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# U.S. Flour Milling on the Rise

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American millers are grinding increasing amounts of wheat into flour to meet consumer demand. Flour consumption in the United States has grown almost steadily since 1970, with per capita intake rising by 24 pounds, or an average of over 1 pound each year. And American consumer spending on bakery products topped \$50 billion in 1990.

Growing interest in healthy eating and convenience has set the pace for this growth. Consumers have been boosting their consumption of fiber, bran, and whole grains. At the same time, they are buying more highly processed convenience foods—like sandwiches, pizzas,

and tortillas—which often contain large amounts of flour.

This situation reflects a turnaround in flour's fortunes. Per capita consumption of flour is estimated at 135 pounds in 1990—the highest level since the early 1950's and 10 pounds over 1985's mark (figure 1). This trend is in sharp contrast to the declining flour consumption levels recorded in the 1960's and early 1970's. It is also one of the first reversals in flour consumption in the developed world.

## Types of Flour

Wheat flour is the primary grain product consumed in the United States. That's apparent in the wide variety of

food products prepared from flour: packaged flour for home baking, bakery mixes, breads, cakes, cookies, crackers, and pastas. Flour is also used in breakfast cereals, gravies, and soups. Overall, products classified in the bread and cake industry account for about 72 percent of total primary U.S. flour consumption (figure 2).

The flours used in the production of different food items are milled from various wheat classes. Hard wheats are used mainly in breads and rolls, and to a lesser extent, in sweet goods and all-purpose family flour. Soft wheats are used in sweet goods, cakes, cookies, crackers, and prepared mixes. Durum wheat is used almost solely in pastas.

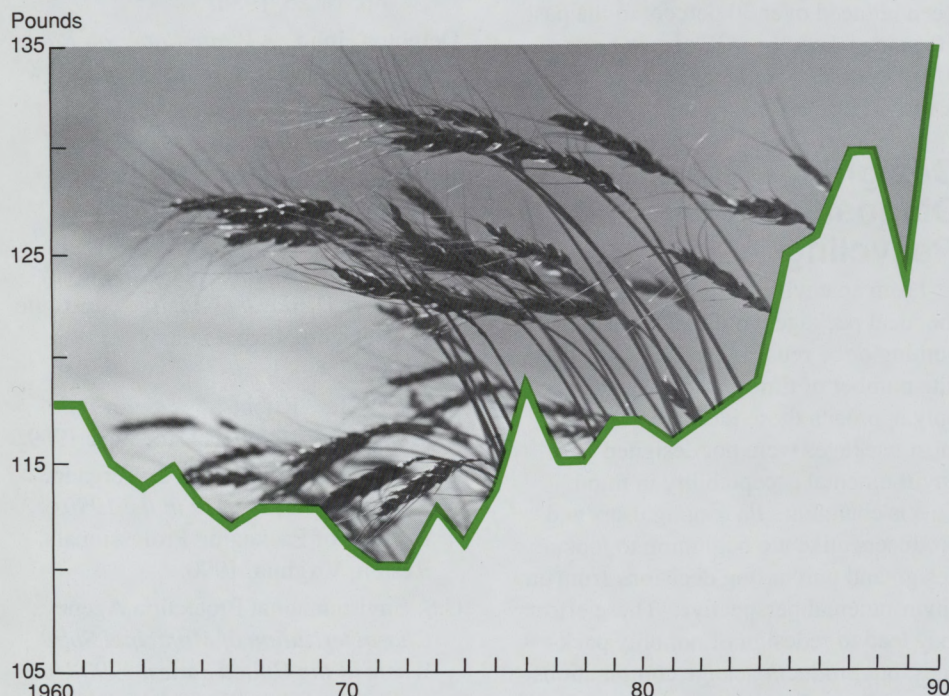
Small amounts of flour are also used for nonfood purposes. The main industrial uses include plywood adhesives, industrial starch (for laundries, textiles, pastes, and paper additives), and industrial alcohol. Minor uses include whiskey, beer, cosmetics, fertilizers, paving mixes, and polishes. Hard and durum wheats account for about 85 percent of the flour used for industrial purposes.

When milled, wheat also produces millfeeds. Millfeeds, pieces of bran and the wheat kernel, generally are used as livestock feeds. Millers exercise a great deal of discretion in determining the mix of flour and millfeeds produced by controlling the speed, pressure, and corrugation of the rollers used in the milling process.

