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THE WORLD FERTILIZER SITUATION AND ITS IMPLICATIONS

By

Donald L. McCune
and
E. A. Harre
Tennessee Valley Authority
Muscle Shoals, Alabama

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Paper to be Presented at
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THE WORLD FERTILIZER SITUATION AND ITS IMPLICATIONS*

By Donald L. McCune and E. A. Harre**

An industry executive addressing a meeting of the U. S. fertilizer industry a few months ago stated: "No matter how much or how little you think you are involved in export problems, the price of your product is and will continue to be directly influenced by the world market situation." This is true in all countries other than those that have completely controlled or protected economies. Any major development--a new plant coming on stream, a new mine being opened, an expansion or curtailment in production at a large plant--sends waves into the market that are felt throughout the world.

With Brazil--importing most of its fertilizers as raw materials, intermediates, or finished products--you, understandably, are vitally interested in the world outlook. Your latest trade figures, furnished by Dr. Cardoso,[1/] point up the importance of your ties with world markets (table 1). Although you are making efforts to build your own facilities, Brazil actually imported a higher percentage of all types of fertilizers in 1970 than 5 years ago. Even with an aggressive building program, Brazil will remain a net importer at least in the foreseeable future. The fact that you are basing a significant portion of your new construction on imported raw materials and intermediates also leaves you dependent on world markets and world market prices.

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*Prepared for presentation at the Marketing Seminar on Fertilizer Industry, by ANDA at Sao Paulo, Brazil, November 21-27, 1971.

**Director, International Fertilizer Development Staff, and Fertilizer Distribution Analyst, Division of Agricultural Development, respectively, Tennessee Valley Authority, Muscle Shoals, Alabama, USA.

[1]Cardoso, F. P. "Fertilizers in Brazil, Marketing and Productiom," ANDA. Sao Paulo, June 1971.

TABLE 1 PERCENT PRODUCT IMPORTED

	N	P_2O_5	K_2O	Rock Phosphate
1958/62	97.6	46	100	52
1963/67	86.5	35	100	67
1968/69	94.9	49.5	100	83
1970	91.3	55.5	100	85

When I was here in 1968, I made an estimate of what I thought your fertilizer use would be and I thought I was pretty optimistic. However, Brazil has been increasing fertilizer consumption at the fastest rate of any major nation. Thus, 2 years later, my prediction is already too low; in fact, my predicted use for 1971 was almost achieved in 1970--and now I hear you are having another excellent year.

The rest of the world is not experiencing the type of gains your industry is enjoying. In 1966 and 1967 world fertilizer consumption increased over 11 percent each year, however, since that time the rate of increase has declined steadily; 9.2 percent in 1968, 7 percent in 1969, and 5.5 percent in 1970.

Even though many plants have been shut down--as much as 2.2 million metric tons of nitrogen capacity in the United States alone[2/]--production capacity has outrun consumption and a definite buyers market has resulted with fertilizer prices sinking to an all-time low. How long this situation of worldwide overcapacity and depressed prices will continue is the concern of all countries and companies as they attempt to formulate long-run strategies and policies to meet their needs over the coming years.

A brief look at some of the factors that have brought about this situation may help reveal what we can expect in the future.

Factors Leading to the Oversupply Situation

I feel that at least seven factors contributed to the current oversupply:

1. There has been great emphasis placed by country and regional planners on fertilizers as the fastest, easiest, and cheapest way of rapidly increasing food production.

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[2]Harre, E. A., "Trends in the Supply-Demand Situation," Searching the Seventies, Tennessee Valley Authority, Muscle Shoals, Alabama, September 1971.

2. There has been a consistent failure by market planners to differentiate between theoretical need and effective demand.

3. The chemical industries, in both the developed and developing world, have overreacted to the prospects of an increasing market demand.

4. New technology contributed large plants that must be run at or near full capacity to obtain any economics of scale.

5. Countries having an abundance of basic raw materials--natural gas, phosphate rock, sulfur and/or potash--have attempted to exploit these resources through fertilizer production.

