Chapter 5 Markets for Citric Acid and By – Products

Chapter 5 Markets for Citric Acid and By-Products

This feasibility study establishes a target territory for the citric acid market in Zimbabwe and Southern African countries. This inevitably is based on a number of uncertain factors concerned with marketing and sales which may affect the introduction of a largely export oriented citric acid plant. These include:

(1) Very tough sales competition can be expected from major citric acid producers as the markets in the countries north of the Sahara are close to the major world source of citric acid, which is Europe, and the markets in the Middle East and further east are the territories of the South East Asian and Chinese producers.

(2) Currently, there is equilibrium in the world's supply and demand for citric acid.

This chapter describes world citric acid markets, the domestic market in Zimbabwe and markets in surrounding countries for the projection of potential sales and plant capacity.

5–1 World Citric Acid Market

World demand for citric acid in 1990 is estimated to be about 500,000 metric tons and the demand has been steadily expanding at an average annual growth rate of 4 to 5 percent.

Citric acid is one of the organic acids, which is a natural constituent contained in lemons, oranges and other citrus fruits, and is widely used in the field of beverages, food, pharmaceuticals, detergents and other industrial applications. Among the organic acids used in beverages and food as a food additive (acidulant and antimicrobial preservative), citric acid accounts for 75 percent of the total volume. Demand growth for citric acid is largely influenced by increases in personal incomes, living standards and leisure time, changes in personal tastes, development of new applications, etc. The current trend in the demand growth will continue since citric acid will maintain its dominant position among other acidulants and the demand will increase in developing countries as so far undeveloped applications in food and beverages expand. In this situation, with a moderately growing market, major citric acid producers throughout the world intended to increase production capacity by completing new plants and also expanding existing plants. Meanwhile recently, such producers have attempted corporate restructuring at the global level.

5–1–1 Citric Acid Producers and Production Capacity in the World

Citric acid producers and their production capacity in the world are shown in Table 5–1. World supply capacity in the aggregate is about 650,000 metric tons. Since this figure is nominal and some producers import crude citrate (less refined than ordinary grade citric acid) primarily from China for reselling or re-exporting after refining, the real capacity figure should be smaller. Thus actual capacity in 1991 is estimated to be around 550,000 to 600,000 tons. The following five companies have about 75 percent of world production capacity:

Company	Production Share in the World
– Haarmann & Reimer (Food ingredients subsidiary of Bayer, the largest chemical company in Germany)	23%
– Jungbunzlauer (Austrian producer)	18%
– Archer Daniels Midland (One of the largest soybean processing companies in U.S.A. Also a major maize processing and milling company)	18%
– F. Hoffmann-La Roche (International major pharmaceutical company located in Switzerland)	9%
– Pfizer (Major pharmaceutical company in U.S.A)	8%

Corporate restructuring amongst major citric acid producers has taken place in recent years and the industry has suffered a loss of leadership and confidence during the restructuring.

- Pfizer sold its plant in Ireland to Archer Daniels Midland in Dec. 1990 and also will sell its plant in Groton, U.S.A. to A.D.M. in '93, preferring to invest in mainstream pharmaceutical activities.
- Pfizer closed down its plant in Canada because of worsening profitability.
- Jungbunzlauer bought the Ladenburg plant in Germany and is planning an expansion of its plant in France.
- The Sturge plant in UK was sold to Haarmann & Reimer in 1990.
- Cargill, a maize processing company, entered into the citric acid business in U.S.A.

In the meantime, China has been expanding its production as a means of earning foreign currency. Today, China has a production capacity of over 50,000 tons/y.

Table 5-1 World Citric Acid Plants, 1991

Area/ Country	Company	Nominal Plant Capacity(TPY)	Expansion (TPY)	Raw Material	Process	Remarks
<North America>						
USA	- Cargill	25,000	-	Glucose (corn starch)	Submerge (Vogelbusch)	Production of crystalline and liquid citric acid; owns corn wet mill. fac.
	- Haarmann & Reimer (Bayer) in Elkhart, Ind.	45,000	-	Dextrose (corn starch)	Frmnt. (Miles)	
	- Haarmann & Reimer (Bayer) in Dayton, Ohio	30,000	-	Dextrose	Frmnt. (Miles)	
	- Archer Daniels Midland in Southport, NC.	60,000	-	Molasses	Frmnt.	Production of food grade acid; sold by Pfizer in 1990
	- Pfizer in Groton, Conn.	45,500	-	Molasses	Frmnt.	(*1); production on behalf of A.D.M.
	Sub-Total :	(205,500)	-			
<Central/South America>						
Brazil	- Fermenta-Produtos(Bayer)	13,000	-	Molasses	Frmnt. (Miles)	
Colombia	- Sucromiles (Bayer)	6,000	-	Sugar	Frmnt. (Miles)	
Mexico	- Quimica Mexama (Bayer)	19,000	-	Molasses	Frmnt. (Miles)	
	- Productos de fermentacion	N/A	-	N/A	N/A	
	Sub-Total :	(38,000)	-			
<East Europe>						
Blugaria	- State Authority	300	-	Molasses	Frmnt.	(*1)
Czechoslov.	- Lachema	6,000	4,000 ('96)	Molasses	Surface Frmnt.	Production at 6,700 tons in 1990 mainly for export
	- Slovlik	N/A	1,500	Molasses	Frmnt.	Obsolete present plant
Poland	- State A'ty at Raciborz	1,000	-	Molasses	Frmnt.	(*1)
	- State A'ty at Zgierz	120	-	Molasses	Frmnt.	(*1)
Rumania	- State A'ty at Giurgiu	1,500	-	Molasses	Frmnt. (Czech)	(*1)
USSR (*2)	- State A'ty at Belgorod	4,000	-		-	(*1)
	- State A'ty at Latvia	N/A	-	-	Frmnt.	
	- State A'ty at Moldavia	N/A	-	Sugar	Frmnt.	
	- State A'ty at Smela	2,640	-	Molasses	Frmnt.	(*1)
Yugoslavia	- Fabrika Limunske Kiseline	7,500	-	Beet Molasses	Submerge(Vogelbusch)	Reconstruction completed in 1988
	Sub-Total :	(23,060)	(5,500)			
<West Europe>						
Austria	- Jungbunzlauer	80,000	-	Molasses	Frmnt.	(*1) Capacity expanded recently
Belgium	- Citrique Belge (Roche)	55,000	15,000 ('91)	Beet/Cane Molasses	Frmnt.	Expansion in progress
Germany	- Jungbunzlauer Ladenburg	30,000	-	Beet/Cane Molasses	-	Plant sold by B. Ladenburg in 1988
Irish Rep.	- Archer Daniels Midland	45,000	-	Carbohydrates	Frmnt. (Pfizer)	Plant sold by Pfizer in 1990
Italy	- Biacor	25,000	-	Molasses	Frmnt.	(*1)
	- Chimica Arenella	6,600	-	Beet Molasses	Frmnt.	(*1)
Spain	- Ebro	5,000	-	Molasses	Frmnt.	(*1)
UK	- Haarmann & Reimer (Bayer)	23,000	36,000	Molasses	Submerge(Sturge)	
	- John & E Sturge	Closed	-	Molasses	Submerge(Sturge)	Closed for completion of new facility
France	- Jungbunzlauer	Planned	40,000 ('93)	Molasses	Frmnt.	To be started from 1993
	Sub-Total :	(269,600)	(91,000)			

Note *1....Capacity estimated
*2....Plants also reported at Leningrad, Vyborg and Yerevan
Sources .....Chem. Intell. File (Chemical Plants Worldwide) and other databases/publications (as of July, 1991)

Table 5–1 World Citric Acid Plants, 1991

Area/ Country	Company	Nominal Plant Capacity (TPY)	Expansion (TPY)	Raw Material	Process	Remarks
<Africa and Middle East>						
Israel	- Gadot Petrochemical Ind.	14,000	-	Molasses	Frmnt. (Miles)	(*1); bought from Miles in 1982
Turkey	- Fursan Fermentasyon	5,335	-	Beet Molasses	Surface	Production of monohydrate and anhydrous
	Sub-Total :	(19,335)	-			
<Asia and Oceania>						
Australia	- Sirius Biotechnology	Planned	3,300	Glucose	Frmnt. (Vogelbusch)	Production of anydrous citric acid
China (*2, *3)	- State A'ty at Hefei	N/A	-	Sweet Potato	Frmnt.	For export
	- State A'ty at Ningxia	3,300	-	Sweet Potato	Submerge (Vogelbusch)	Production of anydrous citric acid
	- State A'ty at Tangshan	Planned	3,300 ('92)	Glucose	Submerge (Vogelbusch)	Production of anydrous citric acid
	- State A'ty at Tianjin	N/A	-	Molasses	Frmnt.	
	- State A'ty at Wanquan	Planned	3,300 ('92)	Cassava	Submerge (Vogelbusch)	Production of anydrous citric acid
	- State A'ty at Yichang	Planned	3,300 ('93)	Sweet Potato	Submerge (Vogelbusch)	Production of anydrous citric acid
	- State A'ty at Zhanjiang	5,500	-	Cane Molasses	Submerge (Vogelbusch)	Production of anydrous citric acid
India	- Andhra Citrates	680	-	Sugar	Submerge	(*1)
	- Citric India	1,500	-	Calcium Citrate	Acidification (Czech)	(*1)
	- Citurgia Biochemicals	5,000	3,000	Cane Molasses	Deep (Sturge)	Production of monohydrate and anhydrous
	- SLV Chemicals	450	-	Molasses	Frmnt.	(*1)
Indonesia	- Budi Acid Yaya	1,080	-	Tapioca Waste/Rice B.	Solid	(*1); calcium citrate also produced
	- Budi Alam Kencana	6,000	-	Tapioca Waste/Rice B.	Solid	(*1); calcium citrate (3,000 t/y) also produced
	- Semerang Diamond Chemical	5,100	-	Tapioca Waste/Rice B.	Solid	(*1)
Japan	- Fuso Chemical	4,000	-	Calcium Citrate	Acidification	(*1)
	- Iguchi Shokuhin	600	-	Calcium Citrate	Acidification	(*1)
	- Iwata Kagaku Kogyo	8,000	-	Corn starch	Submerge	(*1)
	- Kyushu Kako	5,000	-	Sweet Potato/Rice B.	Solid	(*1)
	- San-Ei Chemical Ind.	3,000	-	Calcium Citrate	Acidification	(*1)
	- Satsuma Kako	1,600	-	Sweet Potato/Rice B.	Solid	(*1)
	- Tamai Chemical	600	-	Calcium Citrate	Acidification	(*1)
	- Towa Chemical	900	-	Calcium Citrate	Acidification	(*1)
Taiwan	- San Fu Chemical	1,500	-	Molasses	Frmnt.	
Thailand	- Citric Acid Industry	3,000	-	Tapioca Waste	Frmnt. (Vogelbusch)	Production of citric acid monohydrate
	Sub-Total :	(98,010)	(16,200)			
	Worldwide Total :	653,505	112,700			

Note *1....Capacity estimated
*2....Total plant capacity in China is approx. 50,000 t/y (80% for export).
*3....Plants also reported at Lianyungang and Shijiazhuang.
Sources .....Chem. Intell. File (Chemical Plants Worldwide) and other databases/publications (as of July, 1991)

5–1–2 Citric Acid Supply/Demand Situations in the World

Trade statistics and projected demand for citric acid in each country are summarized in Table 5–2. Also changes in world production capacity and consumption are shown in Figure 5–1.

Because citric acid is used in a very wide range of applications and by a large number of end users, it is rather difficult to find out the precise situation of the world market. The number of end users in Western Europe alone amounts to over 17,000. Of these consumers approximately 10 percent account for 70 percent of the market. It is said that the W. Europe/American producers, listed above, have direct contact with some four to five thousand accounts. The remaining twelve thousand are serviced through local agents who supply to distributors.

The trade statistics in Table 5–2 are based on publications for each country. These figures include re-export and crude citrate volumes, whilst many countries do not report citric acid trade. Hence the projected citric acid demand figures in the table were made on the basis of statistical data, producer's capacity, business magazines in the industry, etc.

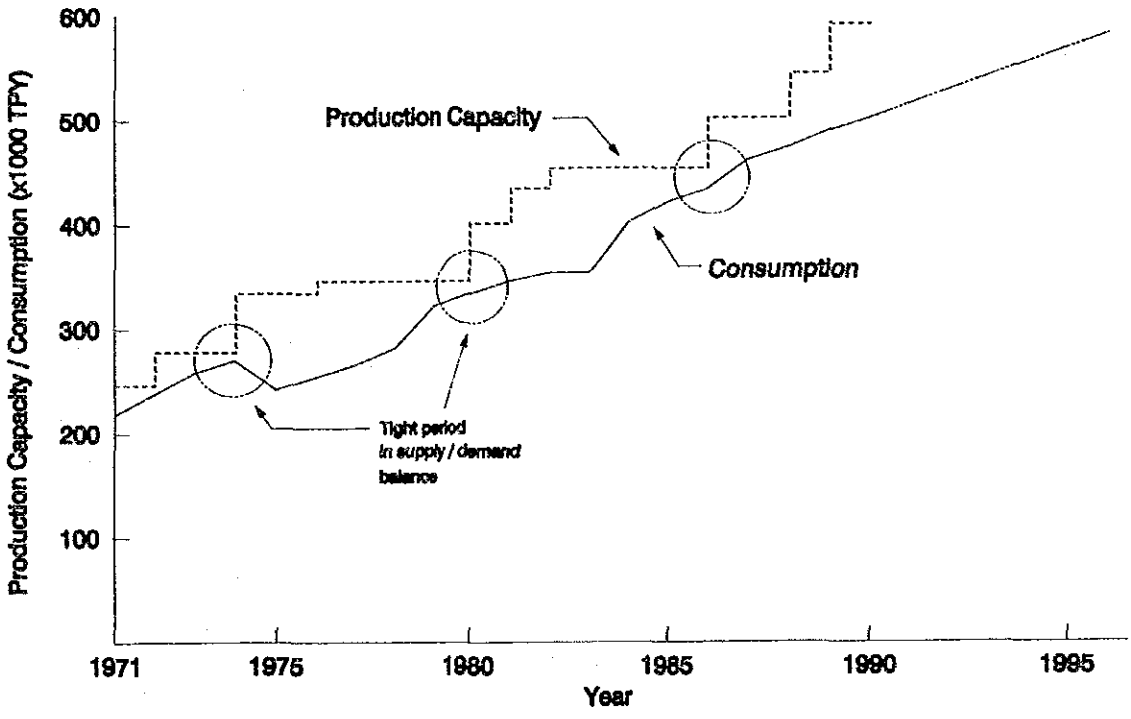


Figure 5–1 Worldwide Production Capacity and Consumption of Citric Acid

Table 5–2 Citric Acid Trade Statistics and Projected Demand (Year: 1989 unless otherwise noted)

Area/Country	Year	Export Quantity (TPY)	Export Value (x1000US$)	Export Unit Price (US$/T)	Import Quantity (TPY)	Import Value (x1000US$)	Import Unit Price (US$/T)	Import Major Source	Projected Demand (TPY)
<North America>									
Greenland	'80	-	-	-	8	16	2,000	Denmark	20
Canada		61	87	1,426	7,873	7,170	911	USA, Belgium , Austria	10,000
USA		7,480	10,950	1,464	29,516	43,286	1,467	Belgium , Austria, German	180,000
		(7,541)	(11,037)	(1,464)	(37,397)	(50,472)	(1,350)		(190,020)
<Central/South America>									
Brazil		-	-	-	-	-	-	-	9,000
Chile		1	2	2,000	1,755	2,642	1,505	Colombia, Austria, Belgium	1,760
Colombia	'86	3,741	5,564	1,487	1	6	6,000	-	2,200
Ecuador	'82	-	-	-	403	695	1,725	Colombia, Belgium, Mexico, German	500
Guinea-Bissau		-	-	-	-	-	-	-	
Guyana	'83	-	-	-	20	68	3,400	USA, UK	30
Jamaica		-	-	-	357	598	1,675	USA, German, Italy	360
Mexico	'88	3,275	4,092	1,249	14	27	1,929	USA, Australia, Puerto Rico	10,000
Puerto Rico	'80	150	304	2,027	80	94	1,175	German	
Paraguay	'84	-	-	-	N/R	124		-	300
Trinidad & Tobago	'87	-	-	-	75	162	2,160	USA, Netherlands, Belgium, China	80
Urguay	'88	-	-	-	126	197	1,563	-	130
Venezuela	'87	-	-	-	2,960	4,727	1,597	Colombia, Mexico	3,000
		(7,167)	(9,962)	(1,390)	(5,791)	(9,340)			(27,360)
<East Europe>									
Poland		-	-	-	-	-	-	-	10,000
USSR		599	855	1,427	N/R	N/R		-	40,000
Yugoslavia		17,390	714		2,061	2,949	1,431	Italy, Austria, German	5,000
		(17,989)	(1,569)		(2,061)	(2,949)	(1,431)		(55,000)
<West Europe>									
Austria	'88	N/R	N/R		1,278	1,718	1,344	China, German, Belgium, Czecho.	4,000
Belgium Luxemburg		N/R	N/R		3,555	4,464	1,256	Austria, German, Netherlands	3,600
Cyprus		-	-	-	-	-	-	-	
Denmark		26	70	2,692	2,516	3,130	1,244	Austria, China, German	2,500
Finland		-	-	-	1,491	1,934	1,297	China, Austria, Indonesia	1,500
France		1,420	1,759	1,239	22,792	25,506	1,119	Belgium, Austria, Italy	20,000
German Fed Rep		N/R	N/R		32,640	38,070	1,166	Austria, Belgium, Irish	30,000
Greece	'87	-	-	-	2,468	4,351	1,763	German, Belgium, Italy, Czecho., etc.	2,500
Iceland		-	-	-	19	33	1,737	Denmark, Netherlands	20
Irish Republic	'87	24,522	37,532	1,531	1,968	4,017	2,041	UK, Austria, Belgium	4,000
Italy	'87	11,299	16,734	1,481	6,226	9,218	1,481	Austria, Irish, Belgium	18,000
Malta		-	-	-	11	19	1,727	UK, Irish	20
Netherlands		2,369	2,892	1,221	8,104	9,885	1,220	Belgium, German, Austria, China	5,000
Norway		4	6	1,500	920	1,160	1,261	China, Austria, Belgium	1,000
Portugal		11	24	2,182	1,344	1,832	1,363	Irish, Austria, Belgium	1,400
Spain		30	61	2,033	7,740	9,635	1,245	Austria, Belgium, Irish	13,000
Sweden		84	107	1,274	2,890	3,705	1,282	Austria, China, Belgium	2,800
Switzerland		312	417	1,337	4,287	6,093	1,421	Austria, China, Belgium	4,000
UK		N/R	6,735	-	16,369	20,896	1,277	Irish, Austria, Belgium	25,000
		(40,077)	(66,337)		(116,618)	(145,666)	(1,249)		(138,340)

Notes 1. N/R ....Not reported
2. Indicated export/import figures include transit traded values and re-exported values.
3. The value of exports based on the FOB, whereas the value of imports on the CIF value.

Sources .....Chem. Intell. File (Chem-Intell Trade), CPI Purch, Chem-Ind., Ag-Europe, and other publications

Table 5–2 Citric Acid Trade Statistics and Projected Demand (Year: 1989 unless otherwise noted)

Area/Country	Year	Export Quantity (TPY)	Export Value (x1000US$)	Export Unit Price (US$/T)	Import Quantity (TPY)	Import Value (x1000US$)	Import Unit Price (US$/T)	Import Major Source	Projected Demand (TPY)
<Middle East and Africa>									
Algeria	'87	-	-	-	2,203	3,732	1,694	Belgium, Austria, Italy	2,300
Bahrain	'88	-	-	-	53	8		Irish, Belgium	50
Canary Islands		-	-	-	91	165	1,813	German, UK, Irish	90
Cyprus		-	-	-	128	200	1,563	Irish, Austria, German	130
Dubai		-	-	-	777	1,019	1,311	-	780
Guinea-Bissau	'81	-	-	-	1	3	3,000	-	
Israel		-	-	-	N/R	1,158		UK, German, Belgium	2,000
Iraq	'86	-	-	-	1,687	2,844	1,686	Austria, Turkey, UK, France	2,000
Jordan		-	-	-	672	752	1,119	China, Indonesia, Austria	680
Kuwait	'84	8	7	875	176	250	1,420	China, Irish, Italy, Belgium	170
Morocco	'85	-	-	-	423	565	1,336	German, Belgium, Irish, UK	500
South Africa	'88	N/R	N/R		3,509	4,664	1,329	-	3,500
Saudi Arabia		1	8	8,000	764	1,127	1,475	Belgium, China, German	760
Sudan	'85	-	-	-	61	101	1,656	Belgium, Netherlands, German	80
Syria	'85	-	-	-	1,701	1,835	1,079	China, Belgium, Austria	1,900
Tunisia	'86	-	-	-	104	187	1,798	-	120
Turkey	'88	N/R	4,019		1,149	1,536	1,337	Belgium, Austria, Italy	3,000
Zaire	'82	-	-	-	39	139	3,564	-	25
Zambia	'79	-	-	-	45	101	2,244	German, Belgium	100
Zimbabwe					N/R	N/R			600
Others		-	-	-	-	-	-		500
		(9)	(4,034)		(13,583)	(20,386)	(1,501)		(19,285)
<Asia and Oceania>									
Australia	'88	29	47	1,621	7,613	11,232	1,475	Irish, China, Mexico	8,000
Bangladesh	'83	-	-	-	270	334	1,237	China	300
Myanmar	'80	-	-	-	66	114	1,727	German	80
China	'88	35,283	38,630	1,095	-	-	-	-	12,000
Hong Kong		4,969	5,229	1,052	5,175	5,243	1,013	China, Irish, Belgium	1,000
India		-	-	-	712	655	920	Taiwan, German, China, Hong Kong	8,000
Indonesia		7,736	7,811	1,010	310	496	1,600	Belgium, UK, Irish	3,500
Japan		45	289	6,422	14,544	19,737	1,357	China, Irish, Austria	18,000
South Korea		-	-	-	4,878	6,139	1,259	Belgium, Austria, Taiwan	4,900
Macao	'88	-	-	-	2	4	2,000	-	
Malaysia		-	-	-	1,673	1,165	696	USA, China, Belgium, German, Austria	1,600
New Zealand	'88	N/R	50		N/R	1,556			1,400
Pakistan	'88	-	-	-	N/R	2,094		China, Belgium, Austria	2,100
Philippines		0	0		1,730	2,735	1,581	Irish, Belgium, Mexico	1,800
Taiwan		93	1,200	12,903	2,569	3,315	1,290	Indonesia, Austria, Brazil	3,500
Thailand	'88	122	177	1,451	771	1,027	1,332	China, Irish	2,500
		(48,277)	(53,433)	(1,107)	(40,313)	(55,846)	(1,385)		(68,680)
Total		121,060	146,372		215,763	284,659			498,685

Notes 1. N/R ....Not reported
2. Indicated export/import figures include transit traded values and re-exported values.
3. The value of exports based on the FOB, whereas the value of imports on the CIF value.

Sources .....Chem. Intell. File (Chem-Intell Trade), CPI Purch, Chem-Ind., Ag-Europe, and other publications

(1) Supply/demand situations in the world

Current world demand for citric acid is approximately 500,000 metric tons/y (reported by European Chemical News, Process Eng., Ned-Chem-Ind., etc.). The demand has increased steadily at an average annual growth rate of 4 to 5 percent in the past decade. Major contributions to the demand growth were 1) the increase in the soft drink market in U.S.A, which accounts for 40 percent of the world market (average annual growth rate of 5.4 percent in the past decade), and 2) replacement of phosphates with sodium citrate as a builder in the American detergent market (average annual growth rate of 18.0 percent between 1983 and 87). In U.S.A. the citric acid demand for beverages in 1990 was 64,400 tons (35 percent of total consumption), and for detergents was 37,000 tons (20 percent).

