

Appendix Tables

Table 3.A.1. The History of Restrictive Business Practices 1790-1965.

Date	Country	Prohibited Conduct	Comments
1790	France	Anticompetitive price fixing	Little enforcement. Overturned in 1926.
1870	Austria	Some cartel provisions. Not enforceable in court	Fell into disuse by 20 th century.
1889	Canada	Restrictive cartel practices	
1890	USA	Conspiracies in restraint of trade	Strengthened in 1914, 1936, 1950, 1978, 1990.
1901	Dominican Republic	Certain cartel practices	Rarely enforced.
1906	Australia	Certain monopolistic practices	Fell into disuse. Revived in 1965.
1920s	Norway	Unregistered cartels	Allowed for review of abusive conduct by a government panel.
1923	Germany	Abusive cartel conduct	Enforcement ceased in 1930s.
1923	Argentina	Abusive conduct of cartels	Little enforcement
1930s	Denmark	Unregistered cartels	Control board to correct abuses.
1930s	Bulgaria	Unregistered cartels	Government could dissolve cartels.
1930s	Yugoslavia	Unregistered cartels	Government could dissolve cartels.
1930s	Romania	Unregistered cartels	Regular government surveillance and review of cartel prices.
1930s	South Africa	Monopolies and restraint of trade	Regular government surveillance and review of cartel prices.
1934	Mexico	Most monopolies and price fixing.	
1936	Portugal	Certain cartel behavior	Never applied
1946	Germany	Conspiracies in restraint of trade	Set up Federal Cartel Office.
1946	Japan	Conspiracies in restraint of trade	Set up Fair Trade Commission.
1946	Sweden	Unregistered restrictive agreements	Authorized investigation.
1946	Argentina	Monopolistic practices, including price fixing	
1948	UK	Set up monopolies Commission	Strengthened 1956, 1964, 1965
1949	Denmark	Unapproved price agreements	Commission established. Laws strengthened 1955, 1957, 1963.
1951	Austria	Unregistered cartels	
1953	France	Setting minimum prices	

Date	Country	Prohibited Conduct	Comments
1953	Ireland	Unfair trading practices	Commission established with enforcement powers.
1953	Japan	Restrictive cartel agreements	Weakened the 1946 law; many exempt industries created 1953-1959.
1953	Norway	Unreasonable prices	Enforced by the King of Norway. Horizontal price fixing declared illegal in 1960.
1955	South Africa	Restrictive agreements contrary to government policy.	
1958	Germany	Broad list of restrictive agreements	Replaced occupation laws.
1958	Netherlands	Unreported cartel agreements	Agreements can be nullified by council.
1958	Finland	Bid rigging	Strengthened in 1964
1958	New Zealand	Unregistered restrictive agreements and unreasonable price effects.	Registration repealed 1961.
1959	Israel	Unregistered restrictive agreements	Set up review board to prohibit certain agreements.
1959	Colombia	Fixing inequitable prices	
1960	Belgium	Abuse of economic power	Authorizes corrective royal orders.
1962	Brazil	Abuse of economic power and attempts to monopolize.	Fines and prohibition orders possible.
1963	Spain	Most restrictive agreements and abuse of dominant position	
1964	Switzerland	Practices that seriously impede competition contrary to the public interest	Courts may annul such practices.
1965	Australia	Collusive bid rigging and unregistered restrictive practices	Can be investigated and terminated.

Source: Edwards (1967).

a) Emphasizes anticartel provisions

Table 4.A.1.1. U.S. Production Capacity and Consumption of Anhydrous Citric Acid, 1989-2000.

Company: Plant	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	<i>million pounds per year</i>											
Pfizer/Archer Daniels Midland: ^a	140	140	140	140	200	180	180	180	220 ^c	220	220	220
Southport, NC	100	100	100	100	180	180	180	180	220 ^c	220	220	220
Groton, CT	40	40	40	40	20	0	0	0	0	0	0	0
Bayer/Haarmann & Reimer:	140	140	150	150	150	150	150	150	150	150	150	150
Dayton, OH	100	100	110	110	110	110	110	110	110	150 ^c	150 ^c	150 ^c
Elkhart, IN	40	40	40	40	40	40	40	40	40	0	0	0
Cargill: Eddyville, IA ^b	0	55	80	80	130	130	160	160	190 ^e	190 ^e	190 ^e	190
U.S. plant capacity	280	335	370	430	480	460	490	490	560	560	560	560
U.S. consumption estimates ^d	300	320	340	390	420	440	475	520	550	570	610	650
U.S. exports	17	21	48	77	50	55	52	68	78	80	67 ^e	67 ^e
U.S. imports	65	61	50	59	95	109	109	95	119	133	166 ^e	180 ^e
Implicit U.S. production	252	280	338	408	375	386	418	493	509	517	511	530
Implicit U.S. plants utilization rate (%)	84	84	91	95	78	84	88	95	91	92	91	95

Source: Connor (2000: Appendix B).

^aADM acquired Pfizer's North Carolina plant in December 1990, and Pfizer continued to supply additional citric acid from Groton until mid-1993 when the plant was closed. Pfizer had a small plant in Canada in the 1980s.

^bCargill made only liquid acid until early 1993 when production of sodium citrate began.

^cSold to Tate & Lyle in June 1998 along with a Duluth, MN lactic acid plant and four citric plants outside the U.S. Sales world wide in 1997 were \$298 million. Will be operated by A.E. Staley.

^dBased on occasional trade-press estimates, long-term growth rates of 6% to 8% per year, and some annual variation due to prices.

^eestimated

Table 4.A.2. Non-U.S. Production and Global Consumption of Anhydrous Citric Acid, 1989-2000

Company: Plant	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	<i>million pounds per year</i>											
Jungbunzlauer (Basel, Switzerland):	132	132	221	243	306	463	463	463	463	463	500 ^e	500 ^e
Pernhofen, Austria	88	88	155	155	174	220	220	220				
Ladenburg, Germany	44	44	66	88	88	133	133	133				
Marckolsheim, France	0	0	0	0	88	88	88	88				
Sumatra, Indonesia (JV)	0	0	0	0	22	22	22	22				
Bayer (Basel, Switzerland): ^a	90	90	134	134	134	160	160	160	160	160	160	200 ^e
Selby, Yorkshire, UK	46	46	46	46	46	72	72	72				
3 Affiliates in Brazil, Mexico, Columbia	44 ^e	44 ^e	88	88	88	88	88	88				
Hoffmann-La Roche (Switz.): Tienen, Belgium	77 ^e	77 ^e	154	154	154	154	154	154	154	154	154	154
Biocor: Padova, Italy ^b	53	53	53	53	53	88	88	88	88	88	100 ^e	100 ^e
Palcitic: Naples, Italy ^b	0	0	0	0	77	77	77	77	77	77	77	77
ADM: Ringskiddy, Ireland ^c	20	20	20	20	20	20	40 ^e	40 ^e	40 ^e	40 ^e	40 ^e	40 ^e
Czech Republic: unknown company	0	0	0	0	66	66	66	66	66	66	66	66
China: many companies ^d	151	186	230	284	351	433	535	661	740	825 ^e	920 ^e	1,000 ^e
Godot Israel: Haifa, Israel	20 ^e	20 ^e	20 ^e	40 ^e	40 ^e	40 ^e	40 ^e	40 ^e	60 ^e	60 ^e	60 ^e	60 ^e

Cargill: India (1994) and Brazil (1999)	0	0	0	0	0	0	44	44	44	44	88 ^e	132 ^e	132 ^e
A.E. Staley/Bharat Starch: India	22 ^e	22 ^e	44 ^e	44 ^e	44 ^e	44 ^e	66	66	66	66	110	110	110
Total U.S. capacity	280	335	370	430	480	480	460	490	490	490	560	560	560
Total non-U.S. capacity ^f	597	630	910	1,015	1,300	1,300	1,611	1,800	1,950	2,050	2,200	2,400	2,500
World Capacity, except former USSR	877	965	1,280	1,445	1,780	1,780	2,170	2,290	2,440	2,540	2,760	2,960	3,060
U.S. and Canada Consumption	320	340	361	412	443	464	500	550	580	605	650	690	690
Europe consumption	339 ^e	364 ^e	390 ^e	450	485 ^e	510 ^e	555 ^e	583 ^e	610 ^e	640 ^e	670 ^e	700 ^e	700 ^e
World consumption ^g	725	800	1,020	1,200	1,330	1,330	1,500	1,600	1,750	1,850	2,000	2,150	2,300

Source: Connor (1999)

e = Estimate by author

^aPurchased the UK plant from Rhône-Poulenc in 1990. The three Latin American affiliates of La Roche are in Mexico, Columbia, and Brazil. Their plant capacities were derived from a report on Roche's global capacity of 300 million pounds in 1990.

