



Vertical Coordination in the Malting Barley Industry: A ‘Silver Bullet’ For Coors?

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Introduction

On a sparkling late-November morning, Wade Malchow (Manager of Agronomy for the Coors Brewing Company) gazes out his office window on the sixth floor of the Coors Brewery in Golden, Colorado. As he scans the sprawling complex, he notices a group of people gathering at the base of a huge, copper brewing kettle that serves as a sentinel to the brewery. Most of those waiting below for a tour of the brewery are looking up at the 50-foot high, salvaged brewing kettle in awe and amazement at its size. Indeed, the Golden facility is the world’s largest single-site brewery. Nonetheless, Wade knows that the sheer size of the brewery does not mean that Coors is the largest brewing company. In fact, a recent merger of two competitors has dropped Coors from eighth to ninth position in terms of worldwide market share.

The company historically has been a small brewer. However, new trends and technology are causing the management of Coors to question their strategic advantages. Historically, one of Coors’ trademarks was that of a completely integrated regional brewer who sourced all of its malting barley needs directly from producers through the use of production contracts. This has served the company well — especially during 2002 when barley quality was poor throughout the United States.

As Wade turns away from the window and returns to his desk, he starts making notes on a yellow legal pad. Although he was promoted into his current position only two months ago, it is time for him to consider the strategic role that his malting barley development and procurement program will play in helping Coors achieve its strategic position in the world brewing industry.

The World Barley, Brewing, and Malting Industries

Malt barley is one of the principal ingredients in the manufacturing of beer. Brewers can either purchase malt barley to manufacture malt which is used to make beer or purchase malt from malting companies instead of processing barley. Beer is considered a mature product, so growth occurs at a slow rate relative to newer industries. Worldwide growth is expected to average 2 percent per year over the next 10 years. U.S. growth is expected to increase only 1 percent per year, while growth in several regions (China-Southeast Asia — 5 to 10 percent, Latin America — 6 percent, Ukraine — 10 to 20 percent) is expected to exceed the average. Beer shipments are shown in Table 1 and per capita

consumption is shown in Table 2. Consumer demand for microbrews has increased the number of small breweries in the United States to more than 1,800 or seven times greater than in 1990.

Feed and Malt Barley

Barley is a highly adaptable cereal grain that is produced in climates ranging from sub-Arctic to sub-tropical. Barley is grown on a large scale in Russia, Australia, Germany, Turkey, and North America. The leading exporters of barley are the European Union, Australia, and Canada. Because of its use in malt beverages, barley is grown in many areas of the world as much for cultural as economic reasons. Europe has long been a producer of malt barley. European subsidies encouraging production has resulted in the European Union competing with Canada as the largest malt barley exporter. A growing percentage of the world trade is in the form of malt.

The implementation of the Canadian/United States Trade Agreement (CUSTA) and the North American Free Trade Agreement (NAFTA) encouraged the integration of the malt barley market between the United States and Canada. Import restrictions were reduced and the Canadian Wheat Board adopted a pricing policy of selling to Canadian maltsters at the Minneapolis cash price less transportation costs. This eliminated price protection for Canadian maltsters. NAFTA eliminated Canadian tariffs on malt barley and malt by 1996 and 1998, respectively. The United States and Canada continue to compete with the European Union's export support programs for malt barley and malt.

Brewers

At the beginning of 2004, the top six worldwide brewers are Anheuser-Busch (11 percent market share, 127.8 million barrels), South African Brewers (SAB) Miller PLC (9 percent market share, 102.2 million barrels), Heineken (7 percent, 80.1 million barrels), Interbrew (6 percent, 72.4 million barrels), Carlsberg (5 percent, 59.6 million barrels), and Ambev (4 percent, 49.5 million barrels). Although Coors is the third largest brewer in the United States, it maintains only 11 percent of the market. This is a relatively small share compared to its primary U.S. competitors Anheuser-Busch, with nearly 50 percent of the market, and SAB Miller with 20 percent. Both of Coors' competitors have substantial financial, marketing, production, and distribution resources. In addition, their size provides for significant scale economies. Their geographic distribution systems reduce the need for satellite redistribution centers and lowers transportation costs. In addition, Coors has higher per barrel costs of operations because it is a single-site brewery.

