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PROCEEDINGS  
OF THE  
34th ANNUAL MEETING  
FERTILIZER INDUSTRY  
ROUND TABLE  
1984



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# Tuesday, October 30, 1984

## Morning Session

### Moderators:

**Harold D. Blenkhorn**

**Edwin Cox III, P.E.**

### Opening Remarks—Chairman

**Harold D. Blenkhorn**

Good morning ladies and gentlemen. It is a pleasure to welcome you to the thirty-fourth Annual Fertilizer Industry Round Table. I would like to extend a special welcome to those who have travelled great distances to attend and take part in our program. I am pleased to report that we have representation from most of the countries of Europe, and from such far-flung corners of the world as India, Australia and Brazil.

As I am sure you will all agree, it is also a pleasure to be in this fine hotel overlooking the inner harbor of Baltimore. The city of Baltimore has a special significance for a seminar dealing with fertilizers, for it could be quite correctly stated that Baltimore is the cradle of the fertilizer industry in North America. It was here in the early 1850's that Davison, Kettlewell and Company established themselves as "grinders and acidulators of old bones and oyster shells". They were followed shortly after by Gustavus Ober and Sons, who produced superphosphate by acidulation of mineral phosphates. These two companies later merged to become the Davison Chemical Corporation. Another name long associated with fertilizer manufacture in Baltimore is that of Baugh and Sons. Baugh began manufacturing superphosphate in Pennsylvania about 1860, and expanded their operations to Baltimore just after the turn of the century. We have first-hand knowledge of local developments in the fertilizer industry since that time. Paul J. Prosser Senior, still living at the age 89, joined Baugh and Sons at the age of fifteen in the year 1910, later becoming president of the Company. Mr. Prosser recalls that there were no less than twenty fertilizer manufacturing plants operating in and around Baltimore during the period of the first world war. His son, Joseph L. Prosser, tells me that in the late 1940's, the annual production of superphosphate in Baltimore amounted to 1,500,000 tons. Among the manufacturers were such familiar company names as American Agricultural Chemicals, Baugh, Davison, Olin-Mathieson, and Royster. It should also be mentioned that the concentration of fertilizer plants in

Baltimore gave rise to many service industries. One that has survived from the early days is the well known equipment manufacturer A.J. Sackett and Sons, who have been in operation since 1887.

Baltimore also has a particular significance for the Fertilizer Industry Round Table. In 1951, the late Vincent Sauchelli, Director of Agricultural Research for The Davison Chemical Corporation, assembled a small group of local fertilizer industry chemists and production managers who met around a table for the purpose of exchanging ideas and experiences in fertilizer manufacturing techniques. This was the modest beginnings of the "Round Table" which is recognized today as a unique International forum in the field of fertilizer manufacturing technology. Our program for this year's meeting provides the usual diversity of information on new processes and on major trends taking place in our industry. We hope your stay in Baltimore will be enlightening and enjoyable.

### Keynote Speaker

**Kent V. Stromsted**

President, Top Yield Industries

Cargill, Incorporated

Good morning, everyone. It's a pleasure to be with you today and to have the honor of being your first speaker. We have an ambitious agenda drawn up for the next few days, and I hope I'm up to the task of getting it off to a good start. Just about a year ago, I delivered a speech at a dealer meeting of a regional fertilizer firm in Ohio. I was maybe 30 seconds into it when a flapping sound in the front row caught my attention. A gentleman was slouched in his seat, head back, eyes closed and his mouth wide open looking very much like a rain gauge. The flapping sound was the beating of an enormous uvula in his throat. Rather than disturb him in the midst of such deep slumber, I lowered my voice and he

slept on peacefully. Now I don't see that uvula yet in this audience, but if I do I'll quiet things down a bit this time, too.

Well, we all know how disappointing it is when things don't meet our expectations. For example, back during those wonderful days of Calvin Coolidge, the White House called the top brass at the Pentagon and told them "the President wants to have breakfast with you the day after tomorrow." So for the next two days, the entire Pentagon worked feverishly on charts, tables, position papers, diagrams—everything you can imagine to bring the Commander In Chief up to date on U.S. Defense and Strategic Planning. After all this work, they showed up at the White House and were escorted into the presidential dining room. In a few minutes, President Coolidge appeared, took his seat and began wolfing down his oatmeal. No one said a word, waiting for the president to open the long-awaited discussion. Only silent Cal lived up to his nickname. Not a word was spoken. As soon as his bowl was empty, Calvin stood up, said "thanks for coming," and strode out of the room.

