WORLD FERTILIZER SITUATION AND OUTLOOK 1978-85

IFDC AND TVA

INTERNATIONAL FERTILIZER DEVELOPMENT CENTER

NATIONAL FERTILIZER DEVELOPMENT CENTER

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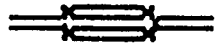

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ABBREVIATIONS USED IN THIS REPORT

N	Nitrogen
P	Phosphorus
P_2O_5	Phosphate
K	Potassium
K_2O	Potash
TSP	Triple Superphosphate
NSP	Normal Superphosphate

MEASURES

m.c.f.	thousand cubic feet
mt	metric ton
%	percent
10^9	billion

GOVERNMENTAL AND INTERNATIONAL AGENCIES

FAO	Food and Agriculture Organization of the United Nations
IFDC	International Fertilizer Development Center
ISMA	International Phosphate Industry Association
TVA	Tennessee Valley Authority
UNIDO	United Nations Industrial Development Organization
USAID	U.S. Agency for International Development

FOREWORD

The purpose of this report is to project the world and regional supply/demand situation for the major fertilizer nutrients for 1978-85. The importance of fertilizer in the world food equation is well recognized. Large increases in food production during recent years are to a large extent a result of the increased use of fertilizer as well as favorable weather in most of the primary agricultural regions of the world. The current world fertilizer market is characterized by oversupply but also by continued strong growth in demand. Production units in the United States, Japan, and Western Europe have closed in recent months, as world prices have dropped substantially from their 1974-75 levels and fertilizer producers' profits have, in many cases, become marginal.

No effort has been made to predict fertilizer prices as the supply/demand situation is only one of the variables in determining price levels. Labor, investment, feedstock, and transportation costs, as well as weather and prices of agricultural commodities, also have an effect on market conditions. These factors change rapidly, are often unpredictable, and can quickly alter both the supply and demand outlook for fertilizers and market prices.

In 1974 TVA published a report, *World Fertilizer Market Review and Outlook*, which dealt with the supply/demand situation. USAID has asked IFDC to update this study. This report is a joint effort of IFDC and TVA and is based on the data files, supply/demand analysis, and forecasting techniques used in the previous TVA report.

Other reports that will be helpful in reviewing the world fertilizer situation include the annual reports of the UNIDO/FAO/World Bank Working Group on Fertilizers, the *Second World-Wide Study on the Fertilizer Industry: 1975-2000* prepared by the United Nations Industrial Development Organization, and the *Current Situation and Outlook* published by the FAO Commission on Fertilizers.

SUMMARY

1. Potential world fertilizer production, based on currently announced construction plans and the operating rates assumed, will increase from 98 million nutrient mt in 1977 to 141 million mt in 1985. In 1969 less than one-fourth of the world's fertilizer was produced in developing countries. Almost one-fourth will be produced in developing countries by 1985.

2. World fertilizer consumption will increase from 95 million mt of nutrient in 1977 to over 135 million mt in 1985.

3. The growth rate in world fertilizer consumption during the next 8 years will be 4.6% annually compared with 6.0% during the past 8 years.

4. World ammonia capacity has been overbuilt. Capacity increased by more than 21 million mt between 1973 and 1978, and another 31 million mt is expected between 1978 and 1985.

5. Potential N fertilizer production will increase from 46 million nutrient mt in 1977 to 72 million mt in 1985, while N consumption is expected to increase from 45 million mt to almost 67 million mt. No shortage of supply is anticipated.

6. Increases in feedstock costs are forcing N production to shift from such traditional producers as United States, Japan, and Western Europe to areas where low-cost natural gas is available.

7. In all regions except North America, Western Europe, and Oceania, phosphoric acid capacity is projected to increase by 50% or more between 1977 and 1985.

8. Potential phosphate fertilizer production will increase from 27 million nutrient mt in 1977 to 39 million mt in 1985, with phosphate fertilizer consumption expanding from 26 million mt to 37 million mt.

9. Potential K_2O production will increase from 25 million nutrient mt in 1977 to almost 31 million mt in 1985. Potash consumption will increase from 23 million mt to 32 million mt. A potash fertilizer shortage is possible by 1985. Between 1977 and 1985 approximately 60% of the world's increase in K_2O production will be in the U.S.S.R.

INTRODUCTION

The world fertilizer situation has changed substantially since 1974. At that time, the world fertilizer industry appeared to be unable to supply sufficient materials to satisfy the demand for plant nutrients, and fertilizer prices increased sharply. Reports of both a food and fertilizer shortage were common; however, the cyclical nature of agriculture and the fertilizer industry was once again ignored.

The world fertilizer market was relatively stable during the 1960-65 period. However, new fertilizer production technology was developed, and capital quickly flowed into what appeared to be an opportunity for sustained large-scale returns. The result was an over-supply of fertilizers accompanied by distress selling, low prices, and poor profits. This lasted into the early 1970's when demand again caught up with supply.

These profitless years led to caution throughout the industry; lack of new investment; closing of old, inefficient plants; and delays or abandonment of new projects. As a result, when demand surged in 1972-74, sufficient capacity was not available to supply market needs. Nations that traditionally exported fertilizers reduced shipments to meet domestic requirements. The 1973-75 shortages (or fear of shortages) resulted, and prices of most fertilizers skyrocketed to all-time records.

This lack of adequate fertilizer supplies caused many developing countries to realize the need to produce a major share of their own fertilizer requirements. At the same time, developed countries expanded capacity because of the profitable situation that existed. Between 1973 and 1978, world ammonia capacity increased 36%; world phosphoric acid capacity increased by 54%; and world potash capacity increased by 16%. These increases have resulted in excess fertilizer capacity, and older, inefficient plants, particularly those with high feedstock costs, are being phased out of production.

During the 25 years prior to 1974, fertilizer consumption had increased at a relatively stable rate. In 1975 world consumption declined for the first time in recent history. In 1978, declines again occurred in some major consuming countries, including the United States. Since 1974 the market has been characterized by wide swings in consumption rather than a steady growth rate. This makes it more difficult to predict future use since the base period selected can result in a large difference in projected growth in the use of fertilizer.

The cyclical pattern of the fertilizer industry is characterized by long periods of oversupply followed by brief periods of shortages. The purpose of this report is to indicate the current and future supply situations and to estimate future consumption levels, assuming unrestricted world trade. Shortages or surpluses that are likely to occur on a regional basis are also identified.

METHODOLOGY

The methods of predicting consumption and the values assumed for operating rates, loss factors, and industrial usage should be reviewed carefully before comparing results of this study with others. The methodology used in this report including assumed operating rates, loss factors, and allocations of supply to industrial markets remain essentially the same as those used in the previous *World Fertilizer Market Review and Outlook* published by TVA in 1974 **(1)**.

The historical production-consumption statistics used in this report are FAO figures for 1962-77. Data for 1978 were not available. The TVA fertilizer plant capacity files were used as the source of historical and projected capacity data. These files are revised as documented announcements of new plants or modifications of existing plants are made. The TVA files contain capacity by plant for each country, as well as the FAO data, and can be accessed by anyone through the General Electric worldwide computer time-sharing system. Capacity data used in this study are as of September 1978.

Data are on a July-June fertilizer year, except for countries reporting on a calendar-year basis. Calendar-year data for 1977 were combined with the 1976-77 fertilizer year. All figures are expressed in terms of nutrient (N, P_2O_5, or K_2O) and are in metric tons. Phosphate rock used for direct application to crops was not included in the consumption figures.

Increases in fertilizer consumption generally occur in three phases. Phase one represents the rapid growth during early stages of development. Phase two is the transition period between rapid development and a mature market and is characterized as a rising straight line. Phase three is the older, mature market in which decreasing rates of increase are observed. A fourth phase in which some countries, particularly in Europe, may now be included is one of no growth, with year-to-year fluctuations in consumption merely reflecting changes in price relationships. The first step in the forecast is to determine the market phase for each country. This helps to indicate the future growth rates that can be expected and, hence the type of curve to be used in forecasting.

Projections can be made as a single number or as a range of values. Ranges are difficult to define, may have little statistical meaning, and are often misused. Therefore, a single projection has been used. This should be thought of as the midpoint around which year-to-year fluctuations will occur.

Neither IFDC nor TVA has a unique method for forecasting fertilizer supply and demand. Some techniques work better for one country than for another. The method used for forecasting consumption in this study was fitting historical time series data to ten basic regression equations and using these equations as a guide in making consumption projections. Usage that would be implied by these projections on a per-capita and per-hectare basis was compared to

historical usage to serve as a check. Differences in future growth rates indicated by these equations were examined country by country within regions and modified where necessary. Although statistical techniques are helpful in making projections, judgment must be involved in forecasting the direction and magnitude of change. Therefore, these results were reviewed within TVA and IFDC, and adjustments were made to reflect additional information available concerning future fertilizer consumption in each country. Projections were made on an individual country basis and then grouped by geographical regions as shown in appendix A.

Any planning done by the fertilizer industry must be based on estimates of future demand. Each projection method has merit but also limitations. All are faced with the lack of reliable and comparable data, particularly when worldwide forecasts must be made. All methods assume to some extent that past trends and relationships will continue into the future.

Probably the most common approach to projecting future demand is extending a straight line that best fits the historical data. Although what happened last year may be the best indicator of what will happen next year, it may not give valid indications for the long run, because large percentage increases can be compounded into astronomical levels of use. Also, the time period used in the calculation of the growth rate can distort the real long-run growth pattern, turning cyclical market swings into fictitious growth markets.

Another method used in determining future demand is based on cropland and recommended levels of fertilization. Ideally, this method should be the most accurate of the forecasting techniques; however, past performance has shown that farmers rarely use fertilizer at the recommended rate. Thus, either some percentage of utilization must be assumed in order to arrive at the forecast, or actual usage levels per crop must be known. These detailed data are not available for most countries. In this study the fertilizer usage rates per hectare that would be implied by the projections were compared with historical rates for the combined areas of nine major crops.

Another method of forecasting fertilizer demand is to project food requirements and then estimate the fertilizer needed to produce the required amounts of crops and livestock. Key variables in this type of study are food consumption per capita, population growth rates, and shifts in diet to more meat as income levels change. Here again, usage of fertilizer per crop is required; but such data are not available. In this study, per-capita consumption of fertilizer was used to check the projections on the assumption that there is a relationship of fertilizer to increasing food requirements and that this relationship is a function of population.

Potential fertilizer production estimates have been based on the production capacity in each country. Because of the complexity of fertilizer production and to avoid double counting, estimated production was based on the capacity of the basic fertilizer materials. For example, in the case of nitrogen, production estimates are derived from total ammonia capacity rather than the capacity of individual products such as urea or ammonium nitrate. This procedure is discussed in more detail in the analysis of the production of each nutrient.

In this study, countries that produce fertilizer materials based on imported ammonia or phosphoric acid are not considered to be producers since this would result in a portion of the supply being counted twice. In those countries where a portion of the fertilizer production is based on trade in ammonia and phosphoric acid, it is difficult to determine meaningful historical operating rates and thus to project actual production levels.

Nameplate capacity has been based on plant operation of 330 days/year in all areas, except the United States and Canada where 340 days has been used. Plants that report capacity on an annual, rather than a daily basis, were not adjusted. June 30 was used as the cutoff date in determining the first year of operation. For example, a plant with an announced startup date of May 1979 would be listed as operating in 1979. A plant scheduled to begin operations in August 1979 would not be considered until 1980. All announced plans are included in this study except those not giving sufficient information on scheduled completion dates.

After the world capacity was tabulated for each year, 1967 to 1985, the first step in estimating the potential supply of each fertilizer nutrient was to calculate the expected total production. It was assumed that a new plant does not reach its full production level until the third year of operation. Operating rates vary by country; however, for most developed countries an operating rate of 30% for the first year, 70% the second year, and 90% the third year was assumed. In developing countries, it was assumed that new plants would operate at 20% capacity the first year, 40% the second year, and 70% the third year and thereafter.

After the estimated production level is determined, two additional adjustments are needed to arrive at the potential fertilizer supply. First, it was assumed that conversion losses in all regions were 10% for nitrogen, 6% for phosphate, and 4% for potash. Second, industrial usage of nitrogen was estimated to be 20% of total supply in the developed regions and 10% in developing regions. For developed regions phosphate industrial usage was assumed to be 10% of the phosphoric acid supply and 4% of the potash supply. No industrial use of phosphate or potash in the developing regions was assumed.

These procedures were used to estimate the potential level of fertilizer production that can be expected for any given year. Actual production is determined by market conditions. Potential production is a measure of the capability of the industry to meet demand and should not be confused with actual production. The difference between the potential production and estimated consumption should help to indicate (1) if additional production capacity

is needed and (2) what price relationships and government policies must accomplish worldwide to bring supply and demand into equilibrium.

A worldwide supply/demand balance does not necessarily occur when production and consumption are statistically the same. There has been about a 5% difference between reported production and consumption. This reflects such things as (1) overformulation in compound fertilizers, (2) distribution losses including pilferage, (3) inherent problems of measuring and reporting fertilizer usage, and (4) material in the distribution pipeline (produced but not yet consumed). A world ratio of supply to demand of about 1.05 suggests market equilibrium. Fluctuations around this level indicate inventory depletion or accumulation. The potential surplus or deficit shown in this study does not include any adjustments for transportation and distribution losses.

LIMITATIONS

Availability of reliable data is the major limitation of this type of study. Two of the largest fertilizer producers and consumers in the world are China and Russia, neither of which makes data readily available. The degree of accuracy of data from many other countries is unknown. Data from countries reporting on a calendar year have been combined with those of countries reporting on a fiscal year. Actual data on losses and operating rates were also very limited.

Consumption is estimated as a residual from reported production and trade data; thus consumption estimates can be in error if inventories change significantly from year to year. Some countries may develop large inventories during one year that will not be used until a later year. This makes consumption in the year in which inventories are being built appear large and then appear small in the year that the inventory is depleted. In countries that are large net importers and may be buying material several years in advance of its eventual use, the accumulation of inventory can add significantly to the compounded rate of increase from which the forecast is made. Hence, the projection should be viewed as a trend of the amount that will be consumed during a specified period rather than a projection for a particular year.

Estimating fertilizer production based on capacity is difficult because of international trade in ammonia and phosphoric acid. Almost all studies, including this one, have estimated fertilizer production by assuming a given operating rate. In reality, this operating rate varies greatly from country to country and from year to year for the same country. Some countries have very low operating rates, and some have rates considerably more than 100%. Some of this variability is due to exports and imports of ammonia and phosphoric acid; however, low rates could also reflect physical limitations that restrict fertilizer production. Since actual data on worldwide ammonia and phosphoric acid trade are incomplete, it is difficult to determine if unusually low or high operating rates are caused by trade or other conditions. Only on a worldwide basis can operating rates be used to historically relate world capacity and world production.

NITROGEN FERTILIZER

World Ammonia Capacity and Nitrogen Fertilizer Production

Almost all N fertilizers are derived from ammonia. Two or three years are normally required from beginning construction before an ammonia plant can be brought into operation. Thus, with a study period extending to 1985, profitable prices could easily bring new plants into production that have not even been planned at this time. However, with plants currently being closed, additional capacity is not expected, and current expansion plans may be reduced if present prices continue.

