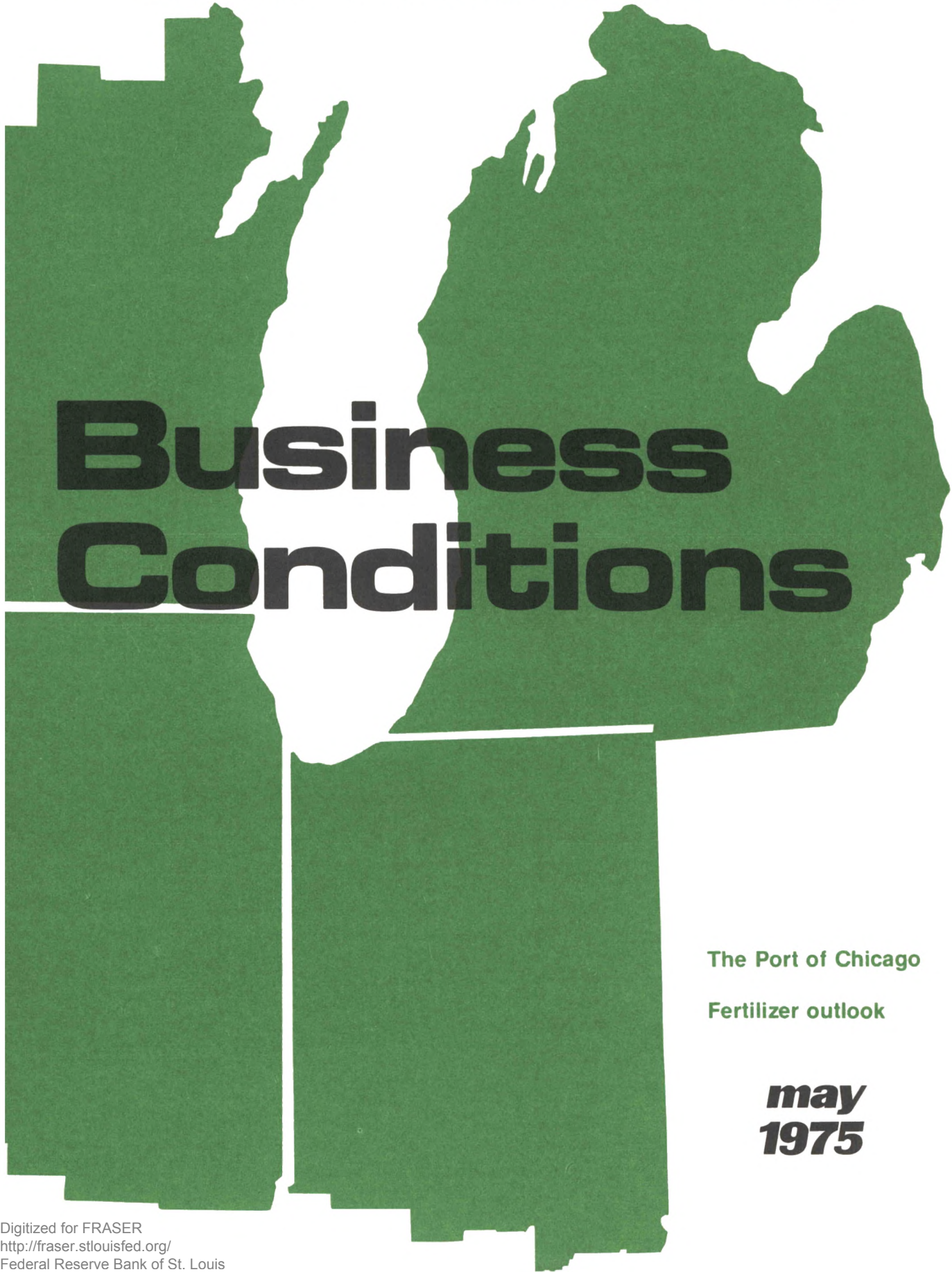
an economic review by the Federal Reserve Bank of Chicago



Business Conditions

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Located at the center of the industrial and agricultural heartland of the United States, the Port of Chicago once held great promise for expansion and growth. This advantage, however, has been undermined by several fundamental changes in modes of transportation.

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While rising capacity will likely exert the major influence on fertilizer prices in the remainder of the Seventies, rising costs portend higher fertilizer prices over the long term.

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The Port of Chicago

Historically, waterborne transportation has played an important part in the growth and development of Chicago as a major commercial and industrial center. Chicago's location at the southwestern tip of a major natural waterway—the port of entry to the heartland of America—has always provided an ideal terminus for shipments of raw materials to be processed and eventually transported by land throughout the United States as finished or semifinished products.

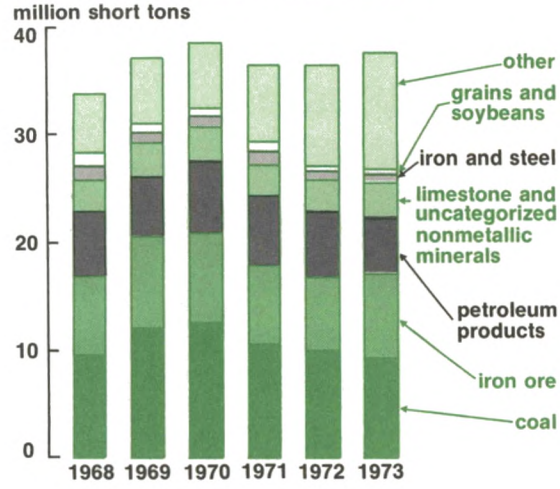
Through the years of Chicago's rapid industrial development, waterborne transportation on the Great Lakes was dominated by shipments of bulk cargoes such as grains, iron ore, quarry products, and fossil fuels. This continued to be the case even after the completion of the St. Lawrence Seaway in 1959 opened Chicago to overseas traffic. In 1973—the most recent date for which complete data are available—the Port of Chicago handled 47.4 million tons of cargo—40.5 million tons domestic, 4.3 million tons overseas, and 2.5 million tons with Canada.