^bPalcitric is part of Gruppo Palma of Naples, Italy. Biocor was owned by UK's Sturge Biochemicals until March 1990. In 1991, Biocor was resold to Italy's Ferruzzi-Montedison, now named Eridania.

^cA fire was reported at this plant in the early 1990s. Excludes Bayer's U.S. plants (see Table 4.A.1).

^dAnnual estimates of capacity are based on constant geometric growth from government capacity figures given for 1987 and 1996. In 1994, China had 103 factories, most of them quite small (74% less than 6.6 mil. lb.), using sweet potato or cassava as the feedstock. Because of low quality, Chinese citric acid sells for 30-40% lower prices than the best quality, but the newest plants are being equipped with modern filtration equipment to improve purity. Some Chinese citric acid is refined and re-exported from Japan.

^fThis line is the total of the non-U.S. plant capacities shown above plus an arbitrary 5% to account for unreported production. Citric acid plants, some quite large, are known to exist in Turkey, India, Indonesia, Korea, Japan, and Latin America. No information is available on the former USSR.

^gBased on total world capacity with an assumed 75-90% capacity utilization and consistent with reported 3-7 % p.a. volume growth. Excludes former USSR.

Table 4.A.3. U.S. Imports and Exports of Citric Acid and Citric Salts, 1991-1998.

Product ^a	1991	1992	1993	1994	1995	1996	1997	1998	1999 b
<i>Million dollars</i>									
Exports (F.O.B. prices):									
Acid	32.7	43.7	27.7	31.1	31.4	38.5	44.3	47.3	40.4
Salts	10.0	17.3	11.6	13.4	11.2	12.5	15.7	13.1	14.8
Totals	42.7	60.9	39.2	44.4	42.6	50.7	60.0	60.4	55.2
Imports (c.i.f. prices):									
Acid	--	--	60.5	67.7	66.2	51.4	58.4	62.3	74.6
Salts	--	--	3.9	3.5	4.1	14.8	15.2	17.2	20.4
Total	--	--	64.4	71.2	70.3	66.2	73.6	79.5	94.9
<i>Millions of pounds</i>									
Exports:									
Acid	46.8	57.8	35.7	39.6	38.6	54.4	60.1	66.0	53.3
Salts	10.4	18.6	14.1	14.8	12.8	14.0	18.0	14.0	13.4
Imports:									
Acid	50.0	59.0	91.2	106.0	104.7	79.7	96.3	107.6	134.8
Salts	--	--	3.7	3.3	4.1	14.8	22.7	25.6	31.2

		<i>Price(Implicit) in dollars</i>									
Exports:											
Acid		0.68	0.76	0.77	0.78	0.81	0.71	0.73	0.72	0.76	
Salts		0.97	0.92	0.82	0.90	0.87	0.89	0.87	0.94	1.10	
Imports:											
Acid		--	--	0.66	0.64	0.63	0.64	0.61	0.58	0.55	
Salts		--	--	0.72	0.79	0.75	0.69	0.67	0.67	0.65	

Source: U.S. Census Bureau, *Stat-USA*, on line service.

-- = Not available

^aCitric acid is identified under the Harmonized Trade System by number 2918140000. Salts and esters of citric acid (including sodium citrate and potassium citrate) are identified by HTS 2918150000.

^bProjected from January-April 1999 trade data.

Table 4.A.4. U.S. Citric Acid Imports from Selected Countries, 1988, 1994, 1998.

Country (Company)	1988		1994		1998	
	Quantity	Price	Quantity	Price ^a (Acid)	Quantity	Price ^a (Acid)
	<i>mil lb.</i>	<i>\$/lb.</i>	<i>mil lb.</i>	<i>\$/lb.</i>	<i>mil lb.</i>	<i>\$/lb.</i>
Canada (Pfizer)	1.3	0.21	0.4	0.64(0.65)	0.3	1.46(1.20)
Mexico (Bayer)	8.9	0.32	2.4	0.72(0.78)	0.0	2.39(--)
UK (Bayer)	2.5	0.31	1.8	0.83(0.54)	0.2	1.68(0.91)
Belgium (Bayer)	41.3	0.29	25.4	0.68(0.68)	12.6	0.67(0.67)
Germany (Jungbunz.)	23.2	0.30	3.0	1.07(0.83)	3.7	0.84(0.63)
Austria (Jungbunz.)	20.2	0.30	26.0	0.66(0.67)	32.1	0.59(0.59)
Italy (Ferruzzi)	4.6	0.31	3.0	0.69(0.69)	0.0	-- (--)
Israel (Godot)	19.0	0.35	26.1	0.79(0.78)	37.4	0.64(0.65)
Indonesia	0.0	--	4.9	0.57(0.57)	1.0	0.60(0.60)
China	14.0	0.27	34.8	0.52(0.49)	44.6	0.49(0.49)
Total ^b	139.0	0.30	130.7	0.67(0.59)	133.3	0.60(0.58)

^aPrice of acid and salts (acid only).

^bIncludes countries accounting for less than 1 percent of total imports not shown separately.

Source: STAT-USA online service.

Table 4.A.5. U.S. Citric Acid Exports, to Selected Countries, 1990, 1994, 1998.

Country	1990		1994		1998	
	Quantity	Price ^a	Quantity	Price ^a	Quantity	Price ^a
	<i>mil lb.</i>	<i>\$/lb.</i>	<i>mil lb.</i>	<i>\$/lb.</i>	<i>mil lb.</i>	<i>\$/lb.</i>
Canada	11.0	0.63(0.65)	22.4	0.76(0.79)	39.1	0.71(0.71)
Mexico	3.2	0.69(0.68)	4.9	0.83(0.78)	10.7	0.64(0.63)
Guatemala	0.1	0.19(0.71)	0.0	-- --	1.0	0.65(0.65)
Venezuela	0.0	-- (--)	0.0	-- (0.60)	1.3	0.46(0.46)
Ecuador	0.0	-- (--)	0.1	0.82(0.82)	0.7	0.58(0.59)
Peru	0.0	-- (--)	0.0	-- (1.47)	1.2	0.59(0.60)
Chile	0.0	-- (--)	0.0	-- (--)	0.5	0.62(0.63)
Brazil	0.0	-- (--)	3.6	0.80(0.80)	1.5	0.65(0.65)
Argentina	0.3	-- (0.56)	1.8	-- (0.66)	0.5	(0.60)(0.60)
Germany	0.5	1.10 (--)	0.3	0.88(0.85)	0.8	1.00(0.78)
Netherlands	0.1	-- (2.15)	0.3	1.20(2.44)	0.2	2.52(2.52)
Belgium	0.5	1.92 (--)	2.1	0.95(0.63)	1.1	1.87(0.67)
France	0.7	-- (0.56)	0.2	1.00(2.27)	0.3	1.14(0.96)
Thailand	0.4	0.63(0.62)	2.6	0.81(0.82)	1.2	0.74(0.82)
Singapore	0.0	-- (--)	0.4	0.65(0.86)	0.5	0.67(0.71)
Indonesia	0.2	0.68 (--)	0.7	0.73(0.79)	0.5	0.57(0.75)
Philippines	0.2	0.73 (--)	3.0	0.83(0.83)	0.1	1.32(1.42)
Japan	5.2	0.75(0.70)	5.8	0.75(0.71)	5.4	0.91(0.99)
Australia	1.9	0.57(0.57)	2.4	0.91(0.92)	4.5	0.85(0.89)
New Zealand	1.3	0.56(0.55)	0.7	0.81(0.80)	0.9	0.69(0.65)
Kenya	0.0	-- (--)	0.0	-- (--)	0.5	0.54(0.55)
S. Africa	0.0	-- (--)	0.2	-- (0.45)	0.1	0.85 (--)
Other Africa	2.4	0.78(0.73)	0.01	1.61(1.32)	0.5	-- (0.63)
Total	32.1	0.70(0.65)	54.5	0.81(0.78)	80.0	0.76(0.71)

Source: U.S. Census Bureau (FT 410 and STAT-USA annual data).

