American Crystal Sugar Company:
Diversification in the Corn Sweetener Industry

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Case Synopsis
The early 1990s offered great promise to sugar beet and corn wet milling companies in the United States. Beverage consumption was increasing, the implementation of the North American Free Trade Agreement (NAFTA) offered enormous market potential for corn sweetener in Mexico where real incomes were increasing, and the U.S. sugar program limited sugar imports through a quota system. The American Crystal Sugar Company (ACSC) was a vertically integrated sugar beet processing company organized as a cooperative and was based in Moorhead, Minnesota. Its members analyzed three alternatives in the mid-1990s that involved significant capital investments. One alternative was to diversify into corn sweetener. A second alternative involved building a desugarization plant to increase sugar extraction while the third alternative was a 15% increase in processing capacity. The case focuses on the sugar and sweetener industries during the 1990s. Students can complete an industry analysis and discuss the effect that an unanticipated change in sweetener demand had on the firm’s balance sheet and income statement. Students should understand the risk involved in “betting the company” on a diversification strategy and how it may “stress the balance sheet” if something goes wrong.

Introduction
The early 1990s offered great promise to sugar beet and corn wet milling companies in the United States. Beverage consumption was increasing, the implementation of the North American Free Trade Agreement (NAFTA) offered enormous market potential for corn sweetener in Mexico where real incomes were increasing, and the U.S. sugar program limited sugar imports through a quota system. The American Crystal Sugar Company (ACSC) was a vertically integrated sugar beet processing company organized as a cooperative and was based in Moorhead, Minnesota.

American Crystal Sugar Company announced in 1993 that it was considering three options for the company. First, it could embark on a diversification strategy by becoming a sugar and corn sweetener company through investment in a corn wet milling plant that produced high fructose corn syrup (HFCS). Second, it could expand sugar beet processing capacity by 15 percent to increase their market share in the refined sugar market. Third, it could add a molasses desugarization plant to further decrease costs by extracting more sugar per ton of sugar beets.

The United States Sugar and Corn Sweetener Industry
Caloric sweetener (e.g., sugar and corn sweetener) consumption in the United States expanded rapidly between 1980 and 1998, from 123 to 160 pounds per capita wholesale disappearance (Exhibit 1). During this period, per capita sugar (produced from cane or sugar beets) disappearance decreased from 90 to 60 pounds while per capita high fructose corn syrup (HFCS) disappearance increased from 38 pounds to 75 pounds, primarily because food manufacturers were switching from sugar to HFCS.

**Exhibit 1. Per Capita Caloric Sugar and Sweetener Consumption, 1966-1994**

<table>
<thead>
<tr>
<th>Year</th>
<th>Beet and Cane Sugar</th>
<th>HFCS</th>
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<th>Dextrose</th>
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<tr>
<td>1994</td>
<td>65</td>
<td>57</td>
<td>20</td>
<td>4</td>
<td>146</td>
</tr>
</tbody>
</table>

HFCS, Glucose and Dextrose are made from corn (Putnam and Allshouse).

1 Human food is typically not available. Putnam and Allhouse measure wholesale disappearance as the difference between available commodity supplies (the sum of production, inventories, and imports) and nonfood use (exports, farm use, and industrial consumption). Thus wholesale disappearance is used as a proxy for consumption.
Sugar Industry
Sugar, or sucrose, is a carbohydrate that occurs naturally in every fruit and vegetable. It is the major product of photosynthesis, the process by which plants transform solar energy into food. Two plants that produce large amounts of sugar from this process are sugar cane and sugar beets. While refined sugar from each of these plants is indistinguishable, there are important and dramatic differences in the production of sugar from these two sources.

Sugar Beet and Sugar Cane Production
Sugar beets are similar to red beets in shape, but have a larger white root and are inedible when harvested. Plant breeders have been able to increase the amount of sugar in the roots over time. Approximately 35 percent of the world’s sugar is provided from sugar beets. In the United States, sugar beets were grown primarily in the Upper Midwest (Minnesota and North Dakota), northern Great Plains (Montana, Wyoming, and Colorado), Great Lakes (Michigan and Ohio), and the Far West (California, Oregon, Idaho, and Washington), as seen in Exhibit 2. Annually, more than 25 million tons of sugar beets were produced. Yields had increased slightly over time. Sugar cane is grown in warm climates (Louisiana, Florida, Texas, and Hawaii). Sugar is contained in the stalks of the plants.

Exhibit 2. Sugar Beet and Sugar Cane Harvested Acres Per Region, 1985-1994a

<table>
<thead>
<tr>
<th>Region</th>
<th>Sugar Beet</th>
<th>Sugar Cane</th>
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<tbody>
<tr>
<td>Great Lakes</td>
<td>131</td>
<td>420</td>
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<tr>
<td>Upper Midwest</td>
<td>125</td>
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<td>Great Plains</td>
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<td>471</td>
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<tr>
<td>Far West</td>
<td>160</td>
<td>510</td>
</tr>
<tr>
<td>Total Sugar Beets</td>
<td>1103</td>
<td>830</td>
</tr>
<tr>
<td>Total Sugar Cane</td>
<td>1191</td>
<td>855</td>
</tr>
<tr>
<td>1986</td>
<td>158</td>
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<td>1987</td>
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</tr>
<tr>
<td>1994</td>
<td>203</td>
<td>613</td>
</tr>
</tbody>
</table>

aGreat Lakes is Michigan and Ohio; Upper Midwest is Minnesota and North Dakota; Great Plains is Montana, Nebraska, and Wyoming; Far West is California, Idaho, Oregon, and Washington (U.S. Department of Agriculture Sugar and Sweetener Outlook).