Now, I don't know what your expectations are of me today. But I can promise you that you won't have 20 minutes of silence. In my remarks this morning, I would like to offer a few observations on the current conditions in the agricultural marketplace, as well as some ideas on what I see ahead for the United States in the International Agricultural Markets. I also want to talk a little bit about what that's likely to mean for the fertilizer industry. And I'd like to take this chance to submit a few ideas on things we can do to make the future brighter for the farm economy and everyone who is involved in it.

As a starting point, let me tell you a little bit about Top Yield and Cargill. Most of you probably already are familiar with Top Yield. We are a regional fertilizer manufacturer, wholesaler and retailer operating in the Ohio River Valley. Back in March of this year, Top Yield became part of Cargill.

Describing Cargill takes a bit more time. Shortly after acquiring Top Yield, our regional superintendent from Chattanooga was trying to find our plant in London, Kentucky. He stopped in at a gas station to get a steer and an old gentleman offered, "Oh yeah, they're the outfit that's just been bought by the biggest company in the world." Cargill is good sized but not in that league. Cargill is a merchandiser, warehouse, transporter and processor of commodities. You're probably aware of it as a grain merchant and oilseed processor. But Cargill is involved in many other activities as well, many of them oriented around serving the needs of the farmer and the agricultural sector in general. Cargill has been involved for years in selling feeds, seeds, chemicals and fertilizer used by farmers. And we look forward to doing even more to help farmers meet their future needs for farm in-

puts, and to remaining an active, contributing member of the fertilizer industry.

### *The U.S. Farmer and World Markets*

In a way, that means I'm wearing two hats today. I've been with Cargill for 12 years now, and I've held a variety of marketing positions for our commodity marketing division in locations from the west coast to the Ohio Valley. But for the past 1/2 year or so, my job has been Top Yield and nothing else. Today, I'm directly involved in meeting the needs of the farmer for his essential production components. But I'm also able to look with some experience at another important need of his—namely, the markets upon which he depends for his economic livelihood.

Over the past decade or so, the U.S. farmer has become fully integrated into a world agricultural marketplace. The days of producing solely for a domestic market are long gone. And everyone involved in farming will tell you that's good. The domestic market can't absorb any significant increases in domestic farm production. Today, it's the export market that shapes the farm economy.