^aPrice of acid and salts (price of acid only).

-- Insufficient quantity.

Table 7.A.1. World Production Capacity and Consumption of Feed-Grade Lysine, 1980-1990.

Company: Plants Outside North America (Year)	1980	1982	1984	1986	1988	1990
<i>Thousand metric tonnes/year</i>						
North American capacity	1	2	13.5	17.5	20.5	34
Ajinomoto & Orsan:						
Saga Prefecture, Japan (1960)	10 ^E	12 ^E	16.0 ^E	20.0 ^E	20.0 ^E	20 ^E
Amiens, France (1978-80)	10 ^E	13	20.0	30.0	40.0	40 ^E
Pathun Thani, Thailand (1986)	0	0	0	3.0	4.5	5 ^E
Kyowa Hakko:						
Hofu, Japan (1960)	4	6	8.0	8.0	10.0 ^E	20 ^E
Sewon (Miwon Group):						
Busan, So. Korea (1980)	5	5	5.0	10.0	10.0	20
World production capacity	34	46	70.5	96.5	113.0	157
World consumption:						
North America	7-10	10-12	24.0 ^E	30.0 ^E	39.0	43
Rest of the world	21-24	28-30	36.0 ^E	50.0 ^E	71.0 ^E	92
Total world	31	40	60.0 ^E	80.0 ^E	110.0 ^E	135

Source: Connor (1999).

E = Estimated by interpolation.

Table 7.A.2. North American Production Capacity and Consumption of Feed-Grade Lysine, 1980-1990.

Company: Plant (Year production began)	1980	1982	1984	1986	1988	1989	1990
<i>Thousand metric tonnes</i>							
Kyowa Hakko/Biokyowa:							
Cape Girardeau, MO (1984)	0	0	7.5	7.5	7.5	7.5	13
Fermentaciones Mexicanas (1980)	1	2	6.0	6.0	6.0 ^E	9.0 ^E	9 ^E
Ajinomoto/Heartland Lysine:							
Eddyville, Iowa (1986)	0	0	0	7.0	7.0 ^E	12.0	12
Total plant capacity:							
United States	0	0	7.5	14.5	14.5	19.5	25
Mexico	0	2	6.0	6.0	6.0	9.0	9
North America	0	2	13.5	20.5	20.5	28.5	34
Apparent N. American production ^a	1	2	10.5	17.5	17.5	21.5	30
Estimated consumption:							
United States	6-9	8-11	20 ^E	26 ^E	33 ^E	36	43
Canada	0.5	1 ^E	2 ^E	2 ^E	3 ^E	4	4 ^E
Mexico	0.5	1 ^E	2 ^E	2 ^E	3 ^E	4 ^E	4 ^E
North America	7-10	10-12	24 ^E	30 ^E	39	44	51
Net imports ^b	6-9	8-10	18.0 ^E	13.5 ^E	21.5 ^E	22.5 ^E	21

Source: Connor (1999).

E = Estimated by interpolation.

Table 7.A.3. *Global Capacity Shares of Leading Lysine Manufacturers, 1982-2000.*

Company	1982	1984	1986	1988	1990	1992	1994	1996	1998	2000
	<i>Thousand Metric Tonnes</i>									
Ajinomoto & Orsan	25	36	60	72	77	120	113	156	175	190
Kyowa Hakko Kogyo	8	22	22	24	42	52	68	68	62	97
Sewon/Miwon	5	5	10	10	30	40	50	80	135	135
Cheil Sugar Co.	0	0	0	0	0	20	25	30	30	30
Archer Daniels Midland	0	0	0	0	0	80	113	113	205	250
Cargill & Degussa	0	0	0	0	0	0	0	0	0	87
Others	0	0	0	0	0	0	3	36	56	41
Total capacity ^a	46	71	97	113	157	320	375	470	647	830 ^E
	<i>Percent</i>									
Ajinomoto	54	50	62	63	52	38	30	33	28	23
Kyowa Hakko	17	31	22	21	25	16	18	14	10	12
Sewon/Miwon	11	7	10	9	18	13	13	17	21	16
Cheil Sugar	0	0	0	0	0	6	7	6	5	4
Archer Daniels Midland	0	0	0	0	0	25	30	24	32	30
Cargill & Degussa	0	0	0	0	0	0	0	0	0	10
Others	0	0	0	0	0	0	1	8	9	5
Total ^a	100	100	100	100	100	100	100	100	100	100

Source: Connor (1999; Tables 1, 2, 6 and 7).

^aIncludes a small Japanese plant owned by Toray Industries that is not shown separately. Toray exited the lysine industry after 1986 but before 1995.

Table 7.A.4. North American Production Capacity and Consumption of Feed-Grade Lysine, 1991-2000.

Company: Plants (Year Production Began)	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
<i>Thousand metric tonnes/year</i>										
Kyowa Hakko/Biokyo:										
Cape Girardeau, MO (1984)	13	15	15 ^E	20 ^E	20 ^E	20 ^E	22	22	28	28
Fermex, Mexico (1980)	15	15	15	15	20	20 ^E	20 ^E	22	44	44
Ajinomoto/Heartland:										
Eddyville, IA (1986)	18	20	20	20	40 ^E	40	60 ^E	60 ^E	60 ^E	60 ^E
Archer Daniels Midland:										
Decatur, IL (1991)	60	80 ^E	113	113	113	113	160 ^E	160	160	160 ^E
Cedar Rapids, IA (1998)	0	0	0	0	0	0	0	45	45	90 ^E
Cargill & Degussa:										
Eddyville, IA (2000)	0	0	0	0	0	0	0	0	0	75
Total plant capacity:										
United States	91	155	148	153	173	173	242	289	368	413
Mexico	15	15	15	15	20	20	20	22	44	44
North America	106	130	163	168	193	193	262	311	384	427
Apparent production ^a	65	85	112	124	142	162	176	180	160 ^E	216 ^E
Estimated consumption:										
United States	47	48	74	79	83	86	87	100	--	--
Canada ^c	5 ^E	5	6	7	8	8	9	10	--	--
Mexico	5 ^E	6 ^E	6 ^E	9 ^E	10 ^E	10 ^E	10 ^E	11	--	--
North America	57	59	86	95	101	104	106	121	128 ^E	141 ^E
Net exports, U.S.	5 ^E	30	34	39	43	59	83 ^E	68	40 ^E	--
Net exports, No. America ^b	8 ^E	26	26	29	41	58	70	59	31 ^E	75 ^E

Source: Cornor (1999: Tables 1, 2, 6 and 7).

^a Includes a small Japanese plant owned by Toray Industries that is not shown separately. Toray exited the lysine industry after 1986 but before 1995.

