



## Bitter Competition: The Holland Sweetener Company versus NutraSweet (A)

In late 1986, the Holland Sweetener Company (HSC), based in Maastricht, the Netherlands, was preparing to enter the European and Canadian aspartame markets. Aspartame, a low-calorie, high-intensity sweetener, had been discovered in 1965 by G.D. Searle & Co., a U.S. pharmaceuticals company. After having secured a number of patents on its discovery, Searle had gone on to develop markets for aspartame as a food-and-beverage additive. By 1986, NutraSweet, the operating entity set up by Searle to build the aspartame business, had reached sales of \$711 million. Now, NutraSweet's patents in the European and Canadian markets were due to expire as of 1987, although the U.S. market would remain protected until December 1992.

Winfried Vermijs, president of HSC, reviewed his company's strategy for competing in the aspartame business. Price and volume forecasts had been prepared for the European and Canadian aspartame markets. On price, two scenarios were being entertained: "normal competition" and "price war." Vermijs wondered which scenario was the more likely.

### Aspartame

High-intensity sweeteners had a long history. In Roman times, grape juice was boiled down in lead pans to produce sapa, a sweet compound used for everything from a food additive to an oral contraceptive. Presaging concerns over the safety of modern high-intensity sweeteners, use of sapa unfortunately led to neurological damage or even death. Discovered in 1879, the oldest high-intensity sweetener still in use was saccharin, a petroleum derivative about 300 times as sweet as sugar (sucrose) of equal weight. In the 1960s, Abbott Laboratories developed cyclamate (30 times as sweet as sugar) but, following studies suggesting a link to cancer, the Food and Drug Administration (FDA) banned cyclamate in 1970. In 1977, the FDA tried to ban saccharin as well, but the resulting public outcry caused Congress to intervene and declare a moratorium. Manufacturers of saccharin were, however, required to place notices on labels, warning consumers of the possible increased cancer risk. Apart from the safety issue, many people found saccharin to have a slightly bitter, metallic aftertaste.

Aspartame was a white powder consisting of L-aspartic acid and L-phenylalanine, two naturally occurring optically active amino acids, together with a small amount of methanol. It had

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the same caloric content as sugar of equal weight, but was 180 times as sweet. Unlike sugar, aspartame did not promote tooth decay. The main drawbacks of aspartame were that it became unstable when exposed to high temperatures (as in baking) and that it had a limited shelf life in soft drinks.

Aspartame had been discovered by accident. In 1965, James Schlatter, a research scientist at G.D. Searle & Co., a pharmaceuticals company based in Skokie, Illinois, was working on a project to develop an anti-ulcer drug. While experimenting with L-aspartic acid and L-phenylalanine, he happened to lick his finger to pick up a piece of paper and noticed a sweet taste. He later coined the term “aspartame” for the combination of amino acids.

## NutraSweet<sup>1</sup>

G.D. Searle & Co. was formed in 1908, although the company’s roots could be traced back to 1888. From its upper Midwest beginnings, Searle grew to become a *Fortune 500* pharmaceuticals company in 1968. Following its serendipitous discovery of aspartame, the company had an opportunity to strike out in a new direction. Searle secured two key patents on aspartame. The “use” patent, obtained in 1970, covered any use of aspartame as a sweetening ingredient. The “blend” patent, obtained in 1973, covered combinations of aspartame and saccharin. Approval from the FDA for the use of aspartame as a food additive was sought the same year.<sup>2</sup> After giving a green light to dry use of aspartame (tabletop sweeteners and powdered drinks) in 1974, the FDA withdrew its approval shortly afterwards, pending the results of further tests. Not until July 1981 did the FDA give the final go-ahead for dry use of aspartame. Wet-use approval (soft drinks) came in July 1983.

In the wake of the regulatory delays, Searle sought extensions of its two patents. It was successful in getting the use patent extended—to 1987 in Europe, to December 14, 1992 in the United States, and to April 1993 in Australia. An attempt to extend the Canadian use patent, which was due to expire in 1987, was unsuccessful. The blend patent was extended to November 4, 1996, in the United States.

