Whole Grains in Schools

A Supply Chain Approach

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Despite challenges and setbacks, school districts have incorporated whole-grain–rich foods into their menus. Student acceptance of these foods relies on a fluid and fully functional supply chain in which all members work together toward a goal of continued innovation in tasty whole-grain–rich products. Nutr Today. 2015;50(3):135–141

The status and future of whole grains changed dramatically with the January 2012 release of the US Department of Agriculture (USDA) Nutrition Standards for the National School Lunch and School Breakfast Programs.1 With whole-grain foods required on school breakfast and lunch menus, foods designated as whole-grain–rich quickly transitioned from aspirational to a mandatory part of school meals. The food industry increased the development and production of whole-grain products for schools as a result. It now is incumbent on members of the supply chain for whole-grain–rich foods in schools to develop relationships and lines of communication for creating an efficient and effective system that ensures a consistent supply of whole-grain–rich products.

The school foodservice industry is 1 of the most complex food business segments. It has a high number of purchase decision influencers, receives unprecedented scrutiny from the community, and utilizes a supply chain system that includes the USDA and group purchasing organizations in addition to the standard food distribution system, all while feeding tens of millions of school children every school day. It is critical to successfully manage this supply chain to reduce cost and increase efficiency.2

Viewing whole grains in schools from a supply chain perspective considers all stakeholders from both supply and demand sectors and facilitates a number of critical process steps that are necessary for delivering whole-grain foods to schools and their students. The whole-grain supply chain provides a flexible framework for analysis, creates a common language for all stakeholders, encourages cross-functional collaboration and planning, and emphasizes horizontal rather than vertical integration of all involved.

WHOLE-GRAIN SUPPLY CHAIN STAKEHOLDERS

The Future of Grains in Schools Task Force, in conjunction with research conducted at the University of Minnesota, identified key stakeholders in the school-meal whole-grain supply chain: wheat breeders and geneticists, growers, millers, government agencies, manufacturers, local bakers, local food supply, school food buyers groups and distributors,
and school foodservice personnel (Figure) . This article examines the relationships of a sampling of those stakeholders as they work together to ensure the smooth and seamless delivery of whole-grain foods into schools. Each player in the whole-grain food system has a role and impact, and benefit is maximized when people are willing to collaborate.

WHOLE GRAINS DEFINED

Whole grains are intact, ground, cracked, or flaked fruit of the grain whose principal components (starchy endosperm, germ, and bran) are present in the same relative proportions as they exist in the intact grain. While a definition for whole-grain foods is not yet established, 2 separate groups recently recommended that a food providing at least 8 g of whole grains per 30 g (27 g/100 g) be recognized as a whole-grain food. For now, consumers can select whole-grain products by looking on the label for 100% whole wheat or whole grain or seeking out products with the Whole Grain Stamp; ingredient lists also are a tool for identifying whole-grain foods based on prominent position on the list and ingredient name (Table 1). The USDA Final Rule issued on January 25, 2012, was based on the Healthy, Hunger-Free Kids Act of 2010 and required that as of school year 2014–2015, all grains served in the National School Lunch and School Breakfast Programs must meet the criteria for whole-grain–rich and also meet weekly and daily minimum requirements. Weekly maximums were permanently suspended in early 2014 to allow districts more flexibility in portion size. Whole-grain–rich items for schools are defined as containing either 100% whole grain or a blend of whole-grain meal and/or flour plus enriched meal and/or flour, of which at least 50% is whole grain. School food authorities (SFAs) can use a checklist to ascertain that a grain product is whole-grain rich (Table 2). Element 2c, which utilizes a product ingredient listing, presents an easy way for schools to determine which foods qualify and is less onerous on manufacturers because they do not have to list grams of whole grain or a whole-grain claim. While whole-grain rich is a defined term, whole-grain products cannot be labeled as such because

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FIGURE. Supply chain for whole grains in schools. [3]
the terminology is considered to be an implied health claim for fiber.
Some grain ingredients such as oat fiber, corn fiber, bran, germ, modified food starch, corn starch, and wheat starch (including potato, legume, and other vegetable flours) do not count, that is, not creditable, because they are not whole grains. A grain product that contains 1 or more of these ingredients is creditable only if the ingredients are present at a level of less than 2% (0.25 oz eq).