Capacity in the 65 countries producing ammonia in 1977 was 76.6 million mt of N, a 61% growth during the past 8 years (table 1). Ammonia capacity is expected to increase by 47% during the next 8 years and reach 113 million mt of N by 1985 (figure 1). Percentagewise, the largest increases are expected to occur in Africa and Latin America, although the largest absolute increase in capacity will be in Asia and the U.S.S.R. Natural gas remains the preferred feedstock. Today, 68% of the world's supply of N is based on natural gas, so the location of cheap natural gas will be a major determinant of the location of future production (table 2) (2).

By the end of 1978 plants with almost 6 million mt of ammonia capacity have been closed. Japan has closed 1.3 million mt of capacity and may close 20% of the remaining plants. In Europe, principally Italy and Spain, plants with a total capacity of more than 725,000 mt have been closed. In the United States idle capacity is estimated to be over 4 million mt of ammonia.

In making N-production projections, a 90% operating rate in developed countries and a 70% rate in developing countries were assumed. The actual rate will depend on market conditions. In 1977 the world produced at approximately these operating rates. However, in 1976 use of these rates would have underestimated actual production by 0.9 million mt.

In 1977 the world produced 46 million mt of N (table 3). An estimated 72 million mt of N will be produced by 1985. In 1977 North America produced 23% of the world's N. Currently, Asia ranks second, with 20% of the world's production. By 1985 Asia is projected to produce 25% of the world's N, and North America will be in third place behind Asia and U.S.S.R. and only slightly ahead of Western Europe.

During the past 2 years, world N fertilizer production has averaged slightly more than 60% of the world's ammonia

Table 1. Regional Ammonia Capacity (3)

	Capacity				Rate of Change	
	1977	1978	1980	1985	1969-77	1977-85
	million mt N				%	
North America	18.2	17.3	17.4	17.4	37	-4
Latin America	2.8	4.3	4.4	6.8	98	144
Western Europe	14.8	14.9	16.1	16.4	29	11
Eastern Europe	9.4	9.9	10.8	12.4	68	32
U.S.S.R.	12.6	14.2	19.4	24.7	121	96
Asia	17.2	19.3	24.5	31.3	89	82
Africa	1.2	1.5	2.9	3.5	142	187
Oceania	.4	.4	.4	.4	-13	-
World	76.6	81.9	96.0	112.9	61	47

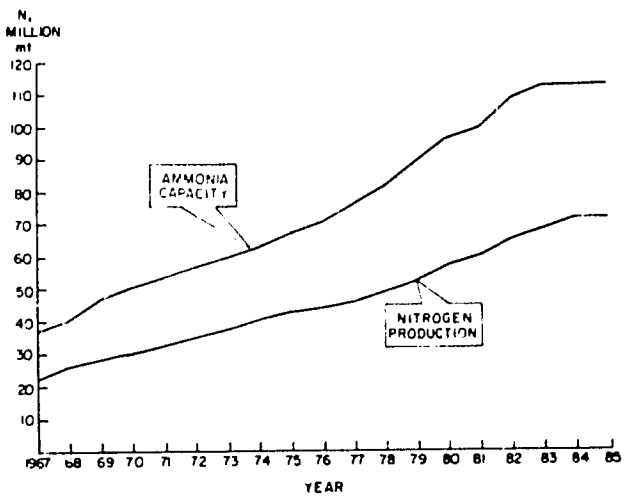


Figure 1. World Ammonia Capacity and Nitrogen Production, 1967-85.

Table 2. Regional Natural Gas Reserves (4)

Region	Reserves (trillion cubic feet)
North America	268.0
Latin America	108.5
Western Europe	136.8
Eastern Europe	11.4
U.S.S.R.	920.0
Africa	207.5
Asia	829.4
Oceania	38.0
World	2,519.6

Table 3. Regional Nitrogen Fertilizer Production (3)

Region	Production				Percentage of Region's Ammonia Capacity			
	1969	1977	1980[a]	1985[a]	1969	1977	1980	1985
	million mt N				%			
North America	7.7	10.8	11.2	11.2	58	59	65	65
Latin America	.6	1.3	2.5	3.8	45	48	55	56
Western Europe	8.1	9.2	10.1	10.6	71	62	63	65
Eastern Europe	2.8	5.8	6.9	8.1	49	62	64	65
U.S.S.R.	4.2	8.5	12.2	17.8	73	67	63	72
Asia	4.6	9.4	12.5	17.8	51	54	51	57
Africa	.3	.7	1.1	2.0	58	57	39	58
Oceania	.1	.2	.3	.3	18	49	65	65
World	28.4	45.9	56.8	71.7	60	60	59	63

a. Based on 90% operating rates in developed countries and 70% rates in developing countries.

capacity. Production of N fertilizer in 1985 is projected to be about 63% of total capacity. Although production as a percentage of capacity has been this large before, this projected high level may occur again because most of the 1985 capacity will have been in operation for a substantial period, whereas currently much of the capacity is new.

Many different fertilizer materials contain N, but urea with 46% N is rapidly becoming the market leader. At present, world urea capacity is estimated to be over 28 million mt of N. It is scheduled to increase to almost 38 million mt by 1980 and to 45 million mt by 1985. If this growth occurs, by 1985 urea will have the greatest share of the world fertilizer market.

This steady increase in growth means that urea will replace some of the older, traditional products such as ammonium sulfate and ammonium nitrate. Considering its high analysis and lower shipping costs per unit, urea should account for an even larger percentage of the world N trade. In Asia urea accounts for a greater share of the market than in most other regions.

World Nitrogen Consumption

Modern crop production systems and plant varieties need ample supplies of nitrogen fertilizers if their full yield potential is to be achieved. Nitrogen is of special importance because plants need it in rather large amounts, it is fairly expensive to supply, and it is easily lost from the soil.

In 1977 total world consumption of N was 45.1 million mt nearly 1.7 times the amount used only 8 years earlier (figure 2). This represents an average increase of 6.8%/year. Total N usage in 1985 is estimated to be 66.6 million mt (table 4). This projection would require world fertilizer consumption to increase by 5.0% annually from now until 1985, a slower rate of increase than that in recent years.

Asia is currently the largest N-consuming region (table 4). In 1985 Asia will consume 28% of the world's N fertilizers. North America, U.S.S.R., and Western Europe will continue to be large N-consuming regions. However, projected growth rates in N consumption are still below the growth levels of other recent time periods (table 5). Except for the years when fertilizer was in short supply, the last decade has had a rapid growth in the consumption of

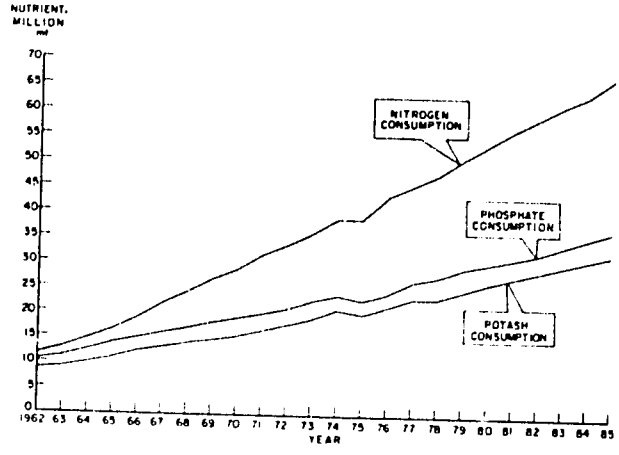


Figure 2. World Nitrogen, Phosphate, and Potash Fertilizer Consumption, 1962-85.

Table 5. Regional Change in Nitrogen Fertilizer Consumption (3)

Region	Change in Consumption			
	1965-70	1970-75	1975-80	1980-85
	%			
North America	58	97	34	17
Latin America	73	59	54	41
Western Europe	41	21	22	14
Eastern Europe	97	31	35	24
U.S.S.R.	116	76	35	28
Asia	113	37	55	31
Africa	44	46	59	33
Oceania	145	11	34	23
World	75	34	39	25

Table 4. Regional Nitrogen Fertilizer Consumption (3)

Region	Total Consumption				Share of World Consumption			
	1969	1977	1980	1985	1969	1977	1980	1985
	million mt N				%			
North America	6.6	10.3	11.2	13.1	25	23	21	20
Latin America	1.1	2.3	2.9	4.1	4	5	5	6
Western Europe	5.8	8.0	8.8	10.0	22	18	16	15
Eastern Europe	2.9	4.4	5.4	6.7	11	10	10	10
U.S.S.R.	3.5	7.3	9.1	11.6	13	16	17	17
Asia	6.0	11.2	14.2	18.5	23	25	26	28
Africa	.7	1.4	1.7	2.3	3	3	3	3
Oceania	.2	.3	.3	.3	1	-	1	1
World	26.6	45.1	53.6	66.6	100	100	100	100

fertilizers. This increase has resulted from widespread educational programs, new varieties, and low fertilizer prices relative to agricultural output. In many areas N was used or became readily available for the first time due to new production plants having been built in developing areas. In other areas, particularly in developed regions, farmers operated at levels they deemed optimum based on current price relationships. In these areas high levels of N use should continue but probably will not achieve high growth rates.

One factor that should be considered in making consumption projections is the increased demand for meat throughout the world. Much more fertilizer is required to produce a given amount of protein as meat than as grain. As meat production increases, more grain is fed to livestock. This means that N requirements will increase faster than if diets remained the same. In addition to the need to produce more feed grains, livestock expansion means more intensive use of pasture and forage crops and greater need for N fertilizer. This shift in diets should help to increase the N demand in the years ahead. The increase in demand for meat is offset to some extent by increasing areas of land used for soybeans. Soybeans fix atmospheric N and thus require little N fertilizer.

World Nitrogen Supply/Demand Balance

In 1977 the world produced 45.9 million mt of N and consumed 45.1 million mt. World ammonia capacity is expected to increase 47% between now and 1985 while N production is expected to reach 71.7 million mt. Consumption is expected to be 66.6 million mt, which would mean a difference of 5.1 million mt (figure 3) or nearly 7% of the production. During the past 2 years this difference has been 2% or less. However, during the past 10 years this difference has averaged about 5%. A surplus of this magnitude may not occur because there will continue to be capacity shutdowns and low operating rates until the imbalance is corrected. Also, some plants currently under construction or planned may be cancelled or delayed until the supply/demand balance improves.

Western Europe, Eastern Europe, and the U.S.S.R. were the only regions with net exports in 1977. The large increase in capacity and production in the U.S.S.R. will allow the export of huge quantities of N which will change world trade patterns considerably.

Regional Nitrogen Supply/Demand Balances

Projections of potential N production have been made using variable operating rates. For the developed countries, an operating rate of 90% is assumed after the third year of plant operation. Operating rates in developing countries are expected to be 70% after the third year of operation. Actual operating rates vary considerably among countries within each classification, as well as from year to year. However,

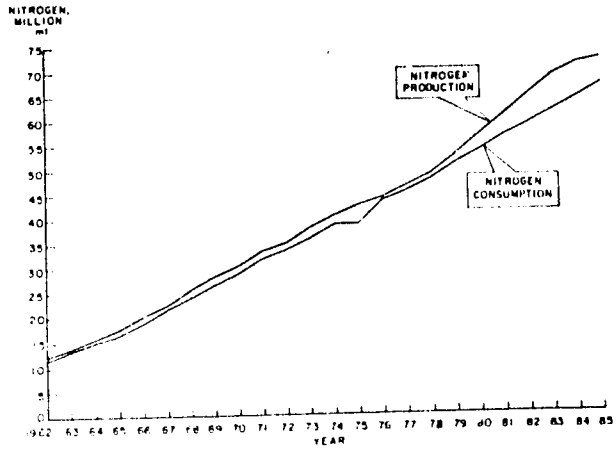


Figure 3. World Nitrogen Fertilizer Production and Consumption, 1962-85.

based on empirical data these operating rates are realistic on a worldwide basis given favorable market conditions.

North America Currently, North America (Canada and the United States) is producing more N than is being consumed in the region. In 1977 production reached 10.8 million mt of N while consumption was 10.3 million mt. Despite this, for the first time in the past decade more N was imported than was exported as ammonia producers found they could import ammonia cheaper than they could produce it. This situation allowed inventories to increase. It is estimated that 26% of the U.S. N capacity is based on natural gas costing over $2.00/m.c.f. (2). It most likely costs this group of producers $100 or more to produce a metric ton of ammonia. Meanwhile, ammonia is trading in the United States at prices below this level. Due to the price situation, it was reported in October that in the previous 18 months 25 out of a total 110 ammonia plants in the United States have shut down or severely cut back operations (5).

Ammonia capacity in North America is expected to remain unchanged through 1985. However, a big question is whether or not the plants closed due to poor market conditions will be brought back into production when the market improves. If North American producers maintain a 90% operating rate, the production of N fertilizers would be about 11.2 million mt in 1980 and remain at that level through 1985. Consumption is expected to increase steadily and by 1985 reach 13.1 million mt, 27% above the 1977 level. This would leave a deficit of 1.9 million mt of N fertilizers to be imported by 1985.

In the United States cheap ammonia imports resulting from surplus capacity throughout the world will encourage large imports into the United States. One major U.S. company has a 20-year contract with the U.S.S.R. under which 350,000 mt of ammonia were imported in 1978, 1.2 million mt are to be imported in 1979, and 2.1-2.5 million mt each year thereafter in exchange for phosphates (6).

New ammonia plants in Trinidad by 1980 and Mexico by 1982 will compound the U.S. import situation. An interesting issue which may arise in the near future is the

government's position on protecting the domestic N industry from the inflow of low-cost imports. Specifically, should the United States import natural gas or ammonia from Mexico? There is strong sentiment that the United States should be self-sufficient in ammonia production from a food production standpoint. However, ammonia producers may not have broad support for restricting the inflow of ammonia because (1) natural gas is being rationed at times in the United States and (2) ammonia production is very capital intensive and only a small portion of the labor force would be affected if imports cause jobs to be lost.

Latin America--Currently, Latin American countries consume considerably more N than they produce. In 1977 production was 1.3 million mt and consumption was 2.3 million mt. However, ammonia capacity is projected to increase by 144%, between 1977 and 1985, a higher percentage of increase than for any other region except Africa. This increase will take place mainly in Mexico, Brazil, and Trinidad. The additional capacity in Brazil will be to reduce its reliance on imports, whereas the additional capacity in Mexico and Trinidad will be for export. Mexico has very cheap natural gas, and some sources have indicated this gas costs as little as $0.25/m.c.f. compared to, in some cases, over $2 in the United States (5). Production potential in Latin America in 1985 is 3.8 million mt while consumption is expected to be 4.1 million mt. Thus, production and consumption will become much more balanced in the future if the increased ammonia capacity is used to produce fertilizers rather than for exporting ammonia. Mexico is by far the major N-consuming country in Latin America.