Table 7.A.5. *World Production Capacity and Consumption of Feed-Grade Lysine, 1990-2000.*

Company: Plants Outside North America (Year)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
<i>Thousand metric tonnes/year</i>											
North American capacity ^a	34	106	130	163	168	193	193	262	311	384	427
Ajinomoto & Orsan:											
Saga, Japan (ca. 1970)	20 ^E	20 ^E	20 ^E	20 ^E	10 ^E	10 ^E	0	0	0	0	0
Amiens, France (1979) ^b	40 ^E	40	40	45 ^E	45 ^E	50	50	50 ^E	60 ^E	60 ^E	60 ^E
Pathun, Thani, Thailand (1986)	5 ^E	10 ^E	10 ^E	10 ^E	15 ^E	15 ^E	15	20 ^E	20 ^E	20 ^E	20 ^E
Bottrighe, Italy (1992) ^b	0	0	0	10 ^E	15 ^E	15 ^E	20 ^E	20 ^E	25 ^E	25 ^E	25 ^E
Sichuan Prov., China (1996)	0	0	0	0	0	0	6	15 ^E	15 ^E	20 ^E	20 ^E
Valparaiso, Brazil (1997)	0	0	0	0	0	0	0	15	15	15 ^E	20 ^E
Kyowa Hakko:											
Hofu, Japan (1977)	20 ^E	20 ^E	20	20	20	20	0	0	0	0	0
Kaba, Hungary (1991)	0	5	5	8 ^E	8 ^E	10 ^E	10 ^E	12	12	15 ^E	15 ^E
Vietnam (1999)	0	0	0	0	0	0	0	0	0	10 ^E	10 ^E
Sewon (Miwon Group):											
Busan, So. Korea (1980)	10	0 ^E	0	0	0	0	0	0	0	0	0
Kunsan, So. Korea (1989)	20	36	36	50 ^E	50	80	80 ^E	96	135	135 ^E	135 ^E
Cheil Sugar Co.:											
Java, Indonesia (1991)	0	9	15 ^E	20 ^E	20 ^E	40 ^E	40 ^E	50 ^E	50 ^E	60 ^E	60 ^E
Degussa/Fermas:											
Slovenska Lupca, Slovakia (1994)	0	0	0	0	3	3	6 ^E	6 ^E	6 ^E	6 ^E	12 ^E

Company: Plants Outside North America (Year)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
AECI Chemical:											
Durban, So. Africa (1994)	0	0	0	0	0	11	11	11	11 ^E	11 ^E	11 ^E
Chinese Govt. Companies	0	0	0	0	3	3	19	19	19 ^E	25 ^E	30 ^E
World production capacity	157	254	284	354	365	458	454	580	679	791	848
World Consumption:											
North America ^a	43	57	69	86	95	101	104	106	121 ^E	128 ^E	141 ^E
Rest of the world	102	116	145	150	159	169	206	229	249	277	304
Total world ^d	145	173	234	245	272 ^c	299	310 ^E	335	370 ^E	405 ^E	445 ^E
Consumption/Capacity Ratio (%)	92	68	82	69	75	65	68	58	54	51	52

Sources: Same as Table 7.A.4 and EC (2001).

^a From Table 7.A.4.

^b From late 1993, Orsan was no longer a partner in these plants.

^c The internal business records of ADM estimate world consumption at 245,000 tonnes.

^d Estimates for the years 1991-1995 are lysine cartel figures taken from trial exhibits. Includes one small plant in Kyoto, Japan owned by Toray Industries that closed some time in the late 1980s or early 1990s. Rest of the world is a residual.

Table 7.A.6. Total U.S. Imports and Exports of Lysine, 1989-1997.

Trade Item ^a	1989	1990	1991	1992	1993	1994	1995	1996	1997 ^b
<i>Thousand dollars</i>									
Value:									
U.S. Imports (c.i.f.)	69966	39394	24811	21408	39564	46218	18272	34830	75269
Food Grade	—	—	—	10890	24100	22173	5792	6113	9381
Feed Grade	—	—	—	10518	15464	24045	12480	28717	65888
U.S. Exports (f.a.s.)	3859	4310	17489	76084	83751	116539	103740	161407	282611
Quantity:									
	<i>Metric tonnes</i>								
U.S. Imports (c.i.f.)	22726	18333	11262	8345	11144	13921	7347	12952	17091
Food Grade	2100 ^E	1900 ^E	1700 ^E	1119	1667	3230	1195	1324	1923
Feed Grade	20626	16433	9562	7226	9477	10691	6152	11628	15168
U.S. exports (f.a.s.)	857	867	6208	37708	43655	51446	49212	71359	104172
Implicit price:									
	<i>Dollars per pound</i>								
U.S. Imports	1.40	2.15	2.20	1.16	1.61	1.51	1.13	1.22	2.00
Food Grade	—	—	—	5.89	5.63	3.11	2.17	2.27	2.06
Feed Grade	—	—	—	0.66	0.74	1.02	0.92	1.12	1.97
U.S. Exports	2.04	2.26	1.27	0.92	0.87	1.03	0.96	1.03	1.23

Source: National Trade Data Bank (CD-Rom).

— = Not available

^E = Estimated from 1992-1997 food-grade trend.

^a Feed grade is identified by originating only from Mexico, France, Italy, India, Thailand, Indonesia, Korea, or Japan at prices of less than \$4 per pound. The official codes for pharmaceutical or feed grades misclassify some shipments, but these have been corrected.

Table 8.A.1. U.S. Lysine Sales, Quarterly 1990-1998.

Period	Quantity Sold ^a						U.S. Market Share		ADM's Export Share
	ADM		Cheil U.S. Imports	ADM	Others				
	Total	U.S.							
	Million pounds						Percent		
1990	Q1	0	0	21.1	0	0	100	--	
	Q2	0	0	21.0	0	0	100	--	
	Q3	0	0	24.0	0	0	100	--	
	Q4	0	0	26.7	0	0	100	--	
1991	Q1	0.7E	0.7	19.8	0	3	97	0	
	Q2	3.5E	3.5	19.9	0	15	85	0	
	Q3	10.9	8.6	18.1	0	32	68	21	
	Q4	17.7	11.6	18.0	0	39	61	34	
1992	Q1	24.3	11.9	9.0	0	56	43	51	
	Q2	29.7	14.3	9.4	0	60	40	52	
	Q3	38.5	19.4	7.8	0	71	29	50	
	Q4	34.2	13.2	18.8	0	41	59	61	
1993	Q1	29.7	12.5	25.2	0	33	67	58	
	Q2	41.5	20.1	16.9	0	54	46	52	
	Q3	44.2	18.8	23.6	0.3	45	55	57	
	Q4	36.6	13.6	32.9	0.3	29	71	63	

Period	Quantity Sold ^a						U.S. Market Share		ADM's Export Share
	ADM		Ajinomoto, Kyowa, and Sewon in U.S.		Cheil U.S. Imports	ADM	Others		
	Total	U.S.							
	Percent								
1994	Q1	40.2	15.7	24.8	0.1	39	61	61	
	Q2	37.3	17.5	22.4	0.2	44	56	53	
	Q3	47.1	19.3	25.9	0.1	43	57	59	
	Q4	46.1	14.8	34.8	0.2	43	57	68	
1995	Q1	46.1	15.2	25.6	0.5	38	62	67	
	Q2	41.6	18.2	21.8	0.5	44	56	56	
	Q3	52.0E	23.0E	26.1	0.5	47	53	56	
	Q4	48.0E	22.8E	28.7	0.5	44	56	53	
1996	Q1	52	19	30.5	1.5	38	62	63	
	Q2	45	17	27.6	1.6	38	62	62	
	Q3	58	19	30.4	1.4	38	62	67	
	Q4	50	21	36.2	1.2	37	63	58	
1997	Q1	60	13	34.9	2.9	27	73	78	
	Q2	55	11	22.1	3.1	26	74	80	
	Q3	70	13	34.8	2.8	27	73	81	
	Q4	60	14	37.6	2.6	27	73	77	

Period	Quantity Sold ^a						U.S. Market Share		ADM's Export Share
	ADM			Ajinomoto, Kyowa, and Sewon in U.S.	Cheil U.S. Imports	ADM	Others		
	Total	U.S.							
	<i>Million pounds</i>								
1998	Q1	70	24	31.7	4.7	43	57	66	
	Q2	65	22	29.6	5.6	43	57	69	
	Q3	70	24	31.2	4.2	43	57	66	
	Q4	75	26	32.0	4.0	44	56	65	

Sources: Connor (2000: Appendix Table A2), Connor (1999: Table 17).

E = Estimated by the author (see notes).

^a For 1995 Q3 to 1998 Q4, estimated first Cheil sales with Indonesia imports (peak in Q2); then estimated Sewon sales with Korean exports to U.S.; then estimated ADM, Kyowa, and Ajinomoto U.S. sales from plant capacities times reasonable utilization rates (peak in Q4). Total U.S. sales of top 4 known up to 1996 Q2 (Table A2); from 1995 Q2, ADM's U.S. sales are estimated from the volume of U.S. exports (Table 17), of which ADM accounts for 90 percent in 1996-1998 and Ajinomoto and Kyowa for 10 percent.