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Common Identifiers for Whole Wheat and Whole Grain7</th>
</tr>
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<tbody>
<tr>
<td>Cracked wheat</td>
<td>... berries</td>
</tr>
<tr>
<td>Crushed wheat</td>
<td>Whole ..., whole grain ...</td>
</tr>
<tr>
<td>Whole-wheat flour</td>
<td>Groats</td>
</tr>
<tr>
<td>Graham flour</td>
<td>Oatmeal</td>
</tr>
<tr>
<td>Entire-wheat flour</td>
<td>Brown rice</td>
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<tr>
<td>Bromated whole-wheat flour</td>
<td>Wild rice</td>
</tr>
<tr>
<td>Whole durum wheat flour</td>
<td>Less common whole grains (amaranth, buckwheat, Kamut, millet, quinoa, spelt)</td>
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Serving size for whole-grain–rich grain products is based on ounce equivalents (oz eq) rather than bread or bread alternate and with 16 g of grains per serving (Table 3).

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Criteria for Whole-Grain-rich School Foods8</th>
</tr>
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<tbody>
<tr>
<td>Element 1:</td>
<td>A serving of the food item must meet portion size requirements for the grains/breads component as defined in Food and Nutrition Service guidance.</td>
</tr>
<tr>
<td>AND:</td>
<td></td>
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<tr>
<td>Element 2:</td>
<td>The food must meet at least 1 of the following:</td>
</tr>
<tr>
<td>a.</td>
<td>The whole-grain content oz eq must be ≥8 g. This information may be determined from information provided on the product packaging or by the manufacturer, if available. For cooked grains and ready-to-eat breakfast cereals, the volumes or weights listed must correspond to 1 oz eq, and whole grains must be the primary grains (with other grains being enriched).</td>
</tr>
<tr>
<td>b.</td>
<td>The product bears a Food and Drug Administration (FDA)–approved whole-grain health claim on its packaging—”Diets rich in whole-grain foods and other plant foods and low in total fat, saturated fat, and cholesterol may reduce the risk of heart disease and some cancers” or ”Diets rich in whole-grain foods and other plant foods and low in saturated fat and cholesterol may help reduce the risk of heart disease.”</td>
</tr>
<tr>
<td>c.</td>
<td>Product ingredient declaration lists a whole grain first. For nonmixed dishes such as breads and cereals, whole grains must be the primary ingredient by weight, with the exception of water. When the whole-grain content comes from multiple ingredients, the combined whole-grain ingredients may be the primary ingredient by weight, even though a whole grain is not listed as the first ingredient. For mixed dishes such as pizza and corn dogs, whole grains must be the primary grain ingredient by weight and be the first grain ingredient listed. For foods prepared by school foodservice, the recipe will guide determination of whether the total weight of whole-grain ingredients exceeds the total weight of non–whole-grain ingredients.</td>
</tr>
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</table>

Notes:
• For products that include flour blends in the ingredient list, the whole-grain content of the flour blend must total at least 8.0 g per oz eq, or the weight of the whole grain must be greater than the first ingredient listed after the flour blend. Any refined flours in the product must be enriched.
• A ready-to-eat breakfast cereal must list a whole grain as the primary ingredient and be fortified to be creditable, unless the product is 100% whole grain. If the grain product includes enriched ingredients, or the product itself is enriched, the ingredients or the grain product must meet FDA standards of identity for enrichment.

CURRENT STATE OF WHOLE-GRAIN CONSUMPTION IN SCHOOLS
The School Nutrition Association 2013 Back to School Trends Survey found that all respondents serve whole-grain–rich items such as breads, rolls, and buns in their school cafeterias; more than 80% offer whole-grain pastas, rice, and cereals; nearly 80% include whole-grain tortillas, pitas, or flatbreads; and 92% report serving pizza with a whole-grain–rich crust.11 The success of whole-grain–rich foods at that time resulted in good measure from the efforts of foodservice directors to introduce and promote them in their schools.
In January 2014, the Government Accountability Office (GAO) reported that student participation in the National School Lunch Program declined by 1.2 million students (3.7%) from school year 2010–2011 through school year 2012–2013, after years of steady increases.12 Nearly all states that completed the GAO survey blamed the drop in participation to decreased student acceptance of the new lunch requirements. Follow-up visits to select school districts discovered...
that students disliked the whole-grain products being served. However, SFA directors noted that acceptance of whole-grain foods has increased over time.