Maltsters

At the beginning of 2004, the six largest worldwide malting companies (in terms of annual production capacity) are Groupe Soufflet (1,387,000 tons), Cargill (1,245,000 tons), Con Agra/Tiger Oats Malt (1,191,000 tons), Groupe Malt Europ (1,124,000 tons), and Lesaffre-ADM/IMC (845,000 tons). The economics of the malting industry depend critically upon selected barley varieties, protein content, plumpness, and moisture content.

Large brewing companies are not completely integrated in terms of sourcing malt. Some companies such as Anheuser-Busch have their own malting facilities, but also purchase

malt from independent maltsters. Maltsters sell malt to brewing companies such as Anheuser-Busch, SAB Miller, Molson, Labatts, and Kirin. In addition, distilling companies such as Jack Daniels, Jim Beam, and Seagrams purchase malt. Other malt purchasers include food processing companies such as Kraft, Malt-O-Meal, and Kellogg.

Coors Value Chain for Beer

Coors maintains the world's largest, single-site brewery in Golden, Colorado. In addition, they have a second brewery in Memphis, Tennessee, and a packaging facility in Elkton, Virginia. Figure 1 diagrams a generic value chain for a firm's activities. This framework can be used to show Coors' activities in the production and marketing of beer.

Supply Chain Management Activities

Coors has always marketed its products based upon its use of high quality inputs. For example, Coors purchased more than 60 springs near its Golden plant to guarantee a stable supply of "pure Rocky Mountain spring water." Coors pays competitive prices for agricultural inputs such as water, rice, refined cereal starch, and premium hops. Its aluminum cans cost slightly more than the bottles used by its competitors. Furthermore, Coors makes its own labels and glass bottles, and built the majority of its own malting equipment and packaging equipment. At one time, Coors owned coal mines in an effort to be energy self-sufficient.

Coors uses an all-natural brewing process and water, hops, cereal grains (rice and refined corn starches), and malting barley to produce their products. Coors has a single source purchasing agreement for specialized paperboard and label packaging with Graphic Packaging International Corporation. In addition, most of Coors' aluminum cans are purchased from Rocky Mountain Metal Container (Coors' limited liability company with Ball Corporation), and more than one-half of all glass bottles are obtained from Rocky Mountain Bottle Company (Coors' limited liability company with Owens-Brockway Glass Container, Inc.). Coors Brewers Limited also has a single source supplier of cans. Finally, weather conditions can significantly impact the supply and quality of the three primary ingredients necessary for producing beer — water, barley, and hops.

Operations

The brewing process begins with the malting of barley. Barley is steeped in water and encouraged to germinate. After four to five days, the "malt" is heated to stop further growth and improve its flavor. The malt is then cracked by steel rollers to expose its contents. The resulting "grist" is then mixed with hot water and left to stand for two hours so that starch can be converted naturally to sugars. The resulting "mash" is sprayed with hot water and filtered to produce a sugary liquid called "wort." Wort is then boiled with hops in copper kettles for 1 to 2 hours. Boiled wort is cooled through the use of heat exchangers and then aerated. Yeast is added and a fermentation process begins that produces carbon dioxide and alcohol. Beer is then aged (conditioned), filtered, and packaged.

The longer process results from a "natural fermentation" or aging process that minimizes the use of additives. Unlike its competitors, Coors does not heat pasteurize its beer to kill bacteria. These processes increase production costs, but also contribute to the production of a high quality product. Beer is brewed in copper kettles that contain about 500 barrels

of beer by the end of the brewing process. At the Golden brewery, the copper kettles have been imported from Germany and are partially handmade. Some of these kettles date back to 1930.

Distribution

Coors products are handled at cold temperatures throughout packaging and distribution to maintain quality. Coors uses a filtering and sterile-fill system that stabilizes beer without heat. Beer is packaged in dark amber bottles and protective cartons to guard against light damage.