Most of the domestic tonnage in 1973, in both source and destination, was made up of five groups of bulk products: coal (26 percent), petroleum and petroleum products (15 percent), iron ore and ore concentrates (19 percent), limestone and quarry products (19 percent), and soybeans and grain (2 percent).

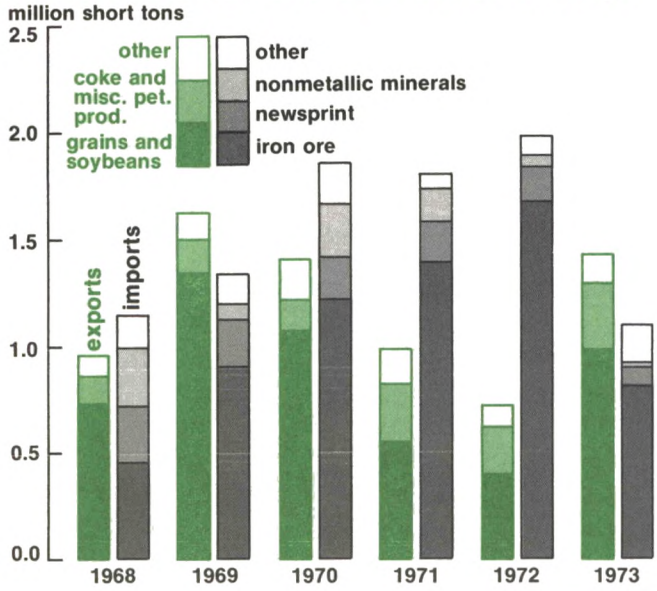
The proportion of bulk cargo involved in trade between Chicago and Canada is even more prominent than in domestic trade. Iron ore shipments from Canada have accounted for as much as two-thirds of Canadian/Chicago trade in some years; the volume of bulk-goods trade with Canada often exceeds 90 percent of the annual Canadian tonnage handled at the port.

Bulk cargoes and semiprocessed materials also are important in Chicago's overseas trade. In recent years iron and steel products (plates, sheets, pipe, and the like) have accounted for 30 to 40 percent of total foreign tonnage handled in Chicago (mostly imports), and processed grain products for an additional 15 to 20 percent. Corn, soybean, and other bulk grain exports make up 30 to 35 percent of total annual volume. Electrical and nonelectrical machinery, with a high value per ton, typically account for only 1 to 2 percent of annual tonnage, but a substantially larger share of total annual dollar value.

The port's domestic trade is founded on raw materials

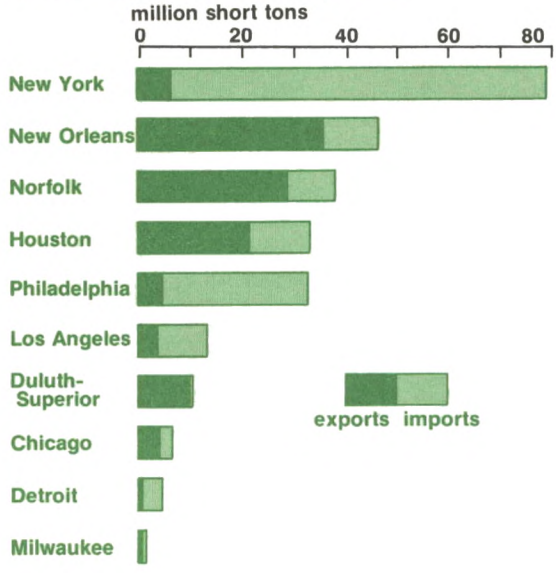


Bulk cargos are the staples of trade between Canada and the Port of Chicago



Chicago port traffic has been about evenly split between imports and exports in overseas trade, whether measured in terms of tonnage or dollars. Chicago's export tonnage typically is somewhat larger than its import tonnage, while the value of imports is greater than the value of exports. An export/import balance is important for achieving economies of operation because ships unloading cargo are able to reload cargo for the return trip. Frequent and cost-competitive sailing schedules traditionally are important ingredients in port development and expansion, and good "turnaround" characteristics are influential factors in the designation of a city as a "port of call" by shipping lines.