## New Mills Locate Near Population Centers

Individual flour mills often grind only one wheat class. Hard wheat mills are the most numerous and accounted for about 70 percent of total U.S. milling capacity in the late 1980's. Soft wheat mills accounted for 20 percent of the

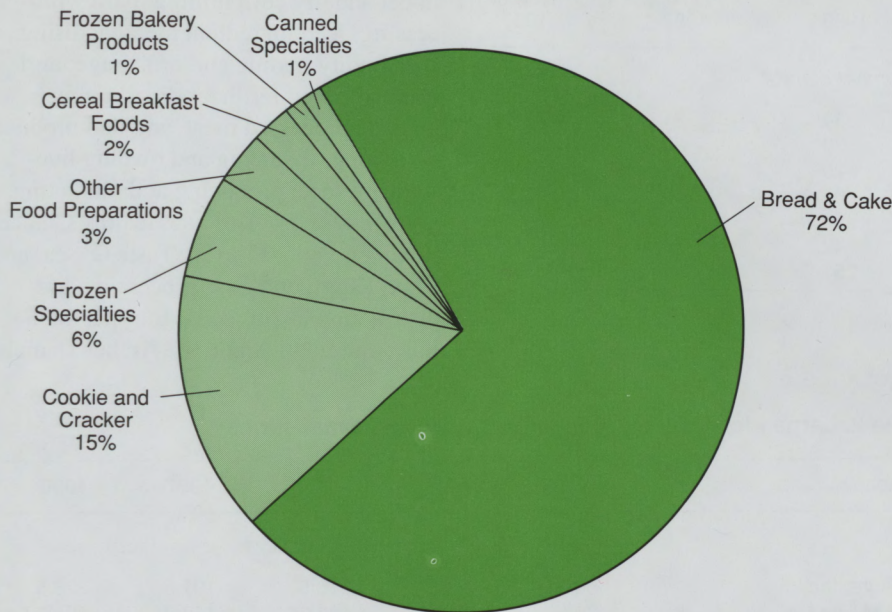
Figure 1. Per Capita Wheat Flour Consumption Increased During the 1980's



Source: USDA, Economic Research Service. *Wheat Situation and Outlook*, WS-291, February 1991, p. 59.

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**Figure 2. Use of Flour By 7 Major Flour-Using Food Industries<sup>1</sup>**



<sup>1</sup>Other industries that use flour include: prepared flour mix and dough, flour and other grain mill products, dog and cat food, and other prepared feeds. The pasta industry consumes large quantities of semolina and durum flour. The *Census* does not disclose flour consumption data for certain industries. Source: *Census of Manufactures*, 1987, various industry series.

total. Durum accounted for 8 percent, and whole wheat mills, 2 percent.

These flour mills were scattered over nearly all States in 1990. States with the largest number of active mills include Pennsylvania, Kansas, New York, Minnesota, Ohio, and California. Milling activity is particularly large in the areas surrounding Lancaster, PA; Minneapolis, MN; Kansas City, MO; and Buffalo, NY.

Mill locations depend largely on the expected costs of shipping flour relative to wheat at the time the mills are built. Because major flour-consuming areas are often far from wheat-growing areas, rail rates are particularly important in determining mill location.

Until the 1950's, mills were often built near wheat-growing areas because rail rates for shipping wheat and flour were about equal. Rates for flour began to rise relative to wheat rates in the early 1960's. Since then, companies have been more likely to build their mills near population centers.

The introduction of covered hopper cars has likely been an important factor causing the change in rates. Hopper cars, developed in the early 1960's, reduced the costs of bulk wheat shipment. While flour can move in special hopper cars, bakers frequently appear to prefer smaller

shipments. Many small baking companies continue to receive flour in bags, and larger firms often do not want to incur the high inventory costs associated with storing large quantities of flour.