An average of 400 insulated rail cars and 1,600 refrigerated trucks leave Coors' brewing and packaging facilities each week. An average railcar contains approximately 7,200 cases of 12-ounce cans, and an average truck holds about 2,000 cases. Coors ships high-gravity beer in glass-lined railcars to Elkton where it is mixed with water and packaged for delivery on the East Coast. Coors is a partner in operating the largest U.S. aluminum-can manufacturing plant in Golden, CO, and is a partner in a glass-bottle manufacturing plant in Wheat Ridge, CO.

Sales and Marketing

Finally, Coors places a freshness code on each bottle indicating the date by which unsold products must be removed from retail shelves. The freshness periods are 112 days for packaged products and 45 to 60 days for kegs. Beer is delivered to bars, beer retailers, and other customers by using trucks. Drivers are responsible for assisting in beer promotion and displays. Coors conducts national advertising campaigns to promote its products using a pull marketing strategy. Because of the maturity of the beer industry, promotion and advertising are critical for expanding market share. In 2002, Coors launched a new advertising strategy aimed at the 21- to 29-year-old market segment. Specifically, Coors formed an especially strong marketing alliance with the National Football League and the Super Bowl. Nonetheless, significant challenges remain. The U.S. beer industry is extremely competitive. Thus, advertising expenditures must translate into increased sales volume.

Service

Coors' service program is typical of other brewers in that it replaces beer before its freshness date expires. It has also established environmental initiatives. Coors introduced one-piece, aluminum cans and aluminum can recycling to the brewing industry in 1959. Since 1990, Coors has adopted several environmentally-related initiatives. Coors recycles office paper, corrugated board, paper board and scrap metal. Reductions in the weight of some bottles have provided annual savings of 72 million pounds of glass since 1988. Coors' cans and corrugated cardboard contain 50 percent recycled products. More than 90 percent of Coors' paper packaging is recyclable.

The Coors Brewing Company

Adolph Coors founded the Adolph Coors Company in Golden, Colorado in 1873. By 1890, production had reached 17,600 barrels per year. By 1937, Coors beer was available in 11 Western states. In 1978, Coors launched Coors Light, which has become the third largest selling beer in the United States. In 2002, Coors' sales volume totaled 31.8 million barrels or about 986 million gallons.

In 1975, the Adolph Coors Company became a publicly traded company on the New York Stock Exchange. It is currently ranked among the 500 largest publicly-traded U.S. companies. The Coors Brewing Company is a wholly-owned subsidiary of the Adolph Coors Company.

Coors products are available throughout the United States and in more than 30 international markets. For example, Coors is involved in the Canadian market through a partnership with Molson. Molson contracts with Coors for brewing, and marketing of Coors products. In Japan, Coors focuses on Coors Original and Zima products.

In 2002, Coors created Coors Brewers Ltd through the purchase of Bass Brewers (United Kingdom) for \$1.8 billion. Based in Britain's brewing center, Burton-upon-Trent, Coors Brewers boast many of the U.K.'s top beer brands including Carling, Grolsch, and Worthington's. The acquisition makes Coors Brewing the ninth largest worldwide brewer.

A number of factors place significant challenges on the financial performance of the Coors Brewing Company. Consolidation has occurred in recent years as regional brewers have merged or been acquired by national or international firms. Tables 3 to 5 present a summary of financial indicators for the years 1998 to 2002.

The U.S. Barley Industry

Barley is the third largest feed grain crop produced in the United States, after corn and grain sorghum. Barley is a short-season, early maturing crop. Therefore, it is produced in a variety of climates and in both irrigated and dryland production areas. Production is concentrated in the Northern Plains and the Pacific Northwest. The United States is the eighth largest producer of barley in the world with current production estimated at 4.9 million planted acres.

Barley is classified as either six-row or two-row, depending on the physical arrangement of the kernels on the plant. Barley is also described as hulled or hull-less by the presence of beards or awns covering the kernels. Six-row barley primarily is grown in North Dakota, Minnesota, South Dakota, and Idaho. Two-row barley is grown in Montana, Idaho, Colorado, Wyoming, Washington, Oregon, and California. North Dakota, Idaho, and Montana are the three largest barley-producing states (Table 6). The U.S. Department of Agriculture National Agricultural Statistics Service has created maps that show county level barley production over time which can be accessed at <http://www.usda.gov/nass/aggraphs/cropmap.htm>.