Lake ports handle much less traffic than seacoast ports

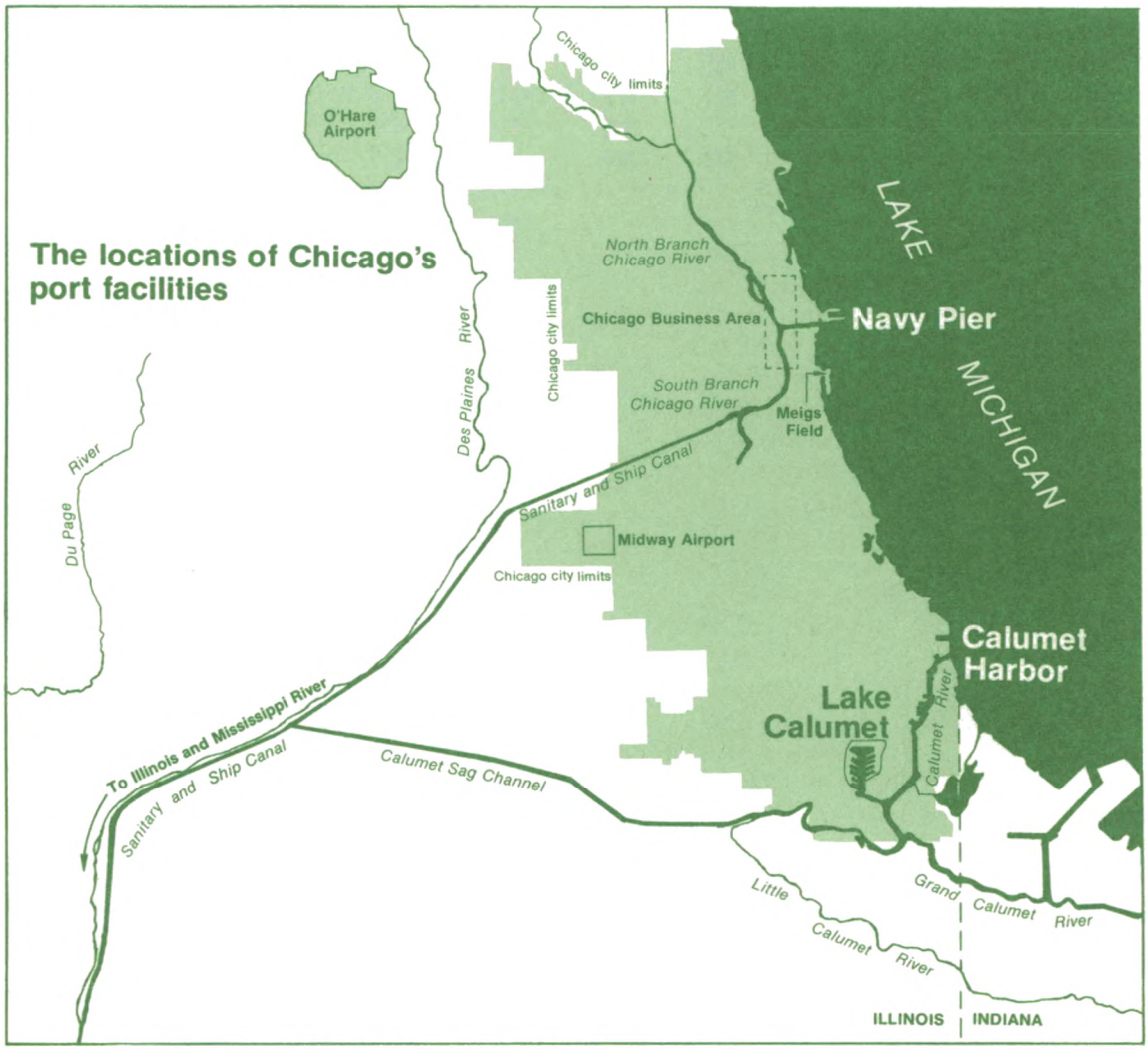


Organization of the port

The deepwater shipping facilities in what is officially recognized as the Port of Chicago are spread among three terminal areas. The primary port facilities are in Calumet Harbor on Lake Michigan and along a six-mile stretch of the Calumet River, both areas in the extreme southeast corner of the city. In 1973 these facilities handled a total of 26.6 million tons of cargo, of which 6.6 million tons represented foreign shipments. To the north, also on the shore of Lake Michigan but at the water's edge of the city's business district, is the Chicago Harbor, also called Navy Pier. This is a small facility, handling primarily a miscellaneous array of relatively high-valued food items, machinery, newsprint, and the like. Total tonnage at Navy Pier in 1973 was 404 thousand tons. The city's other major port facilities are situated in and around Lake Calumet, six miles inland from Lake Michigan via the Calumet River. Tonnage handled by these facilities in 1973 totaled

2.2 million tons, 1.3 million tons of which were foreign.

Two administrative bodies—one state and one city—are responsible for the maintenance and development of the port facilities in the Chicago area. By tradition and by statute the city of Chicago exercises authority over port operations. This arrangement was formalized in 1958 by the establishment of the Department of the Port of Chicago, which is responsible for the Navy Pier facilities. Other port facilities fall under state jurisdictions. In 1951 the Illinois legislature created the Chicago Regional Port District for the purpose of developing deepwater port facilities in and around Lake Calumet. By statute these facilities are leased to private firms. Private interests took the initiative in developing the deepwater port Calumet Harbor facilities at the lake front and inland along a six-mile stretch of the Calumet River. Today, both the Lake Calumet and the Calumet Harbor facilities fall under the jurisdiction of the state's Regional Port District.



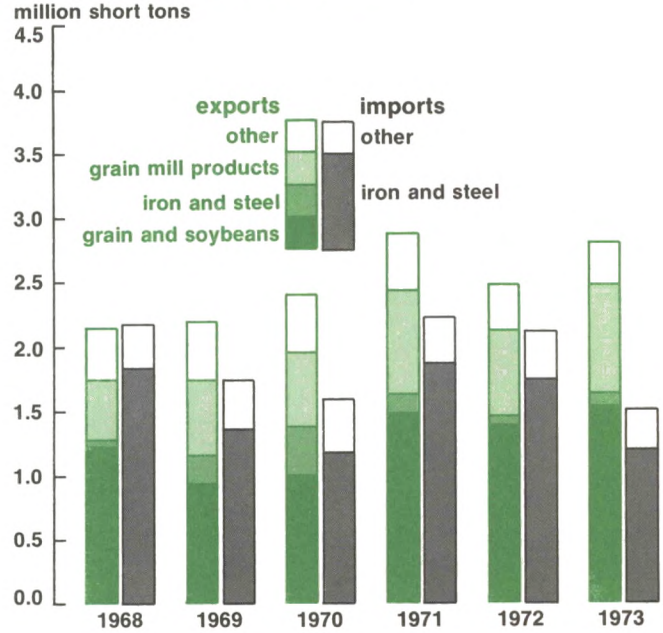
Growth of activities

The growth of port activity over the past 17 years has been primarily tied to the fortunes of overseas trade. Overseas trade activity at the Chicago port reached a record level in 1971 when East, Gulf, and West coast dock strikes resulted in a diversion of traffic to Chicago. Overseas trade handled at Chicago totaled more than 5 million tons in 1971; in 1974 it amounted to just over 2 million tons. More than 50 percent of the decline occurred in 1974, reflecting such unusual short-term circumstances as labor union disruptions, a shipping accident that tied up traffic through the Welland Canal for weeks, and a general slump in economic activity in the United States and abroad. While worldwide economic conditions are expected to affect port traffic again this year, observers believe that the 1975 level will be an improvement over the 1974 level.