Western Europe--Currently, Western Europe is producing about 9.2 million mt of N while consuming only 8.0 million mt. Ammonia capacity is expected to increase by only about 11% between 1977 and 1985. Some plants have recently closed because of poor profits. Consumption is expected to increase 25% between 1977 and 1985, and even with the small increase in capacity, an N surplus is expected to continue. However, it should become smaller by 1985. France, West Germany, and the United Kingdom are the largest consumers in Western Europe.

Eastern Europe--In 1977 N production was 5.8 million mt, and consumption totaled 4.4 million. Ammonia capacity is scheduled to increase 32% between 1977 and 1985 with substantial increases in Romania, Bulgaria, Poland, and Yugoslavia. The production potential in 1985 is expected to be 8.1 million mt. Consumption in 1985 is estimated at 6.7 million mt. Thus, the region will continue to export nitrogen. Poland will remain the largest consuming country, but East Germany and Romania are both expected to consume a million metric tons by 1985.

U.S.S.R.--In 1977 the U.S.S.R. produced 8.5 million mt of N fertilizer and consumed 7.3 million mt. Exports totaled a record 534,000 mt. A large increase in U.S.S.R. ammonia capacity is expected as 40 new N plants are either planned, under construction, or have recently been brought into production (7). How quickly these plants come into production and how Russia decides to allocate this increase among the domestic and export sectors will have a large influence on world N prices. U.S.S.R. ammonia capacity is projected to almost double between 1977 and 1985. This would allow a potential production of 17.8 million mt or a 9.6% annual increase from 1977 to 1985 and result in a surplus of over 6.0 million mt of N. The United States, Italy, and France appear to be the major markets in the short run because of contracts that have already been made.

The 5-year plan for Russia calls for increasing mineral fertilizer production from 90.2 to 143.0 million mt of products including chemical feed additives and plant protection chemicals. However, the plan calls for a 51% increase in mineral fertilizers.

Asia--Currently, Asia consumes slightly over 11 million mt of inorganic N which is almost 2 million mt more than is produced. In addition to this, China consumes a considerable amount of organic N. The Japanese fertilizer industry is making drastic reductions in its fertilizer capacity because of the high cost of importing feedstocks and dwindling export markets. However, despite these reductions a net increase in Asian ammonia capacity of 12 million mt is expected between 1978 and 1985. This increase is equal to three-fourths of all the 1978 ammonia capacity in the United States. Large increases in capacity are planned in India, China, Turkey, Indonesia, and Pakistan. The Middle East is a big unknown. It has 57% of the world's known oil and 29% of the natural gas reserves (4). Although the demand for fertilizers is low in the Middle East, the abundance of low-cost natural gas encourages construction of processing facilities such as fertilizer plants. By 1985 Asian N production could reach 17.8 million mt, a 90% increase from 1977, while consumption will increase to 18.5 million mt, a 66% increase. The net result will be that Asia will still be a net importer of N through 1985. China and India are by far the largest N consumers.

Africa--In 1977 Africa produced 0.7 million mt of N and consumed 1.4 million mt. Ammonia capacity in Africa between 1977 and 1985 is projected to increase by 187%, the largest percentage increase of any region. The largest increases in capacity are expected in Algeria, Libya, Tunisia, and Egypt. In 1985 potential production in Africa is expected to be 2.0 million mt while consumption is expected to reach 2.3 million mt. Egypt is the region's largest N consumer. However, with 47 countries in Africa a regional supply/demand balance is of little consequence as most countries will continue to be N importers.

Oceania--Australia is the only producer in the region. In 1977 production totaled 220,000 mt of N, and the Oceania region consumed 247,000 mt. Normally, Oceania is a small net importer of N fertilizers.

Developing Countries--In 1977 the developing countries produced 9.8 million mt or 21% of the world's N fertilizer. This compares to 11% only 10 years ago. The developing

countries consumed 13.8 million mt of N fertilizer in 1977 which was 31% of the world's consumption (figure 4). Ten years ago they consumed only 24% of the world's N fertilizer.

Ammonia capacity in the developing countries (appendix A) is projected to increase by 116% from 1977 to 1985. Growth in the developed countries during this period is estimated at 27%. Total N production in developing countries in 1985 is projected to be 21.4 million mt. Nitrogen consumption is projected to be 23.6 million mt which would represent a growth of 71% during the 1977-85 period, while growth in the developed countries will be 38%. In 1985 the developing countries will produce 30% of the world's N fertilizer and consume 35% of the world's N fertilizer.

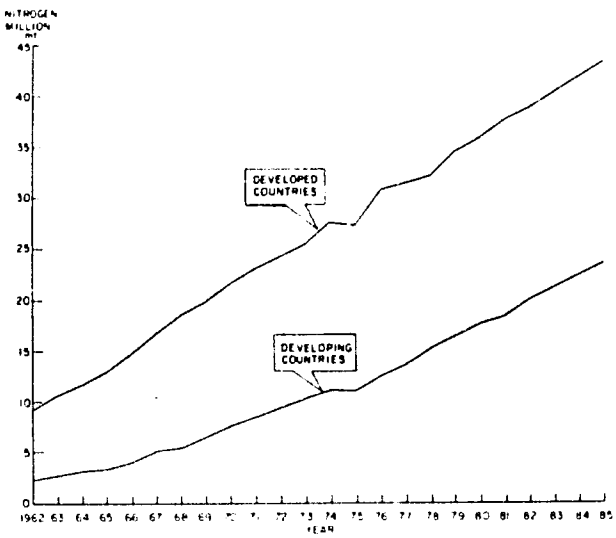


Figure 4. Nitrogen Fertilizer Consumption in Developed and Developing Countries, 1962-85.

PHOSPHATE FERTILIZER

World Phosphate Fertilizer Production

The phosphate market differs from the N market in that there are two basic sources of finished phosphate materials: (1) Products produced with phosphoric acid including TSP, most nitric phosphates, ammonium phosphates, and other complex fertilizer materials, and (2) products produced without phosphoric acid. Normal superphosphate, made by treating phosphate rock with sulfuric acid, is the major product. Others include basic slag (a byproduct of steel production) available for fertilizer use in Europe and the portions of concentrated superphosphate and nitric phosphate that come directly from phosphate rock. This second group of products is declining in importance and as the scheduled expansion in phosphoric acid comes into production, the decline should accelerate.

Total phosphate fertilizer capacity is not very meaningful because capacity of NSP and TSP is usually well above actual production levels. Thus, fertilizer capacity is considerably larger than most estimates if market conditions become very favorable.

One of the most important changes taking place in the phosphate industry is the trend toward phosphoric acid-based fertilizers with the phosphate rock-producing countries producing and exporting greater amounts of phosphate fertilizers and phosphoric acid. Normal superphosphate will continue to face increased competition from higher analysis products. Its usage, primarily in the production of low-analysis mixed fertilizers, is expected to remain at about today's levels through 1985; however, its market share will decline. Normal superphosphate still comprises a large portion of the phosphate market in all regions except North America. Also, NSP contains sulfur, which is needed in some soils. Future production will be concentrated in only a few areas. An increase is expected in the total world production of TSP by 1985 with the largest increase in Asia. The ammonium phosphates and other high-analysis complex fertilizers are fast becoming the most popular way of providing phosphate to the farmer.

Basic slag production is centered in Western Europe. Usage of this product as a source of phosphate has been declining with changes in the steelmaking process. Because this product is directly related to the region's steel industry, it appears that a shift to new steelmaking processes or use of different ores would be necessary to bring about any significant changes from the current production pattern.

The future of the world phosphate industry will depend on developments in phosphoric acid and to a lesser extent, in nitric phosphates. World nitric phosphate capacity is expected to climb from the 1978 level of about 3.2 million mt of P_2O_5 to almost 4.5 million mt of P_2O_5 by 1985. Production will center in Eastern and Western Europe, which together will have 3.7 million mt of capacity by 1985. Nitric phosphates will be of minor importance in other regions of the world.

Phosphoric acid is sometimes used in the manufacture of complex fertilizers by the nitric phosphate process. Only that portion of the P_2O_5 from the nitric acid acidulation of phosphate rock was considered to avoid double counting.

Phosphoric Acid Capacity.—World phosphoric acid capacity in 1977 was 26.4 million mt, a 92% increase over 8 years ago (table 6). Capacity is expected to increase 30% during the next 8 years and reach 34.2 million mt by 1985. Percentagewise the largest increase will occur in Latin America, but the largest absolute increase will be in Asia and the U.S.S.R. where capacity in both areas will increase by over 2 million mt. These two regions will have 35% of the world's phosphoric acid capacity by 1985 compared to 29% currently. All regions except North America, Western Europe, and Oceania are projected to increase their phosphoric acid capacity by 50% or more between 1977 and 1985. North America which now has 35% of the world's capacity will have only 27% by 1985.

In order to analyze the future supply capability of the phosphate industry, it is necessary to look at the raw

Table 6. Regional Phosphoric Acid Capacity (3)

Region	Capacity				Rate of Change	
	1976	1977	1980	1985	1969-1977	1977-1985
	million mt P_2O_5				%	
North America	9.1	9.3	9.4	9.4	48	1
Latin America	.9	1.0	1.4	2.2	54	122
Western Europe	4.7	4.7	4.7	4.7	54	1
Eastern Europe	1.5	1.6	2.1	2.5	166	56
U.S.S.R.	4.0	4.5	5.4	6.8	276	51
Asia	2.4	3.1	3.5	5.3	154	73
Africa	1.4	2.0	2.5	3.2	290	60
Oceania	.3	.3	.3	.3	14	0
World	24.2	26.4	29.3	34.2	92	30

materials that are important in the manufacture of phosphate fertilizers.

Phosphate Rock—Estimates of world phosphate rock reserves vary widely. It is generally felt that an ample supply for the foreseeable future exists, and current reserves are estimated at 144 billion (10^9) mt of equivalent 30% P_2O_5 grade (table 7) (8). An arbitrary judgment would probably classify only 25% of this total as being potentially recoverable by present-day economics and technology.

Phosphate rock production will be a key to the growth and production of phosphoric acid and phosphate products. In 1977, world production of phosphate rock was 115.8 million mt of product (9). Production is concentrated in the United States, U.S.S.R., and northwest Africa. An ISMA forecast based mainly on producer surveys indicates a large increase in production potential by 1982. More than half of the increase would come from North America and northwest Africa. With a production potential of 172.2 million mt by 1982, the phosphate rock situation does not appear to be a limiting factor in phosphate fertilizer production.

In 1977 North America accounted for 41% of the world's phosphate rock production whereas by 1982 the region is expected to have only 36% of the potential production. Africa should be able to increase its share from 25% of the actual production in 1977 to 28% of the potential production by 1985. During the same period, U.S.S.R. would decrease her share of world phosphate rock production from 21% to 17%. The Near East has the potential to increase production from 4.0 million mt to 12.3 million mt of product. There are so many unknowns about some of the new rock reserves that it is virtually impossible to predict the quality and quantity of rock that will be available for world markets. Even with such uncertainties, rock capacity is shifting eastward, as is capacity for phosphoric acid and related products. However, Africa and North America will continue to be the leading export regions but will have help from the Near East producers. Western Europe will remain the largest importing region with Eastern Europe and Latin America being second and third, respectively.

Table 7. Regional Phosphate Reserves (8)

Region	Reserves (billion product tons)
North America	35.6
Latin America	9.6
Western Europe	.3
Eastern Europe	-
U.S.S.R.	7.5
Asia	22.1
Africa	67.2
Oceania	2.1
World	144.2

Sulfur—Sulfur is of primary importance to the phosphate industry as about 55% of the sulfur usage is in phosphate fertilizer production. It is one of the most plentiful minerals and is a byproduct of the petroleum and nonferrous metals processing industries. However, shortages of sulfur are being reported. Production has stagnated, particularly Frasch sulfur in Mexico and the United States, while consumption has been steadily increasing. There appears to be plenty of sulfur in the world, but production costs tend to increase in direct relationship to availability. The big unknown in the present sulfur-market situation is the effect of increased natural gas costs on production and how much sulfur production will occur from involuntary sources such as stack gas, coal, and similar sources. Supply from these will depend to a large extent on environmental regulations. In 1977 only 48% of the 49.0 million mt of sulfur produced came from Frasch mines and pyrites with the remainder being produced by involuntary sources. The Sulphur Institute has projected that very little change in the future will be made in the amount of sulfur coming from Frasch mines and pyrites, but a large increase is expected in the amount of sulfur obtained from gas, oil, smelter-coal, and gypsum operations (10). The rate of consumption for nonfertilizer usage is declining, although usage in sulfur-asphalt construction materials has been very important

recently. The uncertainty about involuntary production which is based more on environmental regulations than on economics, has made producers reluctant to invest and develop new voluntary production.

Phosphate Fertilizer Production.-Potential production of phosphate fertilizers is much more difficult to estimate than for either N or K_2O. The following steps were used to estimate phosphate production: (1) Project basic slag production (important in Europe as a byproduct of steel industry); (2) Project NSP production; (3) Add nitric phosphate capacity, assuming a 90% operating rate in developed countries and a 70% operating rate in developing countries. Operating losses were deducted, but it was assumed that all nitric phosphates were used in fertilizer; (4) Project TSP production; (5) Add phosphoric acid capacity assuming a 90% operating rate in developed countries and a 70% operating rate in developing countries. Operating losses and industry usage adjustments were also made. In the manufacture of TSP, phosphoric acid makes up about 30% of the total. Thus, to avoid double counting, this must be deducted from the phosphoric acid available.

Use of the 90% operating rates for producing phosphate fertilizers in developed countries and the 70% rate in developing countries is arbitrary as the actual rate will depend on market conditions. In 1972-75, the world slightly exceeded these rates. However, in 1977 production was only 93% of the amount that would have been indicated by these rates, which means that use of these rates would have overstated actual production by 2.2 million mt.

In 1977 the world produced 27.3 million mt of phosphate fertilizers (table 8). An estimated 38.9 million mt of phosphate fertilizers will be produced by 1985 (figure 5). In 1977 North America, the world's largest phosphate producing region, produced 29% of the world's phosphate fertilizers. Western Europe ranked second with 20%. Currently, U.S.S.R. and Asia combined produce about the same amount as North America, but by 1985 their production will exceed that of North America and Western Europe combined.

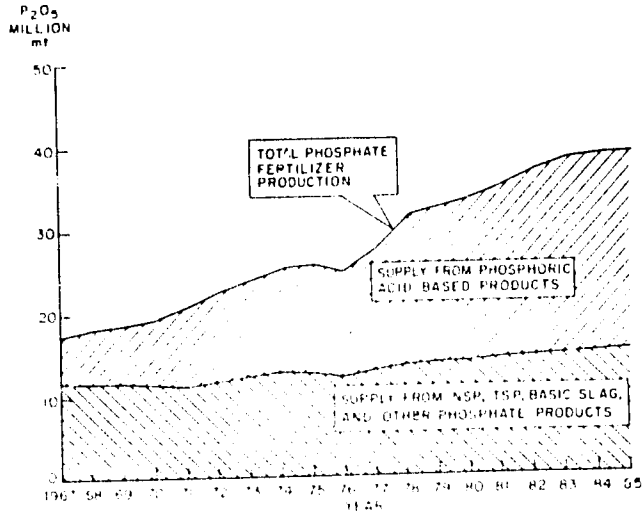


Figure 5. World Phosphate Fertilizer Production, 1967-85.