Barley is used as livestock feed, food, and for barley malt. Each of these uses is best met with specific barley varieties. Currently, 60 percent of the barley grown in the United States is used in food and industrial products, while 40 percent is used as livestock feed. Barley competes with corn and sorghum as a feed grain. It has a higher protein content than corn, which reduces the need for protein supplements in feed compounds. Barley grown for human consumption is used in soups, as an extender for vegetable proteins and is occasionally milled into flour. Barley flour is used in the United States in baby food and in North Africa and Asia for flatbreads or porridges.

Barley production in the Northern Plains is susceptible to damage from fusarium head blight — a fungal disease that can be found in small grain crops. Fusarium head blight commonly occurs in North Dakota on spring wheat, durum, and barley. The disease causes yield loss and light-test weight kernels. It is also associated with fungal toxins (mycotoxins) that are hazardous to animals. In addition, vomatoxin produced from fungi on malting barley creates problems for beer producers. Thus, only small amounts of vomatoxin on malting barley are allowed, and infected grain is heavily discounted by the market.

Barley diseases are managed through several different approaches. Currently, research is being conducted to develop disease-resistant grain varieties. Crop rotations, seed treatment, and fungicides are also being used to combat disease. Cropping practices can reduce the spread of fusarium head blight. The fungus survives best on residue left on or above the soil surface. Therefore, tillage practices that bury harvest residue reduce the inoculum potential of the fungus. No-till farming has become an increasingly common practice in the upper Great Plains and is likely contributing to the persistent presence of fusarium head blight in the region.

Table 7 illustrates monthly U.S. corn, feed barley, and malt barley prices for 1983 to 2003. Barley prices rose from 1993 to 1996 due to a prevalence of fusarium head blight in the upper Midwest during that period.

Malt Barley Production Contracts

Contracts for malt barley production offer maltsters a secure supply of high-quality barley and price premiums for farmers to grow malt barley over higher-yielding feed barley. Malt barley that does not meet quality specifications is sold in the feed market at significant price discounts relative to feed barley because of lower test weights and protein.

Malting companies contract for both two-row and six-row barley varieties. Some contracts are specific to certain varieties as well as quality requirements. The preference for two-row or six-row barley stems from several factors including quality, brewing techniques, price, and style or flavor of the finished product (beer). The two classes differ by kernel size, extract, protein, and enzyme levels. In general, two-row barley has slightly higher malt extraction rates (1 to 2 percent greater) relative to six-row barley. However, this is not true for all varieties.

Most contracts contain specific quality requirements for acceptable malt barley. Some of the requirements include minimum/maximum allowable values for protein, moisture, foreign material levels, skinned and broken kernels, sprout damage, color, and plumpness. Barley must pass stringent tests for the presence of diseases such as fusarium head blight. Most of the characteristics directly affect the brewing process, making contract specifications necessary for high quality beer production.

The price of malt barley is largely determined by the supply of malt in both the domestic and world markets and demand for malt and malt products. The high prices of malt barley relative to feed barley result in malt barley production that often exceeds demand.

This allows maltsters to select the highest quality barley malt. Environmental factors can significantly affect crop production and quality.

In 2002, a combination of disease problems, low growing-season moisture, and abnormally hot temperatures in barley-producing regions devastated much of the malting barley crop. Even in irrigated regions, excessive temperatures caused low kernel plumpness. The 2002 crop was generally considered to be the worst in many years. Many maltsters and brewers scrambled to secure adequate malting barley supplies.

Coors Malt Barley Program

Coors' malting barley varieties have been bred for production in high elevations. These higher elevations tend to be somewhat cooler when many lower elevations experience unusually warm temperatures. Given Coors' strategy of contracting with irrigated producers, Coors' 2002 barley supplies were more than adequate to meet their needs in terms of quantity and plumpness. In fact, Coors sold some of their barley to other maltsters/brewers.