Still, long-term factors hold little promise for a major expansion of overseas traffic on the Great Lakes or at the Port of Chicago. For one thing, the present St. Lawrence Seaway cannot accommodate many of the new container ships—the large, fast, ocean-going cargo ships that have been gaining an increasing share of all overseas traffic. Moreover, even if these ships were able to navigate the seaway effectively, they might lose much if not all of their high-speed and quick-turnaround cost-cutting advantages if forced to negotiate the low speed locks and channels of the seaway, and make numerous port stops to unload or take on cargo.

Containerized shipping has proved to be a major obstacle to the growth of Great Lakes transportation and poses a dilemma to all port authorities on the Great Lakes. Any appreciable increase in imports and exports of high-valued "general cargo" will be containerable goods. Handling such goods would require a substantial expansion of modern container-ship facilities at Great Lake ports. Yet the foreseeable volume of containerable general cargo will support only limited construction of such facilities. Thus, to date, Great Lakes port authorities have shown little inclination to develop a coordinated program to handle such shipping. No doubt this is in part because the most logical plans call for fewer consolidated port locations; some ports would lose a portion of the overseas trade they currently handle. It is well known, for instance, that some transportation authorities subscribe to the position that "fully integrated container facilities" are economically justifiable only at the Chicago port, with substantially lesser container facilities at Cleveland, Detroit, and Milwaukee.

Three product groups dominate Chicago's overseas waterborne trade



The importance of a coordinated approach to these problems was emphasized in Congressional hearings in 1970. At that time, Professor Eric Schenker, a transportation expert, suggested that "...lake ports must realize that their true competitors are the coastal ports, and only through a determined, coordinated, and immediate effort will they be able to meet this competition and expand their penetration of the midwestern transportation market."[1] More recent work by Professor Schenker at the University of Wisconsin's Center for Great Lakes Studies continues to point to the importance of determining the comparative shipping advantage of specialization at the various lake ports as a means of developing an intra-Great Lakes shipping complex.[2]

Given the restrictions imposed by the St. Lawrence Seaway on ship size, Great Lakes ports will not be able to compete with tidewater ports for most containerized traffic. Lake ports might function effectively, however, as ports of call for "feeder" vessels handling container traffic between tidewater and heartland ports.

A unique drawback facing Great Lakes ports has been the fact that ocean-going U.S. shipping lines have not operated on the Great Lakes since 1970—and not since 1968 on a regular schedule. This has meant that in recent years lake ports have not had the opportunity to handle those foreign-bound items or commodities that government policy restricts to U.S. flag carriers. Such items include defense equipment, some agricultural shipments, and other products. These goods must be shipped to seacoast ports by land, depriving the Great Lakes ports of the opportunity to handle them. For the 1975 shipping season one U.S. flag line has announced plans for monthly service between the Great Lakes and the Mediterranean area.

Conclusion

Traditionally, the viability of any port depends on the proximity of that port to its market area and on the ease with which land transportation connects with the port. In this sense the Chicago port, at the center of the industrial and agricultural heartland of the United States, held great promise for expansion and growth. This traditional comparative advantage of location, however, has been undermined by technological changes in modes of transportation. A system of favorable "long-haul" rail tariffs to coastal ports, and more recently the advent of the "unit train," have greatly diminished the price advantages of shipping via the Great Lakes. Less frequent shipping schedules and often substantially longer delivery times to Europe (compared with rail shipments to an East coast port) also have discouraged overseas shipping via the lakes. Future growth in lake port shipping will be dependent upon the resolution of problems of coordination of activities among the various ports as well as within some local port authorities, especially Chicago, and on the ability of the port facilities to make the most effective use of containerization and other new shipping technologies.

Jack L. Hervey

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[1]U.S., Congress, Senate, Committee on Commerce, Special Subcommittee to Study Transportation on the Great Lakes-St. Lawrence Seaway, *St. Lawrence Seaway Development Corporation*, Hearings on S.3137. 91st Cong., 2d sess., 1970, pp. 89-99.

[2]The development of container facilities at the Port of Chicago and the issue of merging the two port authorities in the Chicago area are subjects of a current study by the Illinois Department of Business and Economic Development in cooperation with the Economic Development Administration of the federal government.

Fertilizer Outlook

Chemical fertilizers, in conjunction with other modern farming techniques, have aided the productive capacity of cropland substantially in recent years—some experts estimate that higher application rates of fertilizer may have increased U.S. crop production by one-third or more. Food production at levels that will keep pace with a growing population in the future will require even greater utilization of fertilizer materials.

Over the past two years a supply/demand imbalance that caused fertilizer prices to increase sharply has led to growing concern about the availability and cost of fertilizer. Over the same period a number of developments have substantially altered the manufacturing cost structure. It now appears that supply and demand for most fertilizers is coming back into balance, and this will be the overriding factor influencing fertilizer prices paid by farmers in the next few years.