In the past, the rapid growth of soft drink consumption in U.S.A. was primarily created by the introduction of nutrasweet diet drinks such as Diet Coke and Diet Pepsi, which contain citric acid as acidulants. Recently diet drink consumption in U.S.A. has shown only moderate growth.

The use of phosphate, as a builder (customarily used to enhance washing properties) in liquid detergents, was banned in U.S.A. since it created environmental problems, notably eutrophication of rivers and lakes. Phosphate has been replaced with sodium and potassium citrates (derivatives of citric acid) that are non-toxic and biodegradable. Meanwhile with the introduction and popularity of concentrated detergents which use zeolite, the demand growth of such derivatives will show only a slight increase. However in European markets, following the U.S.A. trend, the demand for phosphate-free liquid detergents has been increasing and consequently the demand for citrates has jumped from thousands of metric tons a year to many tens of thousands of metric tons.

The supply and demand balance for citric acid is shown in Figure 5–1, which indicates a considerably tight period approximately every six years. The current balance is relatively stable, and the market should stay in balance over the next year. But by 1992, unusually, there may be something of a shortage worldwide. New plants and expansion plans, for over 100,000 tons, in the near future are reported in Table 5–1. Specifically the expansion plans of Jungbunzlauer and Haarmann & Reimer will most probably be fulfilled. In the long-term the worldwide demand for citric acid will maintain the past trend and principally will move in step with the growth of global GNP.

The following shows the estimated citric acid demand in 1996 if it increases at an average annual rate of 3 percent:

	1990	1996
World citric acid demand (tons/y):	500,000	597,000

(2) Supply/demand situations by region

Supply and demand balance by region is indicated in Figure 5–2 and world citric acid movement is shown in Figure 5–3.

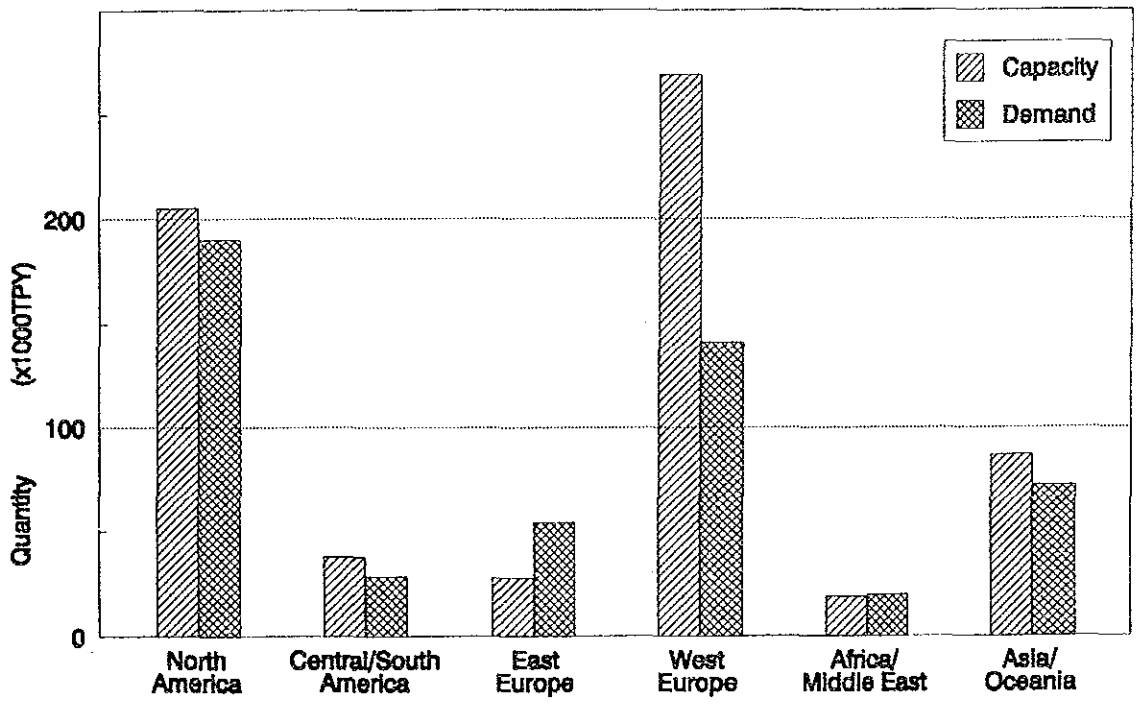


Figure 5–2 Citric Acid Capacity and Demand Balance by Region, 1990

Western Europe accounts for 45 percent of world supply, followed by U.S.A. at 34 percent and Asia/ Oceania at 8 percent. U.S.A. had imported citric acid, about 20 percent of domestic consumption, from Europe several years ago. But with Cargill's entry, imports have fallen and exports have been growing.

Western Europe will continue to be a world supplies of citric acid due to large plant capacity and international competitiveness. Total production by the four countries, Austria, Belgium, Ireland and China, is about 230,000 tons/y and more than 80 percent of it is for export.

Current situations of several corporations/countries are as follows:

– Biacor SpA, the Italian producer, has perhaps permanently stepped back from the US due to low prices and adverse currency exchange rates.

– China has held back under pressure from market conditions and a loss of government subsidies.

– Fusan, the Turkish producer, is reported to have stopped producing citric acid in favor of sodium citrate.

– Indonesia is reportedly having a tough time but is hanging in.

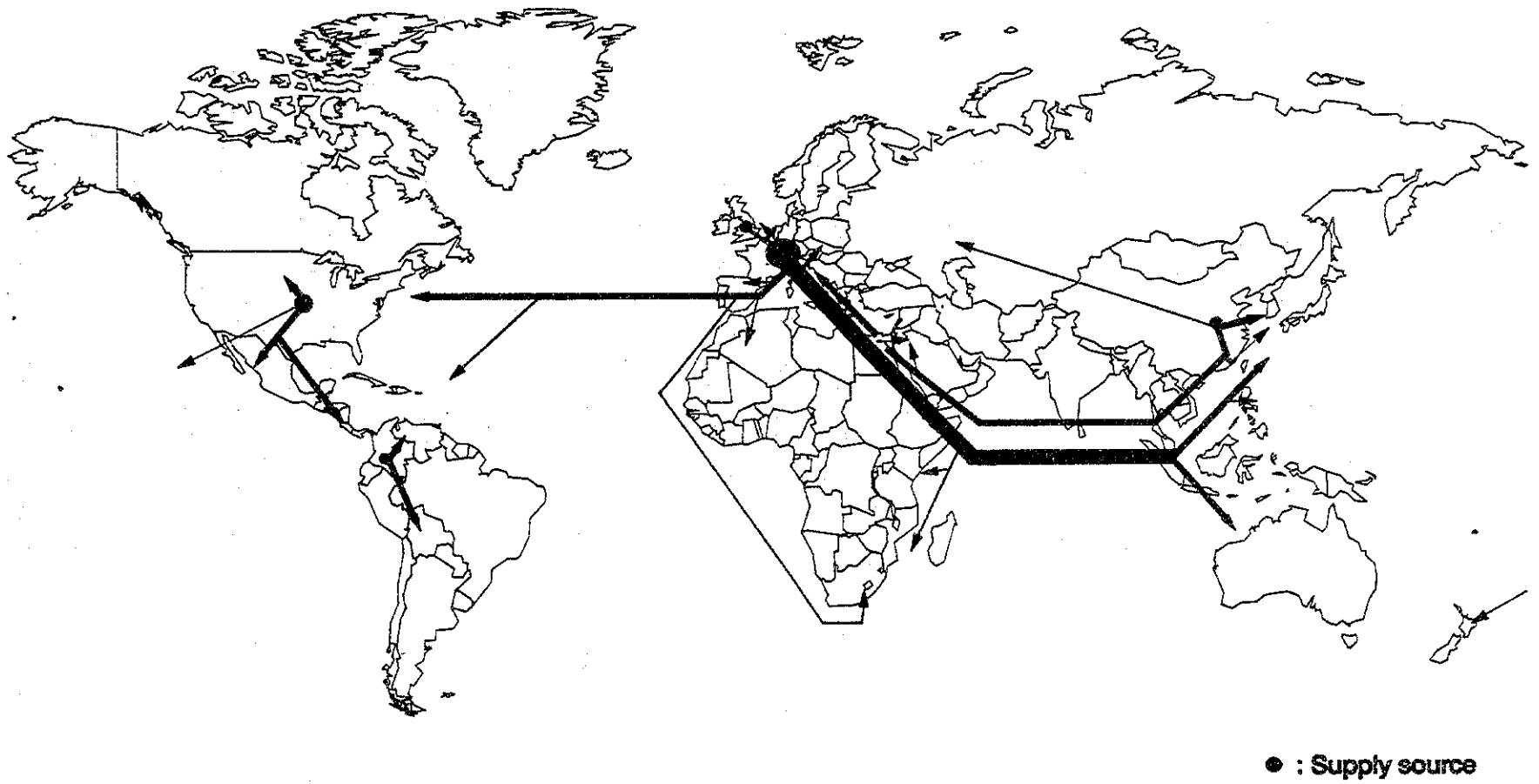


Figure 5–3 World Citric Acid Movement

5–1–3 Prices of Citric Acid

Changes in citric acid export prices (fob base), derived from trade statistics, are indicated in Figure 5–4 and citric acid import prices (cif base) in Figure 5–5.

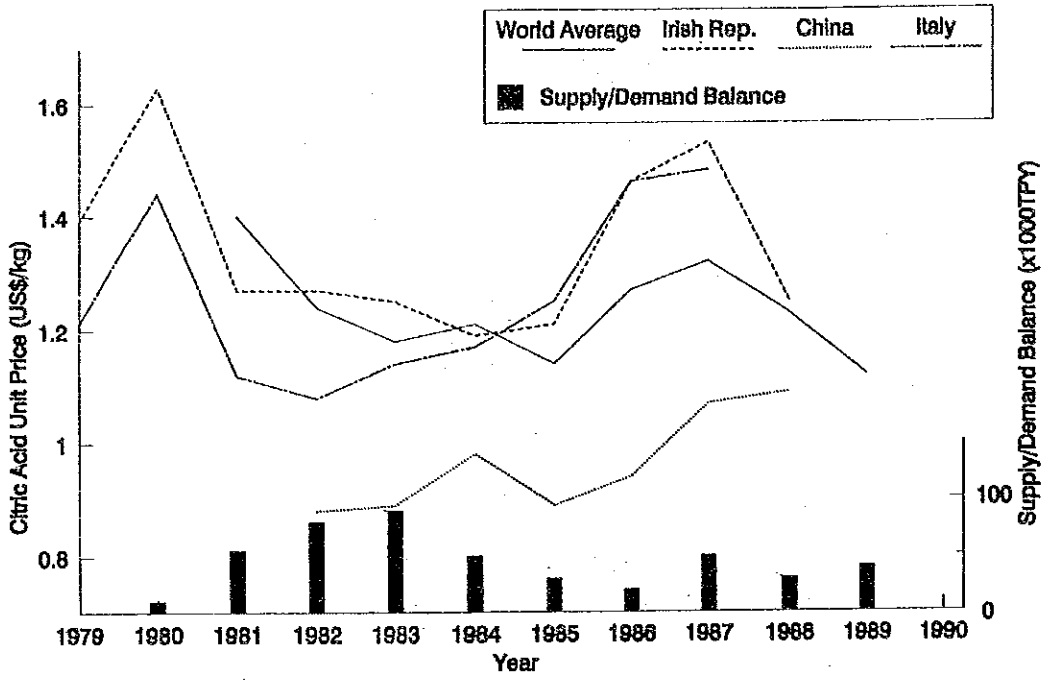
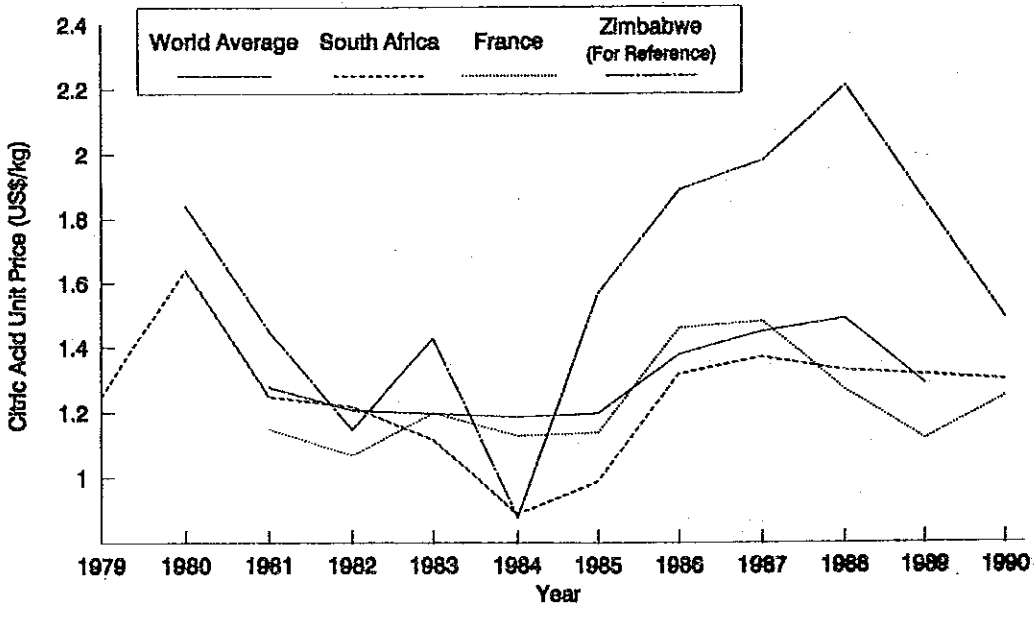


Figure 5–4 Citric Acid Export Price (FOB)



Note: Figures in Zimbabwe from 1985 to 1989 for only reference

Figure 5–5 Citric Acid Import Price (CIF)

The export prices of Ireland, Italy and the world average, except China, vary in the range between 1.0 and 1.7 US$/kg, whereas those of China are between 0.9 and 1.1 US$/kg. Also import prices are from 0.9 to 1.8 US$/kg. From the figure it is obvious that the prices go down when there is excess supply and upwards when the market is bullish. Although international prices in current monetary terms showed some swings in the past, real prices, taking inflation into consideration, have shown a downwards trend. This has resulted from cost reductions due to the entry of producers in developing countries and the installation of large scale and capital intensive facilities by the major producers in Europe and U.S.A.

The following shows changes in U.S.A. spot prices (delivery basis in the continental US):

Table 5–3 Citric Acid Spot Prices in U.S.A.

Year (as of June)	1985	1986	1987	1988	1989	1990	1991
Prices (US$/ton)	1,852	1,896	1,830	1,841	1,841	1,620	1,499

Note : Type of Citric Acid: USP grade, Anhydrous, granular, 100 lb bag, truckload

Source : Chemical Marketing Reporter

In the latter half of 1990, following the entry of a new producer Cargill, the American market experienced downward pricing pressure to 1,389 US$/ton as can be seen in the above table. Since then the market has been recovering as it tried to adjust to the new capacity, and the price has been picking up slowly since early 1991; 1,499 US$/ton in July and 1,609 US$/ton in August 1991.

Current international export prices (fob basis, as of August 1991) are expected to be 1.3 to 1.5US$/kg.

5–2 Citric Acid Market in Zimbabwe and By-Products

Citric acid is the most versatile and widely used organic acid principally in the field of beverages and food and there are a number of consumers. Market situations are somewhat difficult to identify precisely for those reasons. In this study great efforts were made to assess the market situation from various angles, including approaching consumers, suppliers, statistical data and information in the industry, throughout the analysis.

5–2–1 Citric Acid Market in Zimbabwe

(1) Market size from statistics

Import/export data for citric acid in Zimbabwe are shown in Table 5–4.

Table 5–4 Statistical Data for Citric Acid Trade in Zimbabwe

Year	Import Quantity (ton)	Export Quantity (ton)	FOB Import Amount (1,000 Z$)	Unit Price (Z$/kg)	Unit Price (US$/kg)
1980	215	0	250	1.16	1.84
1981	140	0	146	1.04	1.45
1982	209	0	221	1.06	1.15
1983	298	0	470	1.58	1.43
1984	602	0	797	1.33	0.88
1985 (*1)	490	2	1,260	2.57	1.57
1986 (*1)	452	9	1,505	3.33	1.99
1987 (*1)	745	0	2,446	3.28	1.98
1988 (*1)	218 (*2)	1	938	4.30	2.21
1989 (*1)	n/a (*3)	n/a	n/a	–	–
1990	72 (*4)	0	282 (*5)	3.92	1.49

Notes:

(*1) Figures from 1985 to 1989 include other chemicals which are classified under CCCN No. 29.18 or SITC No. 513.9 (Carboxylic acids with alcohol, phenol, aldehyde or ketone function and .....).

(*2) Figures in 1988 are an aggregated value from January to April only.

(*3) Figures in 1989 are not available.

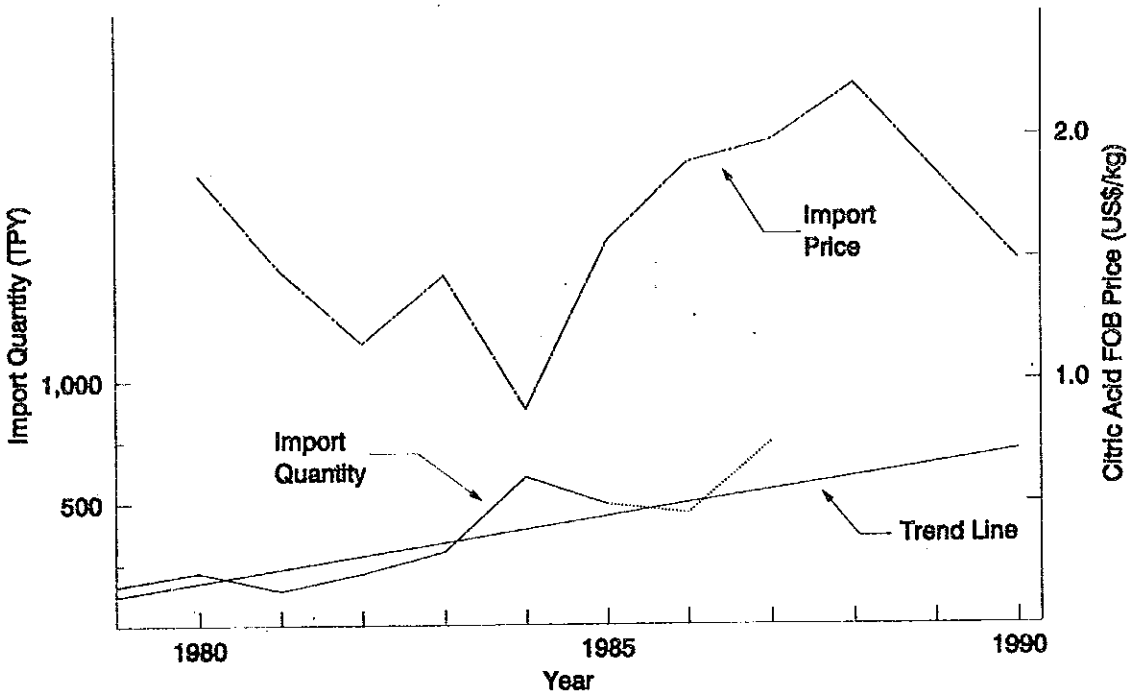
(*4) Figures in 1990 are an aggregated value from January to March only.

(*5) The figure in 1990 is CIF value.

Classifications of trade items were changed twice during the period covered in the table. Citric acid was classified in SITC (Standard International Trading Commodity) Code 51143 "Citric Acid in Bulk" before 1985, and from 1985 to 1989 it was changed into Code 5139, which includes other related chemicals. From 1990 it has been divided into Code 51391400 "Citric Acid" and 51391500 "Calcium Citrate".

SITC Code 5139 (from 1985 to 1989) includes lactic acid, tartaric acid, salicylic acid, etc. as well as citric acid. Based on general considerations and the demand and import figures of those other chemicals, more than 80 percent of the import figures for that period are considered to be citric acid and its salts. Also import data from May 1988 to December 1989 are not available because the computer in the Central Statistical Office was down. Thus recent citric acid import volumes are not available from the statistics.

Figure 5–6 indicates changes of citric acid import volume and its unit prices based on the data in Table 5–4.



Note: Figures from 1985 to 1989 for only reference

Figure 5–6 Citric Acid Import in Zimbabwe

Although there appears to be no obvious correlation between volume and prices, imports increase when the price is trending down and vise versa. In other words, price elasticity to demand is relatively high. Adverse increase in import volume during downward pricing in 1984 is especially noticeable.

Import statistics by country of origin for the past four years are listed in Table 5–5. Major exporting countries are Belgium, (West) Germany, UK, U.S.A. and China. These five countries account for over 80 percent of the total import volume in 1983 and 84, and almost 50 percent in 1986 and 87.

Table 5–5 Citric Acid Import to Zimbabwe

Year: 1987

Country	Quantity (kg)	Amount (Z$)	Unit Price (Z$/kg)	Unit Price (US$/kg)
Hong Kong	46,834	120,899	2.58	1.55
Belgium	62,258	161,529	2.59	1.56
USA	28,755	78,384	2.73	1.64
UK	224,564	623,948	2.78	1.67
Netherlands	18,881	55,050	2.92	1.75
Ireland	24,082	74,810	3.11	1.87
Singapore	7,800	24,428	3.13	1.88
Italy	1,700	5,397	3.17	1.91
China	70,745	227,602	3.22	1.93
France	39,603	127,418	3.22	1.93
Canada	20,015	64,919	3.24	1.95
Austria	4,104	14,219	3.46	2.08
Brazil	250	933	3.73	2.24
S.Africa	97,867	405,885	4.15	2.49
Hungary	10,350	43,041	4.16	2.50
Switzerland	21,700	95,082	4.38	2.63
Poland	22,010	100,709	4.58	2.75
W.Germany	34,728	167,809	4.83	2.91
Denmark	1,155	5,874	5.09	3.06
Spain	2,550	13,566	5.32	3.20
Iceland	2,586	15,699	6.07	3.65
Argentina	250	1,537	6.15	3.70
Rumania	100	645	6.45	3.88
Japan	1,608	14,467	9.00	5.41
E.Germany	150	2,102	14.01	8.43
Total	744,645	2,445,952	3.28	1.98

Year: 1986

Country	Quantity (kg)	Amount (Z$)	Unit Price (Z$/kg)	Unit Price (US$/kg)
Botswana	150	162	1.08	0.64
France	85,224	127,426	1.50	0.89
Netherlands	2,110	3,797	1.80	1.07
UK	64,705	151,305	2.34	1.39
USA	18,374	44,833	2.44	1.45
Belgium	49,600	124,168	2.50	1.49
Israel	3,763	10,493	2.79	1.66
Ireland	3,905	11,408	2.92	1.74
China	8,351	24,902	2.98	1.78
Switzerland	1,714	5,136	3.00	1.79
W.Germany	46,887	158,221	3.37	2.01
E.Germany	23,100	84,801	3.67	2.19
Australia	6,900	26,142	3.79	2.26
Brazil	1,700	6,448	3.79	2.26
S.Africa	34,238	138,025	4.03	2.40
Taiwan	925	3,844	4.16	2.48
Hungary	150	675	4.50	2.68
Austria	61,337	286,181	4.67	2.78
Denmark	519	2,615	5.04	3.00
Spain	18,331	95,187	5.19	3.09
USSR	280	1,594	5.69	3.39
Argentina	100	596	5.96	3.55
Poland	14,450	92,342	6.39	3.81
Japan	2,809	19,439	6.92	4.12
Hong Kong	2,000	85,562	42.78	25.49
Total	451,622	1,505,302	3.33	1.99

Year: 1984

Country	Quantity (kg)	Amount (Z$)	Unit Price (Z$/kg)	Unit Price (US$/kg)
USA	278,317	201,987	0.73	0.48
Netherlands	24,902	34,068	1.37	0.91
China	41,217	59,228	1.44	0.96
Belgium	80,932	122,417	1.51	1.01
India	750	1,353	1.80	1.20
W.Germany	93,077	169,587	1.82	1.21
Ireland	3,000	5,504	1.83	1.22
Brazil	2,800	5,314	1.90	1.26
UK	11,638	23,621	2.03	1.35
S.Africa	40,031	90,547	2.26	1.51
Switzerland	1,702	4,534	2.66	1.77
Denmark	1,000	2,756	2.76	1.83
Poland	8,850	27,518	3.11	2.07
France	4,395	14,105	3.21	2.14
Japan	8,664	32,998	3.81	2.54
Taiwan	400	1,754	4.39	2.92
Total	601,675	797,291	1.33	0.88

Year: 1983

Country	Quantity (kg)	Amount (Z$)	Unit Price (Z$/kg)	Unit Price (US$/kg)
Hong Kong	17,960	16,286	0.91	0.82
China	23,924	24,083	1.01	0.91
USA	58,211	79,420	1.36	1.23
W.Germany	19,602	27,087	1.38	1.25
Belgium	115,291	171,736	1.49	1.35
UK	27,882	43,179	1.55	1.40
Brazil	3,750	6,263	1.67	1.51
Ireland	4,532	7,571	1.67	1.51
Iran	3,150	5,429	1.72	1.56
Switzerland	2,049	4,482	2.19	1.98
Denmark	500	1,143	2.29	2.07
Spain	50	117	2.34	2.12
Israel	7,681	18,400	2.40	2.17
Japan	2,310	5,660	2.45	2.22
France	882	4,304	4.88	4.41
S.Africa	10,087	54,848	5.44	4.92
Netherlands	14	121	8.64	7.82
Total	297,875	470,129	1.58	1.43

Note: Figures for 1987 and 1986 include other chemicals which are classified under CCCN No.29.18 or SITC No. 513.9 (Carboxylic acids with alcohol, phenol, aldehyde or ketone function and .....).

