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## Adding Value to South Dakota Corn: Opportunities in Food Markets

T. J. Hansen

*South Dakota State University*

Evert Van der Sluis

*South Dakota State University*, [evert.vandersluis@sdstate.edu](mailto:evert.vandersluis@sdstate.edu)

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# ECONOMICS COMMENTATOR

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## ADDING VALUE TO SOUTH DAKOTA CORN: OPPORTUNITIES IN FOOD MARKETS



by  
**T. J. Hansen,**  
Research Associate  
and  
**Evert Van der Sluis,**  
Associate Professor



This is the second of a two-part series of articles on exploring ways to market non-traditional products made from corn produced in South Dakota. We again summarize findings from research sponsored by the South Dakota Corn Utilization Council. In this article, we present results from a preliminary feasibility study of processing and marketing white and yellow corn for use in food products. We place particular emphasis on white corn because it is the limiting ingredient in corn products destined for direct human consumption.

### Research Methods

Similar to the approach we took in *Economics Commentator* No. 452, we conducted an external analysis of food corn markets in the U.S. That is, we analyzed customers, competitors, exterior influences, and general conditions in food corn markets. The research project had three objectives:

1. Define the product market for white and yellow corn flour,
2. Identify under-served geographic locations and demographic groups in the U.S., and
3. Assess the growth potential of these markets.

### Food Corn Production

In the past, yellow corn production improvement occurred more rapidly than their white corn counterparts, because research disproportionately

emphasized the development of the agronomic traits of yellow corn. Hence, high yielding yellow corn varieties dominated corn markets until 1975, when the corn milling industry increased its funding for white corn research. Since that time, yield and acreage gaps between white and yellow food corn have narrowed. White and yellow corn yields in the U.S. averaged 145 and 155 bushels per acre, respectively, in 2002. Concurrently, white corn acres totaled 900,000, compared to 1.2 to 1.5 million acres of yellow food corn.

As a result of yield improvements and additional acres planted, white corn production in the U.S. increased from 29 to 135 million bushels between 1980 and 2002. Because the domestic demand for white corn is about 50 million bushels per year, this leaves approximately 85 million bushels for export, mostly destined for Mexico.

To compensate producers for the additional costs associated with producing white corn and preserving its identity in the marketing channel, white corn bears a price premium. However, yield adjusted price premiums of white corn have generally declined since 1998.

As a result of falling price premiums, producer adoption of white corn is increasingly influenced by the agronomic performance of individual varieties. In the past, very few varieties suitable for growing in South Dakota met both crop performance and milling quality standards. However, in recent years, white corn varieties have become more competitive with those of yellow corn in terms of yields and days to reach maturity.

### Food Corn Product Standards

The internationally accepted quality standard of white corn is U.S. No. 2 or better, but an increasing number

of countries favor U.S. No. 1 as the industry standard. The end-use largely determines if quality provisions beyond those of U.S. No. 1 corn must be met.

Because white corn is often used in food production, purity in terms of the corn's color is important to processors. In international markets, the moisture content is generally restricted to between 14% and 14.5%, and stress cracks are confined to a range of 10% to 15%. The least negotiable quality standard pertains to aflatoxin contents, which are not allowed to be above 20 parts per billion.

### **Food Corn Processing**

Both white and yellow corn are processed using one of three methods: 1) tempering degerming, 2) stone-grinding, or 3) alkaline-cooking. Each of these processes yields a substance called masa, which can be made into flour or dough. Both masa flour and masa dough are used to produce taco shells, corn chips, tortillas, and related products.

Because contracts between producers and processors are common in the white corn market, dry mills are often located in areas where white corn production is most concentrated. On the corn production side, Kentucky, Nebraska, and Texas accounted for at least 53% of the total harvested acres in the U.S. in each year between 1997 and 2002. On the processing side, milling facilities exist in 22 different states. However, over 70% of U.S. corn dry milling facilities are located in Illinois, Texas, Indiana, North Carolina, Nebraska, Kansas, and Kentucky. Milling facilities closest to South Dakota are located in Nebraska, Iowa, and Missouri.

Corn flour production generally also takes place near corn crop production, while finished corn products such as tortillas and tortilla chips, are commonly produced close to its consumers. These patterns are a function of product density and the need to minimize transportation costs. In addition, grain processing and trading historically provided employment opportunities and stimulated population growth. Vice versa, population concentration favored the emergence of grain processing and trading facilities in or near cities. In the case of tortillas, over half of the production of tortillas in the U.S. occurs in California and nearly one-fourth takes place in Texas. In contrast, tortilla chip production and consumption are

more dispersed across the U.S. with California, Wisconsin, Pennsylvania, and Ohio each providing more than 10% of tortilla chip production.