Coors varieties have performed well in recent years even though drought conditions generally have reduced the quality of other varieties. Specifically, hot and dry conditions may lead to shrunken kernels and higher protein levels. The importance of barley quality is illustrated by considering brewing yields. Brew house (wort) yield is determined by the pounds of fermentable sugar obtained from each barrel of wort.

Although some barley protein is needed for malting and brewing efficiencies, excessive protein reduces brew house yield. In general, protein levels of 10.5 percent are considered optimal. For each percentage point of protein above the optimal level, brew house yields decline by 0.5 to 0.6 percent. In addition, higher protein levels also reduce pounds of fermentable sugar. That is, excessive protein levels reduce both wort yields and the amount of beer that can be brewed from that wort. Numerically, it may take 22,222 pounds of barley to produce 18,000 pounds of malt from which 500 barrels of wort is obtained. The 500 barrels of wort should produce 750 barrels of blended beer. However, if protein levels exceed 10.5 percent, then both wort levels and the amount of beer that is obtained from that wort may be reduced. Therefore, one might be able to produce only 720 barrels of beer from the 22,222 pounds of barley because of lower wort yields and because a larger proportion of the extract was protein rather than sugar.

A key input in Coors' brewing process is malting barley. Coors contracts with approximately 900 barley growers in Colorado, Wyoming, Idaho, and Montana for 160,000 acres of malting barley. Many of these growers have been producing barley for Coors for more than 30 years. Coors purchases almost \$50 million of barley annually. All barley is sourced through production contracts, and 95 percent of it is contracted with irrigated barley producers.

Production contracts specify strict standards on production practices and quality. For example, only varieties developed by Coors can be planted, and only certified seed can be used. Farmers are not allowed to use seed that has been saved from previous harvests. Coors does not use genetically-modified barley varieties. Barley must meet minimum specifications for plumpness, color, foreign material, skinned kernels, mold, and

maximum limits on protein levels. Coors contracts with producers based on each producer's five-year quality average. Producers who are unable to meet certain quality specifications are not offered contracts. Coors has barley receiving stations in Huntley, MT, Worland and Ralston, WY, Burley and Buhl, ID, and Longmont and Monte Vista, CO.

The barley procurement and breeding program consists of approximately 30 full-time employees. The breeding program is based in Burley, ID. The goal of the program is to develop specific varieties for Coors. Coors expects any single variety to be in service for 5 to 7 years. New varieties are only introduced if they offer improvements in yield, quality, or disease resistance. Coors varieties have lower beta glutens than other malt barley varieties and tend to be among the highest yielding of all varieties. Coors only uses 2-row malt varieties. In some years, Coors is able to sell excess barley to other maltsters. However, Coors never buys barley in the open market. Barley is cleaned at receiving stations before being shipped by rail to Golden. Coors participates in a rail car pool and rents space on "free running" rail cars which are in continuous use between its facilities. They do not currently own or lease rail cars.

Coors varieties are not generally used by competitors such as Anheuser-Busch and SAB Miller. These companies tend to use varieties developed and released by public universities and contract about half of their production. Public varieties are generally bred for yield potential on dryland or irrigated land. Thus, public varieties may not provide quality characteristics to the degree of proprietary varieties.

Future Directions

As Wade continues to write on his yellow pad, he highlights several pending issues:

1. What are the value chain contributions of his malting barley program?
2. What quality aspects of barley are most important to Coors? How can his barley research and development program meet these needs?
3. How does the malting barley program impact profit margins?
4. Is vertical coordination the best method for achieving the desired quality results?
5. If Coors is to become a top five brewer, can the malting barley program meet these increased demands?

Summary

Wade pushes away from his desk and walks to his window. He notices that vehicles are streaming out of the Golden facility at the end of another workday. Yet, new shifts are arriving to maintain the continuous production of malt and beer. Wade muses at the similarity between shift changes and the constant change that occurs in the brewing industry.