Source : Central Statistical Office

(2) Manufacturing industries in Zimbabwe

Most of the citric acid consumers in Zimbabwe are in the soft drinks and food industries.

It is noticeable that, among other sub-Saharan countries, Zimbabwe's manufacturing sector is the largest, most developed, diversified and best integrated, after the Republic of South Africa. Manufacturing has accounted for 25 percent or more of GDP since 1970, followed by agriculture with about 13 percent. In the manufacturing sector, the food and beverage industry is the largest, accounting for 31 percent of all manufacturing sales or Z$ 1,639 million. Meat processing is the most important of the food industries and grain mill processing (including processing of maize, wheat flour, animal feeds and vegetable oil) comes next. The beverage sector, which is the major citric acid consumer, is reckoned at 7 percent of total sales in the food/beverage sector.

The number of corporations in manufacturing was 1,904 in 1986 according to United Nation's data (Industrial Statistics Yearbook). Of these 102 were in the food sector, 18 in the beverage sector (including wine and spirits) and 9 in pharmaceuticals. Also the Census of Production indicates that there were 168,000 employees in overall manufacturing; 28,100 in the food sector, 7,100 in beverages and 1,100 in pharmaceuticals. The World Bank reported that the manufacturing sector is dominated by several companies and almost 80 percent of production is under monopoly or oligopoly conditions.

The growth rate of manufacturing in 1990 was only 4.4 percent. Shortage of foreign currency for importing raw materials, spare parts, production goods and capital goods, has hampered the recent growth of manufacturing industries. Also depreciation of the Zimbabwe dollar reduced the real foreign currency allocation to each company and resulted in blocking the import of these essential materials and goods. It is said that industries have maintained their operations at only 40 to 70 percent of capacity.

The food, beverages, tobacco and wood processing sub-sectors have been particularly seriously hit by the shortage, resulting in a drop in their operations. In the meantime price decontrol and deregulation of basic materials by the government have caused significant inflation and increases in labor and production costs. Even under these conditions manufacturing production rose by 4.9 percent in the first ten months of 1990. The main contributors were drink and tobacco, foodstuffs and chemical and petroleum products.

Considerable growth in the manufacturing sector is expected within the next few years since trade liberalization programs and investment promotion are being accelerated as major parts of the economic reform programs, and import constraints on raw materials and production goods will be relaxed. The government started the Open General Import License system in 1990 in place of the former Import Allocation system. 50 percent of imported items, mainly raw materials, are intended to be in the OGIL list by the end of 1991 for free trading, production goods to be added by 1993, and consumer goods to be included by 1994 or '95. Citric acid was already listed in OGIL in April 1991 and can be imported freely.

(3) Current citric acid market

Major citric acid consumers in Zimbabwe and their consumption are shown in Table 5–6 and the demand profile by consumers/industries is illustrated in Figure 5–7. The total annual demand for citric acid is estimated to be 620 metric tons. The soft drink sector accounts for about 540 tons/y, food industry for 60 tons/y, pharmaceuticals for 6 tons/y and others for 15 tons/y. Major end uses are acidulants for carbonated and crush drinks, acidulants, preservatives and pH control for confectionery, jellies, sauce, margarine, etc., and pH buffer and preservatives for medical tablets and powder. Applications for detergents as a builder or for other industries have not been identified.

Table 5–6 Citric Acid Consumption in Zimbabwe (June, 1991)

Major End Users	Citric Acid Demand (ton/year)	
(1) Soft Drink/Beverage Industry		
– Schweppes Ltd.	360–400	
– Bush Boake Allen Zimbabwe Ltd.	20–30	
– United Bottlers	22–30	
– Lyons & Brooke Bond	24	
– Coldrac Products Ltd.	24	
– Coca Cola Export	65	
	(515–573)	
(2) Food Industry		
– Lever Brothers Ltd. Zimbabwe	5–7	
– Cairns Holdings	5–6	
– Lyons & Brooke Bond	6	
– Arenel	20–30	
– Olivine Industries	5	(*1)
– Crystal Candy	10	(*1)
	(51–64)	
(3) Pharmaceutical		
– CAPS (Central African Pharmaceutical Society)	1–2	
– Sterling Products International, Ltd.	5	(*1)
	(6–7)	
(4) Others	10–20	(*1)
Total (approximately)	582–664	

Note: (*1) Estimated figures

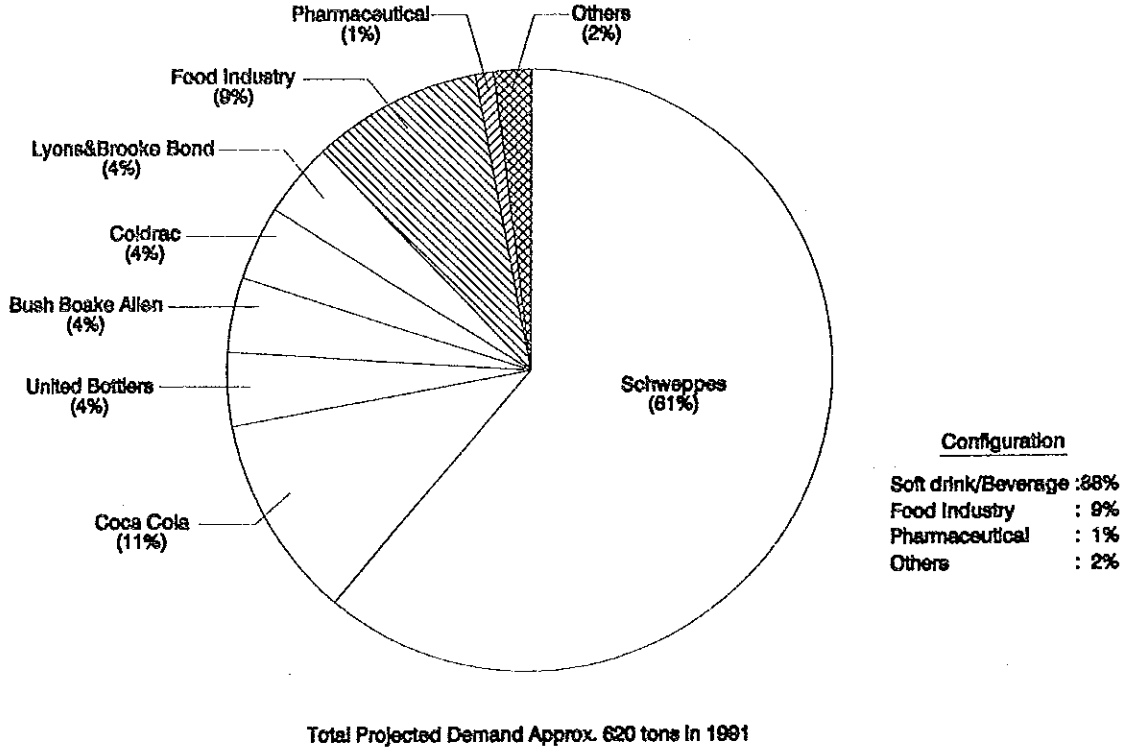


Figure 5–7 Citric Acid Demand Structure

Most of the other enterprises in the food industry are concerned with meat processing, grain mill processing, bakery production and canning and are not citric acid consumers. Nevertheless, there are expected to be many small consumers of citric acid, such as Food & Industrial who use a small quantity of citric acid (about 250 kg) annually for their traditional powder beer production (Predrew). It is expected that the number of such small consumers amounts to more than 30 and their demand is approximately 10 to 20 tons/y.

Major consumers and their current circumstances are described below:

(a) Schweppes Ltd.

Schweppes is a Zimbabwe subsidiary of Cadbury Schweppes plc of UK which is a major soft drinks/food manufacturer. Principal products are crushes and syrups, of which Mazoe Orange is typical (containing relatively small amount of natural fruits), and carbonated soft drinks such as Ginger Ale. Current production for crushes reaches about 12 million liters per year and for carbonated drinks 86 million liters. They started to export their products to neighboring countries recently.

It is said that their supply capability is quite low, because of import restrictions on production goods and shortage of bottles mainly due to foreign currency allocation. The supply capability would have been about 25 percent less than domestic demand during the hottest season, specifically in December. A new orange crush plant at Mazoe is now under consideration.

Schweppes often buys citric acid directly from producers in Europe and U.S.A. Current (anhydrous) citric acid prices in Europe are 6.0 to 7.5 Z$/kg and the delivery price is about 10.0 Z$/kg.

About 20 percent of the citric acid can be replaced by malic acid, but there is no room for lactic acid and tartaric acid.

(b) Bush Boake Allen Zimbabwe Ltd.

Bush Boake Allen is a major company in fragrances and flavors and it has been acquired by Union Camp Corp. of U.S.A. BBA produces beverage base (concentrate) as well as flavors. Total consumption of citric acid is 20 to 30 tons/y and about 90 percent of it is for the concentrate. They are scheduled to expand their concentrate production lines because current production capability is at a relatively low level. Production is said to be 20 to 30 percent below domestic demand. Most of the citric acid is bought from Protea Chemical and current domestic prices are 7.0 to 8.0 Z$/kg. BBA once imported citric acid through barter trading with China in exchange for Tobacco but has stopped the deal at percent.

(c) United Bottlers

United Bottlers is the biggest bottler of soft drinks in Zimbabwe. UB receives the concentrate from Schweppes, Bush Boake Allen, Coca Cola Export, etc. in compliance with franchise agreements and distributes the products after diluting, carbonating and bottling. Also UB produces its own carbonated soft drinks under the name of Spalletta. Their production capacity, including bottling, is as follows:

– Harare plant	:	20 million cases/y
– Bulawayo plant	:	8 million cases/y
– Masvingo plant	:	4 million cases/y
– Gweru plant	:	2 million cases/y
Total		34 million cases/y (or 244.8 million liters/y)

United Bottlers also is facing constraints on production capability because of lack of bottles and foreign currency for importing production goods and materials. It was reported that consumption of soft drinks has doubled compared with four years ago and steady growth can be expected. UB is planning a new bottling plant at Chinhoyi (6 million cases/y) and construction of the plant will be carried out when production at the Harare plant reaches 23 to 24 million cases/y in about 1993.

UB imports about 2 tons of citric acid per month (2.4 to 2.5 tons for the peak period) for its own brand drink "Spalletta" principally through Sylvester & Kitchen at a current price of about 8.0 Z$/kg (delivery basis). As for other acidulants, neither tartaric acid nor lactic acid are used since the former gives a too mellow flavor, whereas the latter gives a too sharp taste like beer.

(d) Lyons & Brooke Bond

The name of Lyons & Brooke Bond is famous in tea production. Most of the citric acid is used for their own soft drink "Sunfrake" and is bought from Cairns Chemicals at a current average price between 8.0 and 11.0 Z$/kg. Citric acid from China is not used for quality reasons. Malic acid is seldom used as a substitute for citric acid because of its price disadvantage.

(e) Coca Cola Export

Coca Cola Export is a Zimbabwe division of the world's biggest soft drink company Coca Cola Enterprises Inc. of U.S.A. and is producing several types of concentrates in Zimbabwe. Citric acid is an acidulant for Fanta and Sprite, whilst phosphoric acid is used for Coke. Coca Cola takes a very rigid attitude to the specifications of products and food additives, and quality control of all the products and materials is made under the administration of the headquarters at Atlanta, Georgia in U.S.A. Coca Cola has a list of approved suppliers for citric acid. Suppliers are requested to provide citric acid with high solubility, better particle size and distribution and a high degree of colorlessness. These are determined by the inhouse standards of Coca Cola which are different from the national standards for food grade citric acid. Suppliers must also have price competitiveness and sustainable supply capability for the specified quality. Coca Cola uses about 65 tons of citric acid per year, mostly direct purchase from suppliers, and the prices (fob basis) are in the range of 1.3 to 1.7 US$/kg.

(f) Lever Brothers Ltd. Zimbabwe

The headquarters of Lever Brothers is located in UK. Lever Brothers make many products ranging from processed foods such as mayonnaise, marmalade, jams, tomato sauces, teas (Lipton) and vegetable oils to shampoos, soaps (Lux) and cosmetic cream. Domestic market shares for some products are, for example, jam 70 percent, marmalade and tomato sauces 30 percent and detergents 75 percent. Major production constraints, caused by shortages of packing materials and other raw materials due to foreign currency allocation, have resulted in insufficient supply compared with current demand. No changes are made in the ingredients for the products even when raw materials are scarce since the product quality is controlled by the headquarters in UK.

The current consumption of citric acid is 5 to 7 tons/y and will be increased to about 20 tons/y when supply capability is expanded. Basically citric acid is directly imported from Europe via Beira port in Mozambique at a delivery price of about 7.0 Z$/kg.

Citric acid predominates over other acidulants such as lactic acid and malic acid. Those acidulants can be used only when the prices are much cheaper.

Lever Brothers used to use imported sweet potato starch as one of the materials for food processing, but today they use only cornstarch manufactured by Food & Industrial.

(g) Cairns Holdings Limited

Cairns Holdings is a major domestic enterprise for processed foods and wines. Primary products include instant coffees, butter, marmalade, jams, fruit juices (syrup), tomato sauce, canned products, etc., diversified with over 800 kinds of products. About 2 percent of these are exported to UK, Netherlands and other countries. They completed construction of another food plant in Botswana in 1988 and started operations there.

Current yearly operating rates have fallen to 50 to 70 percent because of shortage of packing materials, raw materials and spare parts.

Annual consumption of citric acid is 5 to 6 tons. Citric acid is purchased from a chemical supply subsidiary "Cairns Chemical" at a current delivery price of 6.4 Z$/kg. Lactic acid can be used only when citric acid is not available in the market. Also a small quantity of malic acid, about one ton per year, is used.

(h) Arenel and Crystal Candy

Both are confectionery companies, manufacturing chocolate, candies and the like.

Crystal Candy is planning investment for expansion of its production facilities at a cost of Z$ 1.7 million to meet growing demand both in the domestic and overseas markets.

(i) CAPS (Central African Pharmaceutical Society)

CAPS is the biggest pharmaceutical company in central Africa, producing several kinds of medical supplies and cosmetics, in which some are manufactured under a license agreement with Glaxo in UK. Also subsidiaries are located in Zambia, Malawi and Botswana. Products are exported to Uganda, Kenya and the Republic of South Africa. CAPS is planning an expansion of its plant in Zimbabwe for making products suitable to meet FDA standards and for export to Europe and U.S.A.

CAPS directly imports 1 to 2 tons of citric acid (principally hydrate grade) annually from Germany or via a chemical supply subsidiary in the Republic of South Africa through Durban or Beira port, for the purpose of giving flavor and adjusting the pH of tablets. Current delivery prices are 6.0 to 7.0 Z$/kg for hydrate grade and 5.0 to 6.0 Z$/kg for anhydrous. From a technical viewpoint, lactic acid and tartaric acid could be used instead of citric acid, but in practice are not.

(j) Sterling Products International

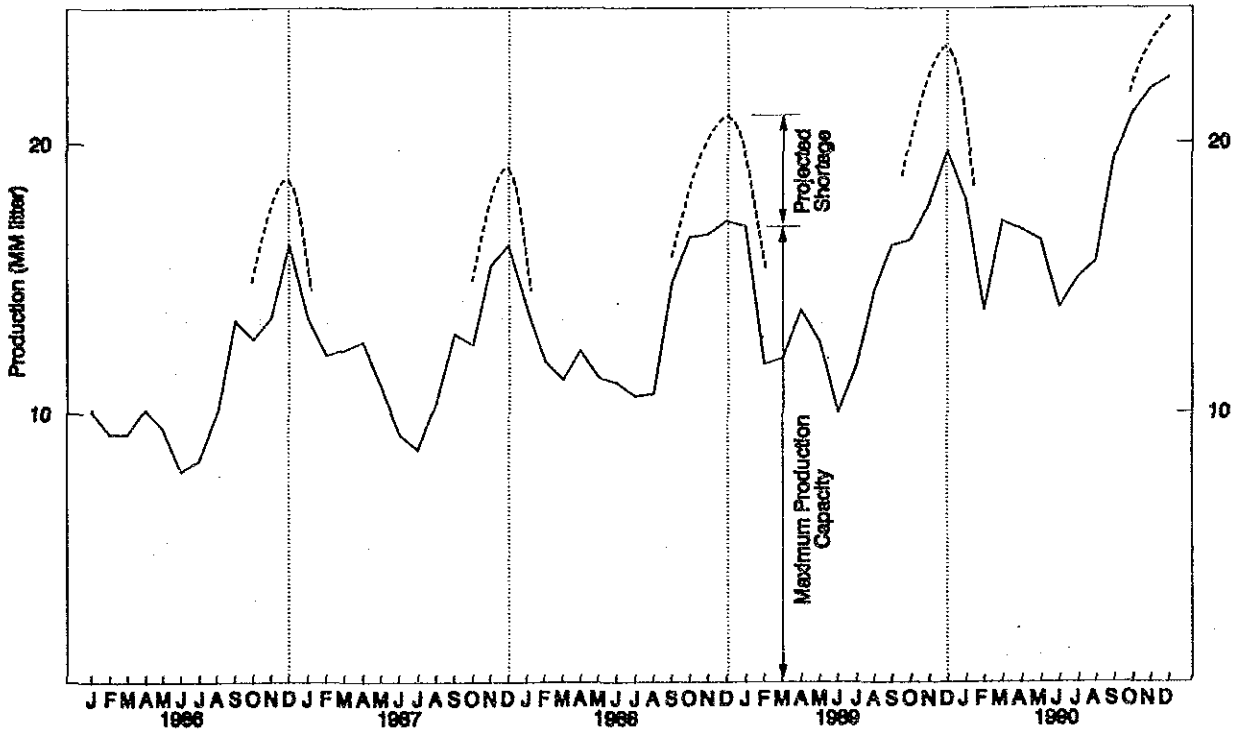
Sterling Products produces an antacid laxative (Andrews Liver Salt), which is popular with European people for suppressing stomach upsets and hangovers. It contains 37 percent of citric acid.

5–2–2 Soft Drink Market in Zimbabwe

The soft drink market, which accounts for 87 percent of citric acid demand, is described below:

(1) Production and demand element

Figure 5–8 shows the monthly production of carbonated drinks during 1986 to '90.



Source : Central Statistical Office

Figure 5–8 Production of Aerated Beverages by Months

In general the demand for soft drinks is largely affected by temperature. The figure indicates a sluggish demand from June to July, which is the coolest season in Zimbabwe, and a peak from October to January in the hottest season. Production is steadily increasing. Production by year is indicated in Table 5–7.

Table 5–7 Annual Production of Aerated Beverages

Year	Annual Production (Million liters)	Growth Rate (%)
1986	129.7	
1987	146.7	13.1
1988	158.0	7.8
1989	173.3	9.7
1990	211.3	21.9

Source : Central Statistical Office

The average annual growth rate of the aerated beverage production has been about 13 percent for the past 5 years. Generally, supply capability is about 20 percent below domestic demand in the hottest season, especially December, as stated in the previous section. It is said that in this period soft drinks disappear from the shops. The dotted lines of Figure 5–8 indicates such a shortage as would be expected. As can be seen from the figure, the total shortage is estimated to be 5 percent of the annual aggregated production or thereabout.

Generally in the long run, the consumption of soft drinks is largely influenced by personal income level, economic conditions, and changes in people's favorite flavor. Relevant economic indicators for the consumption are summarized in Table 5–8.

Table 5–8 Economic Indicators Relevant to Beverage Consumption

Description	Year							
	1980	1981	1982	1983	1984	1985	1986	1987
(i) GDP Per Capita (Z$ Constant price base)	438	468	472	448	445	465	462	444
(ii) Private Consumption Expenditure (Million Z$)	2,184.0	2,934.0	3,369.0	4,235.0	3,885.0	4,310.0	4,752.0	–
(iii) Non-alcoholic Drinks (Million Z$)	105.2	133.0	208.2	346.3	277.5	405.7	485.1	–
(iv) (iii)/(ii) × 100 (%)	4.8	4.5	6.2	8.2	7.2	9.4	10.2	–
(v) CPI for Lower Income Drink and Tabacco	100.0	159.1	172.1	217.9	247.0	264.9	297.3	315.0

Sources : Statistical Yearbook 1989, Quarterly Digest of Statitics

During the period shown in the table, GDP per capita was substantially unchanged. The average annual growth rate of real GDP was about 2.7 percent, which was a slightly below the population growth rate of 3.0 percent. In the mean time, private consumption as a fraction of GDP had fallen from 63.5 percent in 1980 to 44.5 percent in 1986 on a constant price basis, as a result of an increase in net government expenditure. Also the growth rate of private consumption lagged behind the increase in the private consumption index. Final private consumption per capita on a constant price basis was 308 Z$ in 1980 and plunged to 227 Z$ in 1986. It is known that personal incomes have actually decreased.

On the other hand, the growth of the non-alcoholic drinks sector of private consumption has been very significant, and has shown an annual average growth rate of 29 percent on a current price basis, exceeding the average CPI of 20 percent. The non-alcoholic drinks expenditure as a fraction of private consumption rose from 4.8 percent to 10.2 percent in this period. This implies a very high growth rate of the demand for soft drinks.

It is generally explained that the consumption of soft drinks has high elasticity to personal income changes. A sharp increase in soft drink production might have been created by the steady growth of GDP in recent years (see Table 5–9).

Table 5–9 Key Macro Economic Indicators

	1988	1989	1990 (*1)
– GDP Growth Rate (%)	6.5	4.9	4.2
– GDP Per Capita Growth Rate (%)	1.6	4.2	1.4
– Consumption Per Capita Growth Rate (%)	-3.4	5.9	2.8

Note : (*1) Estimated figures

Source : A Framework for Economic Reform (1991–95)

(2) Soft drinks production and market share

The current overall production volume of soft drinks is estimated to be 230 million liters per year. Carbonated drinks account for over 90 percent and non-carbonated drinks (crush, squash and quench juices) for less than 10 percent.