## Manufacturing

To manufacture aspartame on a commercial scale, Searle turned to Ajinomoto, a major Japanese chemicals and food company. Ajinomoto was a leading player in amino acid research and production, dominating the monosodium glutamate (MSG) market. (For financial data on Ajinomoto, refer to **Exhibit 3**.) Ajinomoto supplied a chemical coupling process for manufacturing aspartame, as well as the L-phenylalanine input. (The other input, L-aspartic acid, was widely used in pharmaceutical applications and could be obtained from a number of sources.) Searle agreed to pay Ajinomoto royalties for access to the process technology, and the two parties further agreed to share information on subsequent process improvements. A cross-licensing deal was also struck under which Ajinomoto was given exclusive access to the Japanese aspartame market—where it went on to sell aspartame under the brand names *Pal Sweet* and *Pal Sweet Diet*. Searle retained sole rights to the North American market.

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<sup>1</sup>Some material in this section is taken from “The NutraSweet Company: Technology to Tailor-Make Foods” (Harvard Business School Case No. 589-050) and *Sweet Success: How NutraSweet Created a Billion Dollar Business*, by Joseph McCann (Homewood, Ill.: Irwin, 1990).

<sup>2</sup>Under FDA rules, an applicant had to establish the “added value” of a new product. However, only the efficacy of a new product, and not its cost, entered into the added value assessment. Thus the criterion for approval of a high-intensity sweetener was that it be provably superior to existing sweeteners as an aid to dieting.

It took two to three years to bring aspartame production up to speed. (Once operational, however, a facility had to be run at or near to design capacity. Interruptions to production were prohibitively expensive due to significant mothballing and debugging costs.) Minimum efficient scale was of the order of 2,000 tonnes annual capacity, while plant construction costs exceeded \$100 million. With shipping costs for aspartame around 15-20 cents per lb, NutraSweet and Ajinomoto concentrated production in a limited number of facilities (see Table A).

**Table A** NutraSweet and Ajinomoto Production Facilities

Company	Facility	Annual capacity (tonnes)
NutraSweet	University Park, IL	2,000
	Augusta, GA	3,000
	Harbor Beach, MI	n/a
Ajinomoto	Tokyo, Japan	2,000

Source: *Chemical Marketing Reporter* and *Financial Times* (various issues), casewriter estimates

The NutraSweet-Ajinomoto method of manufacturing aspartame was covered by process patents extending through the late 1990s. With a continuing program of process improvement and capital investment in place, NutraSweet and Ajinomoto aimed to increase the efficiency of their manufacturing operations over time. By 1992, NutraSweet would be proclaiming that it had cut its manufacturing costs by 70% over the previous decade.<sup>3</sup>

## Market Development

Having spent nearly \$80 million in start-up costs (excluding investments in plant), Searle launched its first aspartame product, the tabletop sweetener *Equal*, in October 1981. At that time, the U.S. tabletop sweetener market totaled about \$110 million. It was dominated by one brand, *Sweet 'N Low*, a saccharin-based product made by the Cumberland Packing Company of Brooklyn, New York. Although it was three times more expensive than *Sweet 'N Low*, Searle's *Equal* was an immediate success in the marketplace.

In December 1982, The NutraSweet Group was established as a separate operating division of Searle.<sup>4</sup> Forty-year-old Robert Shapiro, Searle's general counsel, was brought in as president. Educated at Harvard and Columbia Law School, Shapiro had served on several government advisory committees and had then spent time in the private sector before joining Searle in 1979.

Following FDA approval for wet use of aspartame, Shapiro set in motion the now-famous "branded ingredient" strategy. Aspartame, under the brand name *NutraSweet*, was made available to any interested food or beverage manufacturer. This was backed up with extensive advertising (estimated at \$30 million annually) of the brand name directly to end-users and by cooperative advertising with manufacturers. The company gave discounts of up to 40% off the list price of aspartame to manufacturers who agreed to use 100% aspartame as a sweetener (rather than blends of aspartame and saccharin, say), to make NutraSweet their exclusive worldwide supplier, and to display the *NutraSweet* trademark and distinctive red-and-white "swirl" logo on their products and in

<sup>3</sup>Monsanto Company 1992 Annual Report, p. 15.

<sup>4</sup>From now on the term "NutraSweet" will denote this operating entity. The italicized *NutraSweet* will be used to refer to branded aspartame.

their own advertising. By 1986, the company was claiming that 98% of American consumers recognized its logo.<sup>5</sup>

The soft drink market was NutraSweet's primary focus in 1983. The U.S. soft drink industry was dominated by two players, Coca-Cola and Pepsi-Cola, which, between them, accounted for something over 60% of shipments in an industry with annual sales of \$26 billion at the retail level. The diet segment accounted for 20% of the U.S. soft drink market and was growing rapidly. To date, saccharin had been used to sweeten diet soft drinks.