Sugar Processing
Once sugar cane and sugar beets are harvested, sugar contents in the plants deteriorate. Thus, it is important to process the raw material as quickly as possible. Sugar beets are harvested in the fall prior to the soil freezing and stored in open piles. As long as temperatures remain below freezing, the sugar content of piled beets remains fairly constant. A typical processing plant operates 180 to 240 days per year.

Sugar cane is harvested as “needed” by processing plants. Extraction rates and sugar contents of both cane and beets are critical determinants of profitability. Sugar cane and sugar beets have similar raw material yields per acre, but sugar cane had a slightly lower extraction rate relative to sugar beets. Technology had helped increase extraction rates in recent years. Cane sugar plants also operated seasonally.
During the refining process, sugar stored in cane stalks or beet roots was separated from the rest of the plant material. For sugar cane, this was accomplished by grinding cane stalks to extract juices, boiling extracted juice until a syrup was created and crystallized, and spinning the crystals in a centrifuge to produce raw sugar. Raw sugar was shipped to a refinery to be washed and filtered to remove remaining plant materials and color. The “clean” material was then crystallized, dried, and packaged. Sugar beet processing was normally accomplished in a continuous process. Sugar beets were washed, sliced, and soaked in hot water to remove sugar-containing juices. The juice was purified, filtered, concentrated, and dried in a series of steps similar to sugar cane processing. By-products created in this process included molasses and beet pulp, which was used as a livestock feed. Sugar produced from sugar beets and sugar cane was called refined sugar.

**Corn Sweetener Industry**
High fructose corn syrup (HFCS) was a substitute for refined sugar in certain applications. Nearly two billion bushels of corn were processed in 1999 by the corn milling industry. In 1974, world sugar prices increased from $0.03 per pound to more than $0.40 per pound. Industrial sugar users began to use HFCS as a substitute for refined sugar and corn wet milling capacity began to increase. By the late 1970s, sugar prices had decreased to $0.08 per pound, while HFCS production costs were much higher. World sugar prices have generally been lower than in the United States mainly due to government subsidies in many countries. In 1980, Congress passed an import quota on sugar to protect its U.S. sugar industry. The action caused U.S. sugar prices to increase from $0.20 to $0.30 per pound, making HFCS more price competitive with sugar.

**HFCS Production**
The United States produced approximately ten million bushels of corn a year in the 1990s. The majority of corn was grown in the Corn Belt states (Ohio, Indiana, Illinois, Iowa, Minnesota, Missouri, Nebraska, and Kansas). Improvements in pesticide, herbicide, and seed technologies had increased production throughout much of the 1990s. Almost 40 percent of corn production was exported, and another 20 percent was used as livestock feed. An increasing percentage was being wet milled into sweetener (HFCS, glucose, dextrose) and starch products.

**Corn Wet Milling**
The corn wet milling process broke whole corn into its four basic components: starch, germ, fiber, and protein. Each component was further processed or modified into end products. Five steps were used in this process. First, corn was inspected and cleaned. Second, corn was steeped for 30 to 40 hours to begin breaking starch and protein bonds. Third, steeped corn was coarsely ground to separate the germ from the rest of the kernel. Fourth, the remaining slurry was finely ground and screened to separate the fiber from starch and protein. Fifth, starch was separated from the remaining slurry in hydrocyclones. Starch was converted to syrup or made into several other products through an ion exchange process.

**Industry Structure**
Five companies dominated all three industries in 1994. In HFCS, these five firms were Archer Daniels Midland Company (ADM), Tate & Lyle (through ownership of A. E. Staley), Cargill, Corn Products Company (CPC) International, and American Maize. ADM had 32 percent market share followed by Tate & Lyle with 25 percent, Cargill with 19 percent, and CPC and American Maize had 9 percent, respectively. In sugar cane refining, these five firms were Tate & Lyle (36 percent market share), Savannah Foods and Industries (27 percent), C&H (16 percent), and
Refined Sugars and Imperial Holly (8 percent market share, respectively). In sugar beet processing, these five firms were Imperial Holly (24 percent market share), American Crystal Sugar Company (23 percent), Amalgamated Sugar (20 percent), Tate & Lyle (11 percent), and Savannah Foods (10 percent).

Pricing
Pricing was extremely competitive in the sugar and corn sweetener industries. There were regional differences in production costs and sugar cane had production cost advantages over sugar beets (Exhibit 3). Soft drink manufacturers typically bought HFCS on six-month contracts and due to the oligopolistic nature of the industry, information on production costs was a closely held secret. However, HFCS production had been profitable over time. New entrants and expansion of existing competitors was expected due to the increase in demand. However, capacity was anticipated to be greater than demand, which would likely put pressure in operating margins (Exhibit 4). The percentage of corn that was wet milled into corn sweetener and other products was variable depending upon the price of corn (Exhibit 5). Corn was the primary ingredient when the price of corn was low due to greater supply, which helped improve operating margins. Domestic sugar prices were kept above the world price through the use of an import quota and other trade policy measures as seen in Exhibit 7.