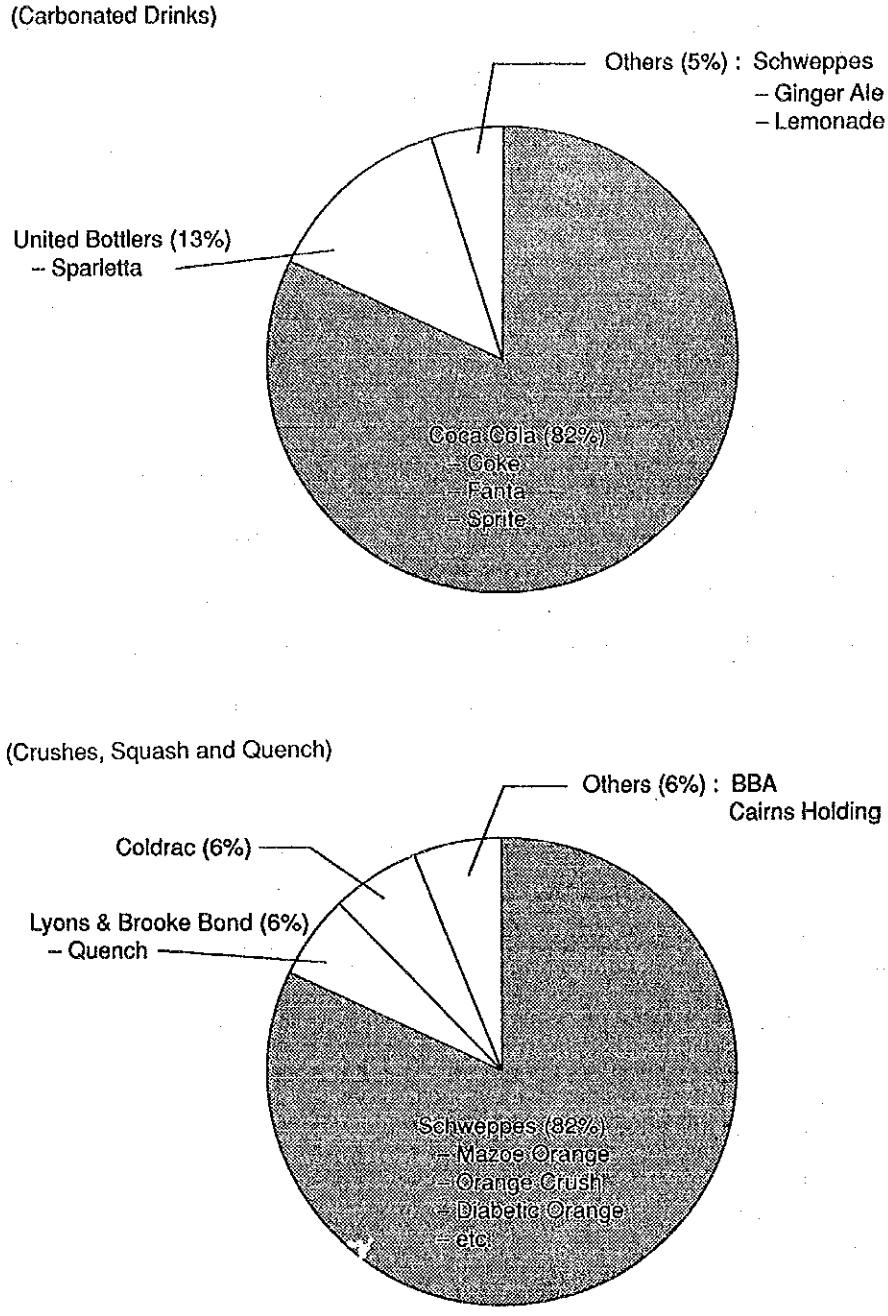


Figure 5–9 Market Configuration in Soft Drinks

Annual soft drink consumption per head is about 25 liters. Consumption for several other countries in 1989 is shown in Table 5–10 for comparison.

Table 5–10 Soft Drink Consumption and GNP/Capita 1989

Country	*Soft Drink* Consumption (ℓ/head)	*GNP per Capita* (US$)
– Portugal	37	4,260
– Spain	75	9,150
– UK	137	14,570
– USA	202	21,100
– Japan	50	23,730

Source : Getranke Industrie 1991–1

It is estimated that the citric acid content is about 0.1 percent by weight for carbonated drinks and 2.0 to 3.0 percent for non-carbonated.

5–2–3 Citric Acid Prices

(1) Comparison with international prices

The import prices of citric acid on a yearly basis are indicated in Figure 5–5 and 5–6 of the previous section. It should be noted that the data from 1985 to 1989 included chemicals other than citric acid such as tartaric acid, lactic acid and salicylic acid. The prices of these are likely to raise the statistical prices by about 20 to 30 percent above the international average prices. Thus the import prices (fob basis) are thought to be almost equivalent or slightly higher than the international prices.

(2) Domestic prices

The current price configuration is shown in Table 5–11. Mean figures, obtained through site surveys, are in the range of 7.0 to 9.0 Z$/kg.

Table 5–11 Citric Acid Price in Zimbabwe

	Description	Price
(1)	FOB price	1.3–1.6 US$/kg
(2)	Freight & insurance (*1)	
	(Israel-Durban)	0.08 US$/kg
	(Brazil-Durban)	0.11 US$/kg
(3)	Inland transportation (*1)	
	(Durban-Harare)	0.12–0.18 Z$/kg
(4)	Surtax	CIF × 20%
(5)	Sales commission for suppliers	Landing price × (15–25)%
(6)	Deliverly price or wholesale price	6.0–10.0 Z$/kg

Note: (*1) Transportation by 20 ton container. Inland transportation by truckload.

When citric acid is purchased through suppliers in Zimbabwe, commission fees of about 20 percent are added to the landing price. Market prices in Zimbabwe rose to 15.0 to 16.0 Z$/kg several years ago when world supply was tight and the import of citric acid was controlled by the foreign currency allocation system. In such a situation suppliers tend to have been one-sided price setters for small scale consumers. Also some suppliers are said to have sold citric acid at as much as 34.0 Z$/kg, which included over 100 percent commission.

5–2–4 Citric Acid Distribution

Large scale consumers, such as Schweppes, Coca Cola and Lever Brothers, often import citric acid directly for most of their own consumption since the more they exported their products, the easier they could acquire an import allocation and licenses for raw materials.

Medium and small scale consumers, amounting to more than thirty enterprises, purchase citric acid through chemical suppliers and agents in Zimbabwe since they don't have their own distribution networks for securing small quantities of citric acid. The number of such suppliers and agents might be more than twenty. Typical names for such suppliers and agents are listed below:

- Protea Chemicals
- Cairns Chemicals
- Sylvester & Kitchen

– HA Sewsel

– ICI Zimbabwe

– Cernol Chemicals

– Gerber Goldschmidt

– Bayer Zimbabwe

5–2–5 Competitiveness with Other Organic Acids

Malic acid, lactic acid and tartaric acid, which are all used as acidulants or food additives, and the competitiveness of citric acid relative to these acids are described as follows:

(1) Malic acid

Malic acid is a natural constituent of a lot of fruits such as apples, strawberries and peaches. Malic acid, as well as citric acid, is widely used in the field of beverages and food as an acidulant and in industrial applications. The world market for malic acid is estimated to be 25,000 to 30,000 tons/y.

Since malic acid only recently entered into the organic acid market, it accounts for only 4 percent of the total acidulant consumption. It is competitive with citric acid in terms of its flavor and taste. The current spot price of malic acid in U.S.A. is 1.79 US$/kg.

In the Republic of South Africa, Butakem (synthetic food additives and organic acidulants manufacturer) started operation of a 2,000 tons/y malic acid plant four or five years ago.

(2) Lactic acid

Lactic acid is a colorless or mild yellow syrup with a tart flavor which is similar to the taste of fermented milk. Lactic acid is used in the manufacture of rice wine, synthetic rice wine, fruit wines and soft drinks as an acidulant.

In Zimbabwe, Food & Industrial produces lactic acid with a monthly production of 80 tons of 25 percent solution, of which 95 percent is sold to a group company "Chibuku Breweries" as a raw material for the production of local beer. Delivery price of the lactic acid (25 percent solution) is 1.68 Z$/kg, equivalent to 0.56 US$/kg, whilst the current market price in U.S.A. is 2.34 US$/kg (for 88 percent solution, food grade, including delivery).

(3) Tartaric acid

Tartaric acid is a natural constituent of grapes. Production of tartaric acid largely depends on how the weather conditions affect grape output since its basic raw material is grapes. Generally, tartaric acid is used in the manufacture of hard type drops and candies, sauce, etc. as acidulant and baking powder as an expanding agent. Because tartaric acid is more expensive than other organic acids, it is principally used together with citric acid or malic acid. World annual production of tartaric acid is 30,000 to 35,000 tons. The current price in U.S.A. is 3.64 US$/kg.

Citric acid accounts for 75 percent of acidulant consumption because of its high water solubility, pleasant acid taste, chelating properties to stabilize color and flavor and price competitiveness. On the whole, malic acid is the most competitive with citric acid. On a global scale, however, citric acid will principally be the major acidulant even if transfer from citric acid to malic acid is anticipated as a world trend. The global citric acid market will grow further because there are many uncultivated market places for acidulant applications in developing countries.

In Zimbabwe as well, citric acid is predominant in the acidulant market. As described previously, only Cairns Holding consumes a small amount of malic acid (about 1 ton/y). Malic acid can substitute for citric acid, but in practice, it is seldom used for the main reason of price difference, said many beverage and food processing companies.

Penetration or export of malic acid produced by Butakem into the Zimbabwe market will be very small for the following reason:

For one reason, malic acid is slightly behind citric acid in popularity for giving a tart flavor to soft drinks and the sales of soft drinks vary depending on changes in people's favorite flavor. Another reason is that transfer to malic acid will not be so simple since specifications of products and materials for multinational companies like Coca Cola and Schweppes are controlled by headquarters and changes are usually made within the framework of total corporate strategies. (Malic acid import to Zimbabwe was not reported in 1990 trade statistics)

As for lactic acid, it is not expected to be competitive with citric acid in beverage applications because of lack of performance and high price although it can be substituted in food processing applications. Tartaric acid is not competitive with citric acid either.

5–2–6 Demand Forecast for Citric Acid in Zimbabwe

The regression analysis method is occasionally used to produce a demand formula using macro economic data. It should also be effective for forecasting the general trend of citric acid and soft drink demands. However it is not applicable in this study because of the many restraints both in relevant data acquisition and in detailed forecasting. Therefore subjective considerations must be used when forecasting citric acid demand taking into account the past trend in the demand growth and changes in the future environment of the beverage/food industries as well as the national economy.

The consumption of soft drinks, which accounts for more than 80 percent of total citric acid, has been steadily increasing even under the restrained circumstances of real personal income growth as indicated in the preceding section. In particular the growth of aerated drinks has been very high, amounting to 7.8 percent in '88, 9.7 percent in '89 and 21.9 percent in '90 compared with the private consumption expenditure growth per capita of –3.4, 5.9 and 2.8 percent respectively. In this period the GDP per capita growth rate is expected to be 1.6, 4.2 and 1.4 percent. This indicates a very high elasticity of soft drink consumption to personal income growth, in other words the potential demand for soft drinks is very large. It is projected that current soft drink consumption per head (about 25 liters/y) will increase to twice the current consumption level in parallel with the national income growth.

Food production has been increasing with an average annual growth rate of 3.1 percent from 1980 to '89, which was above the real GDP growth rate of 2.7 percent. The average growth rate of food production is expected to be around 5 percent per year on the basis of the index of leading economic indicators planned by the government.

Besides the above trend, the demand for the beverage and food sector will be influenced by Economic Reform Programs, Trade Liberalization Programs and demographic changes as listed below:

(a) Positive elements

- Increase in GDP (expected growth rate of 5%/y in 1995), GDP per capita and private consumption per capita (growth rate of 2%/y) resulting from the implementation of the trade liberalization and investment policy.
- Increase in capacity utilization (85 to 90%) and employment opportunity resulting from the structural adjustment programs.

– Increase in younger age groups of the population.

– Increase in social services for poor families (2nd family health project, etc.).

(b) Negative elements

– Increase in temporary unemployment as a result of structural changes.

– Long-running high inflation as a consequence of introducing competition and price decontrol.

– Introduction of the cost recovery system into public services.

Results of the citric acid demand forecast for Zimbabwe are summarized in Table 5–12.

Table 5–12 Forecast Demand for Citric Acid in Zimbabwe

Items	Demand (metric tons)			Average Annual Growth Rate (%)
	1990	1996	2000	1990–2000
Beverages				
– Carbonated	110	196	285	10.0
– Crush/Quench	430	610	770	6.0
Food Processing	58	78	95	5.0
Pharmaceutical	7	8	10	3.0
Others	15	18	20	3.0
Total	620	910	1,180	6.7

5–2–7 Markets for By-Products

This section describes market conditions for by-products related to sweet potato starch, which is the major derivative in the case of citric acid production using sweet potato starch extraction residues, gypsum produced in the citric acid separation process and cornstarch germ extracted in the case of cornstarch production.

(1) Sweet potato starch

In general, starch has very wide applications, such as for saccharose products, including glucose, starch syrup and isomerized sugar, processed starch, gelatin and adhesives for paper and corrugated fiberboard making, beer and other food products.

Its usage ranges over more than 2,000 applications. Starch is classified, according to its raw materials, into cornstarch, sweet potato starch, potato starch and wheat starch. Cornstarch accounts for about 90 percent of starch production in the world. Sweet potato starch and potato starch are produced in Japan, the Republic of Korea and the Netherlands, and this accounts for only 10 percent (or so) of the total starch production in each country.

When sweet potato starch, a new product for the market in Zimbabwe, is considered, the supply side should be reviewed initially.

Historically in the world, starch production originated from sweet potato or potato starch. Sweet potatoes or potatoes were major sources for world starch supply after World War II and then were continually replaced by maize. There are plenty of reasons for the replacement, such as 1) low starch concentration in sweet potatoes or potatoes and unequalized distribution of the starch content, 2) high transportation costs because of the high water content in potatoes, and 3) few applications for the by-products of potatoes, which includes starch extraction residues. But the biggest drawbacks of potato starch production were principally economic reasons, arising from the very low utilization of facilities throughout the year and the restriction in construction of large scale plants. The advantages of producing cornstarch as opposed to potato starches are as follows:

(a) All the ingredients of maize and its derivatives are utilized effectively.

(b) Large scale investment for the facilities is available because they can be operated through the year.

(c) By incorporating saccharose facilities into a wet milling facility, the construction of an advanced and integrated plant is possible, which can produce of dried starch by dehydrating starch solution and also several kinds of processed starch products.

The cornstarch industry can accomodate changes in the proportions of cornstarch, processed starch, starch syrup and glucose in its output as the demand requires. For example, when succharose demand and prices are high, starch syrup and glucose productions can be increased, and vice versa under opposite circumstances. Better profits can be obtained through increased processing of the starch and also good marketing to consumers.

In Zimbabwe, Food & Industrial is producing cornstarch at a monthly production rate of 500 metric tons and corn syrup of 500 metric tons for domestic demand. About 60 percent of the major applications are for the food processing, beverages and pharmaceutical industries and the remaining 40 percent for the paper, corrugated fiber board, and textile industries. Gluten and starch grits are also produced as derivatives for production of stock feeds. Domestic demand for cornstarch and corn syrup is expected to grow at an annual rate of 15 to 17 percent. Food & Industrial intends to expand the facilities under a technical collaboration with Amylum of Belgium.

Currently, starch production is not carried out on a large scale in Zimbabwe since the production of processed food is relatively small. However, it is recognized that the demand for cornstarch, as a more popular saccharose material, will grow steadily in the food processing and soft drink industries, and the demand for embryo, a maize derivative, is very firm in the vegetable (corn) oil market.

The following points in particular can be made when sweet potato starch is considered to be a principal by-product derived from citric acid production using the solid culture process.

(a) About 47,000 tons of sweet potato starch will be produced annually, if 3,000 tons of citric acid is made from the residues of sweet potato starch. The current starch market of 12,000 tons/y is expected to reach 26,000 tons/y in the middle of '90s using an annual growth rate of 17 percent, which was the figure indicated by Food & Industrial. Hence only 14,000 tons or about 30 percent, of the 47,000 tons produced can be expected to be sold domestically, even if the present cornstarch production level is not expanded.

(b) From the supply viewpoint, it will be difficult to provide sweet potato starch economically and stably, compared with the rather cheap cornstarch. For instance, the production cost of sweet potato starch is almost twice that of cornstarch in Japan, although the harvest yield of sweet potatoes in Japan is as much as ten times that of Zimbabwe.

(c) Sweet potatoes are not commercial items in Zimbabwe. It will be essential to produce 190 times more sweet potatoes than the current estimated production of 1,000 tons per year, to secure 47,000 tons/y of starch. This involves many uncertainties with regard to the technology, operations and economy.

In conclusion, a sweet potato starch industry, with a production capacity of 47,000 tons/y corresponding to 3,000 tons of citric acid, cannot be realized at present.

(2) Gypsum

(a) Gypsum market

Gypsum has wide applications as a raw material for cement, gypsum boards, plaster, etc. In Zimbabwe, Zimbabwe Phosphate Industries (Zimphos) makes over 70,000 tons of gypsum annually (water content of 20 percent), in the process of phosphate production for fertilizers (20,000 tons/y). About 35,000 tons of gypsum are sold for cement use, 35,000 tons for fertilizer and several thousand tons is exported to Malawi. There are three cement plants in Harare, Bulawayo and Colleen Bawn, with a total production which is estimated to be 800,000 tons/y. Production of cement has increased at an average rate of 8 percent/y in the past decade. 30,000 to 40,000 tons of gypsum are used annually in cement production. Gypsum is also used as a fertilizer to compensate for the sulfur content in soil. The current ex-factory price of gypsum is 25 Z$/ton.

An oversupply of gypsum has been created in the domestic market and several tens of thousand tons of gypsum are stockpiled at a Zimphos site. About 5,600 tons of gypsum will be made annually in the process of refining 3,000 tons of citric acid. The demand for gypsum will be stimulated by the growth of construction work. However, it is expected that finding a market for all of the 5,600 tons of gypsum will be critical.

(b) Applications

Both mineral and synthetic gypsum are available. Synthetic gypsum is obtained as a by-product of chemical industries and phosphogypsum, the by-product of phosphoric acid manufacture, accounts for over 70 percent of the total synthetic gypsum production. Other synthetic gypsums are often produced by chemical processes such as stack gas scrubbing and titanium dioxide and organic acid manufacture. Most of the synthetic gypsum is in the dihydrate form and can be converted to the hemihydrate form, which is called Plaster of Paris. Major uses are described below:

(Dihydrate gypsum)

- Can be added to portland cement clinker to stop the rapid reaction of calcium aluminates.
- Glass batch gypsum is added to the ingredients used to make glass as an oxidizing and fining agent and scum remover.
- Finely ground white gypsum, terra alba, has many accepted uses as a filler or an inert dilutent.

(Hemihydrate gypsum)

- Gypsum plaster.
- Gypsum wallboard.
- Plaster molds for casting nonferrous metals.
- Molding plasters to form cornices, columns, decorative moldings and other building interior features.
- High quality atmospheric calcined pottery plaster used in the ceramic industry in the production of dishes, sanitary ware, art ware, stone ware, etc.
- Orthopedic plasters are used in hospitals and clinics for all types of orthopedic cast work.
- Insecticide carrier

Another large volume use of gypsum is in agriculture. Generally, it is used for certain types of soils rather than for specific plants.

5–3 Citric Acid Markets in Southern Africa

Southern Africa in this study includes the Republic of South Africa and the countries of the Common Customs Union (Botswana, Lesotho, Namibia and Swaziland), plus Angola, Kenya, Madagascar, Malawi, Mozambique, Tanzania, Zaire, Zambia and Zimbabwe. Details of the Zimbabwe market are referred to in the preceding section.

5–3–1 Economic Background to Southern Africa

(1) Country profiles

Brief profiles of the various countries in Southern Africa are given in the following sub-section:

(a) Republic of South Africa

The Republic of South Africa continues to dominate over other Southern African countries in terms of economic and industrial strength. Economic and trade relations have been expanding despite the political situation. The Republic of South Africa is rich in agricultural products and has considerable mineral wealth. Minimal reserves of oil and gas offset by large reserves of coal encouraged the South Africans to use coal as a feedstock for fuel and petrochemical production. The manufacturing base includes the automotive industry, electronics and a thriving arms sector.

About 38 percent of GDP is accounted for by the services sector. Manufacturing accounts for 24 percent. Finance and insurance and mining make up 18 percent and 14 percent respectively.

Since the early 80s, the imposition of trade sanctions, disinvestment and depreciation of South Africa's Rand had negative effects on the economy, but a side effect was one of a continuing effort towards self sufficiency. The economy picked up in the late 1980s but ran into a balance of payments problem. With South Africa's access to international capital markets extremely limited, gold and foreign currency reserves fell. In 1988 the economy expanded at 3 percent or so but in 1989 it fell back to about 1 to 2 percent. The economy is still in a recession.

During the late 1980s the Republic of South Africa came under considerable external pressure to repeal the apartheid laws and reform the country. In an historic speech in February 1990, President de Klerk announced the unbanning of the ANC, the PAC, the SACP and 36 other political organizations.

Liberalisation has continued and in June 1991 the Group Areas Act and the Population Registration Act were repealed heralding a real end to Apartheid. The moves to a more liberal and democratic society have caused many countries to drop or at least modify economic sanctions against the Republic of South Africa. If peace and stability can be maintained the economic strength of the country will act as a prime mover in getting the economies of Southern Africa on an upward trend.

(b) Botswana

The economy has historically been based on cattle raising and crops. Agriculture today provides a livelihood for over 80 percent of the population, but produces only about 50 percent of food needs and contributes 5 percent to GDP. The driving force behind the rapid economic growth of the 1970s and 1980s has been the mining industry. This sector, mostly on the strength of diamonds, has gone from generating 25 percent of GDP in 1980 to over 50 percent in 1988. No other sector has experienced such growth, especially not that of the agricultural sector, which is plagued by erratic rainfall and poor soils. The unemployment rate remains a problem at 25 percent. A scarce resource base limits diversification into labor-intensive industries.

(c) Lesotho

Lesotho has no important natural resources other than water. Its economy is based on agriculture, light manufacturing, and remittances from laborers employed in the Republic of South Africa. Subsistence farming is the principal occupation for about 85 percent of the domestic labor force and accounts for about 20 percent of GDP. Manufacturing depends largely on farm products to support the milling, canning, leather and jute industries; other industries include textile, clothing, and light engineering. Industry's share of total GDP rose from 6 percent in 1982 to 10.5 percent in 1987. During the period 1985-87 real GDP growth averaged 2.9 percent per year, only slightly above the population growth rate.

(d) Namibia

The economy is heavily dependent on the mining industry to extract and process minerals for export. Mining accounts for almost 35 percent of GDP, agriculture and fisheries 10 to 15 percent, and manufacturing about 5 percent. Namibia is the fourth-largest exporter of non-fuel minerals in Africa and the world's fifth-largest producer of uranium. Alluvial diamond deposits are among the richest in the world, making Namibia a primary source for gem-quality diamonds. Namibia also produces large quantities of lead, zinc, tin, silver, and tungsten, and it has substantial resources of coal.

(e) Swaziland

The economy is based on subsistence agriculture, which occupies much of the labor force and contributes about 25 percent to GDP. Manufacturing, which includes a number of agroprocessing factories, accounts for another 25 percent of GDP. Mining has declined in importance in recent years. High-grade iron ore deposits were depleted in 1978, and health concerns cut world demand for asbestos. Exports of sugar and forestry products are the main earners of hard currency. Surrounded by the Republic of South Africa, except for a short border with Mozambique, Swaziland is heavily dependent on the Republic of South Africa, from which it receives 90 percent of its imports and to which it sends about 30 percent of its exports.

(f) Angola

Subsistance agriculture provides the main livelihood for 80 to 90 percent of the population, but only accounts for 10 to 20 percent of the GDP. Oil production is the most lucrative sector of the economy, contributing about 50 percent to GDP. In recent years, however, the impact of fighting an internal war has severely affected the economy and food has to be imported.