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Table 1. Production of Malt Beverages in the United States, 1990 to 2000^a

	1,000 barrels
1990	201,691
1991	203,707
1992	201,395
1993	202,277
1994	202,805
1995	200,302
1996	200,067
1997	199,176
1998	198,178
1999	197,594
2000	199,650

^aThe Beer Institute

Table 2. Per Capita Consumption of Malt Beverages, 1985 to 2000^a

	Gallons
1985	23.7
1986	24
1987	23.9
1988	23.7
1989	23.4
1990	24
1991	23.2
1992	22.8
1993	22.6
1994	22.4
1995	21.9
1996	21.8
1997	21.7
1998	21.8
1999	21.9
2000	21.8

^aThe Beer Institute

Table 3. Income Statement Data for The Adolph Coors Company, 1998 to 2002 (millions of dollars)

	2002	2001	2000	1999	1998
Gross Sales	4,957	2,843	2,842	2,643	2,464
Beer Excise Taxes	(1,181)	(413)	(427)	(406)	(392)
Net Sales	3,776	2,430	2,414	2,237	2,072
Cost of Goods Sold	(2,415)	(1,538)	(1,526)	(1,397)	(1,333)
Gross Profit	1,362	892	889	839	739
Other Operating Expenses					
Marketing and Administration	(1,057)	(717)	(723)	(693)	(616)
Special Charges	(6)	(23)	(15)	(6)	(19)
Total Other Operating	(1,064)	(740)	(738)	(699)	(635)
Operating Income	298	152	151	141	104
Interest Income	21	16	21	11	12
Interest Expense	(71)	(2)	(6)	(4)	(10)
Other Income, Net	8	32	4	3	5
Net Income Before Taxes	257	198	170	151	111
Income Tax Expense	(95)	(75)	(60)	(58)	(43)
Net Income After Taxes	162	123	110	92	68
Net Income Per Common Share	4.47	3.33	2.98	2.51	1.87

	2002	2001	2000	1999	1998
Barrels of Beer Sold, millions	31.8	22.7	23	22	21.2
Dividends Per Share of Common Stock	\$0.82	\$0.80	\$0.72	\$0.65	\$0.60
Depreciation, millions of dollars	230.3	121.1	129.3	123.8	115.8
Capital Expenditures, millions of dollars	246.8	244.5	154.3	134.4	104.5

Table 5. Selected Balance Sheet Data for The Adolph Coors Brewing Company, 1998 to 2002 (millions of dollars)^a

	2002	2001	2000	1999	1998
Assets					
Cash and Marketable Securities	59.2	309.7	386.2	279.9	287.7
Working Capital	-94	89	118.4	220.1	165.1
Properties, at cost, net	1,380.20	869.7	735.8	714	714.4
Total Assets	4,297.40	1,739.70	1,629.30	1,546.40	1,460.60
Liabilities					
Long-Term Debt	1,383.40	20	105	105	105
Other	116	47.5	45.4	52.6	56.6
Total Liabilities	1,499.40	67.5	150.4	157.6	161.6
Shareholders' Equity	981.9	951.3	932.4	841.5	744.8

^aU.S. Securities and Exchange Commission

Table 6. U.S. Barley Production by State, 2000 to 2003 (thousand bushels)^a

	2000	2001	2002	2003
North Dakota	97,350	79,750	57,040	118,800
Idaho	55,480	50,250	53,960	47,520
Montana	38,000	29,520	39,900	31,590
Washington	34,300	21,000	18,360	14,570
Colorado	12,075	8,560	7,200	8,938
Minnesota	15,360	7,975	6,435	12,750
Wyoming	7,885	6,970	4,900	7,125
California	6,460	5,830	5,100	3,712
Oregon	8,400	4,500	3,700	3,840
South Dakota	5,775	4,056	1,845	2,915
Other	37,643	31,009	37,443	24,327
Total US	318,728	249,420	226,873	276,087