Customers
There were two primary markets for refined sugar: industrial and non-industrial market segments. Industrial market segments included bakery and cereal, confectionery (candy), other food uses, dairy (primarily ice cream), beverage, and other non-food uses. This market had grown slowly over time. Non-industrial market segments included wholesalers, retailers, other non-industrial uses, and HRI (hotels, restaurants, and institutions). Similar to the industrial market, this market had grown slowly over time. Quality was very important with regard to sugar and corn sweetener.

HFCS demand was a derived demand, and its two most important market segments were HFCS-42 and HFCS-55. Both syrups shared advantages, but each offered distinct special qualities to food and beverage manufacturers and consumers. HFCS-42 was popular for producing canned fruits, condiments, and other processed foods that needed a sweetener that did not mask natural flavors. Important users were the beverage industry (42 percent), processed food manufacturers (21 percent), and the cereal and bakery industry (13 percent). HFCS-55 was popular in soft drinks, ice cream, and frozen desserts.

Distribution
Most corn sweetener was shipped by rail although trucks were also used. Because it was shipped as a liquid, special rail cars and tankers were needed to transport the product. These special cars were used strictly for corn sweeteners and thus, backhauls were not available which made transportation costs critical with regard to profitability. Sugar was shipped primarily in bulk through trucking or rail cars. Most HFCS production occurred near the supply of corn, which was the Corn Belt.

Exhibit 3. Ranges of Costs of Producing Raw Cane Sugar, Beet Sugar, and High Fructose Corn Syrup, United States and Select Categories of World Producers,
### 1994a

<table>
<thead>
<tr>
<th>Category</th>
<th>Low</th>
<th>High</th>
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<tr>
<td><strong>Raw cane sugar</strong></td>
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<tr>
<td>U.S. producing regions</td>
<td>11.00</td>
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<td>Low-cost producers</td>
<td>6.41</td>
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<td>Major exporters</td>
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<td>Weighted world average</td>
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<td>13.34</td>
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<td><strong>Cane sugar, white value equivalent</strong></td>
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<td>U.S. producing regions</td>
<td>14.91</td>
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<td><strong>Beet sugar, refined value</strong></td>
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<td>Eastern U.S. producing regions</td>
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<td>Western U.S. producing regions</td>
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<td><strong>High fructose corn syrup</strong></td>
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<tr>
<td>Major Producers</td>
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*Costs are measured in current U.S. cents per pound, factory basis. U.S. producing regions comprise Florida, Louisiana, Texas, and Hawaii; low-cost producers include five producing regions of Australia, Brazil, Guatemala, Zambia, and Zimbabwe; major exporters are seven countries including Australia, Brazil, Colombia, Cuba, Guatemala, south Africa, and Thailand; Eastern U.S. producing regions comprise the Great Lakes and Red River Valley; Western U.S. producing regions comprise the Northern Great Plains, Central Great Plains, the Northwest, and Southwest; low-cost producers are seven countries including Belgium, Canada, Chile, France, Turkey, United Kingdom, and United States; major exporters are four countries including Belgium, France, Germany, and Turkey; HFCS is in cents per pound, HFCS-55, dry weight; major producers is the average of 19 countries including Argentina, Belgium, Canada, Egypt, Finland, France, Germany, Hungary, Italy, Japan, Mexico, Netherlands, Slovakia, South Korea, Spain, Taiwan, Turkey, United Kingdom, and United States (USDA Sugar and Sweetener Yearbook, 2001).*
<table>
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<td>1992</td>
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*U.S. Department of Agriculture’s Sugar and Sweetener Yearbook.

**Exhibit 5. Source and Uses of Corn in Bushels, by Marketing Year (September 1976 to August 1994)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Glucose Syrup</th>
<th>Total Corn</th>
<th>Corn Total Wet Milling</th>
<th>Beverage Alcohol</th>
<th>Fuel Alcohol</th>
<th>Cereal Crop</th>
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<td>1975/76</td>
<td>45</td>
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<td>5,841</td>
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<td>1976/77</td>
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<td>1977/78</td>
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<td>250</td>
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<td>1978/79</td>
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<td>170</td>
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<td>1979/80</td>
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<td>120</td>
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<td>1980/81</td>
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<td>156</td>
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*aTotal corn sweetener column is the sum of HFCS and Glucose Syrup; total wet milling columns is the sum of total corn sweetener and corn starch; data for beverage alcohol, fuel alcohol, and cereal was not recorded prior to the 1980/81 marketing year (U.S. Department of Agriculture’s Sugar and Sweetener Yearbook).

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<th>Year</th>
<th>Corn</th>
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<td>1.42</td>
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<td>4.58</td>
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Corn oil and corn gluten are byproducts that have value (U.S. Department of Agriculture’s Sugar and Sweetener Yearbook).

**Manufacturing**

The manufacturing operations and processes produced products that had primarily two end uses, either food or feed ingredients. Processing of sugar and sweetener were capital intensive and similar in nature. These processes involved adding further value through extraction and refining. Generally, each commodity shared the same network of commodity procurement facilities, transportation services including rail, barge, truck, and storage facilities. The cost of a new corn sweetener plant with economies of size was more than $200 million.