(g) Kenya

Nearly 80 percent of the working population is employed in the agricultural sector. Agriculture accounts for just over 30 percent of GDP. Over 50 percent of agricultural output is subsistance production. Undependable weather conditions and a shortage of arable land hamper long-term growth in agriculture. Population growth at 3.8 percent per year, one of the highest in the world, poses a serious underlying economic problem, however in recent years GDP growth has just exceeded population growth.

(h) Madagascar

Madagascar is one of the poorest countries in the world. During the early to mid years of the 1980s the population growth rate was 3 percent per year and the growth in GDP was minus 0.4 percent per year.

Agriculture, including fishing and forestry is the mainstay of the economy, contributing over 40 percent to GDP and employing 85 percent of the labor force. Agriculture makes up more than 70 percent of export earnings. Madagascar is the world's largest exporter of vanilla. Industry is confined to the processing of agricultural products and textile manufacturing. Industrial development has been hampered by government policies that have restricted imports of equipment and spare parts and put strict controls on foreign-owned companies. In 1986 the government introduced a five year development plan that stresses self-sufficiency in food, increased production for exports and reduced energy imports.

(i) Malawi

In terms of per capita income, Malawi is among the world's poorest countries having an average income less than that of Madagascar. In spite of being poor Malawi has been one of Africa's more notable development successes since independence despite problems of subsistance agriculture, low educational levels, shortage of skilled personnel, lack of mineral resources, inadequate infrastructure and import dependent industries. The economy is predominantly agricultural and operates under a relatively free enterprise environment, with 90 percent of GDP and 90 percent of export revenues.

(j) Mozambique

Mozambique's economy has suffered the damaging effects of a guerrilla war, drought, floods, famine, the displacement of population and severe scarcity of skilled workers and foreign exchange. Per capita income is about the lowest in Africa. Mozambique has failed to exploit the economic potential of its sizeable agricultural, hydropower and transportation resources. National output, consumption and investment, declined through the first half of the 1980s because of the internal disorders, lack of government administrative control and growing foreign debt. A steep increase in foreign aid, attracted by an economic reform policy, has resulted in successive gains of economic growth since 1985. Agricultural output, nevertheless is only at about 75 percent of its 1981 level and grain has to be imported. Industry operates at 20 to 40 percent of capacity, and the economy depends heavily on foreign assistance to keep it afloat.

(k) Tanzania

Tanzania is the third lowest country in terms of GNP per capita. Between independence in 1961 and the mid-1980s the main preoccupation of the nations' policy makers was to lift the majority of the population out of illiteracy, poverty and disease. The Arusha Declaration of 1967 put even greater emphasis on the elimination of these ills along the path to socialism and self reliance. The government pursued a policy of nationalisation of the major industries and the distribution and marketing sectors. Several years of severe economic decline from the late 1970s brought the country to economic collapse. In order to secure aid from international donors, the government adopted measures to redress the economy which were more pragmatic. The economy is heavily dependent on agriculture, which accounts for about 40 percent of GDP, provides 85 percent of exports and employs 90 percent of the work force. Industry accounts for about 10 percent of GDP and is mainly limited to the processing of agricultural products and light consumer goods. The economic recovery program has generated notable increases in agricultural output. The World Bank and the IMF have increased the availability of imports and provided funds to rehabilitate the deteriorated infrastructure.

(l) Zaire

Although Zaire commands enormous economic potential and is richly endowed with a wide range of resources, the mining sector dominates the economy, accounting for 85 percent of export earnings and 22 percent of GDP. Zaire's wide range of geography and climate produces a wide range of food and cash crops. About 66 percent of the working population is engaged in agriculture which provides about 28 percent of GDP. There is a huge potential both to rehabilitate and expand the agricultural sector and to tap the country's forestry resources. The large population represents a potentially significant consumer base and offers great incentives for developing industry and manufacturing. The most immediate obstacle to development is the lack of infrastructure of all categories - road, rail, river transport and telecommunications.

(m) Zambia

Metal mining has traditionally been the country's most important economic activity providing up to 95 percent of foreign exchange earnings. Up until the early 1970s mining accounted for up to 50 percent of GDP, but by the late 1980s accounted for no more than 9 percent. This fall was due to falling prices, rising costs and falling output. Agriculture accounts for about 15 percent of GDP. Manufacturing currently makes up a further 20 percent of GDP. The decline in the economy during the 1980s resulted in reduced imports and growing foreign debt. Economic difficulties stem from a sustained drop in copper production and ineffective economic policies. In 1988 real GDP stood only slightly higher than that of 10 years before while an annual population growth of more than 3 percent has brought a decline in per capita GDP of 25 percent during the same period. A high inflation rate has also added to Zambias' problems in recent years.

(2) Economic statistics

Salient economic statistics for the region by country are shown in Table 5–13.

Table 5–13 Salient Economic Statistics for Southern Africa, 1989

Country	Population (million)	Population Growth (%, 1980–89)	GNP per capita US$	GDP growth (%, 1980–89)	Calorie Supply (kcal/head)	Production of Softdrinks (10^5ℓ, 1984)	No. of Companies (1986)	
							Beverages	Food
South Africa								
Republic South Africa	35.0	2.4	2,470	1.5	3,035	12,395 (*1)	35	182
Botswana	1.2	3.4	1,600	11.3	2,269	98	18	92
Lesotho	1.7	2.7	470	3.7	2,307		[11]	
Namibia	1.7	3.1	1,030	0.4	1,889		---	---
Swaziland	0.7	3.4	810	2.2	---		3	9
Other Southern Africa								
Angola	9.7	2.6	610	---	1,725	99	---	---
Kenya	23.5	3.9	360	4.1	1,973	3,256	---	---
Madagascar	11.3	2.9	230	0.8	2,101		29	86
Malawi	8.2	3.4	118	2.7	2,009		4	24
Mozambique	15.3	2.7	80	–1.4	1,632	77	16	51
Tanzania	23.8	3.1	130	2.6	2,152		---	---
Zaire	34.5	3.1	260	1.9	2,034	826	---	---
Zambia	7.8	3.7	390	0.8	2,026	267	9	96
Zimbabwe	9.5	3.5	650	2.7	2,232	(1,000)	18	102

Note : (*1) Including mineral waters
Source : World Development Report, Industrial Statistical Yearbook

(3) Regional organisations

There are three main organisations in the region:

- Southern African Development Co-ordination Conference (SADCC)
- Preferential Trade Area for Eastern and Southern Africa (PTA)
- Southern African Customs Union

(a) SADCC

The first conference was held in Tanzania in 1979, to harmonize development plans and to lessen the region's economic dependence on the Republic of South Africa.

The membership includes ten countries as described in Chapter 3. The conference has its headquarters in Gaborone, Botswana.

The Lusaka Declaration in 1980, a statement of strategy entitled "Southern Africa: Towards Economic Liberation", was approved, together with a program of action allotting specific studies and tasks to member governments. The members aimed to reduce their dependence on the Republic of South Africa for rail and air links and port facilities, imports of raw materials and manufactured goods, and the supply of electric power. In 1985, however, SADCC report noted that since 1980 the region had become still more dependent on the Republic of South Africa for its trade outlets, and the 1986 summit meeting, although it recommended the adoption of economic sanctions against the Republic of South Africa, failed to establish a timetable for doing so.

In August 1989 it was reported that US $2,537 million of the $6,313 million, required for SADCC projects had been secured. At the donors' conference held in January 1990, the World Bank announced that it was to provide $4,000 million for SADCC member states over the next five years.

(b) PTA

The PTA was founded in 1981 and has its headquarters in Lusaka, Zambia. Member states consists of nineteen countries. The PTA was set up with the aim of improving commercial and economic co-operation in the region and transforming the structure of production of national economies in the region; promoting regional trade and the creation of institutional mechanisms, including monetary arrangements, for facilitating trade, supporting inter-country co-operation in the rationalisation of existing national excess capacity and high-cost industries, and the development of basic and strategic industries; promoting co-operation in agricultural development and improvement of transport links, and the development of technical and professional skills.

The Reserve Bank of Zimbabwe operates a clearing house for transactions for goods and services within the PTA, enabling member states to conduct multilateral trade in their own currencies. From July 1984 tariff reductions (of between 10 percent and 70 percent) were introduced for selected commodities, and in 1987 it was announced that further reductions (of 10 percent every two years) were to be made for these commodities. PTA travellers' cheques, denominated in the PTA unit of account (UAPTA, equal to one IMF Special Drawing Right), were introduced in 1988. A PTA Trade and Development Bank, based in Bujumbura, Burundi, became operational in 1986, with an authorised share capital of UAPTA 400 million. The PTA Federation of Chambers of Commerce and Industry, the Association of PTA Commercial Banks, and the PTA Centre for Commercial Arbitration, were also formed.

(c) Southern African Customs Union

The Southern African Customs Union was founded in 1969 and has no permanent headquarters. The Customs Union Commission meets annually in each of the members' capital cities in turn. The membership includes, Botswana, Lesotho, the Republic of South Africa and Swaziland. The Customs Union provides a common pool of customs, excise and sales duties, according to the relative volume of trade and production in each country. Goods are traded within the Union free of duty and quotas, subject to certain protective measures for less developed members. The South African Rand is legal tender in Lesotho and Swaziland.

5–3–2 Citric Acid in Southern Africa

(1) Introduction

Estimates of citric acid consumption were based on detailed discussions with the major suppliers to the region. These suppliers included those based in the Republic of South Africa plus major West European suppliers contacted in West Europe. Trade data was also used where available as back up to the data.

All citric acid consumed in Southern Africa is food grade. Industrial or non food related uses are minimal consequently the suppliers only stock the food grade product. Most of the consumers of citric acid have their own specifications which usually relate to crystal size and or size distribution and solubility. Where physical characteristics are critical the consumers usually have an approved list of suppliers.

In 1990 consumption of citric acid in Southern Africa totalled 4,620 metric tons. The republic of South Africa dominates the market with 60 percent of consumption, followed by Swaziland with 16 percent of regional use as demonstrated in Table 5–14.

Table 5–14 Citric Acid Consumption in Southern Africa, 1990

Country	Consumption (metric tons)
South Africa	
Republic of South Africa	2,750
Swaziland	750
Others	negl.
Sub-total	3,500
Other Southern Africa	
Zimbabwe	620
Kenya	150
Madagascar	100
Zambia	100
Malawi	50
Mozambique	45
Tanzania	30
Zaire	25
Angola	negl.
Sub-total	1,120
Total	4,620

The relative importance of the main consuming countries is shown in Figure 5–10.

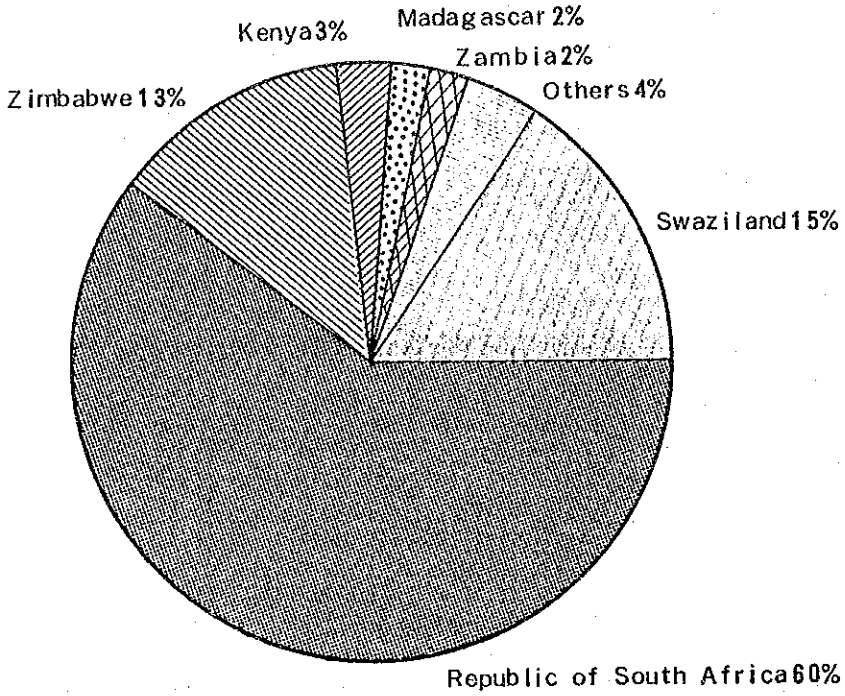


Figure 5–10 Citric Acid Consumption in Southern Africa, 1990 (Percent of Consumption)

Citrate consumption is minimal in Southern Africa and is limited to the Republic of South Africa: The estimated demand for citrates is outlined in Table 5–15.

Table 5–15 Citrate Consumption in the Republic of South Africa, 1990

Citrate	Consumption (metric tons)
– Potassium Citrate	
Food Industry	90
Pharmaceuticals	50
	140
– Sodium Citrate	
Pharmaceuticals	50
Industrial	10
	60
Total	200

The market is showing very little growth.

About 90 percent of citric acid consumption is accounted for in the production of beverages and foodstuffs such as jams and jellies etc. Beverages alone account for some 70 percent of total regional use, see Table 5–16.

Table 5–16 Citric Acid Uses in Southern Africa

Use	*Consumption* (metric tons)
Beverages	3,280
Food	960
Pharmaceuticals	280
Industrial	100
Total	4,620

The markets for citric acid in South Africa and other Southern African states are discussed in the following sections.

(2) Current and future citric acid market in South Africa

(a) Demand

South African (Republic of South Africa and Swaziland) citric acid consumption was estimated to total 3,500 metric tons in 1990, an increase of about 1,000 tons over the 1985 level. The implied growth rate across the period was 7 to 8 percent per year. The rapid rate of growth is mainly a reflection of the start up of the Coca Cola (Conco) plant in Swaziland some 4 to 5 years ago.

South African citric acid consumption is depressed by about 1,000 tons per year due to the availability of malic acid which is priced slightly cheaper than duty paid imported citric acid. The malic acid displaces citric acid in many applications but more particularly in the production of cheap beverages, especially the dry powder variety.

Malic acid is produced by Butakem, a company set up at Butterworth in the Transkei in 1974.

Butakem is primarily involved in the manufacture of synthetic food additives and organic acidulants for the local and export markets. The primary products produced by Butakem are malic acid, tartaric acid, cream of tartar and fumaric acid. In addition, by-products arising from the manufacturing processes include sodium tartrate, potassium tartrate and Rochelle salts. Estimated production is shown in Table 5–17.

Table 5–17 Acidulants Production by Butakem, 1990

Acidulants	Production (metric tons)
Malic acid	2,000
Tartaric acid	600
Fumaric acid	480
Cream of tartar	60
Total	3,140

It was hoped that when the company was set-up in the mid-1970s that it would get support from the soft drink producers. This was not forthcoming because malic acid is not suitable on grounds of taste/acidity for many beverages. In order to protect the company an import tariff was imposed on citric acid imports and current malic acid price is 4.45 to 4.50 R/kg for 3 ton lots which was priced at a level just below that of duty paid citric acid.

Malic acid is expected to hold onto about 1,000 tons of the citric acid market through the 1990s as an equilibrium has been reached.

South African citric acid consumption pattern is dominated by the beverage sector. Carbonated and dry powder beverage production accounted for 64 percent of total citric acid consumption in 1990. The end use pattern is summarised in Table 5–18.

Table 5–18 Citric Acid Consumption in South Africa by End-Use, 1990

End Uses	Consumption (metric tons)
– Beverages	
Carbonated	1,420
Dry Powder	830
Sub-Total	2,250
– Food Processing	
Fruit Juice processors	300
Fruit processors	200
Oil and fats	70
Flavor manufacturers	50
Sub-Total	620
– Other Uses	
Pharmaceuticals	280
Miscellaneous food/beverage uses	250
Industrial/miscellaneous uses	100
– Total	3,500

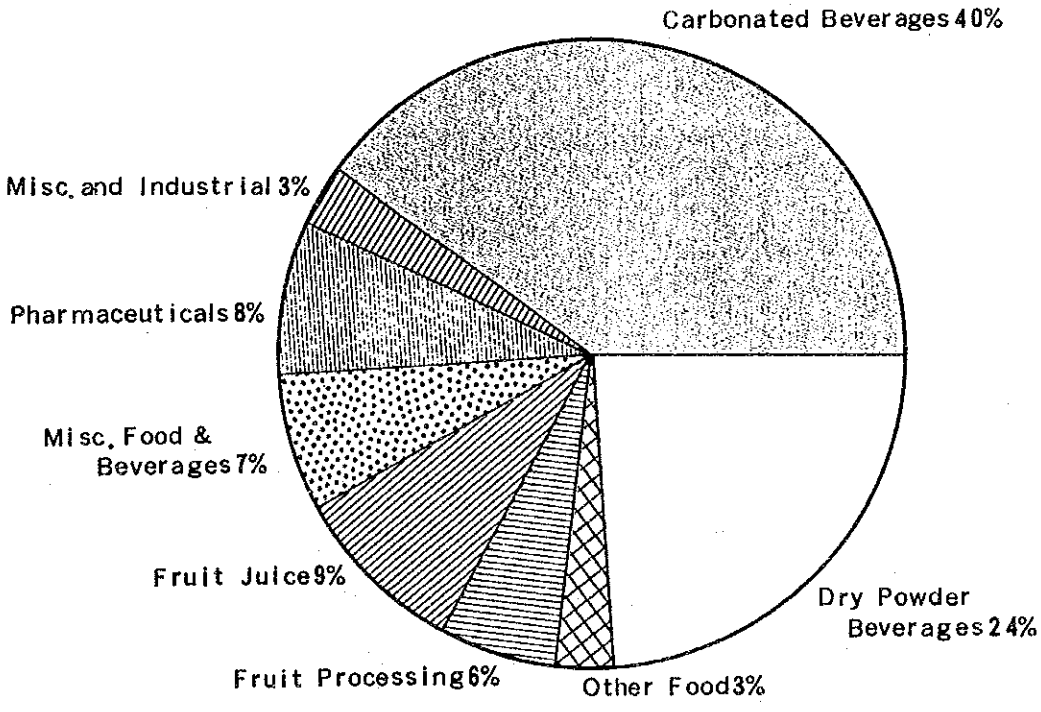


Figure 5–11 Citric Acid Consumption in Southern Africa, 1990 (Percent of Consumption)

The relative importance of the various sectors is shown in Figure 5–11.

(i) Beverages

The beverage sector is divided into two parts, carbonated beverages and dry powder beverages.

a. Carbonated Beverages

The carbonated beverage sector is dominated by the Coca Cola concentrate plant (Conco) located in Swaziland. The Conco plant produces beverage bases (concentrate) for all of Coca Cola's brands sold in Southern and Eastern Africa. The citric acid is used in products such as Fanta, Sprite and Diet Coke but not in Coca Cola which uses phosphoric acid as the acidulant.

The concentrates are sold on to the various bottling plants in Southern and Eastern Africa. The countries supplied include:

- Angola
- Botswana
- Burundi
- Lesotho
- Malawi
- Mozambique
- Republic of South Africa
- Rwanda
- Swaziland
- Tanzania
- Zaire
- Zambia

The Kenyan and neighboring markets are supplied from a concentrate plant in Kenya, and the Zimbabwean market by a plant owned by Coca Cola Export in Zimbabwe. West African markets are supplied with concentrate from Western Europe and Nigeria.

Conco's citric acid demand has been and is forecast to grow by about 10 percent per year through the 1990s. The majority of the demand is in the Republic of South Africa. Demand growth is mainly from the low income population which perceives carbonated beverages to be modern and Western. The carbonated beverage sector is growing at the expense of Kaffir Beer which is in a decline. The Coca Cola brand names also have considerable influence on purchasing patterns.

Sparletta is the second largest consumer of citric acid in carbonated beverage production. Sparletta has no concentrate capacity and no bottling plants. The concentrates are produced by two flavor houses; Bush Boake Allen and Quest. The beverages are subsequently made up by various bottling companies under contract.

Suncrush is the third largest beverage company and produces concentrate for sale on the domestic and export markets. Schweppes has a minor presence in South Africa and is the smallest of the major carbonated beverage producers.

Rumour has it that Pepsi Cola is to restart production in the Republic of South Africa by the end of 1992. This additional beverage capacity could add some 150 to 300 metric tons to citric acid demand.

The estimated offtake of citric acid by company in the carbonated beverage sector is shown in Table 5–19.

Table 5–19 Citric Acid Consumption in Carbonated Beverage Bases, 1990

Company	Consumption (metric tons)	
Conco	750	
Sparletta	320	(*1)
Suncrush	250	
Schweppes	100	
Pepsi Cola	–	(*2)
Total	1,420	

Notes:
(*1) 140 metric tons used by Bush Boake Allen.
180 metric tons used by Quest.
(*2) 150 to 300 metric tons by end 1992.

The total demand for citric acid in carbonated beverage bases is, according to the industry, growing at about 7 percent per year.

b. Dry Powder Beverage Mixtures

Dry powder beverage mixtures are essentially fruit flavored bases which are mixed with water by the consumer. These beverages are cheap and are produced by several companies. In the production of these mixtures citric acid competes with the slightly cheaper locally produced malic acid. The major producers of dry beverage mixtures with their estimated offtake of citric acid in 1990 are shown in Table 5–20.

Table 5–20 Citric Acid Consumption in Dry Beverage Mixtures, 1990

Company	Consumption (metric tons)
Funa Foods	200
Nutritional Foods	150
Jubla Foods	80
Others	400
Total	830

A significant proportion of the dry beverage mixtures is sold through the mine canteens. The major suppliers to the mine canteens are Funa Foods, Nutritional Foods and Jubla Foods. The mining sector is currently going through a recession and the sales of powdered beverage mixtures through the canteens have fallen drastically. Funa Foods, Nutritional Foods and Jubla Foods have recently reduced their purchases of citric acid by some 50 to 70 percent. The medium term trend in this part of the beverage sector is however slow growth.

(ii) Food processing

The food sector includes basically fruit juice processors, fruit canners/processors, oil and fat transformation, and the flavor processors producing flavor bases for resale to the food and beverage industries in general. Consumption of citric acid by the main food processing companies is shown in Table 5–21.

Table 5–21 Citric Acid Consumption in Food Applications, 1990

Food Sector	Company	Consumption (metric tons)
Fruit Juices	Langeberg Coop	150
	Ceres Fruit Juices	150
Fruit Processors	Letaba Citrus Processors	100
	Grannor Passic	100
Oils and Fats	Unilever	70 (*1)
Flavor Houses	International Flavours and Fragrances	
	Haarman and Reimer	50 (*2)
	Quest	
Total		620

Notes:
(*1) Citric acid containing base made up by Quest.
(*2) Citric acid used to produce flavor bases for resale; excludes custom production.

The food processing industry is showing a slow growth of about 2.5 to 3.0 percent per year.

(iii) Pharmaceuticals

Pharmaceutical production is dominated by Beechams Pharmaceuticals. Beechams produces Enos Fruit Salts, basically an antacid formulation produced from various" fruit salts " including citric and tartaric acids. The sales of Enos are stagnating and Beechams intends to reformulate the product so as to drop the price and hopefully stimulate sales. In reformulating Enos, Beechams will reduce or eliminate the quantity of tartaric acid used, because tartaric acid at R20.0 per kg is about 4.5 times more expensive than citric acid. Beechams intends using more citric acid to replace the tartaric acid. The reformulation is due to be completed during 1993. If successful this reformulation will increase Beechams citric acid demand by 130 metric tons.

Estimates of citric acid consumption in pharmaceutical application are shown in Table 5–22.

Table 5–22 Citric Acid Consumption in Pharmaceutical Applications, 1990

Company	Consumption (metric tons)
Beechams Pharmaceuticals	200 (*1)
Others	80
Total	280

Notes:
(*1) Will rise to 330 metric tons during 1993.

The use of citric acid in pharmaceutical applications is showing minimal growth. However, the reformulation of Enos Fruit Salts by Beechams will lead to a step increase in 1993/1994.

(iv) Miscellaneous food/beverage uses

The miscellaneous food/beverage use sector is composed of a large number of consumers, possibly of the order of 60 to 80 companies purchasing small volumes of citric acid for food and beverage use. This miscellaneous sector will track the growth of food/beverage sectors.