Other factors are also important. Box-cars that are used to deliver flour in bags

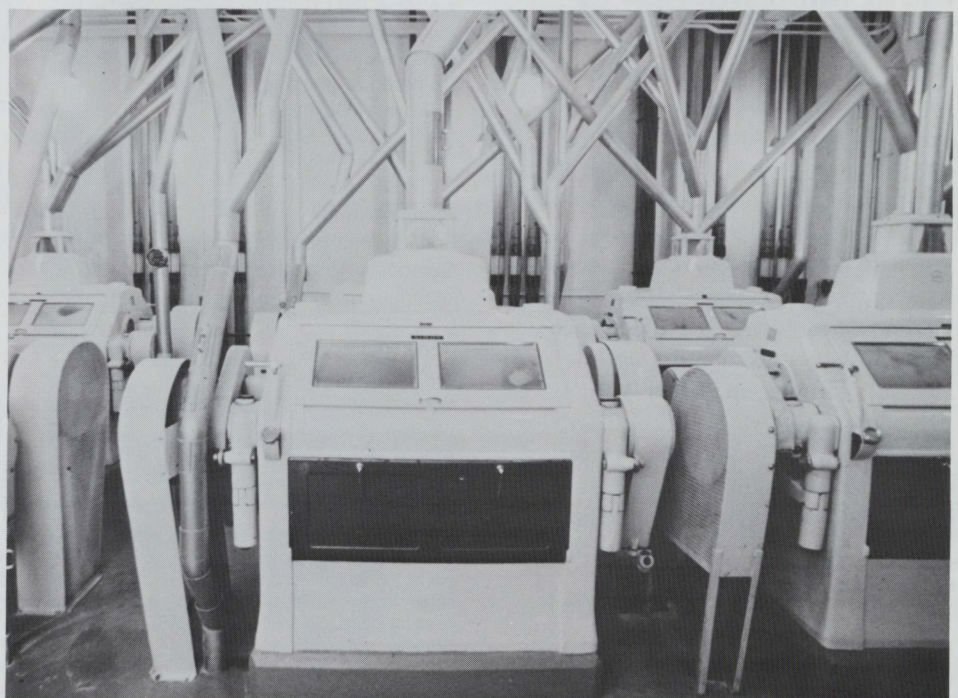
often have higher loss and damage claims and loading costs than covered hopper cars. In addition, sanitation requirements are higher for flour than for wheat.

## Fewer Mills, Greater Capacity

Strong flour demand has meant growth for many firms in the milling industry. But even though new plants have been built, most of this industry growth is in plant sizes, not in mill numbers. Scale economies in processing and transportation are largely responsible for the drop in mill numbers and the large increase in capacity per plant.

The decline in mill numbers reflects a long-term trend toward consolidated production. Total wheat flour and durum mill numbers fell from 292 in 1973 to 219 in 1990. The closing of small mills has offset the escalating number of large-capacity mills (*table 1*). Small mills often either close or carve out niches in specialty markets.

As the number of mills has dropped, the average capacity per mill, as well as total industry capacity, has increased. Total industry capacity increased by 28 percent between 1973 and 1990, and average mill size rose by 70 percent. Mills in the largest size category (those



**Rollers break wheat into coarse particles in the conversion of wheat to flour.**

Photo credit: Millers' National Federation

**Table 1. Wheat Flour Mills Were Fewer In Number in 1990 than in 1973**

| Daily capacity <sup>1</sup> | 1973            | 1978       | 1983       | 1987       | 1990       |
|-----------------------------|-----------------|------------|------------|------------|------------|
|                             | Number of mills |            |            |            |            |
| Under 200 cwt               | 54              | 46         | 34         | 21         | 18         |
| 200-399 cwt                 | 35              | 34         | 30         | 22         | 17         |
| 400-999 cwt                 | 36              | 26         | 20         | 18         | 14         |
| 1,000-4,999 cwt             | 82              | 71         | 67         | 65         | 66         |
| 5,000-9,999 cwt             | 60              | 64         | 58         | 59         | 58         |
| 10,000 cwt and over         | 25              | 33         | 42         | 44         | 46         |
| <b>Total</b>                | <b>292</b>      | <b>274</b> | <b>251</b> | <b>229</b> | <b>219</b> |

<sup>1</sup>Includes hard, soft, whole wheat, and durum mills.

Source: Calculated from *Milling Directory/Buyers' Guide*. Various issues.

with over 10,000 hundredweight of daily capacity) accounted for 54 percent of total capacity in 1990, up from 35 percent in 1973.

Economies of scale are a major factor explaining these overall increases. Millers indicate that, within limits, plant capacity can be enlarged at a less-than-proportionate increase in energy and equipment costs. Per unit labor costs can drop sharply with larger output because the operating crew required for a larger plant is comparable to that for a smaller one. And unit transportation costs can fall if larger mills can negotiate lower rates on the basis of volume than their smaller counterparts.