Table 8.A.2. U.S. Sales Volume of Lysine, By Company, Annual 1990-1998.

Table 3.1.2.2: U.S. Sales Volume by Company, 1990-1998												
Year	ADM			Ajinomoto			Kyowa Hakko			Sewon America ^e	Cheil Food & Chem. ^e	Total
	Total	U.S. Sales ^b	U.S. Exports	Total	U.S. Sales ^f	U.S. Exports	Total	U.S. Sales ^f	U.S. Exports			
Million Pounds												
1990	0	0	0	45	42	3	32	30	2	20.8	0	92.7
1991	34.8 ^a	24.4	10.8	41	35	6	30	25	5	19.3	0	103.2
1992	126.7	58.8	67.9	24	16	8	18	11	7	18.1	0	103.9
1993	152.0	65.0	87.0	55	50	5	36	31	5	16.5	0.6	162.9
1994	170.7	67.3	103.4	57	52	5	45	40	5	15.0	0.6	174.5
1995	187.7 ^b	79.2 ^a	108.5	51	51	0	35	35	0	14.8	0.2	181.9
1996	205.0 ^b	64.0	141.0 ^d	69	61	9	46	39	7	18.8	5.7	190.0 ^a
1997	245.0 ^b	51.0	194.0 ^d	73	62	11	51	41	10	25.7	11.4	192.0 ^g
1998	280.0 ^b	95.0	185.0 ^d	50	39	11	35	25	10	42.7	18.5	220.0 ^g

Source: Table 8.A.1 and U.S. trade data.

^a Projected from six months known production.

^b Projected from ten months known production..

^c Assumes 80% utilization.

^d Assumes 90% of U.S. Exports by ADM (as in 1993-94).

^e Based on import volumes by country.

^f In 1990-91, assumed 55/45 split; in 1992-98, split by relative U.S. production capacities. In all years, a residual. Includes imports.

^g Projections from 1996.

^h Includes liquid lysine.

Table 8.A.3. Global Feed-Grade Lysine Production and Capacity, 1990-1996.

Year	Capacity ^a					Total ^c	Production ^b					
	Ajino-moto	ADM	Kyowa Hakko	Sewon	Cheil		Ajino-moto	ADM ^d	Kyowa Hakko	Sewon	Cheil	Total ^c
1990	77	0	42	30	0	157	73 ^E	0	40 ^E	25 ^E	0	145
1991	88	60	53	36	9	254	78 ^E	15	46 ^E	29 ^E	7 ^E	180
1992	90	80	55	36	15	284	58 ^E	50	34 ^E	30 ^E	12 ^E	199
1993	105	113	58	50	20	354	72	67	42	34	16	236
1994	105	113	63	50	20	364	80	78	43	34	17	254
1995	130	113	70	80	40	458	85 ^E	86	39 ^E	40 ^E	20 ^E	270
1996	131	113	50	80	40	454	87 ^E	92 ^E	35 ^E	55 ^E	36 ^E	310
1990	49	0	27	19	0	100	50	0	28	17	0	100
1991	35	24	21	14	4	100	43	8	26	16	4	100
1992	32	28	19	13	5	100	29	30	17	15	4	100
1993	30	32	16	14	6	100	31	28	18	14	7	100
1994	29	31	17	14	5	100	32	31	17	13	7	100
1995	28	25	15	17	9	100	31	32	14	15	7	100
1996	29	25	11	18	9	100	28	30	11	18	12	100

^E = Estimated

^a From Tables 6 and 7 of Connor (1999).

^b From known production allocations of the lysine cartel during 1993-95 (Eichenwald). Another source confirms that the world dry lysine market shares for the five cartel members in 1995 were: Ajinomoto 34.0%, ADM 26.4%, Kyowa 18.1%, Sewon 14.2%, and Cheil 6.3% according to the Department of Justice (WSJ 7/9/98: B10). Other years estimated from capacity utilization rates.

^c Includes minor producers not shown separately.

^d Includes liquid lysine (dry equivalent); from internal company records 1991-1995 in trial exhibits.

Table 8.A.4. Agreed Lysine Target Prices, by Region, Delivered or CIF, 1992-1995.

Area	Effective Dates									
	10/92 ^a	10/92 ^b	11/92 ^b	12/92 ^a	7/93 ^c	10/93 ^d	1/94 ^e	4/94 ^f	1/95 ^g	
	Currency unit/pound ^h									
North America USA Canada	\$1.05	\$1.05	\$1.05	\$1.20	--	\$1.20	\$1.20	\$1.16	--	--
	--	--	--	--	\$0.85	--	--	--	\$1.30	--
	--	--	--	--	\$0.85	--	--	--	C\$1.75	--
Europe/Middle	\$1.05	DM1.8	DM1.8	\$1.18	DM1.45	DM2.4	DM2.4	DM2.4	DM2.2	DM2.2
Africa: South Africa		\$1.04	\$1.18	--	\$0.85	--	--	--	--	--
Latin America: Mexico	--	\$1.05	\$1.13	--	\$0.85	\$1.22	\$1.22	\$1.18	\$1.22	\$1.22
		--	--	--	P2.95	--	--	\$1.20	\$0.99	\$0.99
Asia/Oceania: Australia	--	\$1.04	\$1.13	\$1.15	\$0.85	\$1.22	\$1.22	\$1.22	--	--
New Zealand		A\$1.54	A\$1.68	--	A\$1.36	A\$1.90	--	\$1.35	A\$1.86	A\$1.86
Taiwan		A\$1.54	A\$1.68	--	NZ\$1.63	--	--	--	--	--
Malaysia		NT\$32	NT\$32	--	NT\$28	--	--	\$1.54	NT\$42	NT\$42
Philippines		--	--	--	--	--	--	\$1.33	\$1.33	\$1.33
		--	--	--	--	--	--	\$1.59	\$1.59	\$1.59

Table 8.A.5. U.S. Feed-Grade Lysine Sales and Capacity, 1990-1996.

Year	North American Capacity and Imports ^a						U.S. Domestic Sales ^b						U.S. Exports All Companies
	Ajinomoto	ADM	Kyowa	Sewoz	Cheil	Total	Ajinomoto	ADM	Kyowa	Sewon	Cheil	Total	
	<i>Thousand metric tonnes</i>						<i>Million dollars</i>						
1990	16	0	24	9	0	49	47.7	0	33.6	23.5	0	104.8 ^E	5.0 ^E
1991	21	60	31	8	0	120	35.0	21.0	35.0	19.1	0	110.0	6.2
1992	21	80	30	7	0	138	27.2	52.0	27.2	12.6	0	118.9	37.7
1993	23	113	32	7	0	175	26.7	82.9	21.8	13.1	0.7	145.2	43.7
1994	23	113	38	7	0	181	38.5	109.4	31.5	16.5	0.7	196.6	51.4
1995	40	113	41	7	1	202	36.5	106.2	29.8	10.5	1.9	184.9	49.2
1996	40	113	41	8	3	205	41.0	130.0 ^E	33.6	17.3	8.1	230.0 ^E	71.4
	<i>Percent</i>						<i>Percent</i>						
1990	33	0	49	18	0	100	46	0	32	22	0	100	5 ^c
1991	18	50	26	7	0	100	32	19	32	17	0	100	6 ^c
1992	15	58	22	5	0	100	23	44	23	11	0	100	32 ^c
1993	13	65	18	4	0	100	18	57	15	9	0	100	30 ^c
1994	13	62	21	4	0	100	20	56	16	8	0	100	26 ^c
1995	20	56	20	3	0	100	20	57	16	6	1	100	27 ^c
1996	20	55	20	4	1	100	18	57	15	8	4	100	31 ^c

Source: Connor (1999) and Table 8.A.1.

^E = Estimated.

^a Tables 6 and 17 of Connor (1999). Includes Mexico, Sewon and Cheil from U.S. import data.

^b From public antitrust litigation documents on ADM's volume and sales (monthly), four "settling defendants" monthly sales and prices, and imports valued at domestic prices.

^c Exports as a proportion of total domestic sales.

Table 9.A.1. Alternative Estimates of the Monopoly Overcharge to U.S. Lysine Buyers.

