exposition and provide product samples containing flaxseed.

- Bagel and muffin sales continue to increase possibly because people are looking for a slightly less expensive treat and an alternative to bread.

- Bagel consumption should increase 3 to 3.5 percent with lower sugar and fat content given as primary reasons. Bagels are perceived as healthful, nutritious, and versatile. Bagels require a small amount of labor, so return on investment is high.

- The market for pre-proofed frozen dough is on the rise for in-store bakeries. However, in the supermarket, increases in slotting and promotional fees and limited freezer space present challenges for manufacturers of frozen products.

- Muffin mixes are the fastest growing category in consumer baking mixes.

- Major manufacturers of granola/breakfast/nutritional bars focus new product varieties on health and convenience.

- Frozen waffles are considered ‘good for you’ products and consumers consider them convenient.

The North Dakota Oils Seed Council (NDOC) should consider these recommendations as it reviews the various options of products in which flaxseed may be utilized. The NDOC should establish priorities and a plan of action to maximize the use of their limited resources. Each product category will require considerable education/marketing expenditures and time. Good quality educational/marketing promotional materials should be developed to entice or encourage manufacturers/wholesalers and possibly retailers to incorporate flaxseed into their products. The NDOC should entice food companies such as Roman Meal or General Mills to help with promotion or retain a few to "lead the effort to promote" by producing sample products designed to increase market potential of flaxseed in a variety of baked goods.

Additional studies of flaxseed are currently in progress including feeding flaxseed to laying hens and using flaxseed in the health food industry. Findings and recommendations from these studies also should be considered.

For further details about this study or for a copy of the complete report, including references, contact North Dakota State University Institute for Business and Industry Development, 1712 Main Avenue, Suite 202, Fargo, ND 58103.

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