World Phosphate Fertilizer Consumption

Soils deficient in phosphorus show good crop yield response to additions of phosphatic fertilizers. The phosphorus level of the soil can be built up by repeated applications of phosphatic fertilizer to the point where little or no response to phosphate occurs. This situation has developed over much of the intensively farmed areas of Europe and North America. Under these conditions correct phosphate fertilizer management will come from a judicious balancing of the phosphate removed by crops and addition of phosphate. Phosphate deficiency is very marked in many tropical soils and is often a key factor limiting agricultural production.

Table 8. Regional Phosphate Fertilizer Production (3)

Region	Production				Rate of Change	
	1969	1977	1980[a]	1985[a]	1969-1977	1977-1985
	million mt P_2O_5				%	
North America	5.1	7.8	7.8	7.9	53	1
Latin America	.3	1.2	1.3	2.1	319	84
Western Europe	5.6	5.5	6.1	6.0	- 2	9
Eastern Europe	1.8	2.9	4.0	4.4	65	52
U.S.S.R.	1.9	4.4	5.9	7.5	127	70
Asia	2.0	3.6	4.7	6.8	83	92
Africa	.7	.9	2.2	2.8	26	205
Oceania	1.2	1.1	1.4	1.4	- 8	30
World	18.5	27.3	33.3	38.9	47	42

a. Based on 90% operating rates in developed countries and 70% rate in developing countries.

In 1977 world consumption of phosphate was 26.5 million mt of P_2O_5 (table 9). Phosphate ranked second in importance to N. For many years, P_2O_5 was the leading plant nutrient. The slower growth of P_2O_5 consumption is partially because it builds up in the soil when applied in excess of plant needs; whereas, N and to some extent K_2O need to be replenished each year because of leaching.

World P_2O_5 usage has increased at an annual rate of 4.8% during the past 8 years and is expected to increase at about 4.2% annually between now and 1985. Phosphate consumption is expected to reach 36.7 million mt by 1985. Phosphate fertilizer is used mainly in the industrialized countries of Europe, North America, U.S.S.R., and Oceania which together accounted for 73% of the total consumption in 1977. As consumption in developing countries increases, consumption in the developed countries is projected to be only 68% of the world's total in 1985 (table 9). North America and Western Europe, particularly, appear to have reached saturation levels of P_2O_5 usage, and large increases in consumption are unlikely.

The most rapid increase in P_2O_5 consumption percentagewise between now and 1985 will occur in Latin America. Growth rates in most areas are considerably lower than those of the past decade (table 10). However, U.S.S.R. and Asia will show the greatest absolute increase in consumption.

World Phosphate Fertilizer Supply/Demand Balance

The world produced 27.3 million mt of phosphate fertilizer in 1977 and consumed 26.5 million mt (figure 6). Phosphoric acid capacity is projected to increase 30% between 1977 and 1985. Potential production of phosphate fertilizers could reach 38.9 million mt by 1985. Consumption is projected to be 36.7 million mt, thus production will exceed consumption by about 2.2 million mt, which is equivalent to about 6% of production. During the past 10 years production has exceeded consumption by about 5%.

In terms of net trade North America in 1977 supplied 2.2 million mt of phosphate fertilizer to the world market. Africa and the U.S.S.R. are the only other regions with even small net export balances. Trade patterns will likely change in the next few years with Africa having the potential to export large quantities of phosphate fertilizers although still not at a level comparable to that of North America. Other regions will increase their import levels.

Table 10. Regional Change in Phosphate Fertilizer Consumption (3)

Region	Change in Consumption			
	1965-1970	1970-1975	1975-1980	1980-1985
	%			
North America	29	4	24	9
Latin America	77	92	57	41
Western Europe	20	-3	14	6
Eastern Europe	60	32	32	22
U.S.S.R.	49	71	51	39
Asia	68	42	47	27
Africa	54	48	38	32
Oceania	-1	-23	29	6
World	35	21	33	21

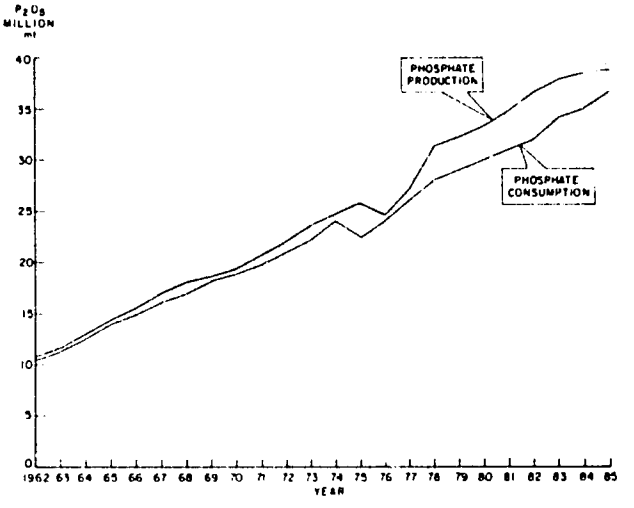


Figure 6. World Phosphate Fertilizer Production and Consumption, 1962-85.

Table 9. Regional Phosphate Fertilizer Consumption (3)

Region	Total Consumption				Share of World Consumption			
	1969	1977	1980	1985	1969	1977	1980	1985
	million mt P_2O_5				%			
North America	4.5	5.6	5.7	6.2	25	22	19	17
Latin America	.7	1.9	2.3	3.3	4	7	8	9
Western Europe	4.9	5.3	5.8	6.1	27	20	19	16
Eastern Europe	2.1	3.1	3.7	4.5	11	12	12	12
U.S.S.R.	1.7	4.1	4.9	6.9	10	15	16	19
Asia	2.4	4.4	5.6	7.1	13	17	19	19
Africa	.5	.9	1.0	1.4	3	3	3	4
Oceania	1.2	1.1	1.2	1.3	7	4	4	3
World	18.2	26.5	30.3	36.7	100	100	100	100

Regional Phosphate Fertilizer Supply/Demand Balances

Production projections for phosphates have been made using a constant operating rate of 90% for developed countries and 70% for developing countries. These operating rates are realistic on a worldwide basis if market conditions are favorable. However, on a regional or country basis, these estimates become less precise because of international trade in phosphoric acid. In the following regional discussions, note that production estimates are based on the above operating rates and thus represent a theoretical production level. Actual regional, and especially country, production may differ substantially depending on market conditions, changes in trading patterns of raw materials, and physical limitations.

North America—In 1977 North America produced 7.8 million mt of phosphate fertilizers and consumed 5.6 million mt. No change in phosphoric acid capacity is expected in either the United States or Canada, thus phosphate fertilizer production is expected to be about 7.8 million mt per year from now until 1985. Environmental considerations are having an important effect on the development of the phosphate fertilizer industry in North America. Consumption is expected to reach 6.2 million mt by 1985, only a 10% gain from 1977. This means there will be a surplus of phosphate fertilizers in North America but a smaller one than previously. The United States exports about 400,000 mt of phosphoric acid, about one-half of which is sold to Brazil.

Latin America—In 1977 Latin America produced 1.2 million mt of phosphate fertilizers and consumed 1.9 million mt. This deficit has been running at about 700,000 mt in recent years. Latin America accounts for almost one-third of the total imports of phosphoric acid in the world. Between 1969 and 1977 phosphate fertilizer production increased 319%. Although a substantial increase in phosphoric acid capacity is expected in Mexico and Brazil, the region's phosphate fertilizer deficit will become greater over time. In 1985 the region will have the potential to produce 2.1 million mt of phosphate fertilizers but is projected to consume 3.3 million mt. Thus, the current deficit will almost double by 1985. Much of this deficit will be made up of imports of phosphoric acid. Brazil is by far the major phosphate-consuming country in the region.

Western Europe—Production of phosphate fertilizers in 1977 totaled 5.5 million mt with consumption being only slightly less. This relatively balanced situation should continue through 1985 even though no increase in phosphoric acid capacity is projected. Any increase in capacity would most likely have to be based on imported rock. Per-hectare usage of phosphate fertilizers in Western Europe is among the highest in the world. Total consumption in 1977 despite being larger than the previous 2 years, was still lower than for any other year from 1971 to 1974. Increases in consumption of only 15% are projected between 1977 and 1985. France, West Germany, Spain, and Italy are the largest consumers.

Eastern Europe—Phosphate production in 1977 totaled 2.9 million mt while consumption was 3.1 million mt. Eastern Europe has produced at an operating rate slightly less than 90% during each of the past 10 years. However, consumption has exceeded production during each of these years. Phosphoric acid capacity is expected to increase by approximately 56% between 1977 and 1985. This should allow production and consumption to be in balance in the future. Poland is by far the largest consuming country.

U.S.S.R.—In 1977 the U.S.S.R. produced 4.4 million mt of phosphate fertilizers and consumed 4.1 million mt. During the past 5 years the U.S.S.R. has had a net trade balance of under 100,000 mt. Phosphoric acid capacity during the last 8 years increased 276%, and another 51% increase is expected between 1977 and 1985. Russia's latest 5-year plan calls for a rapid increase in phosphate fertilizers. Potential production of phosphate fertilizers in 1985 is 7.5 million mt. Consumption is expected to reach 6.9 million mt. Thus would allow for a considerable P_2O_5 surplus, however, the recent exchange of ammonia for phosphoric acid implies that the U.S.S.R. will not increase P_2O_5 exports.

Asia—Asia produced 3.6 million mt of phosphate fertilizers in 1977 and consumed 4.4 million mt. Phosphoric acid capacity between 1977 and 1985 is expected to increase 73%. The absolute increase in capacity in Asia will be 2.2 million mt which is second only to that of the U.S.S.R. Large increases in capacity are expected in Turkey, India, Jordan, and Iraq. Potential production in 1985 is estimated at 6.8 million mt of P_2O_5 while consumption is expected to be 7.1 million mt. Thus, Asia will move closer to a balanced situation by 1985. China, India, Japan, and Turkey are the major consuming countries.

Africa—Phosphate fertilizer production and consumption were balanced in 1977 at 0.9 million mt. Africa consumes only a portion of its total phosphate fertilizer production due to large exports of phosphoric acid and phosphate rock to Europe, Brazil, India, and Japan. Morocco, Tunisia, and Algeria are large exporters of phosphate rock or phosphate products. A 60% increase in phosphoric acid capacity is projected between 1977 and 1985. South Africa is by far the largest consumer of P_2O_5.

Oceania—Relative to other regions, Oceania consumes only a small amount of fertilizer, and the majority of this is phosphates. No increase in phosphoric acid capacity is planned, but higher operating rates could allow production to increase enough to have a balanced situation. Phosphate consumption is projected to increase from 1.1 million mt in 1977 to 1.3 million mt in 1985.

Developing Countries—In 1977 the developing countries produced 4.6 million mt or 17% of the world's phosphate fertilizer. This compares to 10% ten years ago. The developing countries consumed 6.1 million mt of phosphate fertil-

izers in 1977 which was 22% of the world's consumption (figure 7). Phosphoric acid capacity in the developing countries is projected to increase by 177% from 1977 to 1985. Growth in the developed countries during this period is estimated at only 14%. Phosphate production in 1985 is projected to be 9.9 million mt. Consumption is projected to be 10.5 million mt. This would represent a growth of 71% in consumption during the 1977-85 period in the developing countries while growth in the developed countries is expected to increase only 29%. In 1985 the developing countries will represent 25% of the world's phosphate fertilizer production and 29% of the world's phosphate fertilizer consumption.

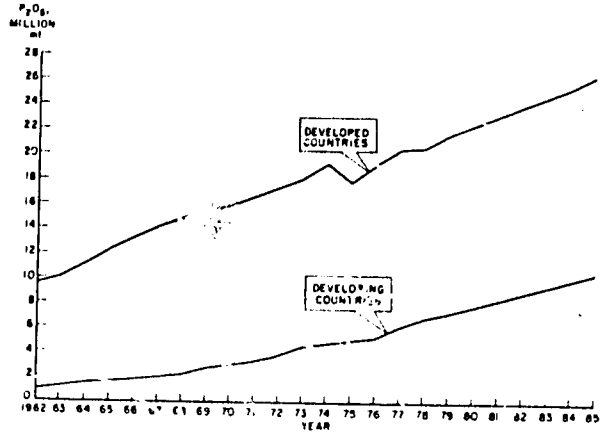


Figure 7. Phosphate Fertilizer Consumption in Developed and Developing Countries, 1962-85.

POTASH FERTILIZER

World Potash Capacity and Production

Potash is obtained from underground deposits formed by the evaporation of ancient seas and from present-day salt lakes and natural brines. It is also widely distributed in silicate rocks and sea water. World K_2O reserves considered recoverable with today's prices have been estimated at over 9 billion (10^9) mt (table 11). Capacity in the 13 countries which produced K_2O in 1977 was estimated at 31.5 million mt, a 35% growth during the past 8 years (figure 8). Potash capacity in 1985 is projected to be 38.0 million mt, a growth of 21% during this 8-year period (table 12). Percentagewise, the largest increase in capacity is expected to occur in Asia although the majority of the absolute increase in capacity will be in the U.S.S.R. Very little growth in K_2O capacity is expected in the United States and in Western Europe.

Potential K_2O production was projected in a manner similar to that of N except that operating rates were allowed to vary by country based on historical data. It takes about 5 years to bring a new potash mine into operation, thus these capacity figures should be relatively firm compared to those of N and P_2O_5 where new plants can be brought into production more quickly.

In 1977 the world produced 25.3 million mt of K_2O (table 13). An estimated 30.9 million mt of K_2O will be produced by 1985. In 1977 a third of the world's K_2O was produced in the U.S.S.R. This share is projected to increase to 38% by 1985. North America currently ranks second with 32% of the world's K_2O production.

In the 1950's Canada started development of large K_2O resources and began large-scale production in 1962. After a period of good demand, the North American K_2O industry was faced with excess capacity and produced at a low operating rate from 1969 to 1973. The Government of Saskatchewan instituted a K_2O conservation program including production controls and minimum price levels in 1970. As a result of the large demand which began in 1973-74, the Government removed these controls and ended the floor price system. Some Canadian producers initiated procedures to make their plants more efficient and

Table 11. Regional Potash Reserves and Resources (11)

Region	Reserves[a]	Total Resources
	billion mt K_2O	
North America	5.0	80.0
Latin America	.1	.3
Western Europe	.7	5.8
Eastern Europe	1.0	8.0
U.S.S.R.	2.0	50.0
Asia	.3	11.0
Africa	-	.2
Oceania	-	-
World	9.1	155.3

a. At average 1978 domestic mine prices.