**Suppliers**

Corn sweetener companies purchased corn on the open market and in most years, there was a surplus of corn. Price was more important than quality. Corn was procured by grain merchandising firms and most corn sweetener companies also owned grain-handling assets such as grain elevators, rail cars, and barges. Many, but not all, sugar beet firms were vertically integrated. Private firms controlled much of the sugar cane production and processing. Both producer-owned cooperatives and private firms owned sugar beet processing facilities. The percentage of sugar in sugar cane or sugar beets was important for profitability and varied from year-to-year depending upon weather, fertilizer applications, and choice of seed varieties.

---


---

*a*
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<tr>
<th>Year</th>
<th>HFCS-55</th>
<th>HFCS-42</th>
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<td>18.54</td>
<td>41.10</td>
<td>28.10</td>
<td>21.31</td>
</tr>
</tbody>
</table>

*Cane sugar and Beet Sugar Raw are in dollars per ton, all other prices are in cents per pound.*

**Industry Trends**

There were several major trends that were impacting the sugar and sweetener industries. These included: 1) the increase in the demand for products made from corn wet milling; 2) trade liberalization agreement with Mexico and Canada; 3) corn and sugar beet acreage increases due to new farm policy; 4) consolidation of beet and cane sugar companies with corn sweetener firms; and 5) interpretation of certain “stuffed molasses” imports by the U.S. Customs Service.

**Consumption**

Throughout much of the 1990s, the United States Department of Agriculture had estimated that the most popular HFCS segment (HFCS-55) would grow approximately 4 to 4.5 percent annually. Soft drink beverage companies were driving much of this growth as they continued to position themselves as “total beverage companies.” Corn sweetener production had steadily increased over time. Likewise, fuel alcohol and food grade corn starch were important markets. There was little evidence to suggest that demand would diminish over the next decade.

**HFCS Trade with Mexico**

The Mexican market offered the opportunity for dramatic volume growth due to increased trade, and the potential to substitute HFCS for sugar in beverages. Mexico was a large producer of sugar cane and had a small HFCS industry. When NAFTA was signed in 1993, Mexico’s sugar industry appeared to be in disarray. The previous year was its lowest sugar production ever recorded. The processing industry had been privatized, and it was widely believed that the new owners had overpaid the Mexican government. Under NAFTA, the Mexican import tariff on United States HFCS fell to 9 percent in 1997, and was scheduled to decrease by 1.5 percent each year thereafter to zero in 2003. This represented a huge growth opportunity for HFCS producers because real consumer income was increasing in Mexico along with soft drink and other beverage consumption.
Exports of HFCS from the United States increased after NAFTA’s signing (Exhibit 8). It was expected that HFCS would displace significant sugar consumption in Mexico. However, the Mexican sugar industry employed almost one million Mexican workers. Mexico’s domestic sugar price was greater than HFCS and Mexican demand for HFCS had increased as bottlers adopted new technology to handle liquid sweeteners. It was expected that NAFTA would result in the United States shipping HFCS to Mexico while allowing imports of sugar into the United States. Specifically, Mexico could export 250,000 metric tons of sugar if it was deemed to be a surplus producer of sugar between 1994 and 1999.

Exhibit 8. United States Trade Wet Milled Corn Products to Mexico and Canada, 1989 to 1994

<table>
<thead>
<tr>
<th></th>
<th>Exports to Mexico</th>
<th>Exports to Canada</th>
<th>Imports from Canada</th>
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<td>663</td>
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<td>197,184</td>
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<tr>
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<td>1991</td>
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<td>93,393</td>
<td>193,556</td>
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<td>1992</td>
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<td>62,301</td>
<td>230,827</td>
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<td>1993</td>
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<td>53,477</td>
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<td>1994</td>
<td>92,854</td>
<td>21,848</td>
<td>164,807</td>
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</table>

*U.S. Department of Agriculture’s Trade Statistics.

U.S. Farm Policy
Production of corn and sugar beets also was increasing in the 1990s. It was expected that Congress would pass legislation that gave farmers more flexibility in planting crops. Thus, corn production was expected to increase and would replace wheat acres in some parts of the western states. Sugar beet production was expected to increase as producers substituted out of other lesser-valued crops into sugar beets. Sugar cane yields also were increasing due to better varieties.

Consolidation
In the 1980s, consolidation began occurring between sugar cane and sugar beet companies. The rationale was diversification in case of production risk caused by weather in one area of the country. Imperial Sugar, a sugar cane company based in Texas, acquired Holly Sugar Corporation, a sugar beet processor with factories in California, Texas, Wyoming, and Montana. British-based Tate & Lyle owned sugar beet factories in the EU and other parts of the world. It also owned A.E. Staley, which was one of the largest HFCS companies in the United States. Tate & Lyle acquired Domino Sugar Company, a sugar cane company that uses Louisiana sugar cane, and Western Sugar, a sugar beet company with factories in Nebraska, Wyoming, Montana, and Colorado.

Stuffed Molasses
A loophole in U.S. Customs rules enabled firms to import from Canada into the United States molasses syrup that had been “stuffed” with Brazilian sugar. Firms extracted the sugar from the molasses and then shipped the syrup back to Canada to be “restuffed” with sugar. This “bootleg” sugar accounted for about 125,000 metric tons of imports annually. The syrup was approximately 95 percent sugar and five percent molasses. The loophole was due to how this molasses was classified by the U.S. Customs. The intent of the U.S. sugar policy was being violated, but it would continue to be imported until this molasses was reclassified.
**Major Competitors in 1994**

Competition was concentrated among several firms, including Archer Daniels Midland Company, Cargill, CPC International, Minnesota Corn Processors, American Maize, Tate & Lyle, and several smaller firms. Not all corn processors competed in every product category. For example, National Starch and Chemical Company, Grain Processing Corporation, and Penford Products Company did not produce high fructose corn syrup. Financial data on the major publicly held firms is presented in Exhibit 9.