NutraSweet sold aspartame directly to major buyers such as Coke and Pepsi via secret, negotiated, multi-year contracts. In 1983, the contracted price was around \$85-\$90 per lb. Although this represented a substantial premium over saccharin (which cost around \$3 per lb) and even sugar (about 25 cents per lb), aspartame replaced virtually all the U.S. soft drink use of saccharin within two years of its introduction. Pepsi, first to use 100% aspartame in its diet beverages, used its head start over Coke to promote Diet Pepsi against Diet Coke.

The 1980s saw intense activity by Coke and Pepsi in the U.S. soft drink market. A memorable episode in the so-called Cola Wars was Coke's 1985 reformulation of its 99-year-old Coca-Cola brand, from which it beat a hasty retreat in the face of consumer resistance. Pepsi responded to the reformulation with commercials proclaiming: "For 87 years Coke and Pepsi have been eyeball to eyeball. It looks like they just blinked . . ."<sup>6</sup>

Over time, NutraSweet expanded aspartame's range of applications to include use in powdered drink mixes, frozen desserts, chewing gum, toppings, cereals, and over-the-counter pharmaceuticals, among other products. However, diet soft drinks continued to be the principal use, accounting for about 80% of total sales of aspartame. The tabletop market accounted for another 15% of sales, other food and beverage products the remainder.

NutraSweet also looked to develop markets for aspartame outside the United States. Canada was an early target. In 1984, NutraSweet and Ajinomoto set up a 50:50 joint venture, NutraSweet AG, based in Zug, Switzerland, to market *NutraSweet* to European commercial buyers and the tabletop sweetener (under the name *Canderel*) to European consumers. As in the United States, the soft drink industry was the primary focus of efforts to sell aspartame internationally, and Coke and Pepsi were again the major buyers. Unlike the situation in the United States, however, Coke enjoyed a strong lead over Pepsi in most overseas markets. In Europe, Coke was estimated to have a 50% market share and Pepsi a 10% share. In Asia, Coke's share of the soft drink market stood at 40%; Pepsi again held a 10% share. In Latin America, Coke held a 55% market share and Pepsi a 20% share.

**Exhibit 1** depicts the growth of the worldwide aspartame market through 1986. In that year, worldwide aspartame prices were around \$70 per lb.

## Acquisition

In summer 1985, Searle was acquired by Monsanto Corporation for \$2.8 billion. Monsanto, headquartered in St. Louis, Missouri, was a leading U.S. producer of agricultural products, plastics and specialty chemicals, performance materials (such as synthetic fibers), and industrial control equipment. (**Exhibit 4** summarizes financial data on Monsanto.) Curiously, the mission of the original Monsanto Chemical Works, formed in St. Louis in 1901, was to challenge the then German

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<sup>5</sup>Monsanto Company 1985 Annual Report, p. 19.

<sup>6</sup>For more information on this and other events in the soft drink industry, see "Cola Wars Continue: Coke vs. Pepsi in the 1990s" (Harvard Business School Case No. 794-055).

monopoly hold on the saccharin market. Now, with the purchase of Searle, NutraSweet became a wholly owned subsidiary of Monsanto.

Since the acquisition, Monsanto had been writing off the cost of the aspartame patents via a \$173 million annual charge against NutraSweet's earnings. The amortization charge would end with the U.S. expiration of the use patent in 1992.

## The Holland Sweetener Company

In April 1985, the Holland Sweetener Company (HSC) was formed in Maastricht, the Netherlands, as a joint venture between Tosoh Corporation and DSM to enter the aspartame market. Headquartered in Tokyo, Japan, Tosoh had begun business in 1935 as a producer of soda ash and caustic soda. The company had since grown to become a diversified manufacturer of basic chemicals, intermediates, and downstream products, as well as scientific instruments and ceramics. Based in Heerlen, the Netherlands, DSM was a chemicals group with interests in plastics, synthetic rubber, fine chemicals, fertilizers, resins, consumer products, and oil and natural gas exploration and development. The company had begun as "Dutch State Mines" around the turn of the century, but over time had been migrating into downstream businesses. Since 1986, DSM had been publicly traded, with the Dutch government retaining a one-third interest. **Exhibits 5 and 6** summarize financial data on Tosoh and DSM.