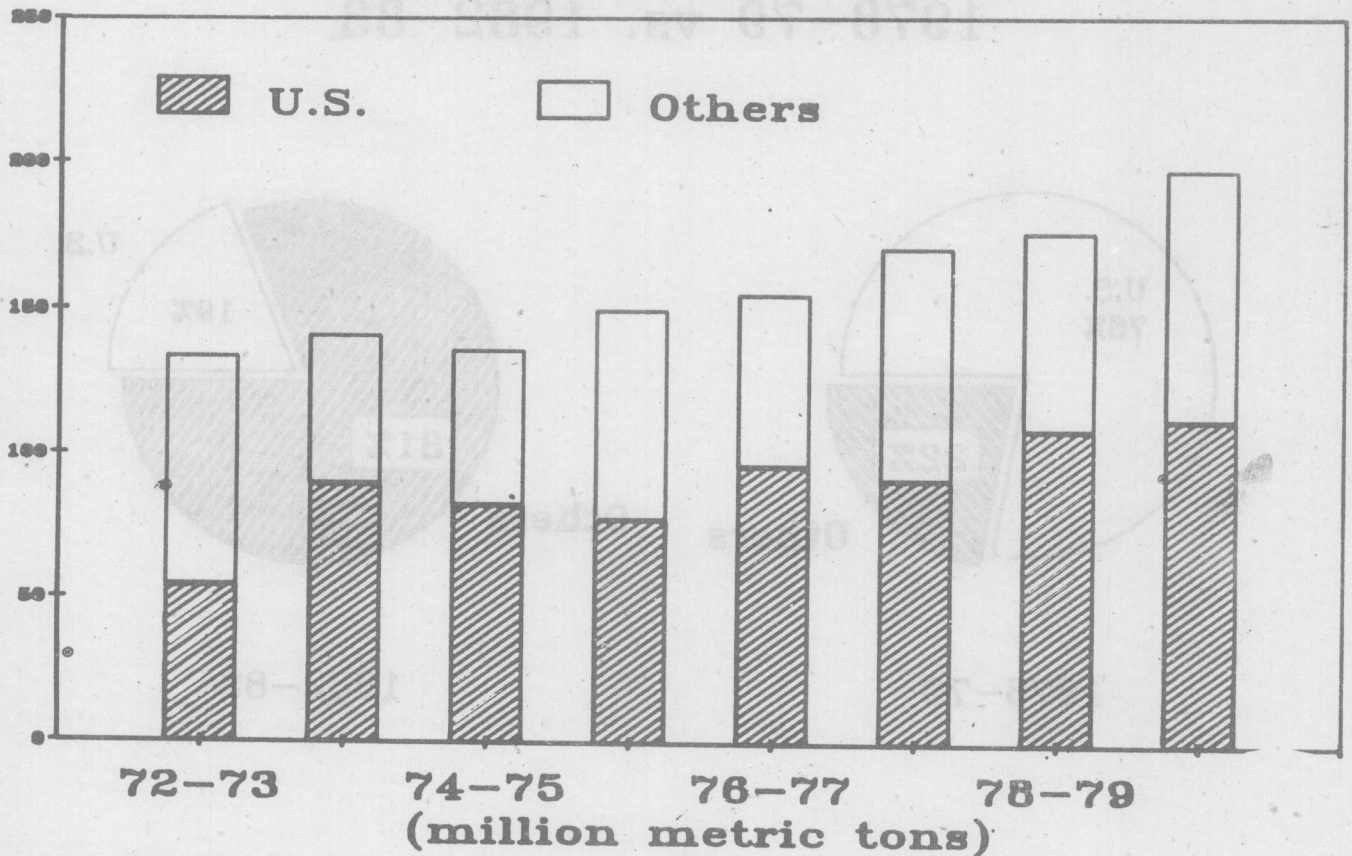
Take a look back at the 1970's. We saw an unparalleled growth in demand for agricultural commodities, which translated into unparalleled good times for the farmer and the suppliers that farmers depend upon. During the 70's, we saw major new buyers of grain emerge on the world scene. We saw commitments from foreign nations to improve diets. We saw generally strong worldwide economic performance and easily available credit. We saw major production shortfalls in some of our competitor exporting nations. And we saw farm policies that allowed the producer to tap into that explosion in demand.

What did this mean for U.S. agriculture? Between 1972 and 1980, world trade in wheat, coarse grains and soybeans increased 90 million tons, or roughly 65 percent. U.S. producers captured nearly 60 percent of that growth. U.S. grain export volume jumped 250 percent. The value of U.S. grain exports increased fivefold. By the beginning of the 80's, U.S. farmers were sending nearly two of every five acres of production into overseas markets, and farm income stood at record or near-record levels.

You know what that meant for our industry as well. Farm production was up, and demand for the farm production components you and I sell was strong. You also know equally well what has happened since then. We've seen market conditions turn completely around. The global economy is in a mess. Credit is tight, and for many of the developing nations that served as major new markets in the 70's, credit just isn't available. The strong dollar makes U.S. grain more expensive. And competing nations have stepped up their efforts to sell abroad, often with the aid of subsidies. To top it all off, we have seen our government embargo sales to the Soviet Union that cut



## Grain Trade In the 1970s



our share of the soviet market from a high of nearly 75 percent to a low point last year of below 20 percent.

U.S. exports, which had climbed to 5.1 billion bushels in 1980-81, have stagnated at about 4.4-4.5 billion for the past three years.