## Flour Mills Change Ownership

The ownership of many flour milling companies has changed in the past 20 years. Several of the largest milling companies more than doubled their mill numbers and daily capacities between the early 1970's and 1990 (table 2).

These transactions have realigned the relative size rankings of those companies holding the largest U.S. milling capacities. Pillsbury ranked as the world's largest flour miller in the late 1970's. The purchase of Peavey led ConAgra to first place in 1983. With the acquisition of International Multifoods in 1988, ConAgra reinforced its rank, and held 276,500 hundredweight of productive capacity in 1990.

Many of these acquisitions have been made by firms that have sizable agribusiness interests. Besides flour

milling, ConAgra, in 1990, was involved in oat and dry corn milling; barley processing; feed ingredient merchandising; commodity trading and brokerage; agricultural chemicals and fertilizer distribution; poultry, processed meat, and deli product marketing; financing and owning livestock on feed; producing and marketing prepared foods (Armour, Healthy Choice, Banquet, Patio, Morton, Taste O'Sea, and Chun King); and food processing and distribution in Australia, Europe, the Far East, and Latin America. Archer Daniels

**Table 2. Large Flour Milling Firms Are Buying Out Small Firms<sup>1</sup>**

| Company                           | 1973         | 1978                | 1983                        | 1987                | 1990               |
|-----------------------------------|--------------|---------------------|-----------------------------|---------------------|--------------------|
|                                   | 1,000 cwt    |                     |                             |                     |                    |
| ConAgra, Inc.                     | 88.3         | 93.0                | 216.5                       | 191.5               | 276.5              |
| ADM Milling Co.                   | 79.5         | 96.0                | 123.0 <sup>2</sup>          | 167.7               | 193.7 <sup>3</sup> |
| Cargill, Inc.                     | 9.0          | 46.0                | 134.0                       | 141.1               | 149.2              |
| Pillsbury, Inc.                   | 94.7         | 111.6               | 121.4                       | 131.7 <sup>2</sup>  | 119.7 <sup>4</sup> |
| Seaboard Allied Milling Corp.     | 62.25        | 91.0                | (-----Cargill-----)         |                     |                    |
| International Multifoods Corp.    | 71.7         | 71.9                | 78.1                        | 80.3                | (ConAgra)          |
| Dixie-Portland Flour Mills        | 33.0         | 47.0                | 51.0                        | 55.0                | <sup>5</sup>       |
| Peavey Co.                        | 59.1         | 98.5                | (-----ConAgra-----)         |                     |                    |
| General Mills, Inc.               | 55.1         | 55.1                | 55.1                        | 62.25               | 66.7               |
| Nabisco Brands, Inc.              | 40.0         | 44.5                | 43.0                        | 28.0 <sup>6</sup>   | 28.0               |
| Ross Industries                   | 33.0         | (-----Cargill-----) |                             |                     |                    |
| Cereal Food Proc., Inc.           | 17.0         | 21.9                | 31.3                        | 68.3                | 68.3               |
| Bay State Milling Co.             | 29.65        | 34.9                | 34.0                        | 55.75               | 50.65              |
| Colorado Milling and Elevator Co. | 29.2         | (Peavey)            | (-----ConAgra-----)         |                     |                    |
| Mennel Milling Co.                | 15.0         | 17.0                | 21.0                        | 21.0                | 22.7               |
| Fisher Mills, Inc.                | 15.0         | 15.0                | 15.0                        | 15.0                | 15.0               |
| Bartlett Milling Co.              | --           | 14.0                | 15.0                        | 13.0                | 13.0               |
| Tennant and Hoyt Co.              | <sup>7</sup> | 10.0                | 11.0                        | (---Pillsbury-----) |                    |
| Centennial Mills                  | 19.0         | 24.0 <sup>2</sup>   | (-----ADM Milling Co.-----) |                     |                    |
| Standard Milling                  | 14.5         | 16.3                | (Uhlmann)                   | (-----ConAgra-----) |                    |
| Sunshine Biscuits                 | 12.15        | <sup>7</sup>        | <sup>7</sup>                | (-----ConAgra-----) |                    |
| North Dakota Mill                 | 10.0         | 10.0                | 18.0                        | 18.0                | 18.0               |
| Acme-Evans                        | <sup>7</sup> | <sup>7</sup>        | 10.0                        | 12.0                | (ADM)              |
| Italgrani USA, Inc.               | --           | --                  | --                          | 15.64               | 15.64              |
| Amber Milling Co.                 | <sup>7</sup> | <sup>7</sup>        | <sup>7</sup>                | <sup>7</sup>        | 15.0               |
| Midwest Grain Products            | --           | --                  | --                          | --                  | 14.0               |

-- = Not listed in the *Milling Directory/Buyers' Guide*.