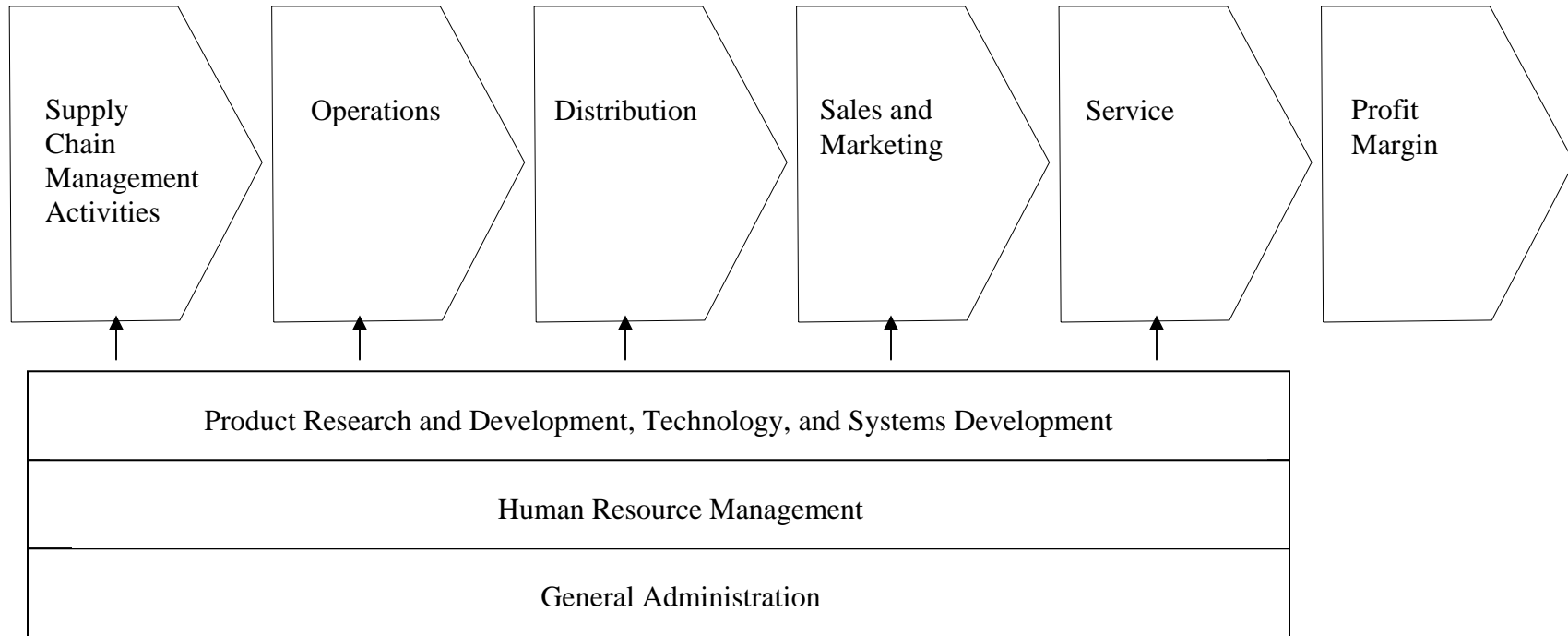
^aUS Department of Agriculture NASS

Table 7. Feed and Malt Barley and Corn Prices Over Time, 1983 to 2003 (dollars per bushel)^a

	Feed	Malt	Corn
1983	2.32	2.33	2.99
1984	2.43	2.47	3.05
1985	2.06	2.21	2.49
1986	1.64	1.87	1.96
1987	1.66	1.92	1.56
1988	2.04	2.68	2.27
1989	2.15	2.99	2.43
1990	2.00	2.46	2.40
1991	1.90	2.36	2.33
1992	1.92	2.32	2.29
1993	1.80	2.26	2.22
1994	1.85	2.29	2.41
1995	2.30	2.66	2.56
1996	2.87	3.25	3.55
1997	2.15	2.62	2.60
1998	1.73	2.50	2.20
1999	1.58	2.34	1.89
2000	1.73	2.49	1.86
2001	1.75	2.48	1.89
2002	1.96	2.72	2.13
2003	2.28	3.11	2.27

^aUS Department of Agriculture National Statistics Service

Figure 1. Description of Value Chain Activities



Source: Porter