Tosoh brought to the hook-up with DSM a patented process for manufacturing aspartame that employed a natural catalyst to solve the problem of achieving a precise coupling between the aspartic acid and phenylalanine inputs. The Tosoh process was capable of using either L-phenylalanine or D,L-phenylalanine (a mixture of the D- and L-isomers) as base feedstock. (**Exhibit 2** sketches the process.) HSC claimed that its method of producing aspartame would be less costly and more flexible than NutraSweet's, although this was disputed. DSM's contribution to the joint venture was raw material supply and traditional chemical processes (courtesy of its Fine Chemicals Division), and knowledge of the European marketplace.

Heading up HSC was Winfried Vermijs, a 50-year-old chemical engineer who had been with DSM since 1961. Vermijs had begun his career working on process development in DSM pilot plants. After a stint as a plant manager in the 1970s, he had returned to research and development activities for several years before taking on general management responsibility as president of HSC.

In February 1986, HSC began work on a 500-tonne aspartame plant in Geleen, the Netherlands, with a view to challenging NutraSweet in Europe and Canada once NutraSweet's patents expired there in 1987. The company received a D.Fl. 35 million (\$17 million) loan from the European Investment Bank toward the project.

In preliminary discussions with potential customers, HSC discovered that NutraSweet had signed Coke and Pepsi to exclusive, multi-year contracts. It decided to lodge a complaint with the European Commission, charging that the contracts were anti-competitive. Joining HSC in the complaint was the Irish company Angus Fine Chemicals.

## New Sweeteners

In addition to aspartame, saccharin, and cyclamate, several other high-intensity sweeteners were on the market or in various stages of regulatory review.

Acesulfame-K had been discovered in 1967 and was now being sold in Europe. It was 200 times sweeter than sugar and was heat-stable, which gave it an advantage over aspartame in shelf-

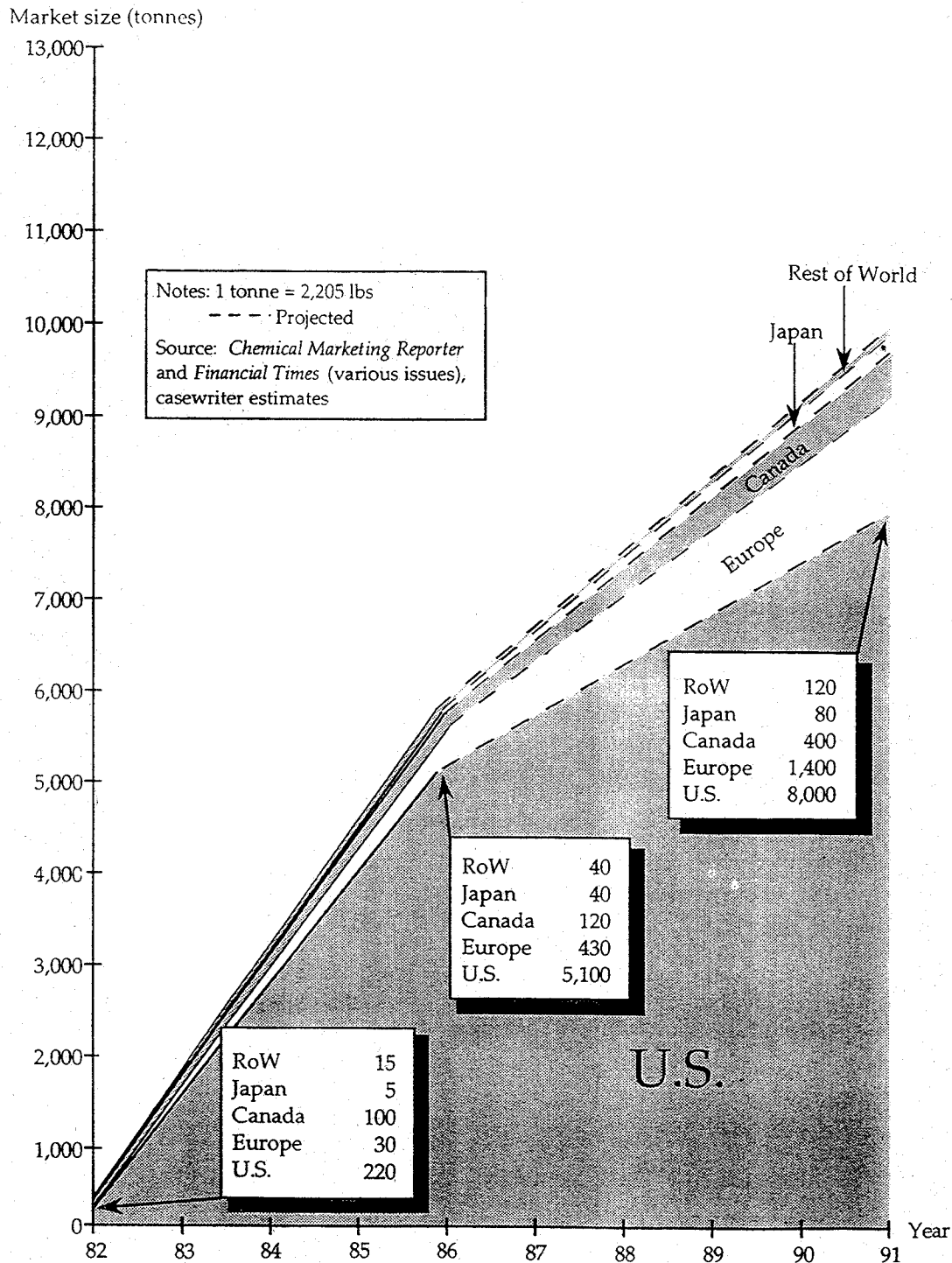
stable products and in baking. Acesulfame-K was manufactured by Hoechst, a major German chemicals company.