Source	Method, Period, and But-For Price (P_{BF})	Overcharge, All Members of the Cartel <i>Million dollars</i>
A. Defendants ADM <i>et al.</i> in federal class action	Unknown, but probably before-and-after analysis probably September 1994-June 1995, and $P_{BF} = \$1.10$	15
B. ADM's criminal U.S. antitrust fine	Department of Justice confidential analysis, July 1992-June 1995, P_{BF} unknown	65+
C. Plaintiffs' estimate in federal class action, price data only	Before-and-after, July 1992-June 1995, $P_{BF} = \$0.70/lb$	156
D. Plaintiffs' estimate in federal class action	Same as C. above, adjusted for seasonality of lysine sales	141
E. Prosecution's estimate based on detailed ADM cost information in U.S. v. Michael Andreas <i>et al.</i>	Average costs or production, distribution, and selling, July 1992-June 1995, $P_{BF} = \$0.81/lb$	78
F. Same as E.	Econometric modeling with qualitative conspiracy-period variable, June 1992-June 1995, no P_{BF} assumption	80

Sources: Connor (2000a,2000b), redacted JOD memorandums, Morse and Hyde (2000)

Table 9.A.2. U.S. Lysine Exports by Country, 1992-1997

Country of Destination ^a	1992	1993	1994	1995	1996	1997	1998
<i>Metric tonnes^b</i>							
Canada	6781	8469	8625	7010	7410	12992	9083
Mexico	1111	1765	3576	2250	3004	6148	4939
Columbia	364	544	512	524	505	254	159
Venezuela	412	305	297	274	189	455	708
Brazil	720	1553	2440	1899	2718	3027	3021
Argentina	205	362	352	304	404	375	371
United Kingdom	1302	1255	832	933	862	1280	2724
Netherlands	9452	9772	15644	19235	25582	26502	31383
Belgium	685	340	0	0	0	17	48
France	856	984	283	2	69	50	167
Germany	2779	1420	342	17	46	6	367
Spain	382	369	556	1055	5432	8141	6647
Italy	102	336	315	0	480	2715	2282
Israel	61	0	0	1	424	932	664
Thailand	1227	1981	1115	1821	3075	2262	210
Malaysia	713	1094	1178	1641	2671	2334	1600
Singapore	73	324	259	476	1515	885	628
Indonesia	0	1069	953	1108	1106	1456	98
Philippines	0	656	767	540	1207	1702	743
China	41	750	3316	878	0	0	127
Korea	0	300	784	578	860	1340	1043
Hong Kong	2902	1174	962	1622	2594	11487	15158
China-Taiwan	810	1473	741	1204	2818	2760	1480
Japan	203	416	421	439	587	806	644
Australia	2793	3636	2450	2315	2372	3919	2753
New Zealand	380	485	291	457	701	591	581
S. Africa	349	308	1210	958	2326	2133	2125
Total	37708	43655	51446	49212	71359	97796	92994

Source: STAT-USA

- a) All countries with exports accounting for 1% or more of any year's exports are listed.
- b) The year 1989 is the first for which lysine is reported separately from other organic acids. Trade was very small from 1989 to 1991.

Table 9.A.3. U.S. Lysine Exports by Country, 1992-1997

Country of Destination ^a (hypothesis classification)	1992	1993	1994	1995	1996	1997	1998
<i>Percent of volume^b</i>							
Canada (U.S. hegemony)	18.0	19.4	16.8	14.2	10.4	13.2	9.8
Mexico (home)	3.0	4.0	7.0	4.6	4.2	6.3	5.3
Columbia (U.S. hegemony)	1.0	1.3	1.0	1.1	0.7	0.3	0.2
Venezuela (U.S. hegemony)	1.1	0.7	0.6	0.6	0.3	0.5	0.8
Brazil (U.S. hegemony) ^d	1.9	3.6	4.7	3.9	3.8	3.1	3.3
Argentina (U.S. hegemony)	0.5	0.8	0.7	0.6	0.6	0.4	0.4
United Kingdom	3.5	2.9	1.6	1.9	1.2	1.3	2.9
Netherlands (U.S. hegemony)	25.1	22.4	30.4	39.1	35.9	27.1	33.8
Belgium (Ajinomoto hegemony)	1.8	0.8	0.0	0.0	0.0	0.0	0.1
France (home)	2.3	2.3	0.6	0.0	0.1	0.0	0.2
Germany	7.4	3.3	0.7	0.0	0.1	0.0	0.4
Spain	1.8	0.9	1.1	2.1	7.6	8.3	7.2
Italy (home)	0.3	0.8	0.6	0.0	0.7	2.8	2.5
Israel	0.2	0.0	0.0	0.0	0.6	1.0	0.7
Thailand (home)	3.3	4.5	2.2	3.7	4.3	2.4	0.2
Malaysia	1.9	2.5	2.3	3.3	3.7	2.4	1.7
Singapore (Cheil hegemony)	0.2	0.7	0.5	1.0	2.1	0.9	0.7
Indonesia (home)	0.0	2.5	1.9	2.3	1.6	1.5	0.1
Philippines (U.S. hegemony)	0.0	1.5	1.5	1.1	1.7	1.7	0.8
China (home: 1996-97)	0.1	1.7	6.4	1.8	0.0	0.0	0.1
Korea (home)	0.0	0.7	1.5	1.2	1.2	1.4	1.1
Hong Kong	7.7	2.7	1.9	3.3	3.6	11.8	16.3
China-Taiwan (U.S. hegemony)	2.2	3.4	1.4	2.5	4.0	2.8	1.6
Japan (home)	0.5	1.0	0.8	0.9	0.7	0.8	0.7
Australia	7.4	6.0	4.8	4.7	3.3	4.0	3.0
New Zealand	1.0	1.1	0.6	0.9	1.0	0.6	0.6
So. Africa	0.9	0.7	2.4	2.0	3.3	2.2	2.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: STAT-USA

- c) All countries with exports accounting for 1% or more of any year's exports are listed.
- d) The year 1989 is the first for which lysine is reported separately from other organic acids. Trade was very small from 1989 to 1991.

Table 9.A.4. Countries Classified by 1992-1997 Patterns of U.S. Lysine Exports.

Observed Trade Pattern ^a (1993-94/1995-96)	Conform to Trade Pattern	Come Close to Hypothesized Trade Pattern
Home or hegemonic markets, ADM rivals (low/low- medium)	Thailand Indonesia Taiwan	France Belgium Germany Italy Japan China (1996-)
U.S. neighbor/hegemony (high/high-medium)	Mexico Brazil Netherlands Korea*	Malaysia* Philippines
Neutral/distant markets (medium/high-medium)	Argentina Spain	(no examples)
Other patterns: (high/higher)	Singapore South Africa	(no examples)
(low/lower)	Canada UK	Columbia* Australia

Source: Table 9.A.3.

a) High, medium, and low are based on two-year averages of percentage volume relative to the 1992-93 base years.

* = Results do not conform to expectations.

Table 9.A.5. Implicit Prices of U.S. Feed-Grade Lysine Exports by Country, 1992-1997.