### *A Changed World Marketplace*

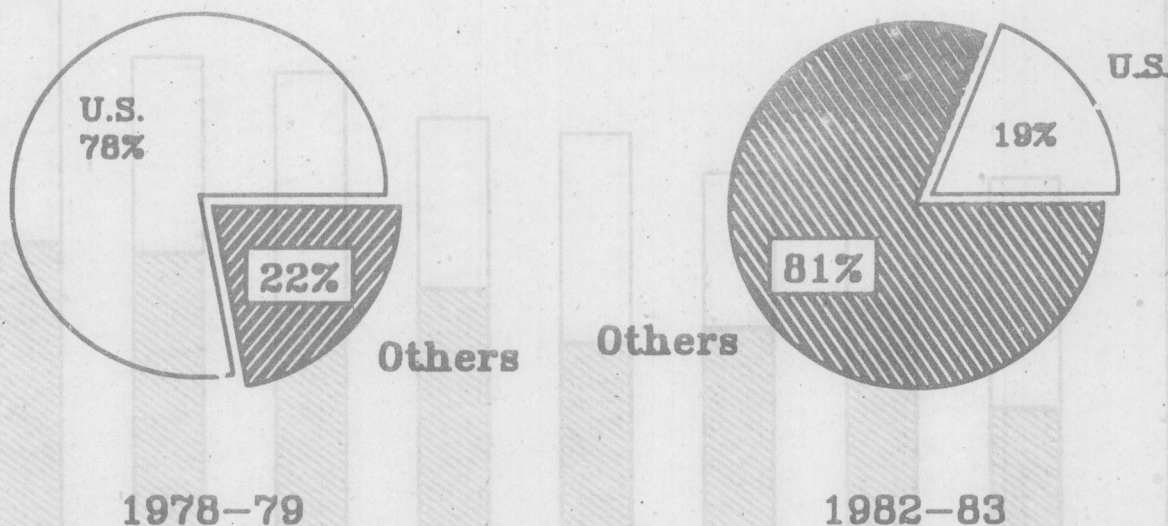
I wish I could tell you that things are going to turn around, and that brighter days are ahead for all of us. I wish I could say that the government will adopt fiscal and monetary policies that will lead to 8-percent interest rates, or that a combination locust swarm, drought and prairie fire will wipe out the crop of a major competitor. But I can't. What I can tell you for sure is this. We've seen a major change in market conditions. The 70's are gone, and it's not likely that we'll see a return of the conditions we enjoyed then. The 1980's will be a buyer's market—

not a seller's market. And we've got to take some steps to deal with that changed reality.

Let's take a very quick look at our current conditions. Over the past three years, as world trade in grain has stagnated, the United States by and large has been left holding the bag. World trade has dropped from 215 million tons to about 200-210 million. At the same time, we've become the world's residual supplier—that is, customers come to us only when they can't obtain their needs from other sources. As a result, the United States has seen its share of markets actually decline in recent years. Not only has the world trade pie shrunk, but our share of it has grown smaller.

We've already touched on some of the reasons for this—the strong dollar, increased competition, commodity programs that keep U.S. prices above world levels, and so forth. Nothing that has happened in this crop year indicates that situation will change appreciably. Incidentally, if you've wondered

## U.S. Share of Soviet Market 1978-79 vs. 1982-83



Source: USDA

about whether barter is a factor in grain trading—the answer is no—or, at most, very limited.

Let's talk for a moment about the '84-'85 column on the chart. This year's corn crop will be about 7.5 billion bushels. That's up sharply from last year, when we had the Pik Program, but still below record production of 8.4 billion in 1982-83. Despite continuing efforts through government programs to keep supply in better balance with demand, we are still going to wind up with sizable carryout stocks. Domestic use of corn will be around 5.1 billion bushels. Exports will take another 2.1 billion; but another 1.1 billion bushels will be left in the bins.

The wheat situation is similar. We'll see a crop of about 2.5-2.6 billion bushels, exports of about 1.5 billion, and a carryout of almost 1.4 billion.