Sucralose, a heat-stable compound 500 times sweeter than sugar, was derived from sucrose by a patented chlorination process developed in 1976 by the British sugar company Tate & Lyle and researchers at Queen Elizabeth College in London. Johnson & Johnson, the U.S. consumer products company, had entered a licensing agreement with Tate & Lyle and, through its McNeil Specialty Products division, hoped to market sucralose in the United States and Japan under the brand name *Splenda*.

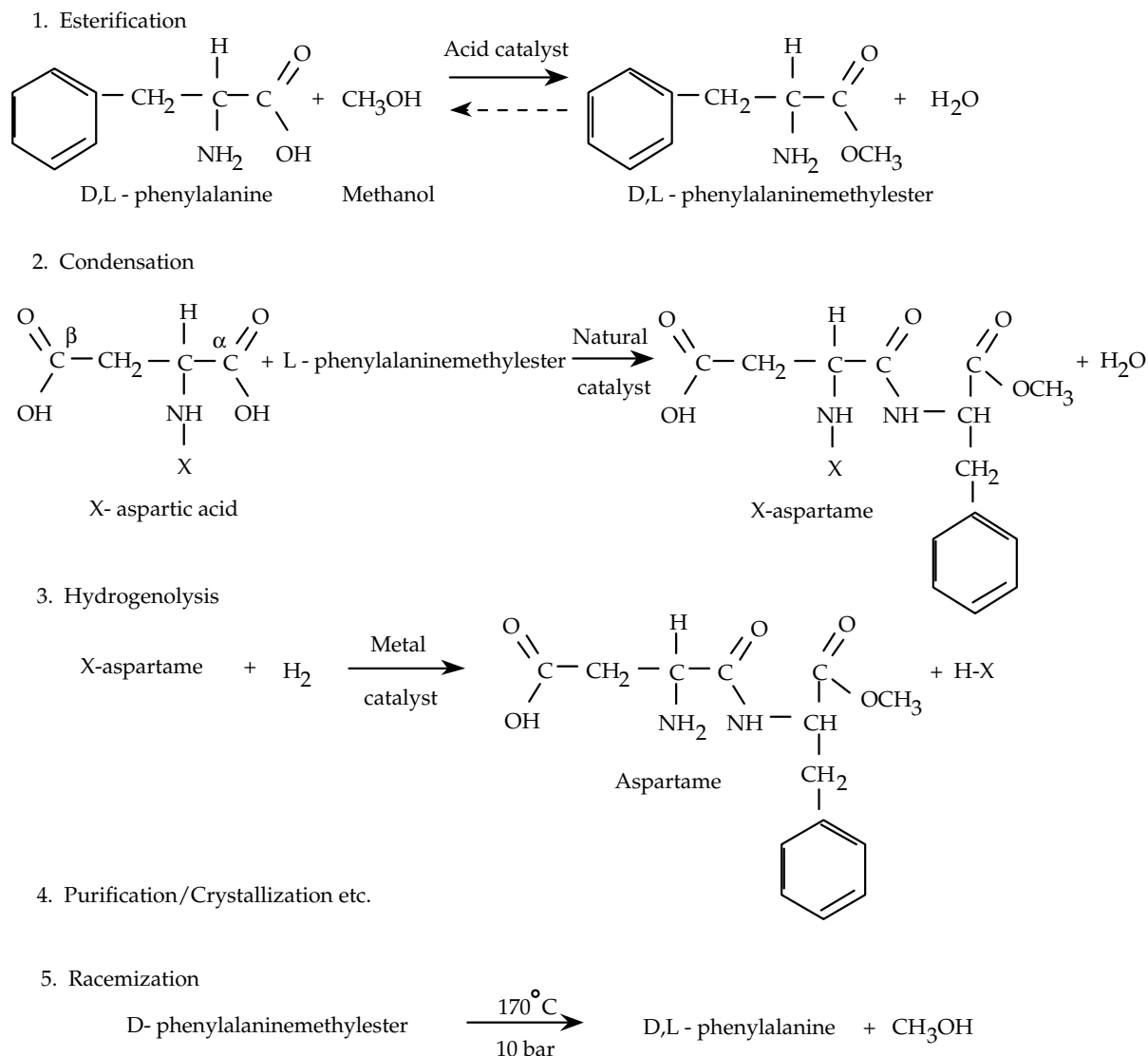
Alitame, a heat-stable product 2,000 times sweeter than sugar, was made by the U.S. pharmaceuticals company Pfizer. A petition for FDA approval was submitted in 1986.