6. There has been a rash of nationalism. Many countries have built their own large-scale production units regardless of their domestic market or ability to compete on the world market. This has led to exports at any price just to keep their plants running.

7. Marketing systems and development efforts in many countries have failed to stimulate demand or to provide fertilizers at levels consistent with announced country plans.

There are no doubt other factors that have contributed to the present situation. The future will depend, however, on how we react to the present situation. Will it be one of continued overconstruction or will the pendulum swing to the extent that demand may somewhere in the future exceed supply?

Each country and company must make its own determination and plan accordingly. To make a sound decision, however, the actions of others must be taken into account. With this in mind let us review the current supply-demand situation for the world and North America.

World Fertilizer Supply-Demand

As many of you know, we at TVA try to keep an up-to-date inventory of world fertilizer production facilities. We have information on over 2,000 plants. This includes those in operation, under construction, and in various planning stages--and those that have been temporarily closed down but not dismantled.

We also maintain records of fertilizer consumption for all countries and periodically make projections of worldwide fertilizer use on a regional basis and for the major countries. The latter is published every 2 years in a report entitled, ''Estimated World Fertilizer Capacity as Related to Future Needs.'' Our latest publication came out in June 1970 with the next one due about 6 months from now. Since we begin our basic data tabulations in November, we do not have a clear picture at this time of what the future capacities or use estimates will be. The figures used in this paper are taken primarily from our 1970 report. The world fertilizer market has changed rapidly in the last 2 years and while the data shown here will be revised in our next review I feel that the conclusions reached today will still be valid 6 months from now.

World Fertilizer Markets

In our 1970 report, it was estimated that world fertilizer consumption would reach 90 million metric tons of N, P_2O_5, and K_2O by 1975 and 114 million by 1980.

These estimates were based, however, on available data through 1968 and thus did not include the further slowdown in worldwide use in 1969 and 1970. Nor did they accurately foresee the tremendous increase in grain production registered in the last 2 years as a result of the ''green revolution.'' While

not final, it is now the general feeling that plant nutrient use in 1980 will be about 5-10 percent below our previous estimate. These lower demand estimates have been included in the following analysis.

On the supply side we estimated that by 1975, if all announced plants came on stream as scheduled, world capacity would exceed 125 million metric tons of plant nutrients. Since that time, there have been a great many changes in plans, both in terms of planned additional capacity, but also cancellation of many construction programs because of the steadily deteriorating market situation.

For those of you that are unfamiliar with our method of determining when supply and demand will reach a balance let me briefly explain the terms used in the following tables. Total capacity is an unadjusted figure based on design levels using 330 days of operation per year. To determine the production capability the capacity data are adjusted for operating levels, process losses, and industrial demand. Thus production capability can be defined as the maximum amount of fertilizer that would be available from the installed capacity, but it is not to be defined as actual production. When the capability-demand ratio reaches 1.16 to 1.18 a balanced market situation is indicated. This allows for normal marketing losses through overformulation, necessary inventory buildup, and transportation and handling losses. It should be pointed out that this ratio is offered only as a guide; different countries and regions may be consistently above or below this level for a wide variety of reasons.

Nitrogen

World nitrogen capacity currently stands at about 55 million metric tons of N and demand for fertilizer nitrogen at between 30 to 32.5 million metric tons N. Our estimate is that nitrogen producers have a production capability exceeding

40 million metric tons. This yields a capability demand ratio of 1.23-1.32--a clear indication that an oversupply situation still exists in this segment of the market.

But the gap between supply and demand is closing rapidly. As shown in table 2, if our previous estimate of use were used and there has been little net change in capacity it appears that equilibrium would be reached by 1973. Regardless of which demand figure is used, a balanced situation is indicated in 1975. By this time, world capacity will be 61 million tons. Demand will exceed 40 million tons--almost double the amount of N used throughout the world in 1968.