Demand and supply in perspective

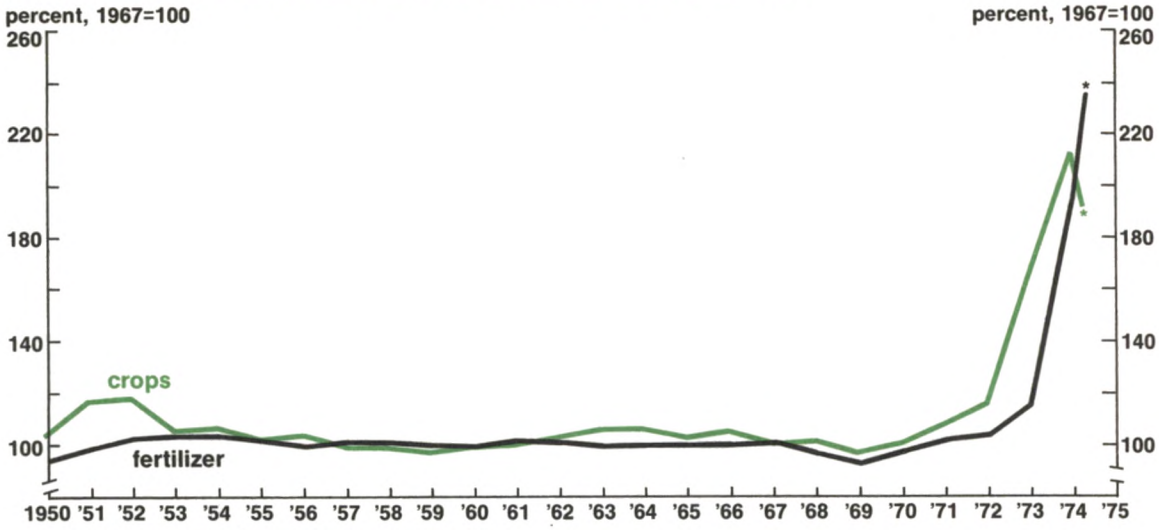
Usage of fertilizer has increased rapidly in the United States since World War II. In 1974 virtually all corn acreage, 80 percent of all cotton acreage, and 66 percent of all wheat acreage were being fertilized. Utilization of the three major nutrients—nitrogen, phosphate, and potash—grew by an average annual compound rate of 7 percent from 1950 to 1960 and by nearly 8 percent from 1960 to 1970. From 1970 to 1974 the average growth rate dropped to just over 4 percent—a decrease probably more related to supply constraints that occurred midway through the period than to a drop in demand.

Nearly all the nitrogen fertilizer consumed in the United States is produced within the country. The United States is a net exporter of phosphate fertilizer and a net importer of potash fertilizer. Approximately 30 percent of U.S. phosphate rock output goes to foreign buyers, and some 15 to 20 percent of phosphate fertilizer production is exported. About 70 percent of the potash fertilizer consumed annually in the United States is imported from Canada.

With the exception of the last couple of years, fertilizer supplies have been generally adequate—as evidenced by the trend of steady or declining prices throughout the Fifties and Sixties. Midway through the Sixties two factors converged and made fertilizer manufacturing enormously appealing from the profit standpoint. The first was a dip in the level of world food production. Many observers interpreted this development as a tremendous opportunity for the United States to "feed the world" in the future. The second factor involved technological breakthroughs—particularly the development of large centrifugal compressor ammonia plants and the refinement of mining techniques that permitted the extraction of high-grade potash ore in Saskatchewan, Canada. These breakthroughs cut production costs by up to one-half for some nitrogen and potash fertilizers. Large expansion projects also were undertaken in the area of phosphate production. A side effect of the rush to manufacture fertilizer was that prices fell sharply and surpluses accumulated.

By 1969 most fertilizer products reached the lowest prices on record and supplies greatly exceeded demand. This depressed situation resulted in losses for manufac-

Fertilizer prices appear likely to decline in the near term if crop and fertilizer prices follow established patterns



Note: Indexes are for crop prices received by farmers and fertilizer prices paid by farmers.

*Average of first 4 months of 1975.