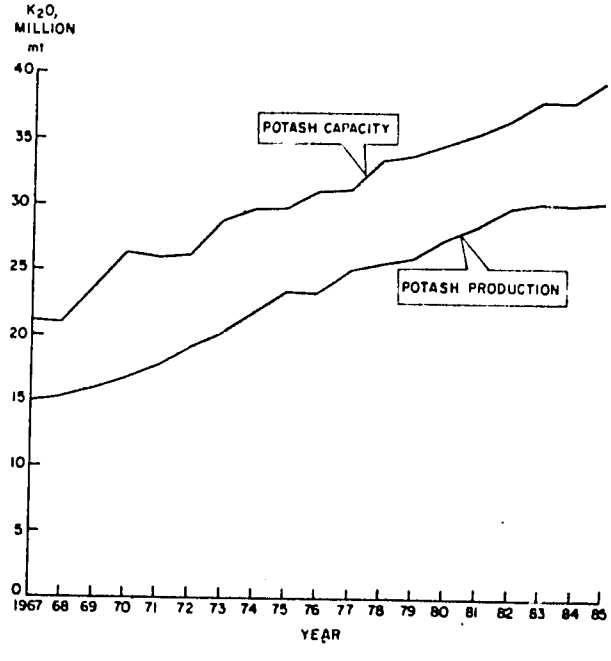


Figure 8. World Potash Capacity and Production, 1967-85.

Table 12. Regional Potash Capacity (3)

Region	Capacity				Rate of Change	
	1969	1977	1980	1985	1969-1977	1977-1985
	million mt K_2O				%	
North America	10.2	10.5	10.6	11.6	3	10
Latin America	-	-	-	-	-	-
Western Europe	5.9	6.9	7.1	7.3	17	7
Eastern Europe	2.5	3.2	3.5	3.7	30	14
U.S.S.R.	3.9	9.3	12.5	13.5	134	46
Asia	.8	1.1	1.1	1.9	34	73
Africa	-	.5	-	-	-	-100
Oceania	-	-	-	-	-	-
World	23.3	31.5	34.9	38.0	35	21

Table 13. Regional Potash Fertilizer Production (3)

Region	Production				Percentage of Region's Potash Capacity			
	1969	1977	1980	1985	1969	1977	1980	1985
	million mt K_2O				%			
North America	5.3	8.0	8.2	9.0	52	76	77	78
Latin America	-	-	-	-	-	-	-	-
Western Europe	4.7	4.5	4.9	5.1	80	66	69	70
Eastern Europe	2.3	3.2	3.3	3.5	93	99	93	96
U.S.S.R.	3.1	8.3	10.1	11.7	79	90	81	87
Asia	.5	1.0	1.0	1.5	67	90	93	81
Africa	-	.3	-	-	-	50	-	-
Oceania	-	-	-	-	-	-	-	-
World	15.4	25.3	27.5	35.2	68	80	78	81

remove "bottlenecks," but others did not because of taxation and fear of expropriation.

In 1977 Canada had a K_2O capacity of 7.8 million mt to rank second in the world to Russia's 9.3 million mt. In 1979 through acquisitions and expansions, the Saskatchewan Government will have control of 40% of the potash industry in Canada. The effect of this involvement on additional private investment in Canada is unclear at this time. The projected increases in Canada's capacity are through improvements in existing operations in the province of Saskatchewan and through new capacity in the province of New Brunswick.

It should be noted that the U.S.S.R. is projected to supply about 60% of the world's increase in K_2O production between 1977 and 1985. Because accurate data from the U.S.S.R. is very difficult to obtain and because of transportation and operational problems, it is entirely possible that this type of increase might not be realized. If it were achieved, there would be marketing uncertainties. If problems occur and Russia does not produce as expected, the Canadian mines may expand more than currently anticipated.

World Potash Fertilizer Consumption

Potash is a major constituent of all plants. It is a more mobile nutrient in the soil than phosphate. Adequate levels of potash generally can be maintained without difficulty by fertilizer applications. Although potash needs in many areas of the world are less than phosphate needs, areas of continuous intensive cropping will need increasing supplies of potash fertilizer.

Many soils are naturally high in K_2O and require little or no supplemental applications for average yields. As a result K_2O ranks third in usage among the primary plant nutrients. In 1977 the world consumed 23.1 million mt of K_2O fertilizers with 32.1 million mt expected to be used by 1985 (table 14). This would imply an annual growth rate of 4.2% compared to a 5.8% increase in consumption each year during the past 8 years. Historically, growth rates have been highest in the U.S.S.R. and Latin America (table 15).

Europe and U.S.S.R. are the major K_2O-consuming regions in the world, using about 60% of the world's K_2O fertilizers in 1977 (table 14). Very little K_2O is used in developing countries. In 1977 both North America and the U.S.S.R. consumed about 5.6 million mt of K_2O. By 1985 the U.S.S.R. will consume about 40% more K_2O than North America. Growth rates in most areas are projected to be considerably lower than during the past decade.

Table 14. Regional Potash Fertilizer Consumption (3)

Region	Total Consumption				Share of World Consumption			
	1969	1977	1980	1985	1969	1977	1980	1985
	million mt K_2O				%			
North America	3.7	5.5	5.7	6.7	25	24	22	21
Latin America	.5	1.1	1.4	1.9	4	5	5	6
Western Europe	4.2	4.7	5.3	5.7	28	21	20	18
Eastern Europe	2.3	3.5	3.9	4.6	16	15	15	14
U.S.S.R.	2.2	5.6	6.7	9.4	15	24	25	29
Asia	1.4	2.0	2.5	3.0	10	9	10	9
Africa	.2	.4	.4	.6	1	2	2	2
Oceania	.2	.3	.3	.3	1	-	1	-
World	14.7	23.1	26.2	32.1	100	100	100	100

Table 15. Regional Change in Potash Fertilizer Consumption (3)

Region	Change in Consumption			
	1965-1970	1970-1975	1975-1980	1980-1985
	%			
North America	42	11	35	16
Latin America	107	67	47	39
Western Europe	12	5	14	8
Eastern Europe	62	38	16	16
U.S.S.R.	63	67	71	42
Asia	63	45	15	18
Africa	37	60	24	31
Oceania	28	22	23	16
World	40	28	32	23

World Potash Fertilizer Supply/Demand Balance

In 1977 the world produced 25.3 million mt of K_2O and consumed 23.1 million mt as fertilizer (figure 9). World K_2O capacity is expected to increase 21% between now and 1985. Based on projected operating rates potential K_2O fertilizer production could reach 30.9 million mt by 1985 with consumption projected at 32.1 million mt. Distribution losses normally account for about 5% of this production. Thus, an extremely tight potash situation is expected by 1985.

North America and the U.S.S.R. were the only regions to have a net trade balance in 1977, and the same situation is expected in 1985. However, the surplus available for export will decline in both of these regions while import demands in most other countries will increase.

Regional Potash Fertilizer Supply/Demand Balances

Production projections for K_2O have been made using operating rates based on the past history for each of the 13 producing countries. Production in each country may differ substantially for a particular year depending on market conditions, changes in trading patterns of raw materials, or physical limitations.

North America—In 1977 North America produced 8.0 million mt of K_2O fertilizer and consumed 5.5 million mt. About three-fourths of the North American K_2O capacity is in Canada, and all of the projected increase in the region's capacity will occur in Canada. North America accounted for 32% of the world's potash production in 1977, but this share is expected to decline to 29% by 1985. Production is expected to increase to 9.0 million mt by 1985 while consumption is expected to reach 6.7 million mt. Thus, North America will continue to be a major exporter of K_2O, but the policies adopted by the Saskatchewan Government could determine the magnitude.

Latin America—There is almost no K_2O produced in Latin America although 1.1 million mt was consumed in 1977. Consumption is projected to reach 1.9 million mt by 1985, and with the exception of a small amount of potassium nitrate production in Chile, all of this will be imported. Brazil is the major K_2O-consuming country, and is currently reviving plans to develop potash reserves.

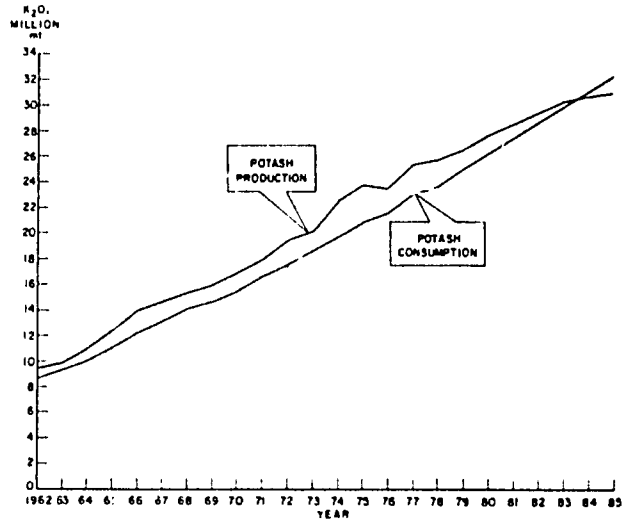


Figure 9. World Potash Fertilizer Production and Consumption, 1962-85.

Western Europe–Approximately 4.5 million mt of K_2O was produced in 1977 compared to 4.7 million mt that was consumed. We expect this pattern to continue although the deficit is expected to increase very slightly. Production in 1985 is projected to be 5.1 million mt compared to 5.7 million mt that will be consumed. This would be a 20% increase in consumption between 1977 and 1985. France and West Germany are the largest consumers.

Eastern Europe–Potash fertilizer production in Eastern Europe totaled 3.2 million mt in 1977 while consumption totaled 3.5 million mt. All the K_2O production is in East Germany. The deficit between production and consumption is expected to widen over time. In 1985 production is expected to reach 3.5 million mt with 4.6 million mt being consumed. Poland consumes more than twice as much K_2O as any other country in Eastern Europe.

U.S.S.R.–In 1977 Russia produced 8.3 million mt of K_2O and consumed only 5.6 million mt. Potash capacity is expected to increase 46% in the U.S.S.R. between 1977 and 1985. Potential production of K_2O in 1985 is 11.7 million mt. Consumption is projected to be 9.4 million mt. Although 60% of the world's increase in K_2O production is projected to occur in the U.S.S.R., by 1985 less will be available for export than in 1977. However, in 1980 production will exceed consumption by almost 3.5 million mt. This will decline to about 2.3 million mt by 1985.

Asia–Asia consumes about 2 million mt of K_2O and only produces about half of this amount. All production is in Israel and China although Jordan will begin production in 1983. In 1985 potential production is projected to reach 1.5 million mt with consumption reaching 3.0 million mt. Thus, the K_2O deficit in Asia will increase over time. Japan, India, and China are the largest consumers.

Africa–No K_2O production is projected for Africa through 1985. The Congo was a producer until the mines were flooded in 1977. Consumption is expected to increase from 0.4 million mt in 1977 to 0.6 million mt in 1985.

Oceania–No K_2O is produced in Oceania. Consumption is only 0.3 million mt and is projected to be 0.3 million mt in 1985.

Developing Countries–Very little potash fertilizer is produced or used in developing countries. In 1977 the developing countries produced 0.6 million mt or only about 2% of the world's K_2O fertilizer. These countries consumed 2.6 million mt of K_2O in 1977 which was 11% of the world's total (figure 10).

Potash fertilizer production in developing countries in 1985 is projected to be only 0.7 million mt. Consumption is projected to be 4.5 million mt which would represent a 73% increase during the 1977-85 period while growth in the developed countries will be only 35%. In 1985 the developing countries will continue to represent only 2% of the world's K_2O fertilizer production but will consume 14% of the world's K_2O fertilizer.

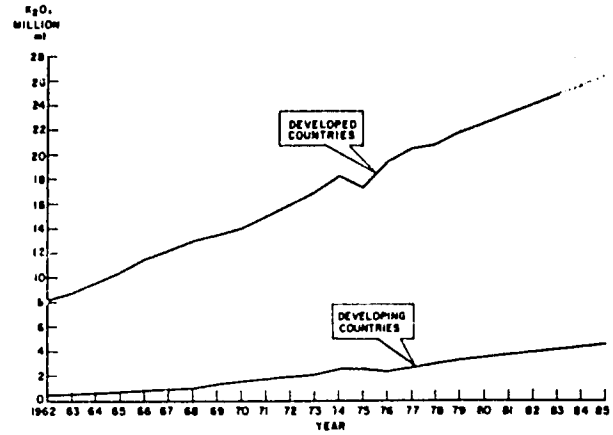


Figure 10. Potash Fertilizer Consumption in Developed and Developing Countries, 1962-85.

WORLD FERTILIZER CONSUMPTION

True fertilizer consumption is the amount of the nutrient that the farmer applies to the soil. However, consumption has to be estimated for most countries because of the manner in which data are reported. Statistically, consumption in most countries is treated as apparent disappearance. If production, trade, and inventory data were accurate, disappearance and consumption would be the same. However, if changes in inventories are unavailable or inaccurate, these errors affect apparent disappearance and may cause large year-to-year variations in the amount of consumption reported. It is sometimes difficult to identify these statistical fluctuations from the start of a major shift in the consumption pattern. For example, a large inventory buildup this year could statistically indicate very high consumption this year and much lower consumption next year. It is important to recognize these year-to-year fluctuations in making and analyzing projections. This is a bigger problem at the country and regional level because world totals tend to average out the problem.

Total world consumption of fertilizer in 1976-77 was 94.6 million mt, a 6.5% increase over the previous year (figure 11). Consumption in 1980 is expected to reach 110 million mt, and the world is expected to consume over 135 million mt of fertilizer by 1985. This means that total fertilizer consumption will increase at an average annual rate of slightly over 5.1% until 1980 and at 4.3% annually between 1980 and 1985.

Although table 16 shows the overall level of fertilizer consumption expected in the future, there are very significant differences between the individual plant nutrients. Nitrogen currently represents about 48% of total N, P_2O_5, and K_2O consumption. Nitrogen will continue to gain an increasing share of total fertilizer consumption while P_2O_5 and K_2O consumption will represent a slightly smaller share of the total market. Latin America, U.S.S.R., and Asia are

also regions which will have a much higher growth rate than North America and Western Europe (table 17). These last two regions which consumed 42% of the world's fertilizer in 1977 are expected to consume only 35% by 1985 (table 18).

Production of fertilizer in the developing countries is expected to increase from 15.0 million mt in 1977 to 32.0 million mt in 1985 (table 19). Consumption of all fertilizers during this period in developing countries is expected to increase from 22.5 million mt to 38.5 million mt (table 20). Eight years ago less than one-tenth of the world's fertilizer was produced in developing countries. Eight years from now, developing countries will produce almost one-fourth of the world's total. More than one-fourth of the world's fertilizer will be consumed in developing countries in 1985.

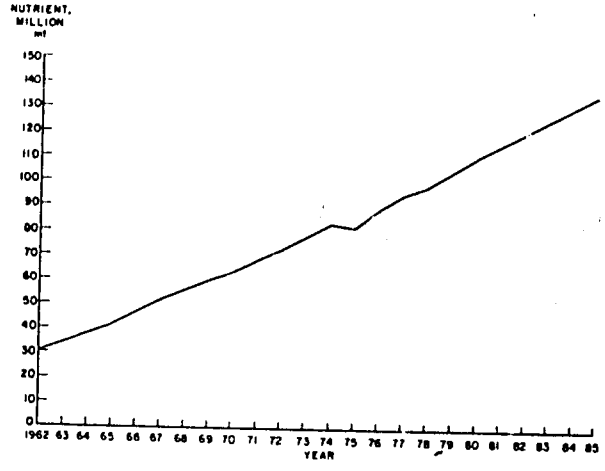


Figure 11. Total World Fertilizer Consumption (N, P_2O_5, and K_2O Combined), 1962-85.