Nitrogen production will still be centered in the developed regions of the world however. More than 48 million tons of N capacity--80 percent of the world total--will be in Europe, Japan, and North America.

The developing regions have been making great strides in their building programs in the last few years and should continue to increase their share of world nitrogen production, which currently stands at about 14 percent of world production. Several developing nations have become net exporters of nitrogen. Others, with little or no domestic nitrogen demand, will begin to put large tonnages of nitrogen fertilizers into world markets.

Phosphates

As with nitrogen, phosphates have been in oversupply throughout the world for several years. In 1970, we projected that P_2O_5 supply-demand would achieve the beginning of a balanced situation in 1975. At that time, we could foresee a capacity of over 35 million metric tons of P_2O_5, production capability at almost 30 million tons and demand at 25 million tons. Our demand estimate for 1975 is now indicated to be almost 2 million tons lower;

TABLE 2 WORLD NITROGEN MARKET

	1971	1973	1975
TOTAL CAPACITY	55.4	60.3	61.0
PRODUCTION CAPABILITY	40.1	44.9	45.4
ESTIMATED DEMAND	30.4-32.5	35.0-38.3	39.5-44.0
CAPABILITY-DEMAND RATIO	1.32-1.23	1.28-1.17	1.15-1.03

TABLE 3 WORLD PHOSPHATE (P_2O_5) MARKET

	1971	1973	1975
TOTAL CAPACITY	33.1	35.4	25.6
PRODUCTION CAPABILITY	26.9	29.4	29.5
ESTIMATED DEMAND	19.4-20.2	21.4-22.9	23.4-25.5
CAPABILITY-DEMAND RATIO	1.38-1.33	1.37-1.28	1.26-1.16

however, it is difficult to assess the effort on this change on the market picture. The phosphate industry is shifting rapidly from low-analysis materials, such as normal superphosphate and basic slag, to high-analysis materials based on wet-process phosphoric acid. Thus, while we have reduced our future demand estimate the rapid decline in capacity for these products may easily make up the difference, leaving little net effect on the market situation.

Potash

The potash situation needs little review. Recent capacity additions far exceeded the most optimistic demand estimate, leading to low prices as producers scrambled for markets. Canada instituted production restrictions to bring some order to its depressed industry and most producing nation's welcomed the stability. Table 4 shows the bleak future outlook for potash markets if production levels were uncontrolled. Demand will probably reach 20 million tons by 1975 but capacity will still be almost 45 percent above this level. As a result of overbuilding during the last few years, plans for two potash mines were cancelled and several units in the United Kingdom also have been delayed or terminated.

Phosphate Rock

Brazil is both producer and an importer of phosphate rock, with imports accounting for more than 85 percent of its requirements. Thus, it should be of interest to review recent developments in phosphate rock supplies. We estimate (see table 5) that world phosphate rock production capacity exceeded 100 million tons in 1970--about 6 million tons over the indicated production level. As compared to 1965, however, phosphate rock producers experienced a decline in their production rates and prices weakened in response to the oversupply situation. We see little change in this market situation

TABLE 4

WORLD POTASH (K_2O) MARKET

	1971	1973	1975
TOTAL CAPACITY	24.7	28.9	28.9
PRODUCTION CAPABILITY	22.7	25.9	26.8
ESTIMATED DEMAND	16.5	18.2	19.9
CAPABILITY-DEMAND RATIO	1.37	1.43	1.35

WORLD PHOSPHATE ROCK SUPPLY

TABLE 5

YEAR	PRODUCTION	CAPACITY
	(Million tons of material)	
1965	70.4	70.9
1970	93.9	100.9
1975		121.3-138.2

in the next few years as new mines are still being developed around the world. Expansions in North Africa and the U.S.S.R. and possibly the opening of new mines in the Spanish Sahara, India, and Australia could raise the world's phosphate rock production capacity to more than 120 million tons. If all of these additions materialize, capacity would stand at 130 million tons--almost 50 percent above the 1970 production level. During the same time period, we estimate only a 27 percent increase in total P_2O_5 use for fertilizer.