(v) Industrial/miscellaneous uses

The industrial/miscellaneous sector accounts for 100 metric tons maximum of citric acid. The main outlet for citric acid in this sector is in the production of detergents by Unilever. This particular end use probably accounts for some 30 metric tons or so. Other minor uses of citric acid include for example, electro plating solutions.

(b) Total citric acid market development

Citric acid demand in South Africa is forecast to grow from the 1990 level of 3, 500 metric tons to 5,750 tons by 2000. The implied growth rate across the period is 5.1 percent per year. The production of beverages will continue to dominate the consumption pattern as demonstrated in Table 5–23.

Table 5–23 Forecast Demand for Citric Acid in South Africa, 1990 to 2000

Uses	Demand (metric tons)			Average Annual Growth Rate, %
	1990	1996	2000	1990–2000
Beverages	1,420	2,130	2,800	7.0
Carbonated	830	1,010	1,150	3.3
Dry Powders	2,250	3,140	3,950	5.8
Food Processing	300	350	390	2.7
Fruit Juice Processors	200	240	260	2.7
Fruit Processors	120	140	160	2.9
Other	620	730	810	2.7
Other Uses				
Pharmaceuticals	280	360	420	4.1
Miscellaneous food/beverage	250	340	420	5.3
Industrial/miscellaneous	100	130	150	4.1
Total	3,500	4,700	5,750	5.1

(c) Supply

As there is no production of citric acid in South Africa, demand is met by imports.

Several companies have considered the production of citric acid, and in the mid-1980s a small pilot plant with a capacity of 120 metric tons per year operated briefly. The plant used South African molasses as feedstock.

Companies that have considered or which are considering citric acid production include:

(i) NCP (Centrachem: Ethanol producer)

(ii) AECI (African Exposive Chemical Industry)

(iii) CG Smith Chemicals (CG Smith Sugar Ltd)

Both NCP and AECI investigated the local markets for citric acid and various routes to its production. Both companies abandoned the idea due to:

(i) The small size of the Southern Africa market.

(ii) Adequate world capacity.

(iii) Lack of suitable feedstock - local molasses are cheap, but have a low concentration of fermentable sugars, are high in waxes and have a high potash content.

CG Smith Chemicals, a division of CG Smith Sugar Ltd of Durban (the largest producer of sugar in the Republic of South Africa) recently carried out a citric acid feasibility study. Although the company has yet to commit itself to the project it is known that:

(i) Board approval has been given to consider the project in more detal.

(ii) Two feedstocks, molasses and sugar, are being evaluated.

(iii) Tentative capacity is set at 10,000 metric tons per year.

(iv) The company acknowledges that due to the small size of the local market, exports of citric acid out of the region will be required.

Imports of citric acid into South Africa (Republic of South Africa) have grown from 2,600 tons in 1985 to nearly 4,200 tons in 1990. The development of the import pattern is shown in Table 5–24.

Table 5–24 Imports of Citric Acid into the Republic of South Africa (Metric Tons)

1985	1986	1987	1988	1989	1990
2,587	3,186	3,490	3,509	3,198	4,195

About 15 percent of these imports are re-exported to the other countries of Southern Africa. Zimbabwe took over 50 percent of the re-exports in 1990. Other recipients of the re-exports include Zambia, Malawi and Mozambique.

The fluctuation of the level of citric acid imports year on year is not a reflection of market conditions but that of stock build up and draw down at the supplier level. Large consumers tend to import direct to the plant whereas the smaller users take product as and when necessary from the various suppliers in the Republic of South Africa. The major suppliers usually hold about three months stocks at any one time.

About 65 percent of supplies are drawn from the West European producers, as indicated in Table 5–25.

Table 5–25 Citric Acid Imports into the Republic of South Africa by Origin, 1990

Company	Quantity (metric tons)
Belgium	1,181
Ireland	677
United Kingdom	433
Israel	306
Austria	297
Hong Kong (*1)	272
Brazil	262
Germany	111
Switzerland	38
Others	618
Total	4,195

Note:
(*1) Mainly traders dealing in Far Eastern products

There are six major suppliers to the South African market, but about 50 percent or more of supply is covered by Roche Products and Pfizer. Roche is the major single supplier. The major suppliers with their agents are listed in Table 5–26.

Table 5–26 Major Citric Acid Suppliers to South Africa

Country	Producer	Agent/Supplier in RSA
Belgium	La Citrique Belge (Roche)	Roche Products
Ireland	ADM	Pfizer
United Kingdom	Sturge (Bayer)	Chem Services
Brazil	Fermenta	Haarman and Reimer
		Protea
Austria	Jungbanzlauer	Lovascz
Israel	Gadot	
	Hong Kong Traders	Various agents
	Others	

(d) Prices

The Republic of South Africa reports import prices on an fob basis. In 1990 imports of citric acid totalled 4, 194, 737 kgs with an fob value of R14, 837, 944. This indicates an fob value of R3.5 per kgs (equivalent to 3.8 Z$/kg or 1.3 US$/kg using current exchange rates).

Depending on the size of the customers the duty paid delivered price of citric acid falls in the range R4.3 to R4.6 per kg (4.7 – 5.0 Z$/kg or 1.5 – 1.6 US$/kg). Conco, the largest single customer in Southern Africa, pays about R4.4 per kg delivered, due to its distance from Durban. Conco takes delivery in containers direct from the producers.

Both current fob unit price and delivery price are cheaper than world average prices.

(e) Tariffs

The import tariffs are calculated in one of two ways depending on which one is the greater.

(i) fob price of citric acid plus 15 percent of the fob value or

(ii) R3.8 per kg less 85 percent of the fob value.

Duty is paid on entry to the Republic of South Africa and the product then moves across the borders of the custom union countries without attracting further duty.

When citric acid is re-exported or transhipped from the RSA duty is paid only once, by the final importing country.

(3) Current and future citric acid markets in other South African states

(a) Demand

Citric acid consumption in the other South African states totalled an estimated 1,120 metric tons in 1990, some 200 metric tons up on the 1985 level. The implied growth rate across the period was 4 percent per year. About 73 percent of all citric acid is consumed in the production of beverages. The remainder is used in various food application in Zimbabwe and Kenya.

Zimbabwe and Kenya are the major users of citric acid accounting for 55 percent and 14 percent of consumption in this sub region. Both Zimbabwe and Kenya have beverage concentrate plants operated by the Coca Cola company. The Zimbabwe plant is basically for the domestic market and the Kenya plant supplies the domestic market and export markets of Somalia, Tanzania and Uganda. Export volumes to these countries are minimal due to the lack of foreign exchange. The largest consumer of citric acid in beverages in this sub region is Schweppes in Zimbabwe.

The Zimbabwean citric acid market is the most developed market in this sub region. Nearly 90 percent of consumption is accounted for in the production of beverages and the remainder in food applications. The major single user is Schweppes which accounts for about 60 percent of Zimbabwean consumption (see preceding section).

Future regional citric acid demand growth will continue to be led by beverage production. Growth in beverage consumption largely depends on:

(i) Population growth

(ii) Inflation

(iii) Real GDP growth

Growth in citric acid consumption in countries other than Zimbabwe and Kenya with their own large concentrate plants will be moderated downwards by the import of concentrate from the Republic of South Africa etc. In all countries the availability of foreign exchange to finance imports of citric acid and spare parts for bottling equipment will also tend to reduce consumption to below its natural potential. For example it is believed that although consumption of citric acid in Kenya is of the order of 150 metric tons the underlying demand is probably closer to 400 tons.

Growth in consumption of citric acid in the sub-region (except Kenya and Zimbabwe) is not expected to exceed that of population growth as shown in Table 5–27.

Table 5–27 Forecast Development in Citric Acid Consumption In Other African States, 1990 to 2000

Country	Consumption (metric tons)			Average Annual Growth Rate, %
	1990	1996	2000	1990–2000
Zimbabwe	620	910	1,180	6.7
Kenya	150	180	210	3.4
Madagascar	100	120	130	2.6
Zambia	100	120	130	2.6
Others	150	180	200	2.9
Total	1,120	1,510	1,850	5.2

(b) Supply

There is no production of citric acid in the other South African states. However it should be noted that a small citric acid plant was built in the early 1980s at Kisamu in Kenya. This plant was molasses based. The plant has never operated and is currently in a semi derelict condition. Schweppes had considered buying the plant and moving it to the Republic of South Africa. This has been abandoned, and it is now believed that the plant can never be rehabilitated. With no local production demand is covered by importation. A large proportion of the citric acid, nearly 60 percent, is supplied as re-exports from the Republic of South Africa. The remainder is imported directly as shown in Table 5–28 and Figure 5–12.

Table 5–28 Citric Acid Supplies to Other South African States, 1990 (Metric Tons)

Country	RSA Re-exports	Direct	Total
Zimbabwe	350	270	620
Kenya	–	150	150
Madagascar	100	–	100
Zambia	80	20	100
Malawi	50	–	50
Mozambique	45	–	45
Tanzania	–	30	30
Zaire	–	25	25
Total	625	495	1,120

(c) Tariffs

The import duties on citric acid and its salts vary from 10 percent in Angola and Zaire to 35 percent in Madagascar. The rates of duty applicable in 1991 for the various other South African states are summarised in Table 5–29.

Table 5–29 Import Duties Payable on Citric Acid and Its Salts in South African Countries, 1991

Country	percent cif
Angola	10
Kenya	30
Madagascar	35
Malawi	25
Mozambique	15
Tanzania	30
Zaire	10
Zambia	15
Zimbabwe	20

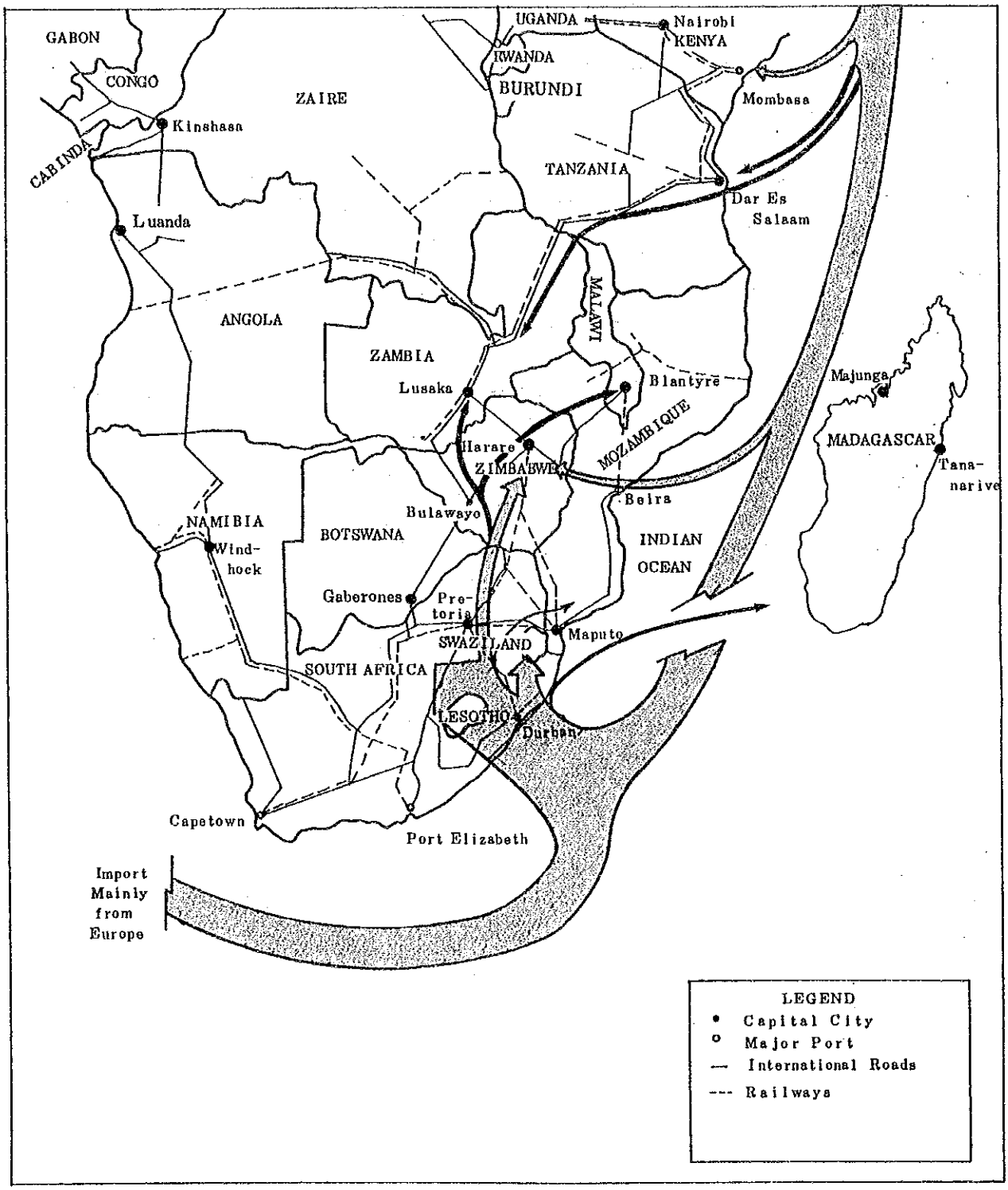


Figure 5–12 Citric Acid Movement in Southern Africa

5–3–3 Regional Summary

(1) Demand

Total citric acid consumption in Southern Africa is forecast to grow from the 1990 level of 4,620 metric tons to 7,600 tons by 2000. The implied growth rate across the period is 5.1 percent per year. South Africa will continue to dominate the demand pattern as shown in Table 5–30.

Table 5–30 Forecast Development in Citric Acid Demand in Southern Africa, 1990 to 2000

Country	Demand (metric tons)			Average Annual Growth Rate, %
	1990	1996	2000	1990–2000
RSA/SACU	3,500	4,700	5,750	5.1
Zimbabwe	620	910	1,180	6.7
Kenya	150	180	210	3.4
Madagascar	100	120	130	2.6
Zambia	100	120	130	2.6
Others	150	180	200	2.9
Total	4,620	6,210	7,600	5.1

(2) Supply

Although no company has announced that it will start production of citric acid it should be noted that CG Smith are actively considering building a plant in the Republic of South Africa. The company is of the opinion, that if a plant is built the capacity should not be less than 10,000 metric tons per year.

If such a plant is built and onstream by the mid-1990s, the region will become a net exporter of some 4,000 tons per year in the mid-1990s, falling to about 2,400 tons per year by the late 1990s.

If no capacity is built regional imports of citric acid will rise through nearly 6,000 tons in the mid 1990s to reach just over 7,600 tons by the end of the decade.

5–4 Plant Production Capacity and Sales Prices

5–4–1 Market Domain and Plant Production Capacity

Production capacity of citric acid plant is estimated on the basis of potential demand both in Zimbabwe and neighboring countries. It should be recognized that the structure of the citric acid industry in global terms is of an oligopoly nature; major producers, principally in Europe and U.S.A., pay attention to other corporate activities in competitive situations on world markets. There seems to be a strategic motive in their corporate activities, such as price setting, investments in new facilities and export activities and the competition is often very intense. Under such circumstances, changes in the world supply and demand balance directly result in changing citric acid prices. If a citric acid plant, which is rather export oriented, is built in Zimbabwe, the export price of its products will have to follow the movement of global market prices for citric acid. In other words, because of high price sensitivity, the market share can be expanded by corporate strategy and marketing efforts.

This section estimates the production capacity of the proposed plant objectively based on data and analysis information but there is no intention of estimating the influence of marketing on plant capacity.

The following premises are considered in the estimate:

- Capacity is based on market size in 1996, or first year of operation.
- Quality of the products will conform with BP or FCC standard for food grade. Principally products are of monohydrate grade but anhydrous grade can be made available, when necessary.
- Quality will be maintained at the average standard of imported products or equivalent.

(1) Potential sales in the Zimbabwe market

In most citric acid importing countries, a simple relationship can be seen between fob import prices of citric acid and import quantity. Figure 5–13 (graph 1) shows a conceptual distribution between citric acid import price on the horizontal axis and cumulative import quantity of citric acid on the vertical axis based on trade statistics for Zimbabwe, France, Greece, Portugal and Pakistan.

The ratio of maximum to minimum import prices is in the range of 1.5 to 1.7. Imports from China, which produces over 10 percent of the world market, are shown in the figure where the curve has an initial step at the cheapest price. Cumulative import quantity rapidly rises as import price increases as shown. The mediam price is somewhere between 1.3 and 1.6 US$/kg. Graph 2 in the figure shows a conceptual relation between citric acid domestic price in Zimbabwe and cumulative import quantity. It is expected that the domestic prices are scattered over a wider range as a result of adding ocean freight costs, insurance cost, import tariff, domestic transportation costs and supplier's commission.

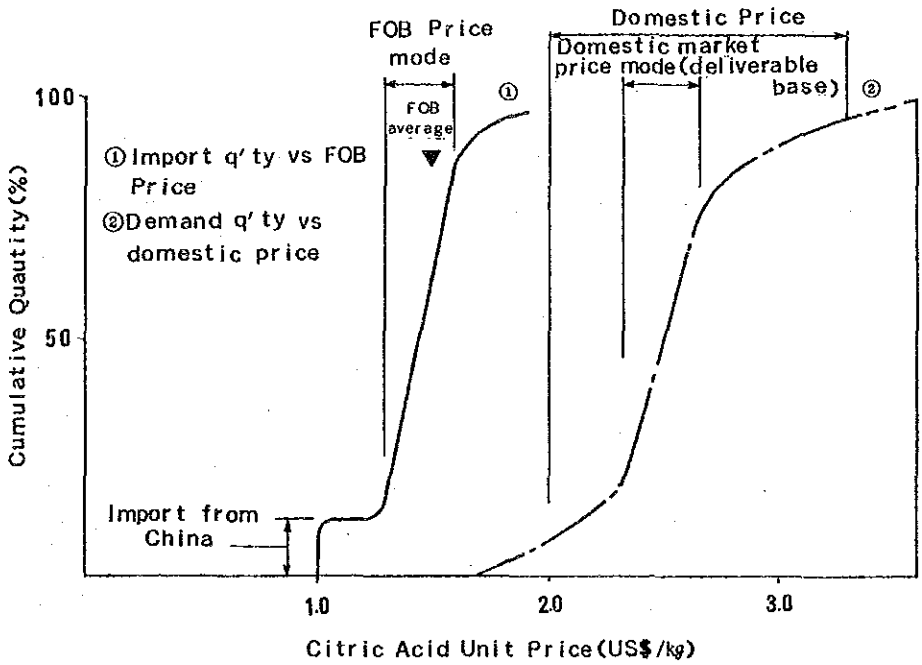


Figure 5–13 Conceptual Distribution-Citric Acid Quantity and Price in Zimbabwe

If a plant is built in Zimbabwe and citric acid is priced competitively with imports at current tariff levels, it would not seem unreasonable for such a supplier to capture most of the Zimbabwe market. In making this assumption however, the following points should be taken into consideration:

(a) Fair competition with the Chinese products will be difficult since the prices are 30 to 50 percent cheaper than the usual imports. Hence it is presumed that the average amount imported from China will be 10 percent of market demand and this quantity is excluded from the potential sales.

(b) Sales to Coca Cola will be difficult to make in the early stages because Coca Cola has a rigid specification which is applied throughout the world and has a list of approved suppliers. Details are given in a subsequent section.

Capacity or sales potential for the Zimbabwe market is estimated as follows:

• Projected market size in 1996	.....	910 tons/y
• Imports from China	.....	–90
Capacity (share)		820 tons/y (90%)

(2) Potential sales in the Republic of South Africa and Southern African Customs Union

One of the characteristics of the RSA and SACU markets is that consumers have stringent requirements for both the quality and the price which are as sophisticated as those in the developed world. A Zimbabwean company would have to compete on the same basis as any other supplier because most companies are subsidiaries or offshoots of multinational companies. The large concerns often have their own specifications for such things as solubility, color, etc. and have an approved list of suppliers. The main concerns which have approved suppliers are Coca Cola and Beechams. These two companies currently account for nearly 1,000 tons of citric acid. This leaves about 2,500 tons of demand in the open market and accessible to competition from new suppliers. However, the main suppliers to the market are well entrenched, and, for example, Roche Products and Pfizer supply about 50 percent of the demand at cheaper prices. Such suppliers would be difficult to dislodge due to their established presence and consumer loyalty.

Capacity or sales potential for the RSA and SACU markets is estimated as follows:

• Projected market size in 1996	.....	4,700 tons/y
• Imports from China	.....	–470
• Half of the size after excluding imports from China	.....	–2,115
Capacity (share)	.....	2,115 tons/y (45%)

(3) Other Southern African countries

Transportation costs are where a Zimbabwean supplier would be able to maintain a price advantage in neighboring markets over other suppliers. If it's not so, export at a cheaper price would be necessary or the product would not be competitive. Zimbabwe is located inland and a major constraint is its high inland transportation costs. For instance the cost of trucking from Harare to Blantyre, Malawi, is about 0.16 US$/kg, which is higher than the cost of ocean freight from Europe. Market territory in surrounding countries is determined by freight costs.

(a) Zambia (Harare-Lusaka: 440 km by road)

Malawi (Harare-Blantyre: 600 km by road)

Citric acid to these two countries is re-exported from RSA. This citric acid is transported to these countries via Zimbabwe. Therefore if citric acid made in Zimbabwe was exported to these countries it would have a price advantage equal to the transport costs from Europe to Zimbabwe via RSA (over 0.1 US$/kg).

(b) Mozambique (Harare-Maputo: 1,300 km by road or 1,200 km by rail)

Current import of citric acid is from RSA (re-export). The capital city, Maputo, is located near Swaziland and has major port facilities. If citric acid is exported from Harare or nearby to Maputo by truck, the cost is almost 50 percent higher than ocean freight from Europe. If exported by rail, the cost would be about the same as the ocean freight.

(c) Kenya (Harare-Nairobi: 2,860 km by road)

Tanzania (Harare-Dar Es Salaam: 2,510 km by road)

Both countries directly import citric acid from producing countries. Inland transportation costs from Harare are 0.3 to 0.4 US$/kg by truck, which is quite higher than the ocean freight from Europe (about 0.1 US$/kg). Transportation costs through Beira by a combination of truck and ship seem to be almost the same as the ocean freight from Europe. However there would be several obstacles, such as several trans-shipments and transportation between Harare and Beira. Also it would take time to establish a new sales network and distribution channels.

(d) Madagascar (Harare-Tananarive: 1,010 km by truck plus 745 miles by ship)

The distribution network of the suppliers in RSA would be utilized for the market in Madagascar. However there would be no advantages because transportation from Harare to Beira and inside Madagascar is by truck, and from Beira to Madagascar (Majunga) is by ship.

(e) Zaire and Angola

Since inland transportation routes have not been developed, ocean transportation via Capetown is necessary. Export to the two countries seems impractical at present.

In conclusion the four countries, Zambia, Malawi, Mozambique and Madagascar, have been selected for export of the product from Zimbabwe and sales potential has been determined as follows:

Country	Market size in 1996	Sales potential (90%)
• Madagascar	120	110
• Malawi	60	55
• Mozambique	55	50
• Zambia	120	110
Total	355	325

(4) Proposed plant production capacity

The selected market and its sales potential are summarized below:

Country	Sales Potential in 1996 (tons)
• Zimbabwe	820
• RSA/SACU	2,115
• Madagascar	110
• Malawi	55
• Mozambique	50
• Zambia	110
Total	3,260 tons

The total sales potential is estimated to be 3,260 tons in 1996 and the proposed plant capacity is 3,000 to 3,300 tons per year. The exports of citric acid from Zimbabwe to the above countries is shown in Figure 5–14.