**Archer Daniels Midland Company**

The Archer Daniels Midland (ADM) Company was incorporated in 1923 as the successor to the Daniels Linseed Co., which was founded in 1902. ADM was involved in procuring, transporting, storing, processing and merchandising agricultural commodities and products. It was one of the world’s largest processors of oilseeds, corn and wheat. The company also processed rice, milo, oats, barley, peanuts and cane sugar. Other operations included transporting, merchandising and storing agricultural commodities and products. It operated 35 domestic and seven international oilseed crushing plants, two dry corn and four wet corn-milling plants. Its daily wet milling capacity was 1,008,000 bushels of corn, which made it the largest firm in the United States.

**Tate & Lyle**

Tate & Lyle was formed in 1921 as a cane sugar refining company in the United Kingdom. It diversified into sugar beet processing in the United States and Europe throughout the 1980s. It also acquired the leading cane sugar refining company in the United States, Domino Sugar. Finally, it diversified into HFCS by acquiring A.E. Staley. In 1994, its daily capacity was 345,600 bushels of corn. Its sugar cane processing plants used 7,800 tons of sugar cane and its sugar beet plants used 20,200 tons of sugar beets annually. In 1994, it was the largest cane sugar refiner; fourth largest sugar beet processor; and second largest HFCS manufacturer in the United States.

**Cargill**

Cargill ranked fourth in sales among food and beverage companies (behind Philip Morris, Con Agra, and PepsiCo). It was a marketer, processor, and distributor of agricultural, food, financial, and industrial products and services. It also was the United States’ largest grain exporter. Many of Cargill’s products were bulk commodities. Consequently, Cargill had developed a vast transportation and distribution network that enabled it to provide low-cost industrial and food products to processors and other customers. Its daily wet milling capacity was third largest in the United States.


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<th>Year</th>
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<th>Sales</th>
<th>CGS</th>
<th>Gross Margin</th>
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<td>-0.72%</td>
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<td>-2.45%</td>
<td>3.05%</td>
<td>5.84%</td>
<td></td>
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</tbody>
</table>

*Tate & Lyle is reported in millions of English pounds (10k reports from these companies).

**CPC International**
Corn Products International (CPC) manufactured products from raw materials, including soybean and other vegetable oils, peanuts, corn and wheat. In 1994, it owned 134 operating plants, of which 21 were engaged in the manufacture of corn refining products. Its daily capacity was 604,800 bushels, which was about the same as Cargill’s.

**American Maize**
American Maize-Products Company was organized in 1906 and engaged primarily in the manufacture and sale of products derived from corn wet milling, such as corn sweeteners and starches for use in the manufacturing processes of several industries. It also manufactured and marketed cigars and smokeless tobacco products. Its daily capacity was 230,400 bushels of corn.

**Imperial Holly**
Imperial Holly was incorporated in 1924 as Imperial Sugar Company and is the successor to a cane sugar plantation and milling operation begun in Sugar Land in the early 1800s that began producing granulated sugar in 1843. In 1988, the Company purchased Holly Sugar Corporation and the Company’s name was changed to Imperial Holly Corporation. Holly was founded in 1905 and incorporated in 1916. In 1994, Imperial Holly Corporation was one of the nation’s largest producers and marketers of refined sugar, producing both cane and beet sugar. The Company refined raw cane sugar at its Imperial Sugar Company refinery in Sugar Land, Texas, and, through its wholly owned subsidiary, Holly Sugar Corporation, produced refined beet sugar...
by processing sugar beets purchased from independent growers at processing plants in California, Wyoming, Montana and Texas. It processed 1,650 tons of sugar cane and 44,700 tons of sugar beets annually.

**Savannah Foods & Industries**
Savannah Foods & Industries, Inc. was originally the Savannah Sugar Refining Corporation in 1916. It was a refiner of sugar cane and marketed a complete line of bulk, packaged, and liquid sugars under the trade name Dixie Crystals. In 1984, the Company acquired Michigan Sugar Company, which was engaged in the processing of sugar beets into refined sugar and the production of beet pulp and molasses. It processed 5,850 tons of sugar cane and 20,200 tons of sugar beets annually. It owned four sugar cane and four sugar beet factories.

**Amalgamated Sugar**
Amalgamated Sugar was a subsidiary of Valhi. This conglomerate also owned: 1) Medite which was the world's second-largest producer of medium density fiberboard; 2) Sybra which was the second-largest franchisee of Arby's restaurants; and 3) Hardware Products National Cabinet Lock which manufactured locks and computer keyboard support arms, and drawer slides for furniture and other markets. In addition, it owned: 1) NL Industries which was the fourth largest producer of titanium dioxide pigments that were used in paints, plastics, and fibers; and 2) Tremont Corporation which was the largest integrated producer of titanium metal products used in aerospace and industrial markets. It processed 36,000 tons of sugar beets annually.