Success will require coordinated efforts by all members of the supply chain, in particular, growers, manufacturers, distributors, and foodservice personnel.

**Focus on the Supply Chain**

*Growers.* The school whole-grain supply chain starts with wheat growers. Wheat is the third largest crop in the United States after corn and soybeans. A positive development for growers has been the increasing use of white whole-wheat flour in whole-grain products, with resultant increases in production, sales, and domestic use. Hard white wheat is a strain of wheat that lacks the genes to develop the phenol-rich dark bran of red wheat. As such, it is lighter in color, has a milder flavor, and offers premium baking performance, but matches red whole wheat in nutrition.

*Manufacturers and Industry.* Manufacturers of whole-grain products for schools include companies of all sizes, from industry giants such as Kellogg’s, General Mills, Conagra, and Schwan’s, to small bakers who contract with local school districts. For large manufacturers, whole-grain product development ideas generally originate in-house. However, they are not created in a vacuum. The sales force, marketing team, school education liaisons, and other company personnel are in constant contact with school districts to discuss their needs. By the time a new product enters the development phase, the manufacturer is reasonably assured that the product will be of value to schools. Both product orders and feedback help guide the development of new products to meet school district needs.

Whole-grain products cost more to produce than those made with refined flour and may take years to develop. Furthermore, manufacturers must subject any new whole-grain ingredient to a costly quality assurance process to ensure that the grain meets company and government standards for quality, safety, and other measures. New products also necessitate new equipment, packaging, and collateral and training materials for foodservice personnel. Manufacturers pass along some costs to school districts. It is expected, however, that production costs and therefore price will decrease with increased demand.

A GAO report exposed lack of availability of whole-grain–rich products in some districts in the 2012–2013 school year. Manufacturers cited lack of time for reformulation and problems matching demand to production. Reported problems with the performance of whole-grain–rich pasta led the USDA to institute a 2-year grace period for those schools needing to return to regular enriched pasta until more satisfactory whole-grain–rich products become available.

In the past few years, food industry research and development has led to creation of new whole-grain–rich products, including cereal, baked goods, and breads. Still, SFAs express a desire for better quality and acceptability of tortillas, biscuits, bagels, and grits made from whole grains.

*Foodservice Brokers and Distributors.* Foodservice brokers and distributors are important “middlesmen” in the whole-grain supply chain, serving as a conduit between food manufacturers and school meals providers. They interact with food manufacturer K-12 schools specialists to learn about new products, provide feedback on the types of whole-grain–rich products desired by schools, and alert manufacturers when products fall short of specifications or expectations. Brokers also help establish product standards that are consistent with school bidding specifications. This requires robust interaction among brokers/distributors and SFAs to determine precisely what schools need. Throughout the bid process, brokers can help ensure adequate supply by communicating anticipated school demand to manufacturers so that they build appropriate inventories and to distributors so that they have the resources to honor all their bids.

*Foodservice Directors and Management Companies.* School food authorities, including school foodservice directors and management companies, hold the key to the successful provision of whole-grain–rich products in schools. When selecting foods, they evaluate a hierarchy of considerations—student acceptance, product availability, and cost, labor, and staff involvement in product promotion.

**PARTNERSHIPS**

Foodservice directors often partner with school foodservice personnel and classroom teachers to help market whole-grain foods to students. Foodservice staff members can be enthusiastic advocates for whole grains, thinking of creative ways to enhance menus by incorporating more whole-grain–rich dishes, sharing and testing new recipes among themselves and with students, and learning different cooking techniques for whole-grain–rich foods. Students may be more willing to try new grain dishes and products when they are introduced to them through taste tests, special whole-grain events, new product featured on the menu, signage in the cafeteria, and integration with classroom lessons. Leveraging their relationship with foodservice management companies, brokers, and distributors, foodservice