Table 16. World Fertilizer Consumption by Nutrient (3)

Nutrient	1969	1977	1980	1985
	million mt			
N	26.6	45.1	53.4	66.6
P_2O_5	18.2	26.5	30.3	36.7
K_2O	14.7	23.1	26.2	32.1
Total	59.5	94.6	109.9	135.4

Table 17. Total Regional Fertilizer Consumption (N, P_2O_5, and K_2O) (3)

Region	Total Consumption					Growth Rates		
	1969	1976	1977	1980	1985	1970-75	1975-80	1980-85
	million mt					%		
North America	14.8	20.2	21.4	22.6	25.9	12	32	15
Latin America	2.4	4.4	5.3	6.6	9.3	71	53	41
Western Europe	14.9	17.1	18.1	19.8	21.8	8	18	10
Eastern Europe	7.3	11.3	11.0	13.1	15.8	33	28	21
U.S.S.R.	7.4	16.3	16.9	20.6	27.8	72	49	35
Asia	9.8	15.9	17.6	22.2	28.6	39	47	29
Africa	1.3	2.4	2.7	3.2	4.2	49	46	32
Oceania	1.6	1.3	1.6	1.8	2.0	-13	29	11
World	59.5	88.9	94.6	109.9	135.4	29	36	23

Table 18. Percentage of World's Fertilizer Consumed by Regions (N, P_2O_5, and K_2O) (3)

Region	1965	1970	1977	1980	1985
	%				
North America	25.4	24.3	22.7	20.6	19.1
Latin America	3.4	4.0	5.6	6.0	6.8
Western Europe	30.2	24.7	19.1	18.1	16.1
Eastern Europe	10.6	12.7	11.7	11.9	11.7
U.S.S.R.	10.8	12.8	17.8	18.8	20.6
Asia	13.7	17.3	18.6	20.2	21.1
Africa	2.4	2.3	2.8	2.9	3.1
Oceania	3.5	2.5	1.7	1.6	1.4
World	100.0	100.0	100.0	100.0	100.0

Table 19. World Fertilizer Production in Developed and Developing Countries (N, P_2O_5, and K_2O) (3)

Classification	1969		1977		1980		1985	
	million mt	%	million mt	%	million mt	%	million mt	%
Developed	57.5	91	83.4	85	97.0	83	109.5	77
Developing	5.4	9	15.0	15	20.6	17	32.0	23
World	62.9	100	98.4	100	117.6	100	141.4	100

Table 20. World Fertilizer Consumption in Developed and Developing Countries (N, P_2O_5, and K_2O) (3)

Classification	1969		1977		1980		1985	
	million mt	%	million mt	%	million mt	%	million mt	%
Developed	48.7	82	72.1	76	81.1	74	96.0	
Developing	10.7	18	22.5	24	28.8	26	38.5	
World	59.5	100	94.6	100	109.9	100	135.4	100

OWNERSHIP

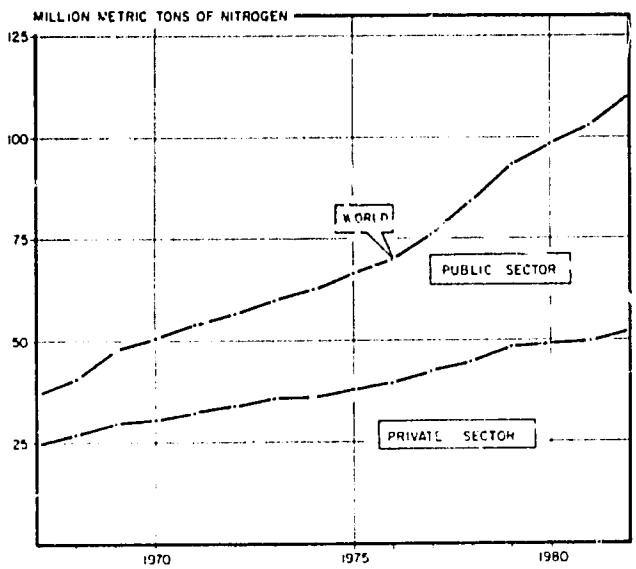
The pattern of ownership and control of the world's fertilizer industry is changing due to differences in natural gas costs, changes in regional consumption patterns, and in turn regional shifts in plant locations. Because the centrally planned and developing countries are increasing their share of the world's capacity, a larger portion of the fertilizer production will be controlled by the public sector. For ammonia it is estimated that by 1982 more than 50% of the world's capacity will be operated by state-owned or controlled plants (figure 12). This estimate compares with 33% in 1967 and 44% in 1977 (12). This trend has been developing since the early 1970's when U.S.S.R. and the developing countries of Asia announced plans to substantially increase their ammonia capacity. About one-third of the world's phosphoric acid capacity is operated by state-owned facilities, most of which are located in the U.S.S.R., Eastern Europe, and North Africa (figure 13). The situation for phosphate rock is similar to that of phosphoric acid (figure 14). The trend toward more publicly owned phosphate capacity should continue into the foreseeable future because most new reserve potentials are located in developing or centrally planned countries.

Most of the world's known K_2O reserves are located in North America, U.S.S.R., and Eastern Europe. By 1982 more than 50% of the world's K_2O capacity will be operated by the public sector (figure 15). U.S.S.R. alone will control one-half of the total capacity for potash production.

FERTILIZER PRICES

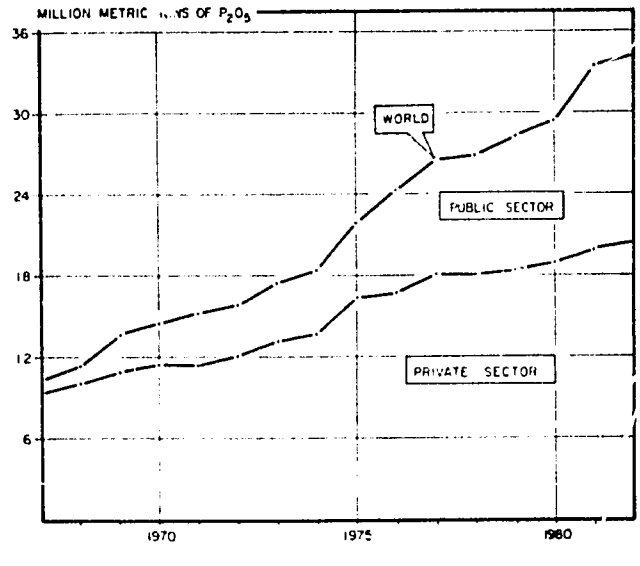
World fertilizer prices bottomed out in 1969 and 1970 at abnormally low levels. Prices began to recover in the 1970's but still were not high enough to encourage expansion of facilities. World grain prices soared during the 1973-74 period, and world food shortages became a widely discussed problem. Nations panicked and most commodities were purchased at inflated prices because of fears of scarcity. Fertilizer was no exception. High food prices, world shortages, and high feedstock prices pushed fertilizer prices to record levels in the fall of 1974 and spring of 1975. During this period there was talk of a permanent fertilizer shortage. As a result some panic buying further compounded price increases. In 1975 fertilizer prices peaked and came down very quickly. Since that date, prices have declined and leveled off. In recent months prices have been relatively stable (figure 16).

It is extremely difficult to establish long-term trends in fertilizer prices, especially in the developing countries. The attempts of many of these countries to become more self-sufficient in fertilizer production have contributed to low prices, overcapacity, and less export demand for the developed countries.



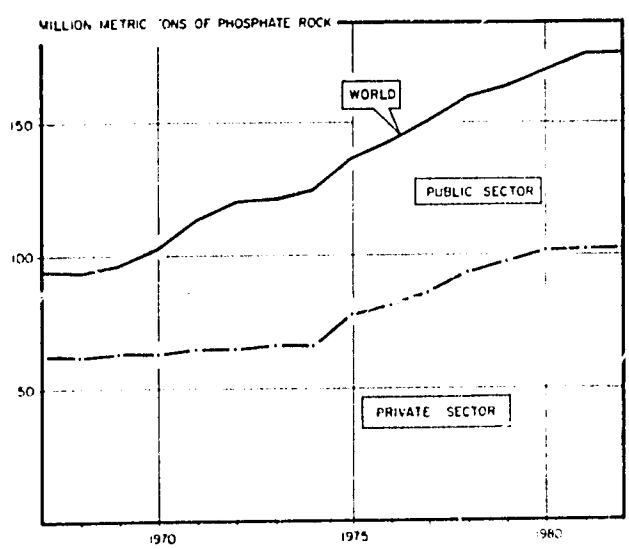
Source: Fertilizer Progress, May-June 1978, Vol. 9, No. 3.

Figure 12. Ownership of World Ammonia Capacity, 1967-82.



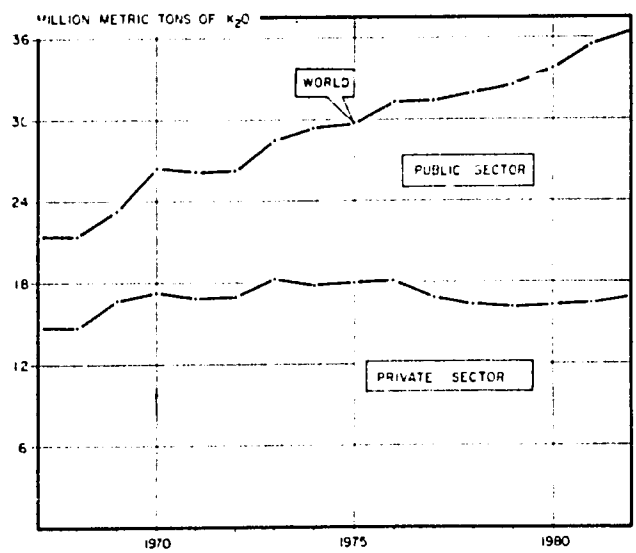
Source: Fertilizer Progress, May-June 1978, Vol. 9, No. 3.

Figure 13. Ownership of World Phosphoric Acid Capacity, 1967-82.



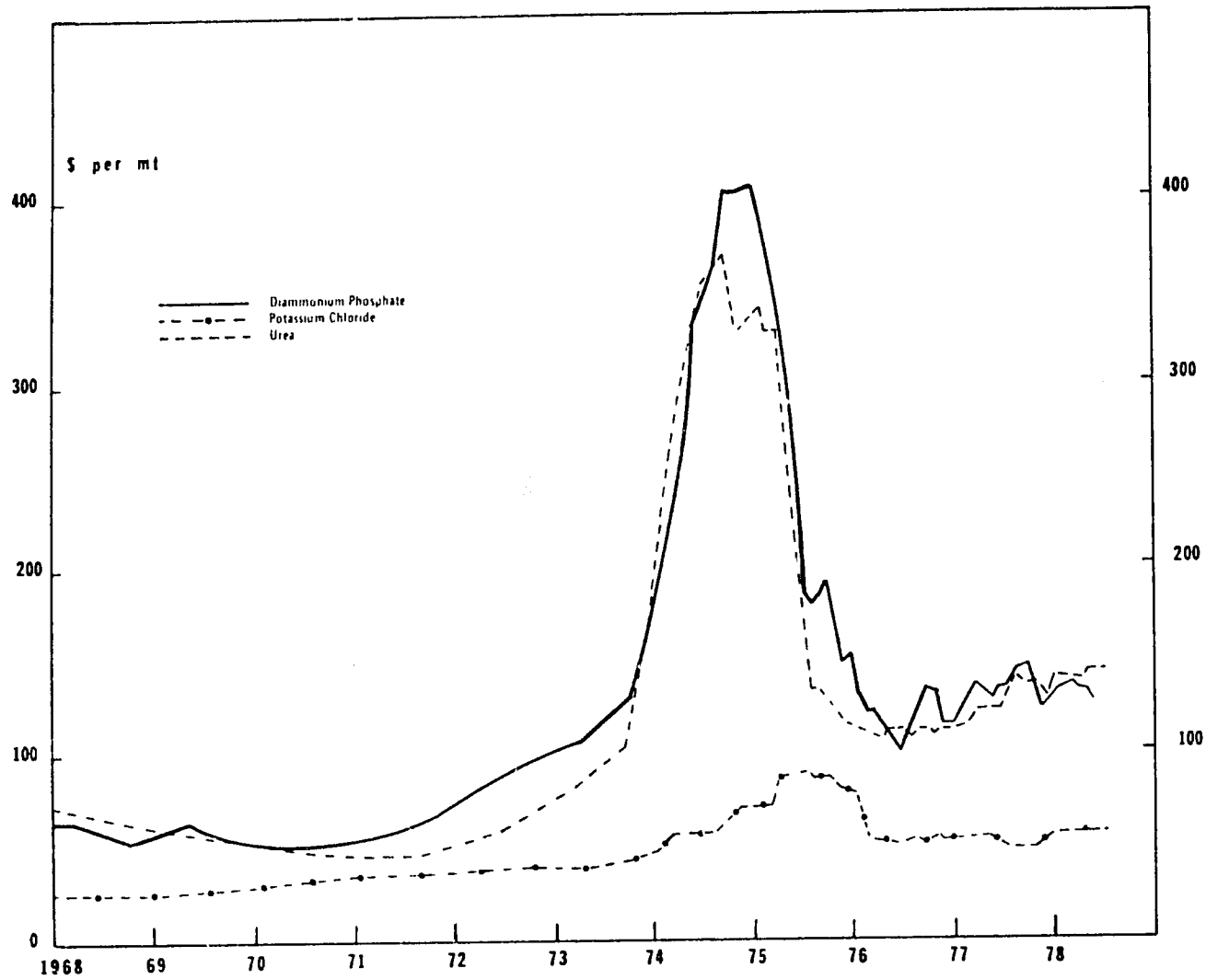
Source: Fertilizer Progress, May-June 1978, Vol. 9, No. 3.

Figure 14. Ownership of Phosphate Rock Capacity, 1967-82.



Source: Fertilizer Progress, May-June 1978, Vol. 9, No. 3.

Figure 15. Ownership of World Potash Capacity, 1967-82.



Source: World Bank

Figure 16. Export Prices of Selected Fertilizers, 1968-78.

The amount and the timing of fertilizer price movement depend upon several factors including production capacity, growth rates in demand, food prices, feedstock costs, inflation, etc. Future developments in the world food situation are expected to have a considerable impact on world fertilizer prices during the next decade. Higher prices for agricultural commodities generally result in increased demand for fertilizers. One of the major factors determining world grain prices is weather, particularly in major crop-producing areas. This relationship between weather and grain and fertilizer prices makes it very difficult to predict future fertilizer consumption levels and prices.

The indices of prices paid by U.S. farmers for fertilizer and of the prices received by U.S. farmers for crops show the historical correlation between crop and fertilizer prices (13).[1] Although a change in grain prices will not necessarily bring about a change in fertilizer prices, they have moved together historically, and there is some evidence that fertilizer prices have lagged crop prices (figure 17).