**American Crystal Sugar Company**

**Company History**
American Crystal Sugar Company (ACSC) was a large sugar beet processing cooperative in the Red River Valley (the Red River divides Minnesota and North Dakota). ACSC was formed from a sugar beet processing firm that was established in 1899 as the American Beet Sugar Company. In the 1930s, the Red River Valley Sugarbeet Growers Association was formed to represent the farmers who sold sugar beets to processors. In the early 1960s, Cuba’s communist revolution and the subsequent action by Congress to cancel Cuba’s large sugar export quota into the United States caused a rapid growth in the domestic production of sugar beets. This industry expansion did not carry over to ACSC, which had changed its name in 1934 to overcome prejudice against sugar beets produced for sugar and to provide a brand name image under the Crystal Sugar trademark. It closed processing facilities and took little action to improve the facilities that remained open during the 1960s.

In 1973, after more than a year of discussion led by Al Bloomquist, the Executive Secretary of the Red River Valley Sugarbeet Growers Association, ACSC was purchased by the more than 1,300 sugar beet growers in the Red River Valley. The growers paid $86 million to transform a corporation publicly-traded on the New York Stock Exchange into a producer-owned cooperative. Changes were immediately apparent as plant equipment, receiving facilities, and storage facilities were improved. Within four years, the acreage planted by member-owners doubled to 300,000 acres. In 1975, a fifth plant in the Red River Valley was added to the existing four plants through the acquisition of the Red River Valley Cooperative in Hillsboro, North Dakota. It processed 41,400 tons of sugar beets annually. Because sugar beets are perishable, ACSC had storage facilities for almost 20 percent of its production each year.
Value-Based Marketing
A Quality Payment System was introduced in 1979. This system paid member-owners based on the amount of recoverable (e.g., extractable) sugar their beets produced and fostered the innovation and dissemination of best management practices for growing, producing, storing, and processing sugar beets. These best management practices led to increased plant efficiencies and grower incomes. The gross beet payment was the value of recovered sugar from the sugar beets a grower delivered plus their share of agri-product revenues, minus the grower’s share of business operating costs. A hauling program allowance and costs, pre-pile quality premium and costs, minimum payment program allowance and costs, tare incentive premium/penalty program and unit retain were used. Growers were paid a hauling allowance based on the distance they must transport sugar beets for delivery to ACSC and may also receive minimum beet payments and an allowance for early delivery of sugar beets prior to the commencement of the stockpiling of harvested sugar beets. The costs of these programs were shared among members on the basis of the net tonnage of sugar beets delivered by each member.

ACSC purchased all of its sugar beets from members under contract. All growers had five-year contracts with the Company. Each grower was obligated to enter into a new five-year contract for subsequent years. In addition, each grower had an annual contract with the Company specifying the number of acres the member was obligated to grow during that year.

Ownership
In 1993, ACSC was owned and controlled by approximately 2,145 producers of sugar beets. Ownership of common stock shares entitled each holder of common stock to one vote regardless of how many preferred shares that producer owned (one preferred share allowed the grower to produce one acre of sugar beets). ACSC was organized as a cooperative. Membership was restricted to those willing to buy preferred stock shares, which in turn conveyed the right and obligation to deliver one acre of sugar beet production for processing for each share. When first organized in 1973, preferred shares cost $100 each. The producer was then paid on the basis of how much total sugar was recovered from the sugar beets harvested. As a producer-owned cooperative, the focus of ACSC’s operations was to add value to the farmer’s production. American Crystal Sugar Company’s mission statement was: To simultaneously maximize shareholder returns and customer satisfaction through innovative farming practices, low-cost production methods, and sales and marketing leadership.

The maximization of shareholder returns and customer satisfaction resulted in continued profitability and success of the cooperative and its member-owners. These three objectives, innovative farming practices, low-cost production methods, and sales and marketing leadership, were the means to achieve shareholder return maximization and customer satisfaction. Because ACSC depended on sugar beets grown by its member-owners, the company, as well as producers, depended on improved sugar beet varieties that were high-yielding and contained high levels of recoverable sugar. American Crystal Sugar Company was among the lowest-cost processor of high quality sugar in the United States, and, as seen in Exhibit 3, the Red River Valley had the second lowest-cost production of sugar beet in the world. (A small region in Chile had the lowest costs).

United Sugars Corporation
Three sugar beet processing cooperatives in the northern Great Plains states had first pooled their marketing and sales functions in 1982 to market byproducts. Minn-Dak Farmers Cooperative and Southern Minnesota Beet Sugar Cooperative formed Midwest Agri-Commodities Company in
1982 to jointly market beet pulp and molasses. American Crystal Sugar Company joined in 1984. In 1993, these same three cooperatives formed United Sugars Corporation to consolidate sugar sales and marketing functions of the three cooperatives and to market all three cooperatives’ sugar to customers in hopes of increasing total market share and reducing per unit marketing costs.

United Sugars Corporation was the third largest marketer of sugar in the United States. The independent sales and marketing operations of United Sugars Corporation and Midwest Agri-Commodities allowed each of the three sugar beet processing cooperatives to focus on agronomic research and plant operations, which enabled low cost sugar beet processing while maintaining a strong and united market presence. United Sugars Corporation sold sugar primarily to industrial users such as confectioners, breakfast cereal manufacturers and bakeries. Approximately 90 percent (by weight) of the sugar was sold to industrial users. The remaining portion was marketed through sugar brokers to wholesalers and retailers under the “Crystal Sugar” and “Pillsbury” brand names and various private labels for household consumption. With regard to brand name sales, ACSC licensed the use of the “Crystal” trademark and sub-licenses the use of the “Pillsbury” trademark to United Sugars Corporation.