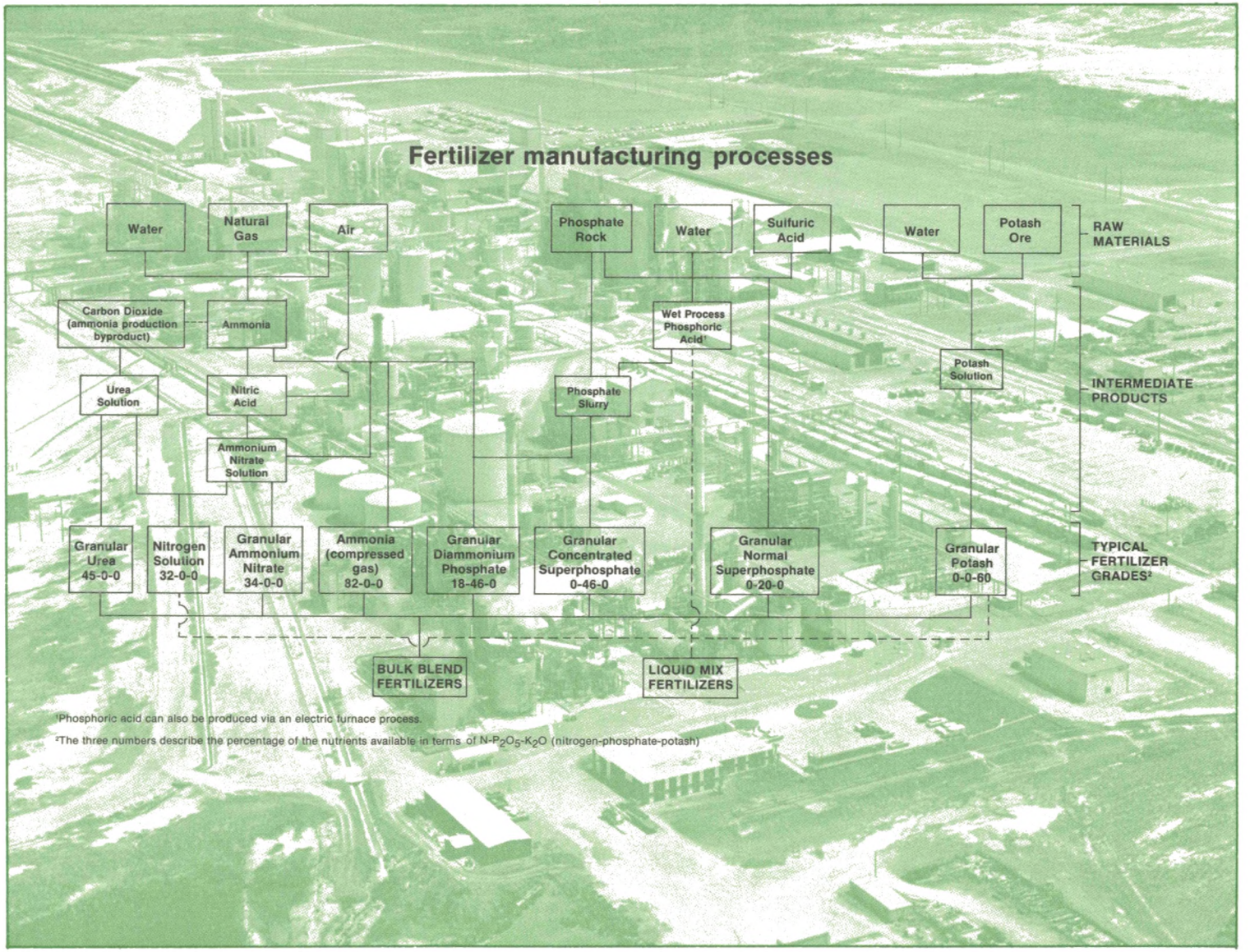
turers, halted nearly all plans for expansion, and closed many less efficient manufacturing plants.

The turbulent 1970s

Marginal increases in crop acreage in 1970 and more substantial increases in corn acreage in 1971 saw U.S. demand for fertilizers begin to absorb some of the surplus supplies. Prices of fertilizers began to strengthen, returning almost to 1967 levels. In 1971, therefore, it appeared that the fertilizer industry was "back in business" with demand and supply coming into balance and with prices returning to a level that would produce profits—after three consecutive years of manufacturing losses.

Then on August 15, 1971 the President of the United States imposed a freeze on wages and prices. This action was untimely for the fertilizer industry since summer is a time of discounts designed to induce dealers to store products over the winter months for sale in the spring. Nevertheless, the August date established a base for fertilizer prices for the next two years. Some pass-through of increased production and distribution costs were allowed over the ensuing period, but domestic price increases were minimal compared to those in world markets. During 1973 world prices of fertilizer were anywhere from 50 to 200 percent above U.S. prices. This situation hastened the flow of fertilizer from the United States to foreign countries exactly at the time that supplies were growing short in the United States.

When fertilizer prices were decontrolled on October 26, 1973, domestic prices simply exploded. By December 1973 the average farm price for concentrated superphosphates had jumped 36 percent above the September level. By April 1974 the price had increased nearly 60 percent over the previous September level, and by September 1974 the average price farmers paid was double the year-earlier level. The average price farmers paid for the most common nitrogen fertilizers rose between



120 and 150 percent in the same September to September period.

The energy crisis

In October 1973 the Arab members of the Organization of Petroleum Exporting Countries (OPEC) began to restrict exports of crude oil. Almost overnight crude oil prices nearly quadrupled and a sharp rise in prices of other energy products ensued. The impact of the energy crisis on the fertilizer industry was evidenced by rising natural gas prices, the major raw material in anhydrous ammonia production. It takes about 38,000 cubic feet of natural gas to produce 1 ton of anhydrous ammonia.

Natural gas prices fall into two categories, interstate gas, regulated by the Federal Power Commission, and intrastate gas, in most instances considered a free market commodity. All domestic natural gas costs had been extremely stable and relatively low compared to the cost of other feedstocks until the Arab oil embargo. As a free market commodity, however, prices of intrastate gas responded quickly to the price increases in energy products, and by the end of 1974 the asking price for new intrastate natural gas was almost ten times more than prior to the oil embargo. Interstate prices, while being adjusted upward, remain well below the price of intrastate gas at the present time.

Other factors, too, have served to increase fertilizer costs in recent years. In 1970 the Canadian government began limiting potash production in an effort to reduce the overabundent supplies that had forced market prices below production costs. Large investments required for pollution control equipment, especially in phosphate production, also limited capital expansion in the early Seventies.

Recent experience

Planted acreage of the 16 principal crops grown in the United States increased substantially during the past two years. Over three-quarters of the increased acreage—up 11 percent from 1972 to 1974—was planted to corn and wheat, which utilize relatively large quantities of fertilizer. Perhaps an even more basic contributor to the sharp increase in fertilizer demand was the rise in crop prices—not only the motivating force behind the acreage expansion but also a source of increased funds and new economic incentive for fertilizer purchases. Crop prices increased over 40 percent during 1973 and rose another 30 percent in 1974.

Nitrogen. Nitrogen utilization is closely linked to corn acreage, and a 7 percent increase in corn acreage in 1973 followed by an 8 percent increase in 1974 pushed demand for nitrogen fertilizer sharply upward. Consumption of nitrogen increased nearly 4 percent in 1973 and 10 percent in 1974, despite substantially higher prices. However, nitrogen fertilizer production has increased only marginally since 1970. Only three new large ammonia plants came on stream from 1970 through 1975, although several smaller plants have either been constructed or reopened. Ammonia plant capacity in the United States has grown by less than 2 million tons in the1971-75 period, compared to a nearly 10 million ton increase in the 1966-70 period.