Country [Plants Owned By]	1992	1993	1994	1995	1996	1997	1998
<i>Dollars per pound (f.a.s.)</i>							
Canada	0.911	0.874	1.016	1.108	1.195	1.150	0.891
Mexico [Kyowa]	1.148	0.856	0.830	1.002	0.947	1.230	0.860
Brazil [Ajinomoto, 1997]	0.962	0.900	1.105	1.130	1.014	1.230	0.936
Columbia	1.028	0.825	1.054	1.136	1.095	1.237	0.867
Venezuela	1.034	0.842	1.018	1.016	1.164	1.158	0.912
Argentina	0.959	0.921	1.083	1.109	1.134	1.233	0.918
Germany	0.722	0.830	1.052	1.272	1.271	1.249	0.771
Netherlands	0.800	0.871	1.008	0.823	1.004	1.144	0.892
United Kingdom	0.702	0.819	1.350	0.783	0.957	1.085	0.904
France [Ajinomoto]	0.911	0.758	1.002	1.152	1.268	0.733	0.864
Spain	0.995	0.985	0.989	0.751	1.016	1.101	0.887
Italy [Ajinomoto]	1.084	0.935	1.244	--	1.015	1.057	0.809
Belgium	3.256	1.865	--	1.219	--	1.254	1.194
Australia	1.031	1.045	1.237	0.994	0.854	1.116	0.916
New Zealand	2.295	0.955	0.947	0.962	1.064	1.095	0.852
Malaysia	1.033	0.990	1.161	1.149	1.035	1.138	0.872
Hong Kong	1.018	0.967	1.061	0.838	0.879	1.086	0.875
Thailand [Ajinomoto]	0.967	0.775	0.851	0.945	1.036	1.092	0.734
Indonesia [Cheil]	--	0.734	0.995	1.090	1.025	1.115	1.064
Japan [Ajinomoto, Kyowa]	5.388	1.039	1.124	1.130	1.114	1.186	0.835
Korea [Sewon]	--	0.749	0.838	0.882	0.922	1.009	0.727
Philippines	--	0.725	1.016	1.005	1.021	1.196	0.811
South Africa	1.149	0.893	1.124	1.060	1.007	1.184	0.843
U.S. Total Exports	0.916	0.871	1.028	0.957	1.026	1.133	0.881
U.S. Total Imports (c.i.f.) ^a	0.66	0.74	1.02	0.91	1.14	1.63	0.73

Source: STAT-USA

-- = Not available, no trade

Table 9.A.6. U.S. Feed-Grade Lysine Imports by Country, 1992-1997.

Country	1992	1993	1994	1995	1996	1997	1998
	<i>Metric tonnes</i>						
Mexico	207	2072	3472	96	0	52	0
Europe:	0	351	3016	60	267	772	391
France	0	348	3016	60	24	11	309
Italy	0	0	0	0	243	761	82
Thailand	0	0	0	0	820	0	720
Indonesia	0	255	272	845	2575	5187	8406
Korea	7018	6786	4151	4080	6428	8805	14622
Japan	0	0	771	821	605	217	46
India	1	16	10	10	19	0	0
Total U.S.	7226	9477	10691	6152	11048	15138	24521
Proportion feed grade	87	85	77	84	85	88	90

Source: STAT-USA

Table 9.A.7. U.S. Feed-Grade Lysine Import Shares by Country, 1992-1997

Country	1992	1993	1994	1995	1996	1997	1998
<i>Percent of volume</i>							
Mexico	2.9	21.9	23.1	1.6	0.0	0.3	0.0
Europe:	0.0	3.7	28.2	1.0	2.4	5.1	1.6
France	0.0	3.7	28.2	1.0	0.2	0.1	1.3
Italy	0.0	0.0	0.0	0.0	2.2	5.0	0.3
India	0.0	0.2	0.1	0.2	0.2	0.0	0.0
Thailand	0.0	0.0	0.0	0.0	7.4	0.0	2.9
Indonesia	0.0	2.7	2.5	13.7	23.3	34.3	34.3
Korea	97.1	71.6	38.8	66.3	58.2	58.2	59.6
Japan	0.0	0.0	7.2	13.4	5.5	1.4	0.2
Total imports	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Imports/consumption	13.1	15.8	16.5	8.8	15.1	17.4	26.6

Sources: Tables 9.A.5 and 9.A.6.

Table 9.A.8. Prices of Imported U.S. Feed-Grade Lysine, 1992-1997.

Country	1992	1993	1994	1995	1996	1997	1998
	<i>Dollars per pound (c.i.f.)</i>						
Mexico	0.80	0.76	1.02	1.40	--	1.34	--
Europe:							
France	--	0.56	1.00	1.79	4.08	12.60	--
Italy	--	--	--	--	1.14	2.19	0.86
India	2.00	2.02	2.09	1.99	1.99	3.02	3.02
Thailand	--	--	--	--	1.04	--	0.65
Indonesia	--	1.00	1.06	0.89	1.11	1.73	0.72
Korea	0.66	0.73	1.03	0.86	1.09	1.44	0.68
Japan	--	--	1.03	0.95	1.56	4.33	10.22
Total food-grade imports	5.89	5.63	3.11	2.17	1.69	1.79	1.35
Total U.S. feed-grade imports	0.66	0.74	1.02	0.92	1.14	1.63	0.73
U.S. Domestic price	0.81	0.87	1.13	1.01	1.11 ^a	--	--

-- = Not available

a) First six months only.

Table 13.A.1. Criminal Fines Paid by Global Price Fixers in the United States, 1996-2000.

Product	Defendant/Subsidiary	Date Announced	Amount
			<i>Dollars</i>
1. LYSINE	Archer Daniels Midland Co:	October 1996	\$70,000,000
	Exec. V.P. Michael Andreas ^d	July 1999	350,000
	V.P. Terrance Wilson ^d	July 1999	350,000
	V.P. Mark Whitacre ^d	July 1999	350,000
	Ajinomoto Co., Inc./Heartland Lysine:	November 1996	10,000,000 ^a
	Div. Mgr. Kanji Mimoto	November 1996	75,000 ^a
	Div. Mgr. Hirozaku Ikeda	November 1996	0
	Director Kazutoshi Yamada	Pending	--
	Kyowa Hakko Kogyu Co., Ltd.:	October 1996	10,000,000 ^a
	Div. Mgr. Masaru Yamamoto	October 1996	50,000 ^a
	Sewon America, Inc.:	December 1996	1,250,000 ^a
	Pres. Jhom Su Kim	December 1996	75,000
	Cheil Jedang, Ltd.	December 1996	1,250,000 ^b
2. CITRIC ACID	Archer Daniels Midland Co.:	October 1996	30,000,000 ^a
	V.P. Barrie Cox	October 1996	0
	Bayer AG/Haarmann & Reimer:	January 1997	50,000,000
	H&R Pres. Hans Hartmann	January 1997	150,000 ^a
	Hoffmann-La Roche, Ltd./Citrique Belge NV:	March 1997	14,000,000
	Mgr. Dir. Udo Haas	March 1997	150,000 ^a
	Jungbunzlauer International AG:	March 1997	11,000,000
	Pres. Rainer Bilchbauer	March 1997	150,000 ^a
	Eridania Beghin-Say/Cerestar Bioproducts NV:	June 1998	400,000
	Mgr. Dir. Silvio Kluzer	June 1998	40,000
3. VITAMINS	Alusuisse/Lonza AG	September 1998 ^b	10,500,000 ^a
	DCV, Inc./DuCoa LP:	March 1999	
	Pres. Lindell Hilling	March 1999	Indicted
	Div. Pres. J.L. Fisher	March 1999	Indicted
	Div. V.P. Antonio Felix	March 1999	Indicted
	Chinook Group Ltd./Chinook Group Inc.:	March 1999	5,000,000
	V.P. John Kennedy	March 1999	Indicted
	Sales Mgr. Robert Samuelson	March 1999	Indicted

Product	Defendant/Subsidiary	Date Announced	Amount
			<i>Dollars</i>
	Hoffmann-La Roche, Ltd:	May 1999	500,000,000 ^a
	Managing Dir.	May 1999	100,000
	Kuno Sommer ^d		
	Div. Pres.	August 1999	150,000
	Roland Brönnimann		
	Mktg. Dir. Andres Hauri	April 2000	350,000
	BASF AG	May 1999	225,000,000 ^a
	Div. Pres.	April 2000	125,000
	Reinhardt Steinmetz		
	Div. Pres. Dieter Suter	“ ”	75,000
	Group V.P., Hugo Strotmann	“ ”	75,000
	Rhône-Poulenc [amnesty]	May 1999	0 ^a
	Takeda Chemical Industries	September 1999	72,000,000
	Eisai Co.	September 1999	40,000,000
	Daiichi Pharmaceutical	September 1999	25,000,000
	Hoechst AG/Roussel	Pending	--
	Nepera/Cambrex Corp.	Pending	--
	Mitsui Co./Bioproducts Inc.	pending	--
	Degussa/Vitachem Inc.	May 2000	13,000,000
	Reilly/ Vitachem Inc.	May 2000	2,000,000
	E. Merck KGaA	May 2000	14,000,000
4. SODIUM GLUCONATE	Akzo Nobel Chemicals NV/ Glucona v.o.f.	September 1997	--
	Avebe BA/Glucona v.o.f./ Glucona America:	September 1997	10,000,000
	Mgr. Dir. Cornelius R. Nederveen	September 1977	100,000
	Mgr. Dir. Marcel L. van Eekhout	September 1997	100,000
	Roquette Frères SA:	December 1997	2,500,000
	Bertrand Dufour	December 1997	100,000
	Fujisawa Pharmaceutical Co./ PMP Fermentation Inc.:	February 1998	20,000,000
	Asso. Div. Dir. Akira Nakao	February 1998	200,000
	Unindicted co-conspirator [probably ADM]	December 1997	0 ^a
5. HEAVY-LIFT MARINE CONSTRUCTION	Heere Mac v.o.f.:	January 1998	49,000,000 ^a
	Director Jan Meek	January 1998	100,000
	Unindicted co-conspirators [leniency program]	January 1998	0 ^a