The culture of ACSC was that of a learning organization. Best management practices were instituted and benchmarking was conducted not only in ACSC’s five processing plants, but also between ACSC and the two other cooperatives that collectively owned Midwest Agri-Commodities and United Sugars Corporation. This interaction between the processing plants, and the three different organizations helped each company gather knowledge, ideas, and insight to improve their competitiveness. American Crystal Sugar Company had been profitable during the early and mid-1990s and many had seen their stock appreciate from $100 a share in 1975 to almost $2,500 a share in 1992 (Exhibits 10 to 12).

**Exhibit 10. American Crystal Sugar Abbreviated Income Statement (in $1,000), 1993-1994**

<table>
<thead>
<tr>
<th></th>
<th>1993</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Sales</td>
<td>$542,665</td>
<td>$563,420</td>
</tr>
<tr>
<td>Cost of sales</td>
<td>123,048</td>
<td>171,612</td>
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<tr>
<td>Gross profit</td>
<td>419,617</td>
<td>391,808</td>
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<tr>
<td>Selling, general &amp; administrative expenses</td>
<td>109,195</td>
<td>110,538</td>
</tr>
<tr>
<td>Other operating income</td>
<td>255</td>
<td>1,630</td>
</tr>
<tr>
<td>Income (loss) from operations</td>
<td>310,677</td>
<td>282,900</td>
</tr>
<tr>
<td>Interest and other expenses</td>
<td>6,777</td>
<td>8,827</td>
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<tr>
<td>Income (loss) before income taxes</td>
<td>303,900</td>
<td>274,073</td>
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<tr>
<td>Provision (credit) for income taxes</td>
<td></td>
<td></td>
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<tr>
<td>Net income (loss)</td>
<td>303,900</td>
<td>274,073</td>
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<tr>
<td>Beet Payment</td>
<td>284,143</td>
<td>255,372</td>
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</table>

*Cost of sales does not include payments to producers for sugar beets. As a cooperative operating on a pooling basis, American Crystal Sugar Company made three payments to producers for their sugar beets after they had been processed, the sugar extraction has occurred, and the final value was known. The cooperative paid a beet payment to each producer based on the sugar quantity and quality of each producer’s sugar beets. Its goal was to pay out as much as possible each year to its members and retain as little as possible of the net income.*
Exhibit 11. American Crystal Sugar Company Balance Sheet (in $1,000), 1993-94

<table>
<thead>
<tr>
<th></th>
<th>1993</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Current Assets</td>
<td>124,077</td>
<td>118,319</td>
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<tr>
<td>Property &amp; equipment</td>
<td>164,081</td>
<td>190,110</td>
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<tr>
<td>Other assets</td>
<td>15,160</td>
<td>16,040</td>
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<tr>
<td>Total Assets</td>
<td>303,318</td>
<td>324,469</td>
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<tr>
<td>Total Current Liabilities</td>
<td>91,258</td>
<td>87,460</td>
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<tr>
<td>Long-term debt</td>
<td>85,729</td>
<td>101,724</td>
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<td>Other liabilities</td>
<td>1,736</td>
<td>15,019</td>
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<tr>
<td>Deferred income taxes</td>
<td>4,482</td>
<td>4,657</td>
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<tr>
<td>Total Liabilities</td>
<td>183,205</td>
<td>208,860</td>
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<td>Preferred Capital</td>
<td>30,429</td>
<td>30,429</td>
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<tr>
<td>Common Stock</td>
<td>21</td>
<td>24</td>
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<tr>
<td>Additional Paid-in Capital</td>
<td>5,558</td>
<td>5,558</td>
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<td>Unit Retains</td>
<td>71,076</td>
<td>81,433</td>
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<tr>
<td>Pension Liability Adjustment</td>
<td>-651</td>
<td>-2,386</td>
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<tr>
<td>Retained earnings</td>
<td>13,680</td>
<td>551</td>
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<tr>
<td>Total Stockholders’ Equity</td>
<td>120,113</td>
<td>115,609</td>
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<tr>
<td>Total Liabilities and Stockholders’ Equity</td>
<td>303,318</td>
<td>324,469</td>
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</table>


Exhibit 12. Value of Average American Crystal Sugar Company Preferred Stock as Reported by AgWeek, 1989 to 1994

<table>
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<th>Marketing Year</th>
<th>Dollars per Share</th>
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<tr>
<td>1988/89</td>
<td>1004</td>
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<tr>
<td>1989/90</td>
<td>772</td>
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<tr>
<td>1990/91</td>
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<td>1992/93</td>
<td>1700</td>
</tr>
<tr>
<td>1993/94</td>
<td>1294</td>
</tr>
</tbody>
</table>

*These are an average of willingness-to-pay and willingness-to-sell prices reported in AgWeek’s classified section. They may or may not represent actual negotiated prices.