There were also several naturally derived high-intensity sweeteners. Stevioside, made from the leaves of the South American Stevia plant, was in demand in Japan. Thaumatin, genetically engineered to replicate proteins found in berries of certain West African plants, was being used as a sweetener in Japan, Brazil, and the U.K. Neither sweetener had yet been approved in the United States.

One trend expected to strengthen if a wider range of high-intensity sweeteners became available was blending. Researchers had found that combining sweeteners could have a synergistic effect: the blend was sweeter and might have a better taste profile for certain applications than either sweetener separately. U.S. health authorities also encouraged a multiple-sweetener approach on the grounds that it reduced the health risks from any one product.

**Exhibit 1** Growth of Worldwide Aspartame Market

**Exhibit 2** Main Steps in the HSC Process for Making Aspartame



Source: Holland Sweetener Company

Notes:

- (a) X = proprietary group
- (b) The Nutrasweet-Ajinomoto chemical coupling process produces 70% to 80% α-aspartame and 20% to 30% β-aspartame. The α- and β-forms are then separated via selective crystallization, and the β-form split back down into raw materials.



**Exhibit 3** Ajinomoto Co., Inc.: Financial Data

Financial Summary (¥ millions)

	1982	1983	1984	1985	1986
Net Sales	444,509	470,169	482,307	510,788	515,062
Cost of Goods Sold	335,128	356,498	359,880	378,877	387,737
SG&A	83,829	84,667	87,561	94,819	96,280
Operating Income	25,552	29,004	34,866	37,092	31,045
Interest Income (Expense)	(6,415)	(7,009)	(6,644)	(6,575)	(7,062)
Provision for Income Taxes	12,182	14,024	18,401	20,760	17,163
Other Income (Expense)	3,174	2,844	3,234	5,277	8,266
Net Income	10,129	10,815	13,055	15,034	15,086
Total Assets	368,050	380,545	395,337	438,240	492,193
Long-term Obligations	73,968	73,101	68,775	89,197	130,816
Shareholders' Equity	145,785	161,948	171,196	188,675	210,741
Current Assets	208,691	211,364	224,580	252,464	272,832
Current Liabilities	147,741	145,493	155,362	160,366	150,633

Sales by Business Segment (¥ billions)

	1982	1983	1984	1985	1986
Seasonings	136.6	137.1	128.7	133.5	137.7
Edible oils	86.5	87.1	90.3	93.2	86.3
Processed foods	147.9	153.1	160.0	166.6	177.2
Amino acids, pharmaceuticals, and specialty chemicals	45.0	59.4	67.2	78.3	75.5
Other products	28.5	33.5	36.2	39.2	38.4