Phosphates. Phosphate rock production has not kept pace with domestic utilization and exports in recent years. Total inventories of phosphate rock have dropped to the minimum workable level. However, the long-term contracts that many rock producers have with fertilizer companies suggest that sufficient rock supplies will be available to meet domestic demand although exports may be pared for the next year or two. Furthermore, plans are underway to increase phosphate rock mining capacity by almost 60 percent by 1980.

Wet process acid production is currently being expanded and will enable the

industry to increase production of phosphate fertilizer. A number of new wet process plants brought on stream since mid-1973 increased acid production in 1975 about 35 percent over 1973 levels. Additional expansion projects and new plants will raise phosphoric acid capacity approximately 40 percent by 1980.

Potash. Most North American potash facilities are located in Saskatchewan, Canada. U.S. facilities, located in New Mexico, California, and Utah, account for about one-fourth of total North American capacity. In recent years, however, due to cutbacks in Canadian production, U.S. facilities have accounted for almost one-third of the total production. However, high-grade ore in the United States has been mined out for the most part.

Canadian potash production facilities were overbuilt in the late Sixties. In 1970 the Saskatchewan provincial government effected regulations causing potash producers to limit production to 50 percent of rated capacity in an effort to deal with oversupplies and to establish a floor price on Canadian potash.

Usage of potash followed the same upturn as nitrogen and phosphate in 1973 and 1974. By 1974 North American utilization outstripped production by nearly one-half million tons. Inventories were sufficient to handle the increase, but rising demand set off a scramble to increase the capacity of Canadian plants. That task, however, proved to be more difficult than expected. Even though plants were operating far under rated capacity, equipment and labor shortages slowed expansion efforts. During the 1973-74 year (July 1 to June 30) Canadian producers only reached about 70 percent capacity. Canadian potash production could reach about three-fourths of rated capacity this year.

Production costs up

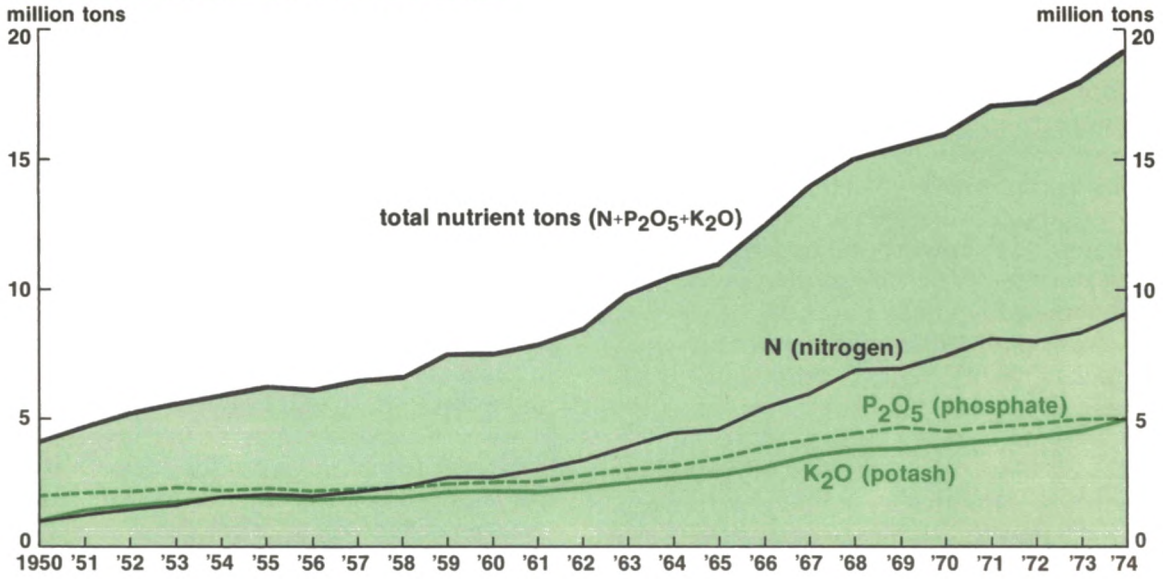
The cost of producing almost all fertilizer has increased rapidly since 1973 and it is likely that this trend of rising costs will continue well into the future. Raw material and energy costs are up substantially—some due to political action rather than economic relationships—while inflation and demand have pushed new plant building costs to about three times the 1973 level.

Increasing natural gas costs (or the costs of substitute products), higher plant costs, and policies of Canadian governments will have the most impact on future fertilizer costs. For example, the average cost of interstate natural gas used in ammonia production in 1974 was around 45 cents per 1,000 cubic feet (MCF), compared to intrastate gas at about 20 cents per MCF. The weighted average cost was about 35 cents per MCF, which means gas costs were a little over $11 per ton of ammonia. Some observers suggest that interstate gas prices to industrial customers may rise to $2 per MCF by 1980, indicating that natural gas costs for manufacturers utilizing interstate gas might total around $75 per ton of ammonia.

Yet even with raw material and plant construction costs at record levels, it is conceivable that these expenses may come under downward pressures in the future. Should the cost of alternative energy supplies, such as crude oil, decrease, the drop could be reflected in natural gas prices, as was the recent increase. When measured on a BTU equivalent, the current price of crude oil, about $11 per barrel, translates into about $2 per MCF of natural gas. If the price of crude oil were to decline to $7 per barrel, the equivalent natural gas price would be about $1.25 per MCF, or 25 to 35 cents less per MCF than some recent contracts made by ammonia producers.