### TABLE 3 Grain Product Servings

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Servings</th>
<th>Calories</th>
<th>Protein g</th>
<th>Vitamin B6 mg</th>
<th>Iron mg</th>
</tr>
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<tbody>
<tr>
<td>Baked goods (breads, bagels, biscuits, etc)</td>
<td>1 oz eq requires 16 g of creditable grain ingredients</td>
<td>1 oz eq equals 28 g</td>
<td>1 oz eq equals 28 g or ½ cup cooked</td>
<td>1 oz eq equals 28 g or ½ cup cooked</td>
<td>1 oz eq requires 16 g of creditable grain ingredients</td>
</tr>
<tr>
<td>Cereals and grain products (oatmeal, brown rice, pasta, etc)</td>
<td>1 oz eq requires 16 g of creditable grain ingredients</td>
<td>1 oz eq equals 28 g</td>
<td>1 oz eq equals 28 g or ½ cup cooked</td>
<td>1 oz eq equals 28 g or ½ cup cooked</td>
<td>1 oz eq requires 16 g of creditable grain ingredients</td>
</tr>
<tr>
<td>Ready-to-eat breakfast cereal</td>
<td>1 oz eq equals 28 g or 1 oz by weight, or 1 cup flakes or rounds, 1½ cups puffed, or ¾ cup granola</td>
<td>1 oz eq equals 28 g</td>
<td>1 oz eq equals 28 g or ½ cup cooked</td>
<td>1 oz eq equals 28 g or ½ cup cooked</td>
<td>1 oz eq requires 16 g of creditable grain ingredients</td>
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</table>
managers can access materials to increase student participation through promotional and education materials and programs for the cafeteria and classroom.

**COMPLIANCE**

Whole-grain–rich products that qualify with the federal regulations are more widely available today. Still, SFAs need to ensure that products meet whole-grain–rich food specifications, examine ingredient statements and Nutrition Facts for compliance with school foods and Dietary Guidelines standards, and maintain documentation such as a product label or manufacturer formulation statement on each product purchased. Recipes for whole-grain–rich foods should list all ingredients by weight and volume. The USDA offers guidance to schools to help them adapt their bidding process for whole-grain–rich foods (Table 4).

In creating new school meals guidelines, the government lowered an important barrier to whole-grain–rich products in schools, availability. Still, products are not always available in the range of portion sizes needed to comply with the original maximum servings per week requirements. The shortage, combined with student dissatisfaction with smaller portions of grains, prompted the government to temporarily and then permanently suspend that part of the regulation, requiring school districts to meet the minimum but not maximum weekly requirements and allowing large whole-grain portions. The school meals certification process can be arduous for SFAs. The variety of grain foods and portion sizes that may be offered in a single day, especially in schools with multiple age groups, complicates compliance calculations, as well as ordering procedures and inventory management. The 2014 lifting of the maximum for weekly grain servings occurred in part out of consideration for the difficulties faced by SFAs. Even without a maximum, SFAs still must choose grain foods that fall within total limits for calories and saturated fat.

**TABLE 4 Guidelines for Soliciting Bids for Whole-Grain-rich Products**

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<table>
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<tr>
<td>• For products with whole grain as the first ingredient on the label, that is, the weight of whole grain is greater than any other ingredient, ask that food product labels and ingredient statements be submitted with the vendor's bid on whole-grain products.</td>
<td></td>
</tr>
<tr>
<td>• If the first ingredient is not a whole grain, but the product has multiple whole grains in the ingredient list, request documentation from the manufacturer as to the weight of the first ingredient and the total weight of all of the whole-grain ingredients. The total weight of the whole-grain ingredients must be greater than the weight of the first ingredient.</td>
<td></td>
</tr>
<tr>
<td>• For products with whole grain as the primary grain ingredient by weight: Specify that a whole grain be the first grain ingredient of the product. Ask that food product labels and ingredient statements be submitted with the vendor's bid on whole-grain products.</td>
<td></td>
</tr>
<tr>
<td>• If the first grain ingredient is not a whole grain, but there are multiple whole-grain ingredients in the product, require the manufacturer to complete a product formulation statement documenting the weight of the first (refined) grain ingredient and the total weight of the whole grains. The total weight of the whole-grain ingredients must be greater than the weight of the first grain ingredient. If the manufacturer uses flour blends of whole grain and enriched flours, the manufacturer must provide documentation to show that the primary grains in the product are whole grains.</td>
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**TABLE 5 Supply Chain Recommendations**