Similar to trends observed for many industries, corn milling concentration has increased over the past two decades. As an illustration of this increase, the number of corn dry mills in the U.S. dropped from 88 to 50 between 1988 and 2003. During this time period, large capacity mills which could profit from inherent economies of scale displaced corn dry mills of smaller capacities. In 2003, nearly half of all corn dry mills had the capacity to grind at least 20,000 bushels of white corn per day and ninety-seven percent of all corn dry mills had the capacity to grind at least 12,000 bushels per day. As a result, current milling capacity in the U.S. remains near 100% despite the decline in the number of mills. Hence, production above current levels would require opening new domestic milling facilities or processing additional grain abroad.

### **Food Corn Consumption**

Between the 1970-1974 period and 2000, U.S. consumption of all corn products (corn flour and meal, hominy and grits, and corn starch) increased from 10.2 to 28.4 pounds per capita. Over the same three-decade period, the share of corn flour and corn meal consumption out of total corn consumption remained unchanged at about 62%. In comparison to that of other grain flours, the increase in the amount of corn flour consumed between 1970 and 2000 is particularly impressive. Namely, the amount of corn flour consumed increased by 150% since 1970, compared to an increase of just 31% for wheat flour.

Growth in the Hispanic population is an important contributor to the increased consumption of corn flour. In 2002, over half of the tortilla industry's growth was attributable to the Hispanic population. As a segment of the total U.S. population, Hispanics are young and growing, and consume diets rich in corn. On average, Hispanics spend more money on food than do non-Hispanics (\$102 compared to \$85 per capita per week). Further, Hispanic population centers coincide with large population centers in general, as evidenced by the fact that eight of the ten largest U.S. cities are also among the ten largest Hispanic population centers.

An additional explanation for the increased consumption of corn flour is that traditional Mexican foods, such as tortillas and tortilla chips, have gained market access in residential, restaurant, and institutional settings. For example, between 1990 and 1998, the growth in both volume and sales of tortilla chips approached 33%, and tortilla chips have become a solid competitor to potato chips in the snack food industry. The sales gap between tortilla chips and potato chips is expected to continue to narrow in the future. Another corn food product, tortillas, had steadily increasing sales between 1998 and 2002, with per capita U.S. consumption rates nearing one tortilla per day. Tortillas and tortilla chips are expected to make further inroads in the diets of the population at large.

The increased demand for corn food products among both Hispanic and non-Hispanic segments of the population suggests that the markets for food products made from white and yellow corns will continue to grow in the foreseeable future. If the consumption of corn flour and corn meal remains unchanged from 2000 levels at 17.5 pounds per capita per year, and if the U.S. population increases according to standard Census Bureau projections, the total amount of corn flour and meal consumed in the U.S. would amount to nearly six trillion pounds by 2025.

“Mexican” foods made from white corn flour are well placed to meet the increasing demand for convenience among U.S. consumers, both at the retail and food service levels. As the processed tortilla industry continues to grow, large flour producers will in turn stand to benefit from the drive towards convenience.

### **Geographical Analysis**

Future growth in U.S. corn flour markets depends largely on continued growth in the U.S. Hispanic population, and the further acceptance of “Mexican” foods among people of non-Hispanic backgrounds, both at home and away.

Based on population growth trends and current production and processing infrastructures, the region comprised of Arizona, California, Colorado, Nevada, New Mexico, Oklahoma, Texas, and Utah is expected to continue to have the greatest demand for corn flour and corn food products. Production and processing levels within this region are inconsistent with the

levels of current and projected demand for corn flour and corn food products. The absence of processing expansion activity within this region suggests that these states will continue to rely upon the development of corn production and processing industries elsewhere in the U.S.

The South-East and states along the Atlantic Coast currently have a moderate amount of white corn production and dry mill processing. This region is also likely to undergo an increase in the demand for corn products, but will largely be able to meet the increased demand from its large urban centers.

The Midwest is a leading producer and processor of white corn. Also, its population in general and its Hispanic population in particular are one of the slowest growing in the U.S. Hence, the region will continue to export corn and its processed products to corn-deficient areas in the U.S.

### **Concluding Comments**

White corn production appears to have become less lucrative in recent years, because price premiums have declined and international market opportunities continue to be variable. On the other hand, there may be financially rewarding opportunities for entering or investing in the white corn processing market. If the domestic demand for these corn food products continues to increase or if international demand for corn becomes more consistent, additional domestic processing facilities will be needed to support the increased production. Failure to invest in such infrastructure would result in increased corn processing outside the U.S. Based on the analyses outlined in this report, we provide a cautiously optimistic assessment about potential opportunities that may be available to South Dakota corn producers willing to organize themselves to further investigate the feasibility of processing and marketing white corn products.

### **For Further Reading**

Hansen, Tonya, and Evert Van der Sluis. *Corn-Based Food Production in South Dakota: A Preliminary Feasibility Study*. South Dakota State University, Department of Economics, Research Report, Forthcoming.

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Economics Department  
South Dakota State University                      Phone: 605-688-4141  
Box 504 Scobey Hall                                      Fax: 605-688-6386  
Brookings, SD 57007-0895                      E-Mail: Penny.Stover@sdstate.edu

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**SOUTH DAKOTA STATE UNIVERISTY**  
**Economics Department**  
**Box 504**  
**Brookings, SD 57007-0895**

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