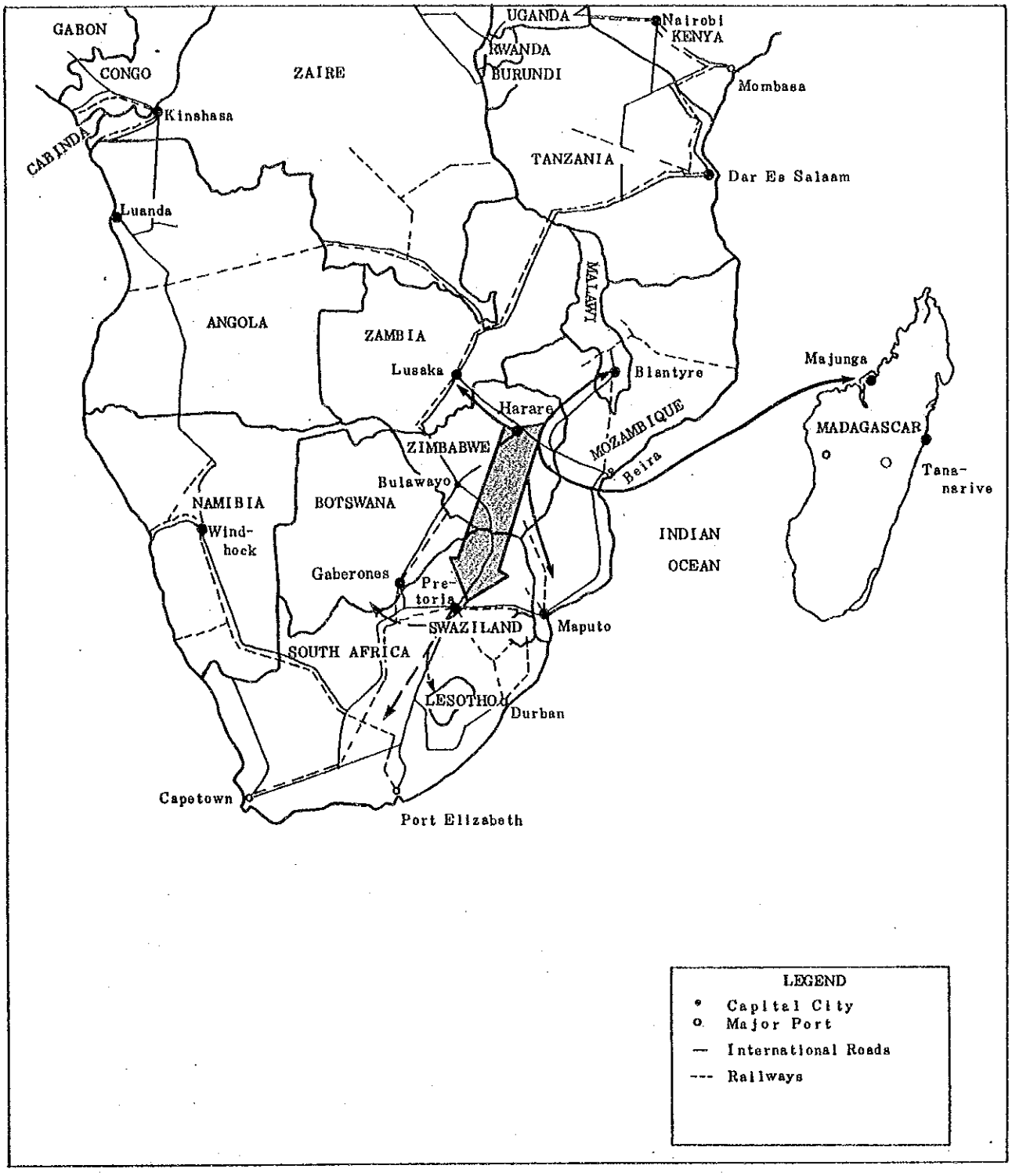


Figure 5–14 Projected Citric Acid Export from Zimbabwe

5-4-2 Sales Prices

In practice, pricing or pricing policy has much to do with corporate strategies and decisions are made from many angles, such as economic situations, supply and demand balance, competitive situations, costs and consumers trends. Pricing is very often made by integrating both approaches, i.e. marketing (or market price) and accounting (or cost calculations). When sales in existing markets are considered, pricing in terms of the current market situation is a prerequisite. Consequently, reasonable sales prices are established in this section based on actual market situations. Such prices are also reviewed in terms of production costs in Chapter 16 "Financial Analysis".

(1) Pricing by marketing approach

International prices of citric acid on an fob basis are 1.3 to 1.5 US$/kg as mentioned earlier. Domestic prices (delivery basis) are different in each country, e.g. 1.9 to 3.2 US$/kg in Zimbabwe, 1.6 to 1.8 US$/kg in U.S.A., 2.5 to 3.2 US$/kg in Japan and 1.54 to 1.65 US$/kg in the Republic of South Africa. This is primarily due to the differences in the corporate environment of the citric acid industries and the trade policies of each country, such as import tariffs, production subsidies and import quota systems.

In the USA domestic production has recently exceeded domestic demand and export has started. The average export price of citric acid in 1990 was 1.46 US$/kg, which is more than 10 percent below domestic prices.

In Japan the import of citric acid from developing countries, principally China, increased to over 30 percent of the demand, or more than 6,000 tons, because the government gave preferential import tax concessions to developing countries in the 1970's. 14,500 tons/y of citric acid are imported, of which more than 40 percent is crude citric acid which is sold at the above indicated prices after refinement. Domestic suppliers in Japan are forced to make great efforts to maintain competitiveness.

In the Republic of South Africa, major European and U.S. suppliers are entrenched in the market. Relatively cheap prices seem to be the result of the suppliers' strategy in a competitive market.

Citric acid prices show differences in each area and country. Major suppliers in Europe and U.S.A., who have enough capacity for export, tend to establish price differentials between the domestic market (higher prices) and the export market (lower prices) to maintain their export market share. This has resulted in arbitrage trading in the markets, that is, even major exporting countries import citric acid, and some traders sell the products by utilising the price differentials between different markets.

Hence pricing should follow the reality of the market and the structure of the industry on a global level as described above.

(a) Domestic sales price in Zimbabwe

Current domestic prices will be used, even though it is a bit higher, in order to provide an incentive to promote the new industry.

(b) Export sales price

The average European export price on an fob basis will be referred to for the export price from Zimbabwe. It will be a bit higher than the current fob price to the Republic of South Africa.

The above prices are reviewed and compared with cost calculations in Chapter 16.

(2) Domestic price in Zimbabwe

The mode of current prices in Zimbabwe is 7.0 – 9.0 Z$/kg or 2.22 – 2.86 US$/kg (1 Z$ = 3.15 US$) and the median value is 2.54 US$/Kg. Substracting costs for inland transportation (0.03 US$/kg) and sales tax (10%) from the figure, the average ex-factory price is determined as 2.26 US$/kg.

(3) Export sales prices

Average export prices on an ex-factory basis for RSA/SACU and the other four countries are shown below:

For pricing purposes, the average European export price of 1.4 US$/kg was adopted. Also consideration has been given to the advantages resulting from the differences of transportation costs to each country.

(a) Republic of South Africa

- Difference in transportation cost

Europe	–	RSA	: 0.10	US$/kg
ZW	–	RSA	: –0.03	
Difference			0.07	US$/kg

- Sales price

1.4	+	0.07	=	1.47	US$/kg

(b) Zambia and Malawi

- Difference in Transportation cost

Europe	– RSA	:	0.10	US$/kg
RSA	– Zambia, Malawi	:	0.10	
ZW	– Zambia, Malawi	:	-0.06	
Difference			0.14	US$/kg

- Sales price

1.4	+	0.14	=	1.54	US$/kg

(c) Mozambique and Madagascar

- Difference in transportation cost : not recognized
- Sales price : 1.40 US$/kg

(4) Distribution/marketing organization and resale prices

Citric acid has very wide applications. The number of consumers ammounts to nearly 200 in both the Zimbabwe and export markets, whereas the number of employees in the new citric acid plant will be about 120. So to be realistic, one can say that 1) the establishment of a large sales department will not be possible and 2) development of the company's own distribution channels for export markets will be difficult. Thus it will be more economical and practical to use existing networks of chemical suppliers or dealers in Zimbabwe or networks of suppliers in South Africa (not major ones).

The new company will make sales agreements with such suppliers and dealers for the export and resale of citric acid. The resale prices will not be decided by the new company since they should be decided according to the rules of free competition. The above product prices are ex-factory basis. For consumer prices, actual transportation costs and sales commissions will be added. So the expansion of sales in export markets will largely depend on the efforts of these suppliers and dealers. The new company will have to make very active sales promotion with suppliers and dealers in the early stage of plant operation; for instance, distribution of product sample to consumers.

5–5 Sales Plan

As a general rule, a sales plan is very important for acquiring corporate profits. It should include both long and short term plans. Naturally the sales plan described in this section is of a reference nature for purposes of the feasibility study. The premises of the plan are explained below:

(1) Nominal production capacity is 3,000 metric tons per year.

(2) Sales volume is principally as aforementioned, except:

(a) Priority is given to the sales to the Zimbabwe market over other countries' markets. As the domestic demand increases, sales volume for export markets should be decreased in the following sequence: Mozambique, Madagascar, RSA/SACU, Zambia and Malawi.

(b) Sales to Coca Cola Export in Zimbabwe for the first year of operation is 0 percent and for 2nd year and later 50 percent.

(c) Sales to RSA/SACU for the first year is 60 percent of the potential sales (2,115 tons) and for the 2nd year 80 percent.

(3) Growth rate of citric acid demands in Zimbabwe after 2000 is estimated to fall because the soft drink consumption per head will reach twice the current consumption by the end of the 90s. Growth rates and forecast demand for each kind of consumption are indicated in Table 5–31.

Table 5–31 Forecast Demand for Citric Acid in Zimbabwe, 2000 – 2015

Items	Demand (metric tons)		Average Annual Growth Rate (%)
	2000	2015	2000–2010
Beverages			
– Carbonated	285	685	6.0
– Crush/Quench	770	1,385	4.0
Food Processing	95	200	5.0
Pharmaceutical	10	15	3.0
Others	20	30	3.0
Total	1,180	2,315	4.6

Growth rates for citric acid demand in Zambia and Malawi will follow the trends shown in Table 5–30.

(4) Sales prices calculated in the preceding section are adopted throughout the life of the project.

The resulting plan is shown in Table 5–32 which gives the volume, amount and demand summary.

Table 5–32 Citric Acid Demand Summary/Sales Plans by Volume and Amount

<CITRIC ACID DEMAND SUMMARY IN SOUTHERN AFRICA> (Unit: ton)

Year	1990	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1. Zimbabwe	620	909	970	1035	1105	1179	1233	1289	1348	1409	1474	1541	1612	1686	1763	1844	1930	2019	2112	2210	2313
2. RSA/SACU	3500	4693	4933	5188	5456	5741															
3. Other Countries																					
.Kenya	150	183	190	196	203	210															
.Madagascar	100	117	120	123	126	129															
.Zambia	100	117	120	123	126	129															
.Mozambique	45	53	55	57	58	60															
.Malawi	50	59	61	63	65	67															
.Tanzania	30	36	37	38	39	40															
.Zaire	25	30	31	31	32	33															
.Angola	-	-	-	-	-	-															
Total	4620	6197	6515	6852	7210	7588															

<SALES PLAN BY VOLUME> (Unit: ton)

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1. Zimbabwe	703	809	862	917	977	1020	1065	1113	1162	1213	1267	1324	1383	1444	1509	1577	1647	1721	1799	1880
2. Zambia	105	108	111	113	116	119	122	126	129	132	136	139	143	147	150	154	158	162	167	171
3. Malawi	53	55	57	58	60	62	63	65	67	69	71	73	75	77	80	82	84	87	89	92
4. RSA/SACU	1267	1776	1971	1911	1847	1799	1749	1697	1642	1585	1526	1464	1399	1331	1261	1187	1110	1029	945	857
5. Mozambique	48	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Madagascar	105	108	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2281	2905	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Capacity Utilization	76%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Domestic Sales	31%	28%	29%	31%	33%	34%	36%	37%	39%	40%	42%	44%	46%	48%	50%	53%	55%	57%	60%	63%
Export Sales	69%	72%	71%	69%	67%	66%	64%	63%	61%	60%	58%	56%	54%	52%	50%	47%	45%	43%	40%	37%

<SALES PLAN BY AMOUNT>

Citric acid unit price
- .Zimbabwe :2.26 US$/kg
- .Zambia/Malawi :1.54 US$/kg
- .RSA/SACU :1.47 US$/kg
- .Mozambique/Madagascar:1.40 US$/kg

(Unit: x1000US$)

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
1. Zimbabwe	1588	1829	1947	2073	2208	2306	2408	2514	2626	2742	2864	2992	3125	3265	3410	3563	3723	3890	4065	4248	57388
2. Zambia	162	166	170	175	179	184	189	193	199	204	209	214	220	226	232	238	244	250	257	263	4172
3. Malawi	82	85	87	90	92	95	98	100	103	106	109	113	116	119	123	126	130	134	138	142	2188
4. RSA/SACU	1863	2611	2898	2809	2714	2644	2571	2494	2414	2330	2243	2152	2057	1957	1853	1745	1632	1513	1390	1260	43159
5. Mozambique	67	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	137
6. Madagascar	147	151	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	298
Total	3909	4910	5102	5147	5194	5229	5265	5302	5342	5383	5426	5471	5518	5567	5618	5672	5728	5787	5849	5913	107332
Domestic Sales	41%	37%	38%	40%	43%	44%	46%	47%	49%	51%	53%	55%	57%	59%	61%	63%	65%	67%	70%	72%	
Export Sales	59%	63%	62%	60%	57%	56%	54%	53%	51%	49%	47%	45%	43%	41%	39%	37%	35%	33%	30%	28%	
Average Unit Price(US$/kg)	1.71	1.69	1.70	1.72	1.73	1.74	1.75	1.77	1.78	1.79	1.81	1.82	1.84	1.86	1.87	1.89	1.91	1.93	1.95	1.97	

Chapter 6 Agriculture in Zimbabwe

Chapter 6 Agriculture in Zimbabwe

6–1 Current Agricultural Situation

6–1–1 National Economic Development Plan

The First 5–Year National Economic Development Plan (1988-1990) placed emphasis on the following six target policies:

(1) Restructuring and control of the national economy, as well as economic expansion

(2) Land reform and efficient land utilization

(3) Raising the living standards of the entire population, in particular, the peasant population

(4) Increasing the number of employment opportunities and manpower development

(5) Development of science and technology

(6) Maintaining the correct balance between the environment and development

These target areas reflect the government's idea of expediting the economic self-reliance of the native people of Zimbabwe. This direction in policy is intended for advancement in a stabilized political and economic situation.

6–1–2 Economic Reform Program

The Second 5-Year National Economic Development Plan (1991-1995), which will be published in the near future (as of August, 1991), has been drawn up on the basis of the "Framework for Economic Reform (1991-95)" already issued. The aim of this economic reform program is for radical economic liberalization. The government intends to buy the land owned by large-scale commercial farmers, to promote a resettlement plan by transferring the land to communal peasant farmers, and to keep the price of white maize (staple diet of most of the population) stable.

More than one million families have migrated to the communal farm land so far; most of them are forced to live below the average living standard or in poor condition as most of the communal areas are low productive land. It has been reported that the livelihoods of a number of families are supplemented by the allowances given by the young seasonal workers in the towns who left their families, while agriculture is supported by women for the most part. There is a tendency for the earnings gap to widen between successful families and those who are unsuccessful, even in the communal areas.

According to the resettlement plan, the government is to purchase the land belonging to large-scale commercial farmers, and the communal peasant farmers are to migrate to the land thus purchased. Fifty-two thousand families have already been resettled on a land area covering 3.2 million hectares. As this land includes public areas, such as schools and roads, the actual land area distributed to the peasant farmers is about 15 hectares per family on average. The government is planning to amend the Land Acquisition Act in the Second Five-Year Plan, with the intention of buying a further 5 million hectares of land from large-scale commercial farmers and to have another 110,000 families resettled on the new land. However, as the government is projecting a radical budget cut in the new economic program in other respects, land acquisition and resettlement are to be undertaken to the extent allowable by the government budget, so as not to damage the agricultural productivity of small-scale farmers, making it less than that of large-scale commercial farmers. For that purpose, the farmers will undergo training so that efficiency may be maintained. The present rate of land tax will be increased in order to facilitate the distribution of the unusable farming areas of large-scale commercial farmers in the resettlement plan.

There are considerable problems with the distribution of enough food to the poor population of Zimbabwe, although the situation is not critical on a nationwide scale. For instance, the high mortality rate of infants, aged between two and five, is caused by malnutrition. It is feared that the food problem for poor families will worsen as a result of price inflation. Hikes in food prices have been seen in certain communal areas, since the transportation and distribution networks are not yet well developed. The government intends to cope with this serious problem by deregulating the stringent controls over the movements of agricultural products, as well as implementing liberalization programs.

6–1–3 Agricultural Situation

As shown in Table 6–1, the value of the nation's exports amounted to US$1,680 million in 1989 as compared with US$1,124 million in 1985. The growth rate increased by 50% in this four-year period.

Table 6-1 Trade Balance
(U.S. $Millions at Current Prices)

	1985	1986	1987	1988	1989
Trade Balance	202	312	382	512	361
Merchandise Imports	922	1,013	1,073	1,157	1,319
Consumption	125	120	114	120	150
Investment	274	394	395	450	505
Intermediate Goods	326	378	434	481	522
Petroleum	197	121	130	106	142
Merchandise Exports	1,124	1,325	1,455	1,669	1,680
Agriculture	337 (30%)	398	405	436	419 (25%)
Mining	257 (23%)	386	409	487	416 (25%)
Manufacturing	298 (26%)	290	333	401	463 (27%)
Others	232 (21%)	251	308	345	382 (23%)

Source : ZIMBABWE A Framework for Economic Reform (1991 - 95) Jan. 18, 1991

The agricultural sector has contributed to the economic growth of Zimbabwe, although recently the industrial sector (mining and manufacturing) has made a greater contribution than agriculture. The agricultural sector accounted for 30% of total exports in 1985, or US$337 million, although in 1989 it fell to 25%, or US$419 million.

While imports of consumption commodities have been restrained, imports of capital goods have been allocated in a scheduled manner. The government has maintained the position of a trade balance surplus, about US$350 million, over many years, by increasing the allocation of imports as against the resulting expansion of exports.

Maize is a prime agricultural product in Zimbabwe. Recently, however, the types of crop production have become diversified, and the farming areas for crops such as sugarcane, cotton, tobacco, coffee, tea and fruit have been increased. The farming productivity of these crops has been greatly improved, and the production quantity has reached a level whereby such crops can be exported. Among others, tobacco exports amounted to as much as Z$650 million in 1989, followed by cotton (Z$183,4 million), coffee (Z$47.0 million), crops from market gardening (Z$47.0 million), and tea (Z$20.0 million).

The total population of Zimbabwe was reported to be about 9.12 million as of 1988. Of this total, 6.3 million belonged to the agricultural sector, accounting for 70% of the population. The economically active population (aged 15 or older) amounted to about 3.6 million, about 2.5 million of whom were engaged in agriculture.

6–1–4 Types of Farm by Scale

The types of farm in Zimbabwe can mainly be divided into the following three sectors:

(1) Large-scale Commercial Farming

In general, large-scale commercial farms have been owned by Europeans since before independence.

Number	:	4,500 farming families
Farming area	:	2,000 hectares per family on average
Pasture	:	About 10,000 hectares

(2) Small-scale Commercial Farming

Small-scale commercial farms are owned by native commercial farmers.

Number	:	About 10,000 farming families
Farming area	:	About 100 hectares per family, including pasture

(3) Communal Peasant Farming

Communal peasant farms are owned by self-supportive native farmers in communal areas.

Number	:	About 780,000 farming families
Farming area	:	2 hectares per family
Pasture	:	Communal

For a resettled farmer promoted by the government, the farming area is about 5 hectares, and the pasture covers between 40 and 50 hectares.

(Note: The farming area per family is based on the results of a survey conducted by the National Farmers' Union)

6–1–5 Agricultural Organization

To promote and accelerate the development of agriculture, the government has established the following agencies at the Ministry of Agriculture and Land.

– Department of Research & Specialist Services

– AGRITEX

– Veterinary Services Department

The Agricultural Finance Corporation (AFC) has been established to deal with financing for farmers. Currently, the annual interest rate of the AFC is 13%. Although substantial amounts of finance are for communes and resettled farmers, individual farmers, cooperative societies and private enterprises can also use finance from the AFC.

All the sales and distributions of agricultural products (excluding crops from market gardening, barley, tea, sugar and tobacco) and livestock (excluding swine and chickens) are controlled by government agencies. However, such control is now to be deregulated in accordance with the new economic reform program. Under the Agricultural Marketing Authority (AMA), a government agency, are the Grain Marketing Board (GMB), the Cold Storage Commission (CSC), the Cotton Marketing Board (CMB), and the Dairy Marketing Board (DMB).

Particularly for agro-economic activities, the following three different sectors organize and run their own cooperatives:

- Commercial Farmers' Union (CFU) by large-scale commercial farmers
- Zimbabwe National Farmers' Union (ZNFU) by small-scale commercial farmers
- National Farmers' Association of Zimbabwe (NFAS) by communal peasant farmers

One of the major roles of the above organizations is to interface between the member farmers and the government. The bulletins published by these organizations offer information about the economic issues as well as legislative affairs about which the member farmers are concerned.

For agricultural development, the following items are considered necessary:

(1) Lease of agricultural equipment by public corporations

In the communal areas, there is almost no agricultural equipment available for deep ploughing, land improvement, dredging and transportation. It is recommended that public corporations offer leasing services for agricultural equipment.

(2) Improvements to the running of cooperative unions

It is recommended to introduce joint purchasing for production materials, cooperative sales, joint farming and training for leader farmers.

(3) It is also recommended to strengthen cooperative activities by establishing a water users' association, a land improvement cooperative and farmer training centers.

6–2 Natural Conditions

6–2–1 Geographical Features

Zimbabwe is a landlocked country located in southern Africa. The country's natural frontiers are the River Zambezi and Lake Kariba in the north, and River Limpopo in the south. The country is bordered by Zambia in the northwest, Mozambique in the east, South Africa in the south, and Botswana in the southwest. As shown in Figure 6–1, most of the land is a high plateau, and the highest mountain, Mt. Inyanga (altitude of 2,392 m), is located in Manicaland Province in the eastern region, with an altitude of over 1,800 m and bordered by Mozambique. From this region to Harare, there is rolling hilly land with an altitude of over 1,500 m. From Harare to Burawayo in the central part of the country, there is a highland plateau with altitude of 1,200 m. This plateau forms a watershed, and rivers flow down in various directions either to the southeast or south and to the northwest or north. Surrounding these plateaus, land sloping rather gently extends with an altitude of about 900 m. The areas situated at the lower elevation form basins as high as 600 to 400 m.