<sup>1</sup>Acquiring milling companies are in parentheses. <sup>2</sup>Includes alternating durum capacities. <sup>3</sup>Does not include 31,000 cwt daily capacity held by ADM Holding Co. (formerly Dixie-Portland). <sup>4</sup>Pillsbury announced on Jan. 28, 1991, that it had reached an agreement to sell 4 of its 8 flour mills to Cargill. This action would increase Cargill's total milling capacity by 51,700 cwt. <sup>5</sup>Held by ADM Holding Co. <sup>6</sup>All but 1 mill acquired by ADM. <sup>7</sup>Less than 10,000 cwt daily capacity.

Source: *Milling Directory/Buyers' Guide*. Various issues.

Midland (ADM), Cargill, and Pillsbury also have substantial holdings.

The rationale behind these milling acquisitions is not always clear. By expanding their plant holdings and, in certain cases, integrating vertically, some companies may be able to improve their profitability over the long run through cost reduction. They may be able to negotiate lower transport rates; improve scheduling; and spread production, marketing, and financial risks over a larger volume of activity.

A greater number of plants held by a company, however, does not necessarily ensure lower costs and higher profits. Discussions with the trade suggest that less use of procurement economies occurs than might be expected. Different operations are commonly treated as competing profit centers, with profit maximization goals that may be incompatible. The operations of several agribusiness firms were sold off in the late 1980's, including all of the flour mills owned by International Multifoods Corp.

### Fewer Firms Own Flour Mills

As the largest milling firms have expanded their holdings, concentration in the industry has increased substantially (table 3). In 1990, the top 12 companies owned about 80 percent of all milling capacity, up from 68 percent in 1973. They owned 108 wheat flour and durum mills. This total accounted for about 50

percent of all mills in the industry and all but 1 of the U.S. flour mills with 10,000 hundredweight or more of daily capacity.

The top four firms (ConAgra, ADM, Cargill, and Pillsbury) collectively increased their market share at a fast pace in the 1980's. As a group, they owned about 58 percent of all industry capacity in 1990, up from the 34 percent of capacity held by the top four firms in 1973 (table 3).

The economic downturn, if prolonged, will have an uncertain effect on acquisitions. The pace of acquisitions could slow from that of the mid-1980's if companies find themselves strapped for cash. However, some companies with large financial resources might eagerly purchase mills being offered for sale at recession-level prices.

### Competition Appears To Remain Strong

Although concentration has increased rapidly, many in the milling industry agree that flour milling remains highly competitive. Millers often appear to treat flour as a very price-sensitive product, believing that the lowest-price, highest-volume operation gets the business. An example helps provide evidence:

- The milling margin, at \$2.05 in January 1991, was lower than most of the margins calculated in the 1980's, and more than 25 cents less than the margin in mid-1986. (The milling margin is the sum of bakery flour and millfeed prices per hundredweight of flour produced, less

the cost of the wheat needed to produce a hundredweight of flour.)

- At the same time, the cost of the wheat needed to produce a hundredweight of bakery flour (Kansas City standard patent) averaged \$6.45 for January 1991, about the same as the cost in mid-1986.
- The mid-month price of bakery flour in January 1991, at \$7.05 per hundredweight, was the lowest since the 1970's and about a third below prices in the early 1980's.

The milling industry historically has been quite competitive. For instance, one industry study stated that net income (after taxes) as a percent of sales ranged from -0.11 to 3.28 percent for major milling firms between 1977 and 1982. For diversified firms, the study found that the earnings of flour milling divisions were lower than the total companies' average earnings.