Source: Ajinomoto Co., Inc. Annual Reports

**Exhibit 4** Monsanto Corporation: Financial Data (\$ millions)

Financial Summary

	1982	1983	1984	1985	1986
Net Sales	6,325	6,299	6,691	6,747	6,879
Cost of Goods Sold	4,804	4,734	4,839	4,841	4,344
Marketing and Administrative Expenses	691	681	722	919	1,244
Technological Expenses	329	359	446	548	596
Amortization of Intangible Assets	-	4	7	88	218
Restructuring Expense (Income)	-	-	-	949	(158)
Operating Income (Loss)	501	521	677	(598)	635
Interest Income (Expense)	(19)	(23)	(8)	(115)	(160)
Provision for Income Taxes	172	201	268	(170)	203
Other Income (Expense)	42	71	38	445	161
Net Income	352	368	439	(98)	433
Total Assets	6,077	6,427	6,373	8,877	8,269
Long-term Obligations	524	590	1,537	3,092	2,772
Shareholders' Equity	3,512	3,671	3,810	3,651	3,781
Current Assets	2,454	2,755	2,597	3,277	2,808
Current Liabilities	951	1,220	1,202	2,378	1,716

Business Segment Results

	1982 <sup>a</sup>	1983	1984	1985	1986
<b>Net Sales</b>					
Agricultural Products		1,250	1,338	1,152	1,153
Chemicals		4,148	4,360	4,051	3,548
Electronic Materials		120	220	137	154
Fisher Controls		535	550	652	645
NutraSweet		-	-	317	711
Pharmaceuticals		-	15	262	665
Oil & Gas		241	203	172	-
Biotechnology Product Discovery		-	-	-	-
Corporate		5	5	4	3
TOTAL		6,299	6,691	6,747	6,879
<b>Operating Income (Loss)</b>					
Agricultural Products		366	389	243	283
Chemicals		230	336	234	613
Electronic Materials		(56)	4	(67)	(139)
Fisher Controls		24	27	36	(66)
NutraSweet		-	-	58	142
Pharmaceuticals		(15)	(30)	(84)	(119)
Oil & Gas		41	27	16	-
Biotechnology Product Discovery		(21)	(24)	(31)	(41)
Corporate		(48)	(52)	(54)	(38)
TOTAL		521	677	351	635

**Exhibit 4 (continued)** Monsanto Corporation: Financial Data (\$ millions)

## Business Segment Results (continued)

	1982 <sup>a</sup>	1983	1984	1985	1986
<b>Research and Development</b>					
Agricultural Products		92	129	142	135
Chemicals		14	22	32	105
Electronic Materials		112	131	128	15
Fisher Controls		13	23	20	21
NutraSweet			-	11	25
		-			
Pharmaceuticals		15	24	96	177
Oil & Gas		21	-	-	-
Biotechnology Product Discovery		21	24	31	39
Corporate		23	25	26	6
TOTAL		311	378	486	523
<b>Total Assets</b>					
Agricultural Products		1,401	1,420	1,235	1,156
Chemicals		3,201	3,222	2,982	2,704
Electronic Materials		253	280	302	228
Fisher Controls		503	536	636	612
NutraSweet		-	-	1,862	1,883
Pharmaceuticals		3	80	1,438	1,394
Oil & Gas		543	578	-	-
Biotechnology Product Discovery		15	31	33	50
Non-operating Assets		508	226	389	242
TOTAL		6,427	6,373	8,877	8,269
<b>Capital Expenditure</b>					
Agricultural Products		169	119	115	88
Chemicals		213	279	291	244
Electronic Materials		26	47	55	51
Fisher Controls		29	32	53	38
NutraSweet		-	-	4	39
Pharmaceuticals		4	7	33	53
Oil & Gas		101	107	85	-
Biotechnology Product Discovery		15	17	3	6
Non-operating Assets		3	6	6	1
TOTAL		560	614	645	520

**Exhibit 4 (continued)**      Monsanto Corporation: Financial Data (\$ millions)

Business Segment Results (continued)

	1982 <sup>a</sup>	1983	1984	1985	1986
<b>Depreciation and Amortization</b>					
Agricultural Products		90	100	110	105
Chemicals		298	273	248	236
Electronic Materials		28	30	37	122
Fisher Controls		20	21	28	36
NutraSweet		-	-	73	205
Pharmaceuticals		1	7	39	67
Oil & Gas		85	69	59	-
Biotechnology Product Discovery		1	1	2	7
Corporate		1	2	3	2
<b>TOTAL</b>		<b>524</b>	<b>503</b>	<b>599</b>	<b>780</b>

Source:    Monsanto Corporation Annual Reports

Note:      NutraSweet's share of the European joint venture's earnings are reflected in "Other Income (Expense)" in the Financial Summary.