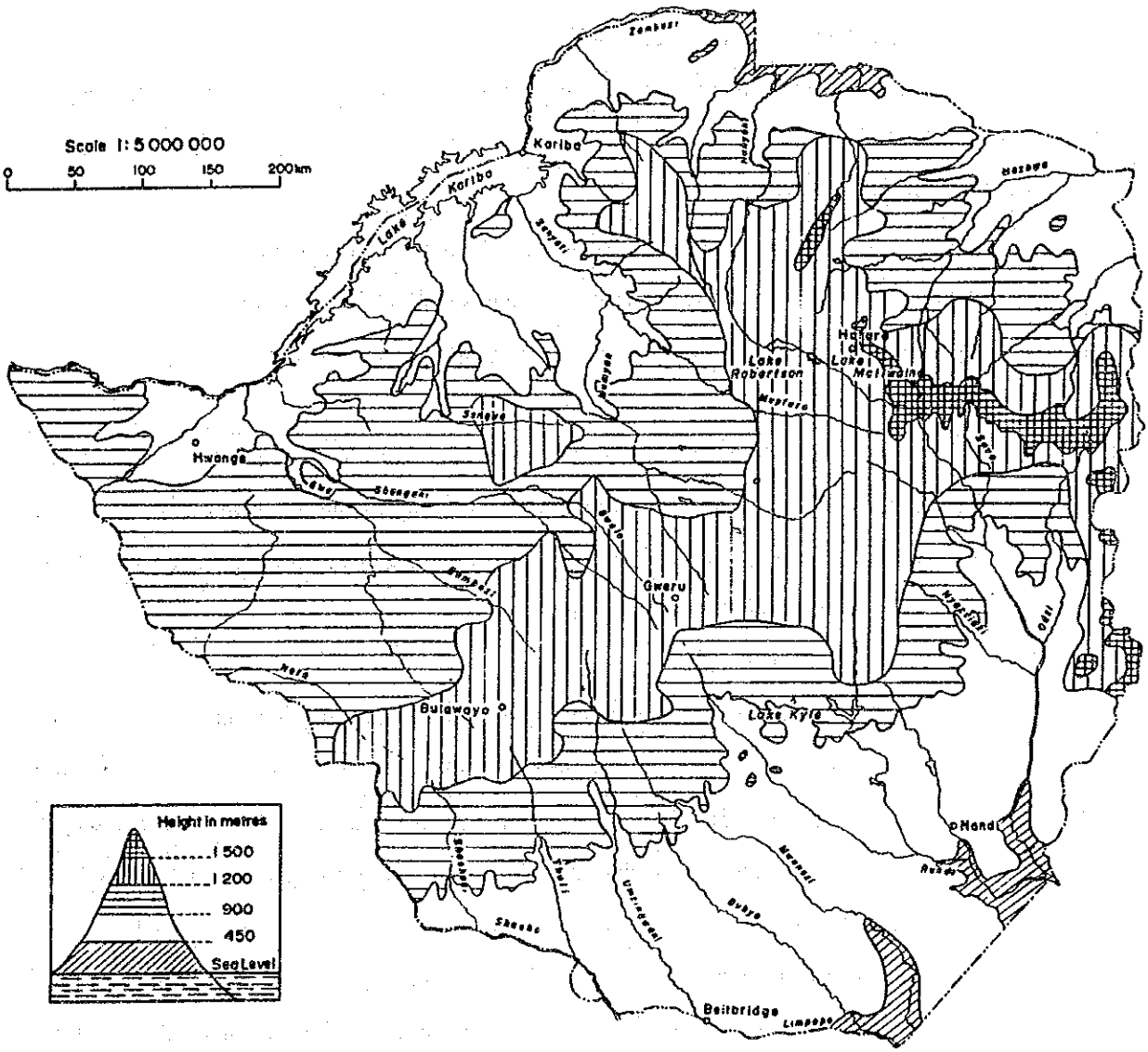


Figure 6–1 Map of Zimbabwe

Source: The New Junior Secondary Atlas for Zimbabwe

6–2–2 Agricultural Climate

(1) Temperature

The temperature in Zimbabwe is of a tropical nature in the lower elevated area, while having semi-tropical characteristics in the high land. The relative humidity is low, and the average daily temperature is shown in Figure 6–2. In terms of temperature, the national land can be divided into the following five zones:

(a) Hottest zone (average temperature not less than 25°C)

This zone is located in the low land in the northern region where extensive farming is practiced.

(b) Hot zone (22.5°C to 25°C)

This zone is situated in the low land in the regions of the north, northwest, south and southeast, and upland crops such as sugarcane, cotton, maize and sunflower are the major agricultural products. There is also pastureland for cows, as well as national parks.

(c) Moderate zone (20°C to 22.5°C)

This zone covers an extensive area over the hilly land at an elevation somewhat higher than the above two zones. Farming in this zone include mainly wheat and upland crops like maize and others, followed by semi-extensive as well as semi-intensive stock farming. A part of this zone is also occupied by a national park.

(d) Cool zone (17.5°C to 20°C)

This zone lies mainly over the high land located in the central part of the country. In this zone, intensive farming is practiced for the higher productivity of cereals (maize, wheat, sorghum and so forth), crops for industrial use (cotton and tobacco), and vegetables other than drought-resistant crops. Intensive livestock farming is also practiced using concentrated feed.

(e) Coolest zone (average temperature not more than 17.5°C)

This zone is located in the eastern mountainous area and plateau with an altitude of over 1,500 m. This comprises most of the forest area in the country. Farming in this zone includes plantations of crops such as fruit, tea and coffee, and cereal crops for home consumption. Intensive livestock farming is also practiced.

(2) Rainfall

The climate of Zimbabwe can be divided into two distinct seasons, i.e., the dry season (May to September) and the rainy season (October to April), and there is no rainfall in the dry season. As shown in Figure 6–3, even in the rainy season, only limited area have an annual rainfall of more than 1,000 mm, and these areas include the eastern mountainous region, the Harare region and a part of the Masvingo and Shurugwi Provinces. Two thirds of the country, where the elevation ranges from 900 to 1,500 m, has an annual rainfall of between 600 and 1,000 mm. Most of the country's farmland as well as grassland exist in this zone. The areas with an annual rainfall of less than 600 mm are located in the southern and western regions, where most of these areas are grassland.

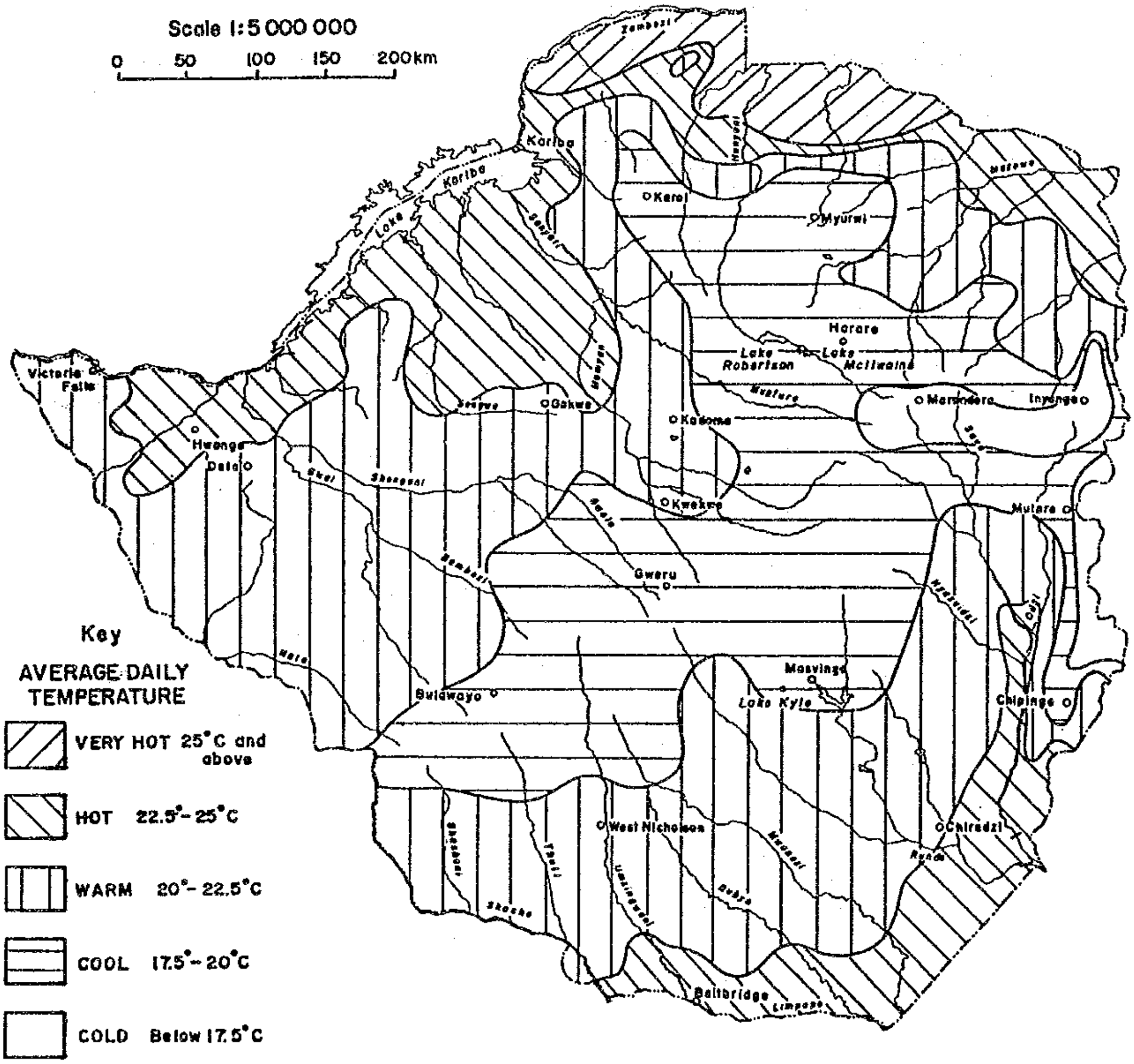


Figure 6–2 Average Daily Temperature in Any One Year
Source: The New Junior Secondary Atlas for Zimbabwe

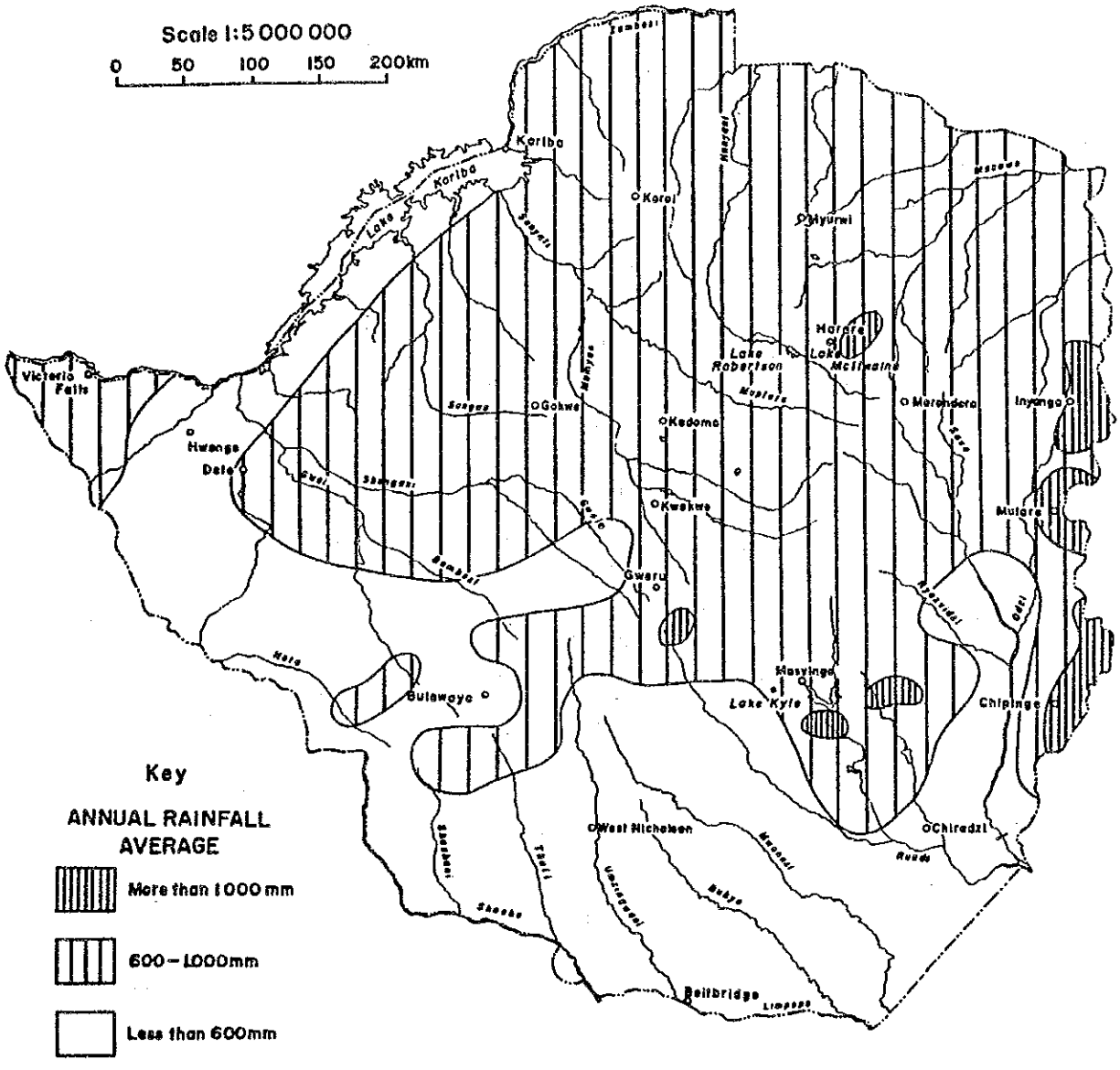


Figure 6–3 Average Rainfall in Any One Year
Source: The New Junior Secondary Atlas for Zimbabwe

6–2–3 Soil

As shown in Figure 6–4, the land soil covering the plateau from the east to the central part of the country is red or red-yellow colored kaolinitic soil of weathered deposits derived from granite.

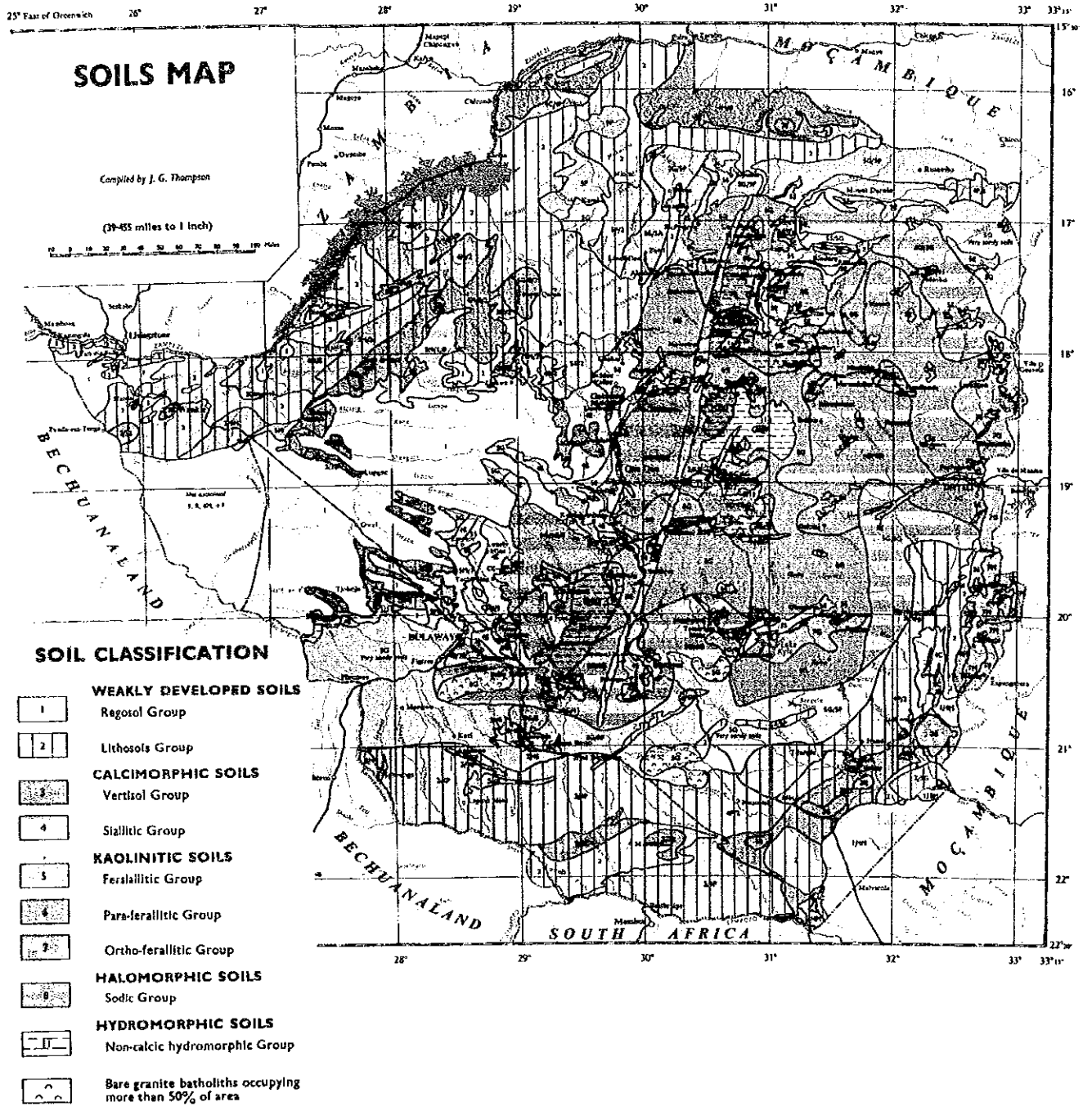


Figure 6–4 Soil Map of Zimbabwe

These areas are partly composed of saline soil and hydromorphic soil. The soil texture is represented mostly by sandy loam. In farmland around Harare, however, the soil texture varies from silty clay loam to clay. In the low land of the southern and northwestern areas, there is black or gray-brown colored calcimorphic soil as well as immature soil of weathered deposits derived from geniss. The soil texture in these areas includes varieties of loam, clay loam, clay and sand and, in some cases, a mixture of gravel and stones.

As described in the above, most of the land in Zimbabwe is composed of Kaolinitic soil of an inactive acid nature. This type of soil is suited to the planting of upland crops, which means that most of the large-scale farms are located in these areas.

Calcimorphic soil is classified into the vertisol group and the monmorillonite group, both of which are alkaline in nature. According to the soil survey conducted by the study team, the pH level is in the range of 8.0 to 9.0. In this soil, cotton, maize, wheat and sunflower are planted, although it is not suitable for sweet potato planting.

Saline soil is dispersed in Kaolinitic soil and calcimorphic soil. Common crops such as maize, wheat and sweet potato cannot be grown in saline soil. Only salinity-resistant crops such as nutmeg, cabbage, sugar beet, great millet, cotton and Bermuda grass can be planted in saline soil.

Hydromorphic soil is found within the distribution area of Kaolinitic soil; in other words, hydromorphic soil is dispersed to a small extent in the eastern part of Harare, around Chivbu, and to the south of Gweru. This soil consists of acid sand or acid sandy loam eroded from lime, and therefore offers poor productivity. In particular, the immature soil around Chivbu is made from non-consolidated regosol with coarse soil particles, resulting in extremely low crop productivity.

As described in the above, the most of the soil in Zimbabwe is sandy, featuring comparatively high permeability, but low water retentivity and low fertility. In particular, the nitrogen, phosphate and sulfur contents are not sufficient in many areas. Some areas are composed of red clay soil, loam and vertisol, which contain a very small amount of effective water due to the low content of organic substances. In general, farmland with a shallow ploughing layer in Zimbabwe tends to suffer from drought, and the fertility is low as experienced with sandy soil.

6–2–4 Classification of Land Use

Based on the natural conditions as a whole, the climatic condition (rainfall in particular) and the soil conditions, land use can be classified into the following five zones (also see Figure 6–5):

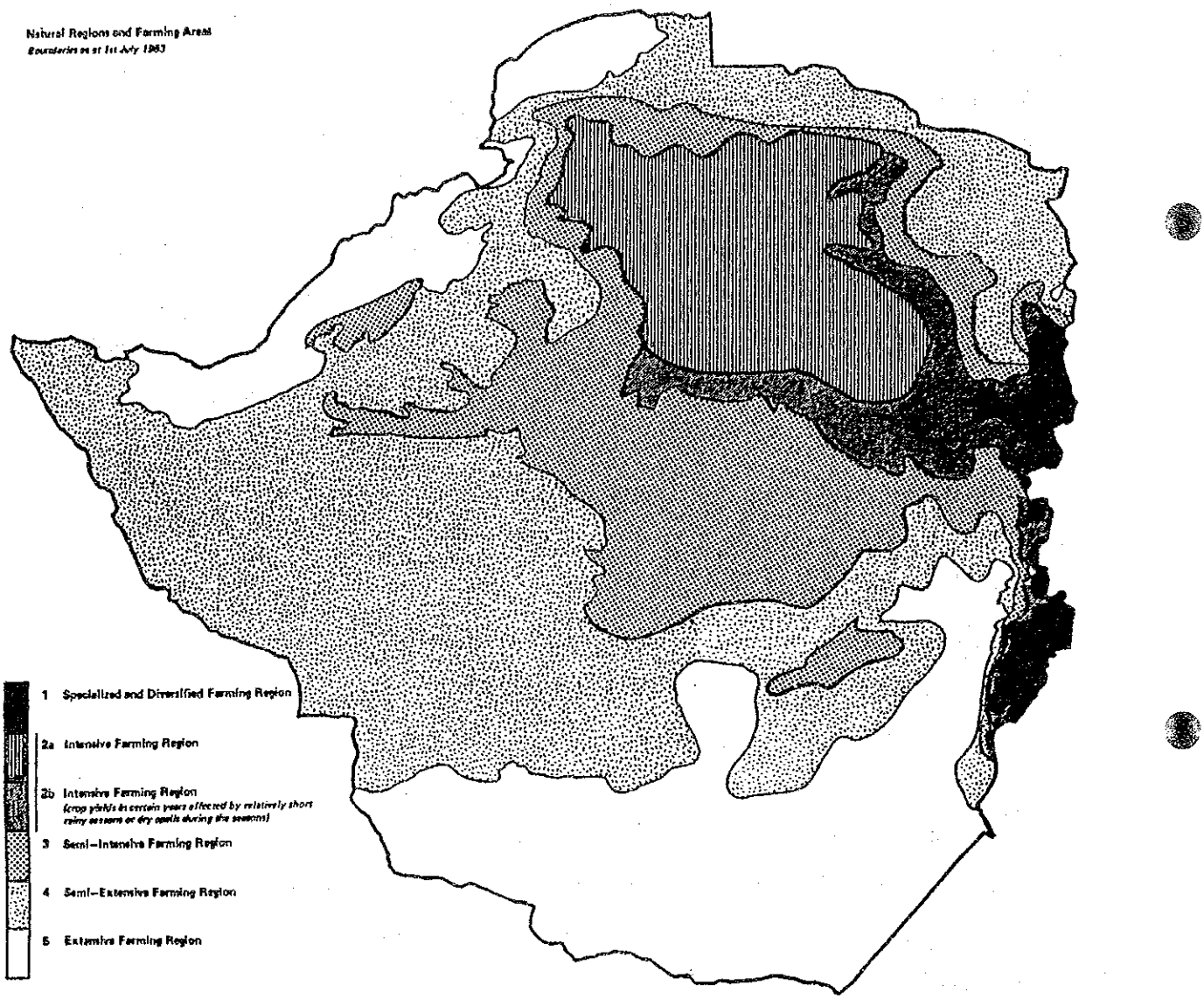


Figure 6–5 Natural Regions and Agriculture
Source: Statistical Yearbook 1989

(1) Forest and specialized farming zone

Annual Rainfall : More than 1,000 mm of rainfall in the area with an altitude of not more than 1,700 m, and 900 mm in the area over 1,700 m

Products : Fruit, coffee, tea, vegetables, rice and timber, as well as livestock

Area : 7,000 km^2 (2% of the total area)

Farming Pattern : Large-scale commercial farms at 74%, communal farms at 24%, and small-scale farms at 2%

(2) Intensive farming zone

Annual Rainfall : 750 to 1,000 mm

Products : Upland crops (tobacco, cotton and vegetables) and livestock

Area : 58,600 km^2 (15% of the total area)

Farming Pattern : Large-scale commercial farms at 74%, communal farms at 22%, and small-scale farms at 4%

(3) Semi-intensive farming zone

Annual Rainfall : 650 to 800 mm

Products : Feed crops, cash crops, maize, tobacco, cotton and livestock

Area : 72,900 km^2 (18% of the total area)

Farming Pattern : Large-scale farms at 49%, communal farms at 43%, and small-scale farms at 8%

(4) Semi-extensive farming zone

Annual Rainfall : 450 to 650 mm

Products : Drought-resistant crops and livestock (beef cattle)

Area : 47,800 km^2 (38% of the total area)

Farming Pattern : Large-scale farms at 34%, communal farms at 62%, and small-scale farms at 4%