**Betaseed**

ACSC developed and marketed sugar beet seeds with Betaseed, Inc., a Minnesota corporation that was a wholly owned subsidiary of KWS Kleinwanzlebener Saatzucht, AG, a German seed company that was one of the three largest seed companies in the world. Through the Betaseed arrangement, ACSC had the right to market its branded seed to its own members. Betaseed had the right to market Betaseed branded seed to ACSC members and also to market both the Company’s branded seed and its Betaseed branded seed in all other markets.
Strategic Direction
In the early 1990s, ACSC began to think about diversification. It did not want to lose its low-cost production strategy. Sugar beets were planted in a crop rotation with other commodities such as malt barley (used to make beer), corn, edible beans (pinto beans were used in many Mexican foods), potatoes, and spring wheat (used in frozen bread dough and similar products) or durum wheat (used to make pasta). Many producers began thinking about “integrating their crop rotation” by investing in other cooperatives. Some of those cooperatives included Spring Wheat Bakers (a spring wheat cooperative), Dakota Growers Pasta (a durum milling and pasta cooperative), and several edible bean and potato processing cooperatives. In fact, some of ACSC’s members invested in more than one of these new cooperatives.

The producers who owned ACSC began to think about diversifying into sweeteners through horizontal integration across sugar into corn wet milling (e.g., HFCS). This would change the portfolio of the cooperative. One key issue was whether diversification would change ACSC’s strategy. American Crystal Sugar Company’s low cost strategy was successful. It was unclear whether diversification would continue that strategy or if it signaled a change in strategy to differentiation. The producers who were on ACSC’s Board of Directors had to approve major strategic decisions.

Ultimately, the 2,145 producer members discussed three alternatives. First, ACSC could invest in a corn wet milling plant to produce HFCS and thereby diversify its sugar product portfolio. In addition, United Sugars Corporation already had customer contacts and would market the sweetener products from the plant. This was clearly a move into product differentiation of sugar and corn sweeteners.

Second, ACSC could further reduce its costs by investing in new technologies that would further extract sugar from molasses, or molasses desugarization, a continuation of its low cost strategy. Third, it could add more capacity and expand volume, which would lower costs even more through scale economies. The latter two alternatives reinforced ACSC’s existing low-cost production strategy. Any decision would require that ACSC maintain at least 35 percent equity as a percentage of assets.

If the overall United Sugars Corporation strategy was successful, it would need additional sugar and hence, more acreage. In order to be a single source for all types of sugar and sweetener products, it would also likely need a sugar cane partner but that was not part of the current discussion. The Board was to vote on the alternatives.

The Three Alternatives
Corn Wet Milling
Integration into corn wet milling had many advantages. Demand for HFCS was increasing. Although the industry was approaching maturity, additional capacity was needed to meet projections of United States and Mexican demand. If a plant could be built with little debt (i.e., its members would supply the equity), it would help reduce the plant’s cost structure. It was decided to investigate forming a joint venture company, ProGold LLC. ProGold LLC would be a joint venture between ACSC ($48 million investment), Golden Growers Cooperative ($51.1 million), a new corn growers cooperative, and Minn-Dak Farmers Cooperative ($5.2 million).
The remainder of the investment would be borrowed. ACSC’s share of the plant would be 46 percent.

The total cost of the plant would be $260 million. The facility had the capacity to grind 72,000 bushels of corn per day, roughly 25 million bushels of corn per year, and would be located in Wahpeton, North Dakota. All of its capacity was to produce HFCS and related by-products. ProGold would enter into exclusive marketing agreements with United Sugars Corporation to market corn sweeteners and other primary products, and with Midwest Agri-Commodities to market by-products. Such a diversification strategy had great appeal to producers as it catered to necessary crop rotations. But the risks were huge as its competitors were all entrenched in North America and competed fiercely with one another in the HFCS market.

**Molasses Desugarization**

American Crystal Sugar Company was proud of the fact that it was the low cost beet sugar producer. Molasses desugarization offered an opportunity to lower its costs even more. Because molasses was a low-value byproduct, an opportunity to extract more sugar per ton of beets would be another way to remain competitive on processing costs. The remaining molasses and byproducts from the molasses desugarization process were marketed primarily to yeast manufacturers and for use in animal feed. It already owned one such plant that processed almost half of the molasses. A molasses desugarization plant would cost $96 million, which would make it possible to desugarize all of its molasses. Continuing to lower its costs by building another desugarization plant and adding more capacity would continue to strengthen ACSC’s core competence of low processing costs. The company that manufactured the technology was willing to help finance 50 percent of the total investment and would own that 50 percent. (ACSC could purchase the 50 percent at a later date at a lower price). A nine percent discount rate and a 30-year life were assumed for this investment.

**Expand Processing Capacity**

It was possible to grow more sugar beets in Minnesota and North Dakota. Currently, ACSC controlled supply by only purchasing sugar beets from its members who were allowed to plant according to how many preferred shares they held. Selling an additional 61,500 acres of stock at $1,500 a share would provide $91 million and allow production capacity to expand by 15 percent. This expansion is the most that could be done with the existing plants. Sugar beets were a high value crop and its members were prepared to invest in expanding production capacity. This would give them the greatest amount of market share in the industry.

**Summary**

Any expansion strategy into corn sweetener production, molasses desugarization, or additional capacity was not without risk. This strategy was clearly focused on lowering costs for sugar beet processing rather than becoming a sugar and sweetener company, similar to competitors such as Tate & Lyle. But the large capital expenditures were a concern because the failure of any alternative could have severe downside risk in the event that it did not succeed.

**References**


**Michael Boland and David Barton**

Michael Boland is associate professor of agricultural economics at Kansas State University. David Barton is professor of agricultural economics and director of the Arthur Capper Cooperative Center at Kansas State University.

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