Product	Defendant/Subsidiary	Date Announced	Amount
			<i>Dollars</i>
6. HEAVY-LIFT MARINE TRANSPORT	Dockwise NV:	January 1998	15,000,000 ^c
	Christiaan Bernadus van der Zwan	January 1998	150,000
	Bastiaan Albertus de Jong	January 1998	75,000
	Dockwise U.S.A.	January 1998	1,000,000 ^c
7. GRAPHITE ELECTRODES	Showa Financing/Showa Denko Carbon Inc.	February 1998	29,000,000 ^a
	UCAR International, Inc.:	April 1998	110,000,000 ^a
	Pres. & CEO Robert Krass ^d	September 1999	1,250,000
	COO Robert J. Hart	September 1999	1,000,000
	SGL Carbon AG:	May 1999	135,000,000
	CEO Robert J. Koehler	May 1999	10,000,000
	Carbide/Graphite Group, Inc. [amnesty]	February 1998	0 ^a
	Tokai Carbon Co.	April 1999	6,000,000
8. SORBATES	Eastman Chemical Co.	October 1998	11,000,000
	Hoechst AG:	May 1999	36,000,000
	Mktg. Mgr. Bernd Romahn	May 1999	250,000
	Nippon Gohsei:	July 1999	21,000,000
	Hiroimi Ito	July 1999	350,000
9. BROMINES	Great Lakes Chemical Group [amnesty]	June 1999	0 ^a
	Dead Sea Bromine Group	July 2000	7,000,000
	Albermarle Corp.	pending	--
10. SODIUM ERYTHORBATE	Pfizer Corp.	July 1999	10,000,000
	Fujisawa Pharmaceutical/PMP Fermentation	pending	--
11. MALTOL	Pfizer Corp.	July 1999	10,000,000

E = Estimated by the author.

-- = Not available as of late 2000.

a) This fine represents a substantial departure from the maximum fine mandated by the U.S. Sentencing Guidelines.

b) Under court seal until March 1999.

c) Fines enhanced by large sales of *global* affected sales.

d) Also required to serve prison sentences.

Table 13.A.2. Record Criminal Fines Imposed on Corporate Price Fixers, United States, 1995-2000.

Date Offered	Company	Industry	Amount
			<i>\$ million</i>
1992			2.0
August 1995	ICI Explosives USA	Explosives	10.0 ^a
September 1995	Dyno Nobel	Explosives	15.0 ^b
October 1996	Archer Daniel Midland	Lysine and citric acid	100.0 ^c
April 1998	UCAR International	Graphite electrodes	115.0
May 1999	BASF AG	Bulk vitamins	225.0
May 1999	Hoffmann-La Roche	Bulk vitamins	500.0

Source: www.usdoj.gov/atr.

^aThis was the first application of the maximum “statutory” Sherman Act fine.

^bThe first application of the federal felony statute that permits fines based on twice the harm. In addition to the \$15 million paid by Dyno Nobel, a wholly-owned subsidiary of Nobel Industries of Norway, a joint venture 50%-owned by Dyno was fined \$1.9 million.

^c\$70 million for lysine and \$30 million for citric acid.

Table 16.A.1. Civil Settlements Made by Global Price Fixers in the United States, 1996-April 2000.

Product	Plaintiffs ^a	Defendants	Date Offered	Amount
				<i>Dollars</i>
LYSINE	Federal Class	Archer Daniels Midland	April 1996	25,400,000
		Ajinomoto	April 1996	10,000,000
		Kyowa Hakko Kogyu	April 1996	10,000,000
		Sewon America	1997	4,000,000E
		Cheil Jedang	unknown ^c	1,000,000E
CITRIC ACID	Federal Class	ADM <i>et al.</i>	unknown ^c	20,000,000E
		ADM <i>et al.</i>	unknown ^c	15,000,000E
		Archer Daniels Midland Management	September 1996	30,000,000
		ADM Board of Directors	June 1997	8,000,000
		Mark Whitacre	March 1998	12,600,000
		Archer Daniels Midland	September 1996	35,000,000 ^b
		Bayer/Haarmann & Riemer	December 1996	46,000,000 ^b
		Hoffmann-La Roche	October 1996	5,680,000 ^b

Product	Plaintiffs ^a	Defendants	Date Offered	Amount
				<i>Dollars</i>
		Jungbunzlauer Intl.	October 1996	7,570,000 ^b
		Cargill	--	0 ^c
	Class opt-outs	ADM <i>et al.</i>	1997	105,000,000E ^d
	State class	ADM <i>et al.</i>	1997-1999 ^f	40,000,000
CORN SYRUP	Federal class	Corn Products Co., Intl. Archer Daniels Midland Cargill Tate & Lyle/A.E. Staley American Fructose	September 1996 pending pending pending pending	7,000,000
VITAMINS	Federal class	Hoffmann-La Roche BASF Rhône-Poulenc Takeda Eisai	March 2000 March 2000 March 2000 March 2000 March 2000	136,000,000E 47,500,000E 41,500,000E 24,200,000E 11,000,000E

Product	Plaintiffs ^a	Defendants	Date Offered	Amount
				<i>Dollars</i>
		Daiichi	March 2000	6,500,000E
		Hoechst	March 2000	90,000E
		Lonza	2000	7,600,000E
		DCV/DuCoa	2000	5,500,000E
		Chinook	2000	16,400,000E
		Mitsui/Bioproducs	2000	11,100,000E
		E. Merck	2000	750,000E
		Degussa/Vitachem	2000	7,600,000E
		Nepera	2000	5,750,000E
	Class opt-outs	14 companies above	2000	800,000,000- 1 500 000 000
SODIUM GLUCONATE	Federal class	Avebe BA and Akzo Nobel Chemicals BV: Glucona America Inc. Fujisawa Pharmaceutical Co.: PMP Fermentation Products, Inc.	pending pending	350,000E 700,000E

Product	Plaintiffs ^a	Defendants	Date Offered	Amount
				<i>Dollars</i>
		Nippon Soda Co.	pending	
		Novus International	pending	
MONOSODIUM GLUTOMATE	Federal Class	Ajinomoto	pending	
		Archer Daniels Midland	pending	
		Takeda Chemical	pending	

E = Estimated by the author.

-- Not available or undetermined as of late 2000.

^a "Federal class" is direct buyers seeking compensation under the Sherman and Clayton Acts. "Class opt-outs" are companies that qualify as direct buyers to be members of the federal class but decided to opt out and seek compensation through negotiation. "State class" is indirect buyers in about 16 U.S. states that permit damages to be sought under their state antitrust laws.

^b The original offer made by Bayer in 1996 was reduced to \$38 million in 1997 by the presiding federal judge because several buyers opted out of the class.

^c Refused to negotiate with buyers and was eventually dismissed from the case.

^d Only ADM publicly announced its settlement amounts to opt-outs (\$36 million). Roche later said that its fines and settlement were about \$10 million. If all the citric-acid sellers paid settlement amounts proportional to ADM, then the four opt-outs received \$53 million and Unilever possibly \$25 million more (Connor 2000; Appendix B). Thus, the range is likely \$95 to \$114 million.

^e Believed to have been offered mostly in 1997.

^f Believed to have been offered mostly in 1998.

^g Believed to have been offered mostly in 1999.



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