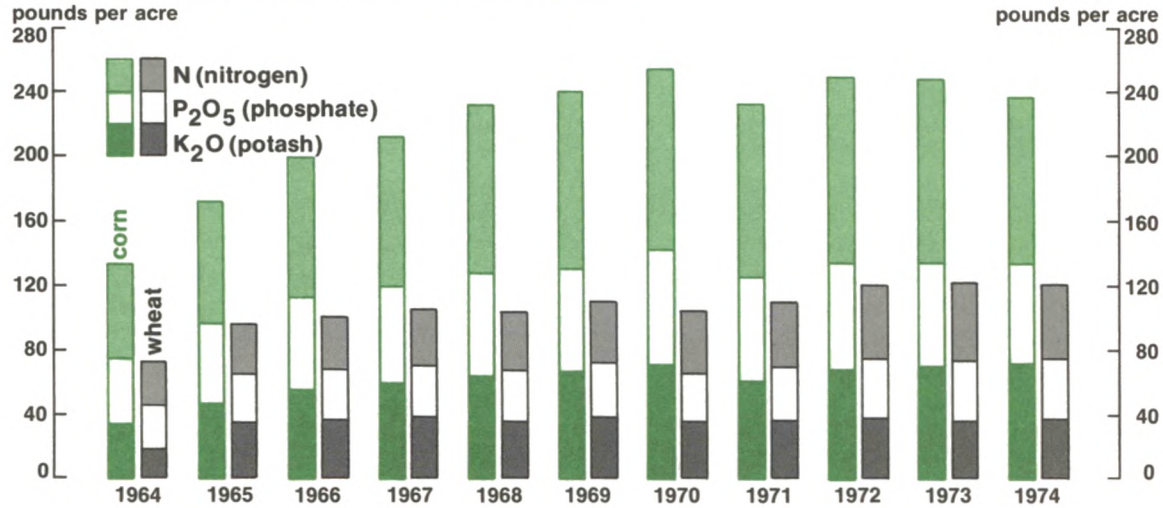
There are a couple of characteristics of fertilizer production that tend to mitigate rapid increases in some costs. One, it is not labor intensive. Two, many fertilizer raw

Fertilizer usage continues to grow but at reduced rates in the Seventies



materials, other than natural gas, are limited to usage within the fertilizer industry and, therefore, are extremely sensitive to supply and demand pressures within the industry. Thus, as demand pressures on fertilizer subside, the prices of raw materials usually drop. On the other hand, transportation and distribution costs remain subject to the upward pressures of inflation.

Application rates have declined or held steady in recent years due to fertilizer shortages and high prices



Future prices

Fertilizer prices peaked in 1974 and early 1975 and are expected to begin a slow decline for the next year or two. More pronounced price declines are apt to take place in the late Seventies, bringing fertilizer/crop price relationships back to more traditional levels both in the United States and abroad. Over the long term, however, an upward climb in fertilizer prices will likely prevail as forces of supply and demand begin to balance.

Nitrogen fertilizers. Prices of nitrogen fertilizers will likely come under increasing downward pressure as new production capacity comes on stream in the next few years. If all the nitrogen-producing facilities scheduled to be built between now and 1980 are completed, both in the United States and other parts of the world, nitrogen production capacity will exceed current demand projections and will likely result in a surplus of nitrogen fertilizers. Nevertheless, if the cost of natural gas—more generally the cost of energy products—holds near current levels, or rises, it will have a profound effect on the long-term cost of ammonia, and therefore, on all nitrogen fertilizers. Interstate natural gas prices are expected to rise, and as "old" intrastate gas contracts expire and are replaced with contracts supplying gas at higher rates—in the United States the new rates will be substantially higher in most instances—nitrogen prices will rise accordingly.

Phosphate fertilizers. Phosphate will most likely continue to reflect supply/demand conditions in the fertilizer industry. Phosphate fertilizer prices are likely to be under downward pressure for the remainder of the Seventies. However, high energy costs (electricity is used to mine rock), Environmental Protection Agency regulations on strip-mining and on waste products from phosphate manufacturing, as well as increasing transportation and distribution costs will likely serve to drive phosphate fertilizer costs upward over the longer term.

Potash fertilizers. The amount of increase in North American potash production for the remainder of this decade remains uncertain. Potash prices will reflect the policies of the governments that control production, primarily the provincial government of Saskatchewan. A regressive, retroactive tax has already been imposed on Canadian potash producers, and the provincial government has announced that it will take a controlling interest in any new mining adventure—a move that surely will limit the desire of investors to expand capacity in that region. Thus, while the basic production facilities are available, there is a question as to whether firms will upgrade those facilities to rated capacity. Rising Canadian prices and government restrictions on output may make it profitable to continue operations in the U.S. potash mines for a longer period than previously anticipated. In contrast to nitrogen and phosphate, potash prices may continue to rise slowly in the remainder of this decade.

Future trends

Rising production capacity will likely be the overriding factor influencing fertilizer supplies and prices in the remainder of the Seventies. Nevertheless, rising costs, particularly for natural gas, portend higher fertilizer prices over the longer term. From the end of World War II until the late Sixties the farm price of fertilizer held steady or declined as improved manufacturing technologies and increasing economies of scale more than offset rising costs. However, it is unlikely than farm fertilizer prices will reach the low levels of the late Sixties in the foreseeable future. Higher manufacturing costs will cause firms to cut back production much sooner than in the past when

prices fall. Increasing transportation and distribution costs also will tend to hold fertilizer prices at much higher levels.

Lower energy costs at some future date may stem increases in the cost of manufacturing nitrogen fertilizer. And there is always a possibility of additional improvements in manufacturing technologies. However, these are unknowns at the present.

Terry Francl