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<tr>
<td>• Innovate to develop new whole-grain–rich products and dishes that are somewhat familiar to students and taste good.</td>
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<tr>
<td>• Reach out to student influencers and opinion leaders when marketing whole-grain–rich products.</td>
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<tr>
<td>• Encourage trial through sampling and promotions in the cafeteria, with manufacturers, distributors, and parents assisting with the scheduling and coordination of taste testing.</td>
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</tr>
<tr>
<td>• Identify practical methods for evaluating recipes and products to determine whether they meet the criteria for whole-grain rich.</td>
<td></td>
</tr>
<tr>
<td>• Communicate up the supply chain to report products that perform poorly or spoil before their “use by” date.</td>
<td></td>
</tr>
<tr>
<td>• To help contain food costs, develop the menu carefully, define the bidding and procurement process, manage inventory, train employees, and control production.</td>
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</tr>
<tr>
<td>• Join a purchasing group with other districts to procure whole-grain products at a more favorable price.</td>
<td></td>
</tr>
<tr>
<td>• Consider creative solutions such as a centralized district bakery, contracts with local bakeries and restaurants, and staff training from chefs contracted by the broker/distributor to help do more with less.</td>
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</table>
ADDITIONAL CHALLENGES

Whole grains and whole-grain–rich foods present additional challenges. They require close attention to freshness and storage. The oil content of the bran and germ increases susceptibility to rancidity, necessitating proper handling at all steps in the supply chain. Whole-grain confusion has been and continues to be problematic because the current definition of whole-grain–rich is difficult to use and forces school foodservice directors to rely on manufacturers to translate that definition into products that meet whole-grain–rich standards. Limited funding and cost of food have been cited as pressing issues for school nutrition programs. Districts vary in their cooking facilities, with some having full food production facilities and others only being able to thaw and reheat foods. This means that available whole-grain–rich options must range from dishes cooked from scratch to those that are heat-and-serve. Such differences make collaborative relationships between schools and distributors, brokers, and/or manufacturers a necessity to ensure that each district has access to a broad-enough selection of products.

The School Nutrition Association suggests that school districts continue to face challenges in adapting to the new nutrition standards. Food and administrative costs have risen, school meal program revenue is down, student acceptance of new menu items can be low, and plate waste has increased. School Nutrition Association advocates for retaining the school year 2013–2014 standard of 50% whole-grain–rich offerings and delaying the transition to 100%, noting the difficulties in finding acceptable specialty whole-grain–rich foods such as tortillas and pastas and in overcoming regional preferences for certain refined grains. Table 5 contains supply chain–based recommendations.

SUPPLY CHAIN SUCCESS STORY

For more than 10 years, District 279 Osseo Area Schools in Osseo, Minnesota, tried to add and increase the amount of whole grain in the breads baked from scratch in district kitchens. Success was limited—different staff members, ovens, mixers, and equipment yielded different results. Each school had to adjust its recipes and procedures, yet no school was able to create products that students would eat. In early 2011, foodservice director Tom Pellegrino, RD, and his team contacted the Future of Grains in Schools Task Force, which put them in touch with Jessica Wellnitz, a senior food technologist in the Cargill Bakery Category. Within a few months, Wellnitz had created recipes using white whole-wheat flour that met with staff approval, were easy to follow, and yielded similar results in each of the district’s kitchens. Students and teachers enthusiastically embraced the new bread items on the menu.

CALL TO ACTION—NEXT STEPS

Environment plays a significant role in supporting healthy decision making. The practical process of moving whole-grain–rich foods into schools must simultaneously integrate whole grains into the supply and distribution chain and address the many underlying environmental factors that may deter or prevent youth and their families from benefitting from healthier food options. The procurement cycle starts and ends with the school district. It is incumbent upon foodservice directors to plan menus; accurately forecast food, equipment, and labor needs; communicate with supply chain partners; and manage the bidding process. In addition, partnerships among foodservice directors, government, growers, manufacturers, brokers, distributors, school districts, the entire school community, and beyond are needed to make change happen in the food world and improve the nutrition well-being of our society.

Acknowledgment

The authors thank the Future of Grains in Schools Task Force whose collaborative efforts laid the foundation for this article. Their collective vision not only highlights potential barriers and challenges to the implementation of regulations for whole grains in school foodservice, but also rallies each of us to work together to overcome those challenges for better nutrition for our children.

REFERENCES

2. Boettger JA. Effects of Organizational Attributes on Adoption of Technology for Supply Chain Management in Large School Nutrition Programs [doctoral dissertation]. Ames, IA: Iowa State University; 2009.


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