The increase in use of fertilizer over the last decade is a remarkable achievement. Yet it appears that fertilizer supplies on a world-wide basis are still more than ample to meet the demands of the next few years. Assuring adequate supplies of materials depends, however, on the industry receiving adequate returns on their investments. This is true for both the private and public sectors of the industry. In the last 2 or 3 years, these returns have not been realized and at the present time proposals for new construction get little serious consideration. As a result, the supply pendulum has changed direction and the world market is moving toward equilibrium. Whether we proceed to a period of shortage or maintain a stable market situation will depend on the industry's market planning abilities and how well it has learned the harsh lessons of the last few years.

World Trade

Trade is a vital part of the worldwide supply picture, with almost 30 percent of the total demand for fertilizer moving through world trade channels (table 6). Movement has almost doubled since 1965 and some interesting developments will deserve watching over the next few years. First of all, while the total tons of plant nutrients moved in trade increased over 3 percent last year the share of the total market actually declined slightly, primarily because shipments from developed regions to developing nations decreased

TABLE 6

WORLD FERTILIZER TRADE HAS INCREASED IN IMPORTANCE

YEAR	N	P_2O_5	K_2O	TOTAL	PERCENT OF WORLD DEMAND
		(Million metric tons)			
1965	3.51	1.68	5.16	10.35	25.2
1967	4.92	2.27	6.70	13.89	27.3
1969	6.59	2.90	8.26	17.75	29.8
1970	6.59	2.71	9.01	18.31	29.2

(table 7). Demand increases were not as great this year as last and I realize that part of this was the large inventory buildup that occured in some developing countries. With the exception of potash, the reason for the decline may be the fact that the developing nations are beginning to produce their own materials. The results of all of the plant construction in the last few years are beginning to be felt in the market place.

This shift should be watched carefully by any nation that is deeply committed to imports for fertilizer materials. On the other hand developed nations may be looking for new markets as older traditional markets shrink in importance and new opportunities may occur for the importing countries to develop supply sources in other development regions.

North America

North America accounts for almost one-fourth of the world fertilizer market and has been a major source of supply for Brazil. As a result, the changes in this market have a great effect on the world and on Brazil's fertilizer fortunes. These changes have been rapid as North America appears to be leading the other developed regions in correcting its oversupply problems.

Nitrogen

No new ammonia plant construction is anticipated in North America. Thus, we project that N capacity will remain at its current level of almost 14 million metric tons N for the next few years (table 8). This should result in a production capability for fertilizer of 10 million tons N. Demand projections indicate that North America will use 8.5 million tons N by 1973 and 9.6 million by 1975. If these supply-demand levels are realized, nitrogen supplies will be in balance during 1973. With no additional construction, producers should enjoy steady improvement in their plant

TABLE 7

TRADE WITH DEVELOPING REGIONS MAY HAVE REACHED ITS PEAK IN 1969

YEAR	NET EXPORTS BY DEVELOPED NATIONS		
	N	P_2O_5	K_2O
	(Million metric tons)		
1965	1.61	0.46	0.56
1967	2.81	0.87	0.96
1969	4.04	1.20	1.42
1970	3.99	0.91	1.12

TABLE 8

NITROGEN MARKET IN NORTH AMERICA

	1971	1973	1975
	(Million metric tons)		
TOTAL CAPACITY	13.9	13.9	13.9
PRODUCTION CAPABILITY	10.0	10.0	10.0
ESTIMATED DEMAND	7.5	8.5	9.6
CAPABILITY-DEMAND RATIO	1.33	1.18	1.04

operating rates. This assumes that the net trade balance for this region will not be a factor. The United States exports large tonnages of N. But its imports are equally large and appear to be growing faster than exports. Also, curtailment of AID-sponsored shipments has brought our nitrogen trade balance down to the point where exports now equal imports. Should the United States successfully develop new export markets this balance could shift rapidly toward a short supply situation.