Millers in the late 1980's have often mentioned the importance of focusing on quick and accurate responses to bakers' needs, consistent product quality, and the development of market niches. Some observers have noted the importance of a heightened focus on innovation, segmentation of markets, and greater cost-effectiveness.

### Performance Consistency a Pressing Concern

The 1990's will likely bring an increased focus on the performance consistency of flour. Some baking analysts contend that the baking performance of flour has dropped substantially in the past 25 years. This is one of the most pressing current issues in both the milling and baking industries.

Several factors substantiate the fact that flour performance has declined. For instance, one baking company executive reported that in 1975, more than 96 percent of the company's bake tests (which summarize grain, texture, feel, and color) yielded an acceptable bake score. By 1987, less than 50 percent of all flour met their requirements, and in 1989, the number was below 15 percent. Over this period, the company had used the same

Table 3. Concentration of Mills Increased at a Fast Pace in the 1980's

| Size grouping                  | 1973    | 1978      | 1983      | 1987      | 1990      |
|--------------------------------|---------|-----------|-----------|-----------|-----------|
| <i>Cwt of capacity</i>         |         |           |           |           |           |
| 4 largest                      | 334,200 | 399,100   | 594,900   | 632,000   | 739,100   |
| 8 largest                      | 550,650 | 664,100   | 822,100   | 898,600   | 952,750   |
| 12 largest                     | 675,500 | 813,500   | 926,400   | 1,020,600 | 1,024,090 |
| <b>All firms</b>               | 997,107 | 1,099,610 | 1,174,206 | 1,217,276 | 1,271,923 |
| <i>Percent share of market</i> |         |           |           |           |           |
| 4 largest                      | 33.5    | 36.3      | 50.7      | 51.9      | 58.1      |
| 8 largest                      | 55.2    | 60.4      | 70.0      | 73.8      | 74.9      |
| 12 largest                     | 67.7    | 74.0      | 78.9      | 83.8      | 80.5      |
| <b>All firms</b>               | 100.0   | 100.0     | 100.0     | 100.0     | 100.0     |

Source: Calculated from *Milling Directory/Buyers' Guide*. Various issues.

equipment, the same method and formula, and the same individuals had performed the bake tests since 1973. (See box "Factors Affecting Flour Performance.")

However, the relationship between laboratory tests and flour performance is a complex issue. First, lab tests differ in importance to different types of bakers. Lab tests appear to be a special issue for soft wheat bakers who produce a wide variety of cookies, crackers, cakes, and pastries. Second, lab tests do not necessarily reflect conditions in the production plant. Two lots of flour with the same lab analysis rating can bake quite differently. At times, tests show virtually no correlation between lab analysis and baking performance.

Bakers have increasingly used additives to produce a commercially acceptable product. These additives include

### Factors Affecting Flour Performance

Industry analysts suggest that several factors have likely contributed to the change in flour performance:

- Genetics—Producers encouraged breeders to produce higher yielding varieties that resisted disease. Breeders focused on higher yields, with less emphasis given to the end product performance of flour.
- Proliferation of wheat varieties—Wheat varieties that represented 85 percent of the acreage planted in Kansas in 1986 did not exist in 1977. The varieties planted in 1977 likely contained better baking characteristics.
- Agronomics—Increased irrigation and fertilization may have reduced flour performance.
- Milling efficiencies—Changes in milling practices may be a factor.
- Drop in protein content—The decline in flour performance in the 1980's has occurred in conjunction with a decline in the average protein content in the wheat crop. However, protein quality is as important as protein quantity.



After wheat is broken into coarse particles at the roller stage, it is run through box-like sifters where it is shaken through a series of screens to separate the larger from the smaller particles.  
Photo Credit: Millers' National Federation

oxidants and vital wheat gluten that strengthen the protein and assist with gas retention. They were once used sparingly or not at all and today are often used at their legal limits.

*Note:* Most of the data reported in this article were obtained from the *Milling Directory/Buyers' Guide*, published annually by Sosland Publishing Company. This publication represents the most comprehensive source of information on mill locations and plant capacities. The milling industry regards these numbers as a benchmark. The tables presented here differ slightly from those presented in the *Milling Directory/Buyers' Guide*. Data reported in the Census of Manufactures are used sparingly in this article. Census data for SIC Code 2041 include not only flour mills, but also other establishments "primarily engaged in milling flour or meal from grain, except rice," including dry corn, buckwheat, and rye mills. ■

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