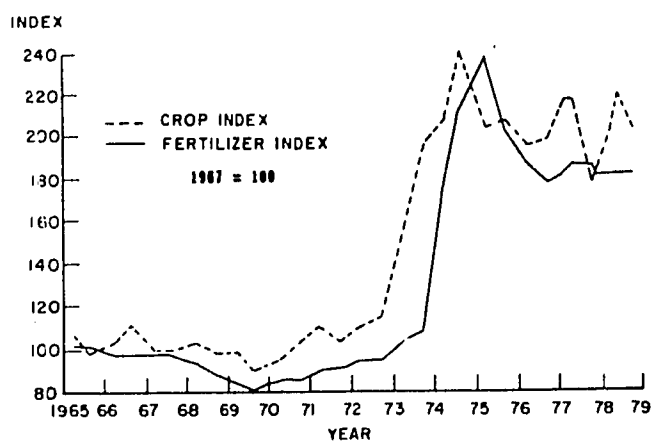


Figure 17. U. S. Index of Fertilizer Prices and Index of Crop Prices, 1965-78.

1. Since 1965 this correlation has been 0.92.

However, the current situation is characterized by record supplies of crops and overcapacity in fertilizer production. Government agricultural set-aside programs in the United States are designed to take land out of production. Thus, it is difficult to foresee a major increase in fertilizer prices. Profits of producers are being severely squeezed, and producers in the United States, Japan, and Europe are being forced to close plants. There is a floor on fertilizer prices; however, it is difficult to determine because production costs vary widely and decisions at some state-owned production facilities are not dictated entirely by economics. During the next few years fertilizer prices are expected to move in a relatively narrow band compared with those of the past 5 years unless production costs or prices of agricultural commodities change significantly.

Weather patterns throughout the world with the major exceptions of Brazil, China, and Australia have generally been favorable for the past 2 years. If a large reduction in crop production occurs because of droughts or some other reason, higher grain prices could increase the demand for the fertilizer the following year and significantly influence world fertilizer prices. However, natural gas costs, the amount of capacity that is shut down, the overall fertilizer supply/demand situation, and many other factors will also determine future price levels of fertilizer.

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APPENDIX A

List of Countries by Regions

AFRICA

Algeria
Angola
Botswana
Burundi
Cameroon
Central African Republic
Chad
Congo
Dahomey
Egypt
Equatorial Guinea
Ethiopia
Gabon
Gambia
Ghana
Guinea
Ivory Coast
Kenya
Lesotho
Liberia
Libyan Arab Republic
Madagascar
Malawi
Mali
Mauritania
Mauritius
Morocco
Mozambique
Niger
Nigeria
Reunion
Rhodesia
Rwanda
Senegal
Sierra Leone
Somalia
South Africa
Spanish Sahara
Sudan
Swaziland
Tanzania
Togo
Tunisia
Uganda
Upper Volta
Zaire
Zambia

ASIA

Afghanistan
Bahrain
Bangladesh
Bhutan
Burma
China
Cyprus
India
Indonesia
Iran
Iraq
Israel
Japan
Jordan
Kampuchea
Kuwait
Laos
Lebanon
Malaysia
Mongolia
Nepal
North Korea
Oman
Pakistan
Philippines
Qatar
Saudi Arabia
Singapore
South Korea
Sri Lanka
Syrian Arab Republic
Taiwan
Thailand
Turkey
United Arab Emirates
Vietnam

OCEANIA

Australia
Fiji
New Zealand
Pacific Island
Papua New Guinea
West Samoa

NORTH AMERICA

Canada
United States

LATIN AMERICA

Argentina
Bahamas
Barbardos
Belize
Bermuda
Bolivia
Brazil
Chile
Colombia
Costa Rica
Cuba
Dominican Republic
Ecuador
El Salvador
Guadeloupe
Guatemala
Guyana
Haiti
Honduras
Jamaica
Martinique
Mexico
Netherland Antilles
Nicaragua
Panama
Paraguay
Peru
Puerto Rico
Saint Kitts, etc.
Saint Lucia
Saint Vincent
Surinam
Trinidad
Uruguay
Venezuela
Virgin Islands

WESTERN EUROPE

Austria
Belgium
Denmark
Finland
France
Greece
Iceland
Ireland
Italy
Luxembourg
Malta
Netherlands
Norway
Portugal
Spain
Sweden
Switzerland
United Kingdom
West Germany

EASTERN EUROPE

Albania
Bulgaria
Czechoslovakia
East Germany
Hungary
Poland
Romania
Yugoslavia

U.S.S.R.

U.S.S.R.

DEVELOPED COUNTRIES

Includes North America, Western Europe, Eastern Europe, U.S.S.R., Japan, Israel, South Africa, Australia, and New Zealand.

DEVELOPING COUNTRIES

Includes Latin America, Asia (except Japan and Israel), Africa (except South Africa), and Oceania (except Australia and New Zealand).

APPENDIX B

Table B-1. Regional Ammonia Capacity

	North America	Latin America	Western Europe	Eastern Europe	U.S.S.R.	Africa	Asia	Oceania	World
	'000 mt N								
1967	10,855	825	9,758	3,478	4,418	351	7,352	130	37,167
1968	12,058	987	10,233	3,824	4,943	499	8,025	130	40,699
1969	13,241	1,396	11,518	5,591	5,732	499	9,114	514	47,605
1970	13,601	1,396	12,228	5,755	7,067	524	9,695	514	50,780
1971	13,421	1,531	13,005	6,099	7,940	796	11,237	474	54,503
1972	13,440	1,591	13,798	6,149	8,250	926	12,281	474	56,909
1973	13,910	1,735	14,157	6,881	8,726	926	13,590	446	60,371
1974	13,858	2,303	14,109	8,065	9,254	926	14,115	446	63,076
1975	14,850	2,672	14,360	8,385	10,364	832	15,093	446	67,002
1976	15,342	2,767	14,752	9,199	11,434	1,208	15,290	446	70,438
1977	18,158	2,767	14,820	9,391	12,644	1,208	17,206	446	76,640
	Forecast								
1978	17,378	4,281	14,863	9,931	14,232	1,480	19,316	446	81,927
1979	17,314	4,281	15,768	10,794	16,452	1,560	22,338	446	88,953
1980	17,362	4,443	16,105	10,794	19,421	2,865	24,528	446	95,964
1981	17,362	4,443	16,105	11,553	20,901	2,865	25,588	446	99,263
1982	17,362	5,590	16,105	12,440	24,733	3,463	28,533	446	108,672
1983	17,362	6,571	16,377	12,440	24,733	3,463	30,742	446	112,134
1984	17,362	6,760	16,377	12,440	24,733	3,463	31,301	446	112,882
1985	17,362	6,760	16,377	12,440	24,733	3,463	31,301	446	112,882

Table B-2. Regional Nitrogen Fertilizer Production

	North America	Latin America	Western Europe	Eastern Europe	U.S.S.R.	Africa	Asia	Oceania	World[a]
	'000 mt N								
1962	3,349.3	317.4	4,525.6	956.3	1,168.0	144.7	1,716.5	24.4	12,202.2
1963	3,792.4	354.9	4,761.5	1,030.7	1,414.0	170.5	2,019.5	20.5	13,564.0
1964	4,326.4	469.1	5,209.6	1,151.5	1,759.0	184.2	2,386.4	19.1	15,505.3
1965	4,805.7	519.7	5,827.3	1,344.5	2,099.0	190.1	2,661.0	26.0	17,473.3
1966	5,458.3	510.6	6,355.7	1,628.3	2,712.0	218.1	3,087.6	35.5	20,006.2
1967	6,023.9	500.0	7,032.6	1,885.7	3,188.0	240.3	3,523.1	44.0	22,437.6
1968	7,077.1	538.4	7,664.9	2,191.5	3,753.0	239.5	4,047.8	55.0	25,567.3
1969	7,693.2	622.1	8,144.9	2,750.8	4,177.0	288.8	4,616.7	95.0	28,388.5
1970	8,233.6	739.2	7,841.3	3,250.3	4,509.0	366.6	5,080.8	160.0	30,180.8
1971	8,887.2	749.0	8,106.6	3,670.4	5,423.0	402.8	5,587.8	145.0	32,971.9
1972	8,896.0	795.6	8,372.1	3,942.2	6,055.0	483.3	6,241.4	176.0	34,961.6
1973	9,204.6	844.5	8,949.2	4,152.0	6,533.0	552.2	7,407.4	182.0	37,824.9
1974	9,960.9	863.3	9,346.4	4,373.3	7,209.0	461.7	8,025.4	197.2	40,437.3
1975	9,369.0	1,102.5	9,808.9	4,772.7	7,806.0	551.7	8,824.3	198.0	42,433.1
1976	10,365.7	1,196.3	8,957.4	5,345.5	8,467.0	594.6	8,693.9	180.0	43,800.5
1977	10,750.0	1,315.0	9,204.9	5,806.8	8,531.0	686.7	9,369.6	220.0	45,884.0
	Potential Production[b]								
1978	11,360.9	1,775.3	9,565.2	6,166.6	9,291.2	773.7	9,630.9	289.0	48,852.8
1979	11,219.5	2,036.2	9,699.7	6,544.0	10,525.8	830.6	11,110.8	289.0	52,255.6
1980	11,229.8	2,453.7	10,110.3	6,870.2	12,202.8	1,125.6	12,517.4	289.0	56,798.8
1981	11,243.7	2,479.9	10,383.0	7,158.4	13,863.3	1,366.3	13,778.2	289.0	60,561.8
1982	11,250.6	2,705.0	10,435.8	7,568.6	15,731.6	1,772.4	14,959.2	289.0	64,712.2
1983	11,250.6	3,049.8	10,494.6	7,933.3	17,194.6	1,869.3	16,051.8	289.0	68,133.0
1984	11,250.6	3,518.0	10,572.9	8,061.0	17,807.8	2,014.5	17,215.8	289.0	70,729.6
1985	11,250.6	3,787.0	10,612.1	8,061.0	17,807.8	2,014.5	17,843.1	289.0	71,665.1

a. Note that world production normally exceeds world consumption by about 5%.

b. Based on a 90% operating rate in developed countries and a 70% operating rate in developing countries.

Table B-3. Regional Nitrogen Fertilizer Consumption

	North America	Latin America	Western Europe	Eastern Europe	U.S.S.R.	Africa	Asia	Oceania	World
	'000 mt N								
1962	3,146.4	427.6	3,379.8	1,012.0	859.0	352.8	2,324.3	40.9	11,542.8
1963	3,675.4	494.0	3,826.0	1,111.8	1,070.0	379.8	2,564.9	50.7	13,172.5
1964	4,099.0	647.3	4,035.8	1,282.0	1,360.0	443.6	2,994.3	78.5	14,940.5
1965	4,378.7	683.0	4,274.2	1,551.3	1,759.0	510.8	3,140.5	76.5	16,373.9
1966	5,050.1	727.9	4,646.6	1,805.3	2,282.0	559.4	3,674.7	81.7	18,827.6
1967	5,744.4	806.4	5,024.7	2,099.7	2,656.0	546.1	4,779.0	119.4	21,775.7
1968	6,478.4	954.2	5,513.7	2,346.9	3,089.0	601.2	4,810.6	146.6	23,940.5
1969	6,554.2	1,122.8	5,754.0	2,881.0	3,454.0	670.1	5,999.5	187.3	26,622.9
1970	7,036.7	1,279.5	6,003.8	3,056.8	3,798.0	735.2	6,692.0	187.7	28,689.6
1971	7,670.5	1,558.5	6,442.1	3,209.7	4,605.0	822.5	7,498.7	157.8	31,764.7
1972	7,622.0	1,443.9	6,821.5	3,429.8	5,182.0	954.0	7,753.7	138.1	33,344.9
1973	7,921.5	1,629.5	6,986.2	3,675.0	5,606.0	1,060.9	8,589.8	206.3	35,677.2
1974	8,809.6	1,680.5	7,411.0	3,791.1	6,224.0	1,074.5	9,488.4	217.8	38,696.9
1975	8,340.0	1,877.2	7,235.8	4,001.4	6,696.0	1,071.2	9,146.9	208.1	38,576.6
1976	10,001.5	1,967.5	7,704.4	4,537.7	7,339.0	1,250.9	10,248.9	188.0	43,238.0
1977	10,263.9	2,274.7	8,041.2	4,414.3	7,252.0	1,428.2	11,166.8	246.9	45,087.9
	Forecast								
1978	9,677.2	2,468.2	8,239.8	4,829.7	8,066.0	1,491.6	12,395.4	257.1	47,424.9
1979	10,773.9	2,693.6	8,538.3	5,146.7	8,564.0	1,594.1	13,282.2	267.7	50,860.4
1980	11,169.9	2,890.5	8,821.6	5,403.6	9,061.0	1,701 6	14,151.9	279.3	53,479.3
1981	11,559.3	3,094.1	9,073.5	5,659.5	9,559.0	1,813.0	15,025.0	289.8	56,073.3
1982	11,944.9	3,312.4	9,324.3	5,918.6	10,057.0	1,926.2	15,897.2	300.4	58,681.1
1983	12,325.9	3,546.3	9,573.5	6,175.9	10,556.0	2,041.3	16,778.1	311.0	61,308.1
1984	12,702.1	3,799.7	9,812.5	6,433.7	11,054.0	2,153.0	17,657.0	326.6	63,938.5
1985	13,073.6	4,066.6	10,049.9	6,691 4	11,553.0	2,267.6	18,540.1	342.2	66,584.3

Table B-4. Regional Phosphoric Acid Capacity

	North America	Latin America	Western Europe	Eastern Europe	U.S.S.R.	Africa	Asia	Oceania	World
	'000 mt P_2O_5								
1967	5,634	113	2,629	187	378	440	875	187	10,443
1968	5,768	113	2,782	297	678	463	1,032	222	11,355
1969	6,320	632	3,022	597	1,195	515	1,205	222	13,708
1970	6,422	622	3,408	697	1,365	515	1,283	222	14,544
1971	6,195	698	3,514	757	1,798	548	1,420	222	15,152
1972	6,254	698	3,627	877	1,798	713	1,669	279	15,915
1973	6,807	698	3,649	1,048	2,159	869	2,036	279	17,545
1974	7,038	773	3,797	1,158	2,465	888	2,009	243	18,371
1975	8,803	873	4,466	1,358	2,805	1,048	2,162	243	21,758
1976	9,069	873	4,676	1,531	4,040	1,378	2,404	253	24,225
1977	9,336	971	4,657	1,591	4,493	2,008	3,059	253	26,368
	Forecast								
1978	9,395	1,008	4,587	1,661	4,633	2,338	3,127	253	27,002
1979	9,395	1,008	4,587	2,097	5,313	2,338	3,342	253	28,333
1980	9,395	1,375	4,687	2,097	5,443	2,503	3,507	253	29,260
1981	9,395	1,628	4,687	2,332	6,763	3,054	4,823	253	32,935
1982	9,395	2,151	4,687	2,332	6,763	3,054	5,099	253	33,734
1983	9,395	2,151	4,687	2,332	6,763	3,219	5,306	253	34,106
1984	9,395	2,151	4,687	2,332	6,763	3,219	5,306	253	34,106
1985	9,395	2,151	4,687	2,475	6,763	3,219	5,306	253	34,249