Phosphates

The North American phosphate market rebounded sharply in 1971 after 3 years of disappointing demand. Preliminary data indicate a consumption of 4.7 million metric tons of P_2O_5 with a 1-million-ton increase scheduled by 1975 (table 9). On the other hand, capacity has declined with normal superphosphate levels down to about half of their 1967 high. If this trend continues total P_2O_5 capacity in North America will be about 7 million tons, yielding a production capability of 6.5 million tons.

With its strong basic position in raw materials for phosphate fertilizer production, North America should continue to export large tonnages of these products. Total demand--domestic use and net exports--would be high enough to bring the P_2O_5 market into balance during 1972. If no new additions to capacity are forthcoming by 1975, production capability would be equal to the total demand, resulting in a tight supply situation.

Potash

Production capability for potash in North America will remain at almost twice domestic demand through 1975. We can assume that rationing of some form will continue in Canada, changing as export markets are developed.

TABLE 9 PHOSPHATE (P_2O_5) MARKET IN NORTH AMERICA

	1971	1973	1975
	(Million metric tons)		
TOTAL CAPACITY	7.3	7.1	6.9
PRODUCTION CAPABILITY	6.9	6.7	6.5
ESTIMATED DEMAND	4.7	5.2	5.7
NET EXPORTS	0.8	0.8	0.8
CAPABILITY-DEMAND RATIO	1.25	1.12	1.00

Even with rationing we have projected that North America will continue to increase its share of the world potash export market, reaching at least 1.8 million tons of K_2O by 1975 (table 10). This will continue to improve the ratio of production capability to demand. However, the large overcapacity will remain underutilized for some time.

Latin American Markets

With a consumption level of over 600,000 tons of plant nutrients during the fertilizer year 1970, Brazil represents over 23 percent of total consumption in the Latin American countries. Brazil ranks first in total use, followed by Mexico, and Cuba. These three countries account for about 63 percent of the total Latin American demand in 1970 of almost 2.6 million metric tons of plant nutrients.

Brazil has almost tripled nutrient use in the last 5 years (1965-1970), while Mexico and Cuba have doubled their demand levels. The other nations as a group increased use only 36 percent in the same period. It would appear that Brazil, along with Mexico and Cuba, will continue to dominate the Latin American market with Brazil, in particular, leading the way.

From the supply side of the market, however, a different picture emerges. Mexico is approaching self-sufficiency in both N and P_2O_5, but Brazil and Cuba are not. We have projected a 1.3-million-ton increase in Latin America's nitrogen capacity by 1975. However, this is probably a high estimate since one of the large ammonia plants in Venezuela and the Punto Arenas plant in Chile appear doubtful.

Even if Latin America were to reach 2.9 million tons of N capacity by 1975, as shown in table 11, the region still would be far short of self-sufficiency. Much production would be outside the major consuming areas and the producing countries would need to develop export markets in order to maintain satisfactory production levels and the resulting economies to scale.

TABLE 10

POTASH (K_2O) MARKET IN NORTH AMERICA

	1971	1973	1975
TOTAL CAPACITY	9.5	9.5	9.5
PRODUCTION CAPABILITY	8.7	8.7	8.7
ESTIMATED DEMAND	4.0	4.3	4.7
NET EXPORTS	1.4	1.6	1.8
CAPABILITY-DEMAND RATIO	1.61	1.47	1.34

TABLE 11. LATIN AMERICAN NITROGEN MARKET

	1971	1973	1975
Total Capacity	1.61	1.93	2.88
Production Capability	1.04	1.25	1.72
Estimated Demand	1.33	1.60	1.86
Capability-Demand Ratio	.78	.78	.92

With the exception of trade with Mexico, the Latin American nations have little possibility of trade among themselves. Total capacity for phosphates hardly exceeds total demand and little in the way of new plant additions is expected. As demand increases, Latin America will become even more reliant on trade with countries outside the region.