<sup>a</sup>Business segment results unavailable due to restructuring.

**Exhibit 5** Tosoh Corporation: Financial Data (¥ millions)

## Financial Summary

	1982	1983	1984	1985	1986
Net Sales	206,121	208,137	252,661	251,722	246,565
Cost of Goods Sold	169,734	167,661	195,283	184,155	181,245
SG&A	30,550	31,179	37,234	41,675	46,018
Operating Income	5,837	9,297	20,144	25,892	19,302
Interest Income (Expense)	(15,671)	(17,167)	(17,305)	(16,365)	(16,220)
Provision for Income Taxes	100	-	150	3,036	4,406
Other Income (Expense)	(3,495)	5,349	4,682	5,007	5,964
Net Income	(13,429)	(2,521)	7,371	11,498	4,640
Total Assets	273,881	270,681	309,789	325,036	348,094
Long-term Obligations	98,479	95,044	87,276	72,766	84,114
Shareholders' Equity	21,468	21,662	33,383	45,374	49,172
Current Assets	120,316	116,618	156,149	161,647	160,199
Current Liabilities	137,509	139,881	185,797	203,865	211,890

## Sales by Business Segment

	1982	1983	1984	1985	1986
<b>Net Sales</b>					
Chemical Products	50,350	52,851	49,490	42,589	40,869
Petrochemicals	72,670	72,805	92,342	92,084	89,684
Portland Cement	34,997	31,153	28,470	27,195	26,037
Fertilizers	10,007	7,752	7,147	6,475	6,382
Metal Products	13,068	13,486	14,246	15,463	14,317
Fine Chemicals and Specialty Products	25,029	30,090	32,636	39,165	40,909
Other	-	-	28,330	28,751	28,367
<b>TOTAL</b>	<b>206,121</b>	<b>208,137</b>	<b>224,331</b>	<b>222,971</b>	<b>218,198</b>

Source: Tosoh Corporation Annual Reports

**Exhibit 6**     N.V. DSM: Financial Data (D.Fl. millions)

Financial Summary

	1982	1983	1984	1985	1986
Net Sales	18,172	19,750	22,530	23,667	17,712
Cost of Goods Sold	n/a	n/a	20,243	21,585	15,743
SG&A	n/a	n/a	1,268	1,243	1,242
Operating Income	n/a	n/a	1,019	839	727
Interest Income (Expense)	n/a	n/a	(210)	(145)	(83)
Provision for Income Taxes	n/a	n/a	256	263	216
Other Income (Expense)	n/a	n/a	(90)	(29)	(16)
Net Income	(188)	164	463	402	412
Total Assets	9,188	10,241	12,297	13,375	10,030
Long-term Obligations	n/a	n/a	2,500	2,084	2,006
Shareholders' Equity	2,088	2,163	2,625	2,838	2,979
Current Assets	n/a	n/a	7,054	8,279	4,994
Current Liabilities	n/a	n/a	6,061	7,010	3,786

Sales by Business Segment

	1982	1983	1984	1985	1986
<b>Net Sales</b>					
Agro <sup>a)</sup>	n/a	n/a	3,211	3,167	2,091
Chemical Products	n/a	n/a	2,655	2,587	1,950
Plastics	n/a	n/a	3,687	3,809	2,581
Resins	n/a	n/a	1,090	1,030	1,108
Plastic Products	n/a	n/a	754	795	748
Energy and Other	n/a	n/a	12,750	14,223	10,690
Eliminations	n/a	n/a	(1,617)	(1,944)	(1,456)
TOTAL	18,172	19,750	22,530	23,667	17,712
<b>Net Sales by Destination</b>					
Netherlands	n/a	n/a	8,447	9,065	6,861
Other EC Countries	n/a	n/a	10,506	11,611	8,847
Rest of Europe	n/a	n/a	739	676	477
North America	n/a	n/a	1,404	1,101	554
Rest of the World	n/a	n/a	1,434	1,214	973
TOTAL	18,172	19,750	22,530	23,667	17,712

Source:     N.V. DSM Annual Reports

<sup>a</sup>Mainly fertilizers.