Table B-5. Regional Phosphate Fertilizer Production

	North America	Latin America	Western Europe	Eastern Europe	U.S.S.R.	Africa	Asia	Oceania	World[a]
	'000 mt P_2O_5								
1962	2,979.9	143.1	3,891.9	790.5	935.0	249.6	918.3	783.2	10,691.5
1963	3,291.7	158.8	3,989.0	929.0	972.0	280.9	1,000.0	874.1	11,495.4
1964	3,730.6	171.1	4,400.1	1,031.8	1,096.0	327.3	1,172.2	1,019.0	12,948.1
1965	3,991.4	182.6	4,825.0	1,208.9	1,407.0	376.6	1,281.3	1,140.4	14,413.2
1966	4,678.8	191.7	4,872.9	1,293.5	1,599.0	450.6	1,318.5	1,271.8	15,676.7
1967	5,181.0	210.4	5,106.0	1,436.8	1,776.0	546.2	1,534.5	1,264.4	17,055.5
1968	5,480.9	237.9	5,246.0	1,566.4	1,867.0	658.7	1,733.1	1,241.5	18,031.5
1969	5,099.3	276.7	5,593.3	1,757.0	1,934.0	717.2	1,952.5	1,189.9	18,519.9
1970	5,451.4	279.4	5,579.0	1,908.9	2,072.0	741.9	2,053.2	1,133.7	19,219.6
1971	5,929.0	364.8	5,862.4	2,151.6	2,449.0	747.0	2,151.1	1,016.0	20,670.9
1972	6,322.0	476.6	6,125.2	2,263.6	2,673.0	818.1	2,505.6	1,103.3	22,287.4
1973	6,533.4	610.0	6,393.7	2,381.8	2,784.0	924.7	2,724.1	1,321.0	23,672.7
1974	6,928.3	713.1	6,412.8	2,489.7	2,982.0	944.2	2,818.5	1,590.1	24,878.7
1975	7,228.9	758.3	6,275.1	2,640.7	3,504.0	956.4	3,313.4	1,029.1	25,705.9
1976	7,141.0	822.8	4,953.4	2,858.6	4,106.0	858.4	3,166.8	862.8	24,769.7
1977	7,801.0	1,159.3	5,474.9	2,903.3	4,395.0	905.1	3,563.6	1,096.6	27,298.8
	Potential Production[b]								
1978	7,852.5	1,091.3	6,137.6	3,549.4	5,242.5	1,840.5	4,085.6	1,387.5	31,186.9
1979	7,861.5	1,153.6	6,109.3	3,781.0	5,582.3	2,023.0	4,399.6	1,393.9	32,304.2
1980	7,829.2	1,261.0	6,094.3	3,982.8	5,883.2	2,156.8	4,707.7	1,399.0	33,314.0
1981	7,837.0	1,405.3	6,084.3	4,134.1	6,405.5	2,303.9	5,296.1	1,404.0	34,870.2
1982	7,844.8	1,696.0	6,057.4	4,243.2	7,024.6	2,465.1	5,807.2	1,408.8	36,547.1
1983	7,852.3	1,906.6	6,017.5	4,314.4	7,417.1	2,671.3	6,397.8	1,413.5	37,990.6
1984	7,860.1	2,104.7	5,990.3	4,331.9	7,492.3	2,711.5	6,641.2	1,418.1	38,550.1
1985	7,867.9	2,138.3	5,963.3	4,411.8	7,492.3	2,767.1	6,827.3	1,423.6	38,891.6

a. Note that world production normally exceeds world consumption by about 5%.
b. Based on a 90% operating rate in developed countries and a 70% operating rate in developing countries.

Table B-6. Regional Phosphate Fertilizer Consumption

	North America	Latin America	Western Europe	Eastern Europe	U.S.S.R.	Africa	Asia	Oceania	World
	'000 mt P_2O_5								
1962	2,708.0	312.0	3,675.9	903.4	842.0	274.7	1,068.2	792.9	10,577.2
1963	2,971.4	344.4	3,840.1	963.5	853.0	295.0	1,240.9	800.8	11,309.1
1964	3,288.9	425.4	4,116.2	1,154.9	969.0	309.0	1,515.8	893.9	12,673.1
1965	3,441.0	435.1	4,329.6	1,328.3	1,284.0	327.9	1,595.9	1,212.0	13,953.7
1966	3,855.6	456.6	4,377.6	1,444.0	1,504.0	357.0	1,656.0	1,296.4	14,947.2
1967	4,279.1	526.5	4,513.1	1,541.9	1,664.0	388.2	1,909.4	1,287.4	16,109.5
1968	4,439.2	633.3	4,782.5	1,781.8	1,697.0	444.8	2,013.7	1,162.9	16,955.3
1969	4,537.9	737.8	4,917.7	2,099.9	1,748.0	474.6	2,431.8	1,225.3	18,173.0
1970	4,428.7	770.8	5,188.3	2,128.7	1,916.0	503.7	2,681.5	1,198.6	18,816.3
1971	4,683.6	916.3	5,485.5	2,250.0	2,160.0	549.1	2,680.9	1,065.6	19,790.9
1972	4,759.7	993.0	5,721.4	2,359.1	2,442.0	610.7	3,086.7	1,124.1	21,096.9
1973	5,017.1	1,241.7	5,843.5	2,428.2	2,612.0	658.4	3,406.5	1,232.9	22,440.3
1974	5,111.4	1,332.6	5,993.1	2,781.0	2,731.0	693.7	3,895.9	1,618.5	24,157.1
1975	4,594.1	1,482.5	5,041.6	2,817.4	3,276.0	747.1	3,808.3	923.3	22,690.3
1976	5,245.1	1,560.9	4,913.9	3,062.0	3,829.0	799.9	3,838.8	879.3	24,129.0
1977	5,638.0	1,886.5	5,289.5	3,125.6	4,063.0	909.8	4,449.5	1,131.1	26,492.9
	Forecast								
1978	5,156.0	1,971.6	5,552.6	3,360.6	4,250.0	913.4	5,054.6	1,161.4	27,420.2
1979	5,582.6	2,148.4	5,679.4	3,544.0	4,589.0	974.7	5,311.4	1,176.9	29,006.3
1980	5,685.2	2,328.8	5,754.1	3,719.0	4,940.0	1,033.2	5,601.6	1,192.4	30,254.2
1981	5,787.8	2,514.0	5,825.9	3,885.9	5,302.0	1,096.2	5,890.5	1,207.8	31,510.2
1982	5,887.5	2,702.3	5,896.9	4,052.5	5,675.0	1,161.1	6,185.9	1,223.2	32,784.4
1983	5,986.1	2,894.3	5,967.5	4,220.0	6,059.0	1,226.4	6,486.9	1,238.7	34,078.9
1984	6,083.7	3,089.8	6,036.3	4,380.7	6,459.0	1,293.6	6,789.4	1,254.0	35,386.6
1985	6,180.4	3,288.6	6,102.4	4,541.4	6,860.0	1,360.2	7,098.6	1,269.3	36,700.9

Table B-7. Regional Potash Capacity

	North America	Latin America	Western Europe	Eastern Europe	U.S.S.R.	Africa	Asia	Oceania	World
	'000 mt K_2O								
1967	8,372	30	5,800	2,460	3,950	0	800	0	21,412
1968	8,254	30	5,870	2,460	3,950	0	800	0	21,364
1969	10,232	30	5,870	2,460	3,950	0	800	0	23,342
1970	10,755	30	5,870	2,460	6,050	500	850	0	26,515
1971	10,492	30	5,770	2,460	6,050	500	850	0	26,152
1972	9,845	30	6,530	2,460	6,050	500	880	0	26,295
1973	10,498	30	7,175	3,160	6,250	500	900	0	28,513
1974	10,317	30	6,805	3,110	7,750	500	900	0	29,412
1975	10,317	30	6,915	3,110	7,750	500	1,020	0	29,642
1976	10,317	30	7,040	3,150	9,250	500	1,070	0	31,357
1977	10,549	30	6,880	3,200	9,250	500	1,070	0	31,479
	Forecast								
1978	10,594	30	6,880	3,300	10,700	500	1,070	0	33,074
1979	10,540	30	6,930	3,400	11,700	0	1,070	0	33,670
1980	10,649	30	7,110	3,500	12,500	0	1,070	0	34,859
1981	10,921	30	7,125	3,550	12,910	0	1,250	0	35,786
1982	11,629	30	7,175	3,600	13,000	0	1,250	0	36,684
1983	11,629	30	7,235	3,650	13,500	0	1,850	0	37,894
1984	11,629	30	7,235	3,650	13,500	0	1,850	0	37,894
1985	11,629	30	7,345	3,650	13,500	0	1,850	0	38,004

Table B-8. Regional Potash Fertilizer Production

	North America	Latin America	Western Europe	Eastern Europe	U.S.S.R.	Africa	Asia	Oceania	World[a]
	'000 mt K_2O								
1962	2,329.0	54.1	4,054.8	1,675.0	1,165.0	0	101.1	0	9,379.0
1963	2,686.7	54.0	3,903.4	1,752.0	1,331.0	0	147.6	0	9,874.8
1964	3,187.8	54.9	4,244.6	1,845.0	1,400.0	0	191.0	0	10,923.3
1965	3,583.2	56.6	4,571.5	1,857.0	1,894.0	0	344.0	0	12,306.3
1966	4,340.9	56.4	4,826.1	1,926.0	2,368.0	0	447.8	0	13,965.2
1967	4,810.7	45.2	4,665.3	2,006.4	2,626.0	0	466.1	0	14,619.6
1968	5,152.2	22.5	4,624.7	2,205.6	2,868.0	0	495.4	0	15,368.5
1969	5,287.6	15.6	4,712.4	2,293.0	3,120.0	0	535.4	0	15,964.1
1970	5,771.2	15.7	4,775.6	2,346.0	3,244.0	67.0	664.9	0	16,884.4
1971	5,437.8	16.4	4,928.1	2,419.0	4,087.0	123.0	816.8	0	17,828.2
1972	6,127.0	20.9	4,976.1	2,426.0	4,807.0	257.8	832.1	0	19,446.9
1973	6,261.0	16.1	4,811.3	2,458.0	5,433.0	284.3	921.6	0	20,185.2
1974	7,435.8	19.3	5,220.7	2,556.0	5,918.0	265.4	814.8	0	22,230.1
1975	7,697.7	13.5	5,298.2	2,864.0	6,586.0	285.1	953.9	0	23,698.4
1976	6,940.7	9.5	4,273.9	3,019.0	7,944.0	277.1	1,012.5	0	23,476.8
1977	7,999.4	16.2	4,544.3	3,161.0	8,310.0	266.8	964.8	0	25,262.5
	Potential Production[b]								
1978	8,158.1	15.8	4,859.1	3,086.4	8,410.9	100.0	992.6	0	25,622.9
1979	8,064.1	15.8	4,872.8	3,168.0	9,213.5	0	992.6	0	26,326.8
1980	8,173.1	15.8	4,931.1	3,264.0	10,127.8	0	992.6	0	27,504.4
1981	8,314.6	15.8	4,984.9	3,345.6	10,759.8	0	1,041.9	0	28,462.6
1982	8,622.5	15.8	5,042.4	3,408.0	11,116.4	0	1,107.6	0	29,312.7
1983	8,918.0	15.8	5,079.1	3,456.0	11,379.5	0	1,272.0	0	30,120.4
1984	9,014.8	15.8	5,107.8	3,489.6	11,582.4	0	1,387.2	0	30,597.8
1985	9,014.8	15.8	5,146.1	3,504.0	11,696.4	0	1,502.4	0	30,879.5

a. World production 1962-77 includes technical potash production and distribution losses of about 5%.
b. Potential fertilizer production only based on historical operating rates.

Table B-9. Regional Potash Fertilizer Consumption

	North America	Latin America	Western Europe	Eastern Europe	U.S.S.R.	Africa	Asia	Oceania	World
	'000 mt K_2O								
1962	2,156.4	193.9	3,474.5	1,244.4	703.0	96.2	683.8	130.3	8,682.6
1963	2,372.7	210.5	3,663.6	1,247.3	826.0	107.1	758.4	91.3	9,277.0
1964	2,585.6	270.3	3,779.0	1,410.4	901.0	124.4	877.6	128.4	10,076.9
1965	2,694.3	268.6	3,895.4	1,522.4	1,421.0	156.5	924.3	152.5	11,035.0
1966	3,064.1	292.7	3,930.0	1,709.5	1,891.0	158.0	1,066.5	171.1	12,282.7
1967	3,465.4	326.7	3,941.2	1,929.6	1,902.0	184.4	1,165.6	174.9	13,089.8
1968	3,606.6	366.1	4,231.3	2,092.4	2,136.0	191.2	1,292.1	157.0	14,072.9
1969	3,698.7	536.4	4,191.8	2,308.7	2,176.0	201.7	1,404.9	175.7	14,693.7
1970	3,835.7	556.5	4,371.1	2,468.0	2,319.0	214.7	1,508.6	194.5	15,468.2
1971	4,022.9	646.5	4,796.4	2,678.4	2,574.0	237.0	1,519.1	196.0	16,670.3
1972	4,120.4	659.3	4,996.2	3,015.9	2,788.0	264.1	1,572.4	193.9	17,610.3
1973	4,398.1	769.6	5,091.2	3,011.3	3,238.0	294.8	1,750.5	240.5	18,794.0
1974	4,803.2	894.7	5,395.7	3,319.4	3,605.0	308.6	2,118.7	287.9	20,733.2
1975	4,246.1	929.6	4,602.3	3,397.4	3,884.0	343.8	2,182.8	237.9	19,824.0
1976	4,968.2	872.0	4,478.1	3,707.6	5,176.0	326.3	1,814.6	195.7	21,538.4
1977	5,545.6	1,097.1	4,741.6	3,499.4	5,577.0	350.1	2,002.0	251.5	23,064.2
	Forecast								
1978	5,264.8	1,138.5	4,981.2	3,674.9	5,400.0	376.4	2,364.7	274.0	23,474.5
1979	5,557.4	1,261.5	5,125.2	3,819.0	6,143.0	400.7	2,408.9	283.5	24,999.3
1980	5,743.9	1,362.0	5,269.4	3,949.1	6,650.0	426.0	2,501.2	292.9	26,194.6
1981	5,930.5	1,464.9	5,344.7	4,078.1	7,174.0	453.5	2,594.7	302.4	27,342.8
1982	6,117.1	1,570.2	5,434.2	4,207.3	7,714.0	479.0	2,687.1	311.7	28,520.6
1983	6,302.6	1,676.9	5,515.6	4,336.3	8,270.0	506.5	2,775.8	321.0	29,704.7
1984	6,488.2	1,787.4	5,604.7	4,465.4	8,850.0	534.1	2,868.4	330.3	30,928.6
1985	6,673.8	1,897.3	5,692.9	4,593.4	9,430.0	558.6	2,959.4	339.5	32,145.0