With no significant potash reserves currently under exploitation, Latin America will continue to import its potash requirements. It would be hard for Latin America or any other region to justify any new potash developments in view of the current world potash situation.

Market Opportunities for Brazil

Throughout this presentation, I have tried to present pertinent data on those situations that have a direct bearing on the fertilizer market in Brazil. To review, we have seen that worldwide the chaotic market situation of the past few years appears to be turning the corner. North American producers are making great strides toward a balanced supply-demand situation. Latin America, with Brazil in particular, still remains headed toward greater dependence on world trade.

Perhaps I am attempting to send up the warning flag. The downward movement of prices that you have enjoyed for the last few years[a/] may be coming to an end shortly. Products may not be quite as easily available and shipment delays may begin to occur. This will depend, of course, on specific market conditions within the supplying region or country.

In 1968, when we first visited this dynamic and growing country a forecast was made of the future fertilizer demand for 1970 and 1980. A comparison of actual use and projections for 1970 shows that use exceeded the

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[a]Neto, Jose Juca Bezerra, Fertilizers in Brazil: Past, Present, and Future, UNIDO 2d Interregional Fertilizer Symposium, September 1971.

TABLE 12

LATIN AMERICAN PHOSPHATE (P_2O_5) MARKET

	1971	1973	1975
TOTAL CAPACITY	1.10	1.10	1.10
PRODUCTION CAPABILITY	0.79	0.79	0.79
ESTIMATED DEMAND	1.00	1.12	1.30
CAPABILITY-DEMAND RATIO	0.79	0.71	0.61

projection by 14 percent. A review of this forecast for 1980 indicates that the suggested levels of use still appear realistic.

The exception is nitrogen. We had hoped that nitrogen use would increase more rapidly than the other nutrients bringing about approximately a 2-2-1 ratio of use by 1980. No indication of this trend is apparent. Thus, the new forecast takes this into account, depicting about a 1-2-1 ratio for 1980. It is still our belief, however, that efforts should be made to move the basic consumption pattern of use toward a higher N to P_2O_5 ratio.

It will be presumptuous to discuss details of your future fertilizer plans or to suggest, without firsthand knowledge and careful evaluation, the steps that will be needed to sustain the tremendous agricultural expansion that is taking place. Commodity price floors, FUNDAG and other credit schemes all will play a major role by increasing the productivity and purchasing power of the rural population. But large-scale distribution of fertilizers, whether domestically produced or imported, requires a large investment in the development of transportation, storage and marketing facilities, without which growth will be hindered.

The Second Generation

Rapid growth in the worldwide agricultural sector has brought about a new set of problems in many areas commonly referred to as "The Second Generation." You have experienced a few of these problems, such as transportation bottlenecks and lack of storage space for the increased agricultural production.

There has been a preoccupation with expanding supply and solving production problems. But as we have seen, the supply of fertilizers throughout the world will be ample to satisfy the demand. The new problem that

arises is the need for faster moving policy decisions. In the last few years, few policy actions have been taken before a crisis erupts. For example, a rapid increase in agricultural output requires basic pricing decisions or the possibility exists that increased productivity will lead to lower net incomes for farmers. We must now deal simultaneously with population explosions, rapid economic growth, equality of income distribution, comparative trade advantages, foreign exchange, and similar problems.

Secondly, there must be an expanded investment in pest control and, in many areas, irrigation facilities. We need more research on major crops and livestock farming, combining farm enterprises, and employment effects of increased agricultural production.

Thirdly, producing for export requires a much greater commitment than just selling excess grain production in the open export market. In export, ''quality'' grains must be produced, port facilities and storage must be made adequate, and marketing skills must be developed. Without these investments, income received from export markets may be disappointing.

We face a multitude of problems and opportunities in the coming decade. Brazil certainly will be among the leaders in agricultural progress. However, even greater efforts of industry, government, and the farm community will be required to continue the agricultural revoltion that has taken place here in the last few years.