### Market-Oriented Farm Policies

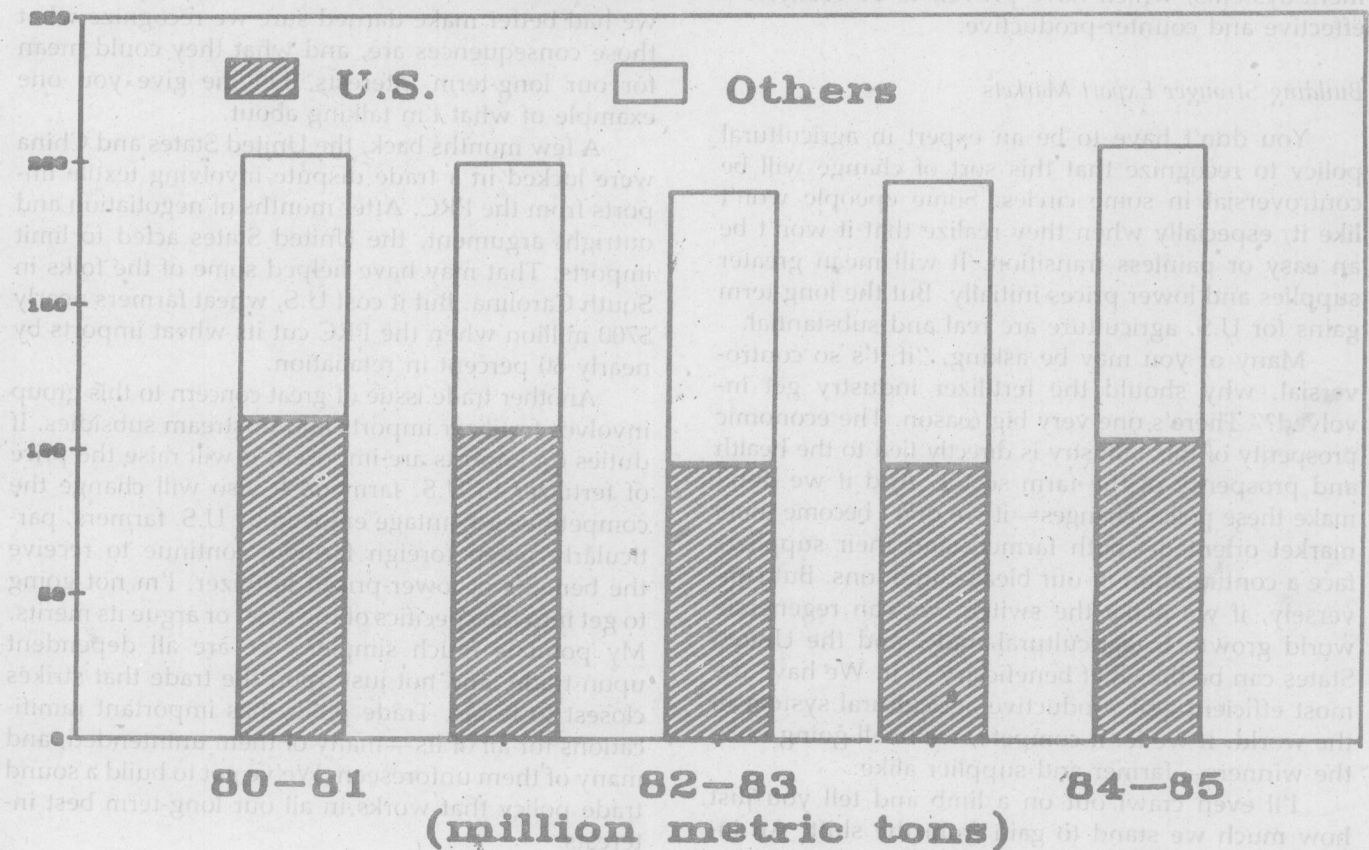
If all this sounds too much like doom and gloom, take heart. I believe there's room for some optimism.

Granted, we're not going to see the salad days of the 70's again. But if we can take advantage of an opportunity in the coming year to make some fundamental adjustments in our farm policies that reflect the changing nature of the marketplace, then all of us can look forward to some better days. If we have the political will and the political courage to build some market-oriented farm policies, we can get world markets growing again, and the U.S. farmer and the U.S. agricultural sector can be the biggest beneficiary. And that also means that the U.S. fertilizer industry can benefit.

What do I mean by "market-oriented" farm policies? First, let me tell you what that doesn't mean. For the past 50 years, we've seen government policies that sought to protect farm income through programs designed to maintain a desired relationship between supply and demand. In strong markets, that didn't mean too much. But in weak markets, it meant extensive use of set-asides, target payments and a whole



# Grain Trade In the 80s



litany of program activities? Has it worked? There are differing interpretations.

No one quarrels with the legitimacy of a government role in providing an adequate supply of food for the consumer, or with the need for farmers to earn an adequate return. The argument is over how best to accomplish that goal. I believe the evidence suggests that those goals are best reached when market forces are allowed to work—that is, when the farmer is free to make his own judgements in response to supply and demand conditions.

In today's market conditions, our current policies just aren't working as well as they need to. Farm income remains a major concern. Farm program costs are skyrocketing and generating all sorts of concern in and out of government. Export markets—our principal source of farm economic growth—are languishing.

We have no real alternative to market-oriented policies. The marketplace isn't going to provide the sort of spectacular conditions that will bail us out of

the current situation. Growth will be slower and less dramatic, at best. We must adopt policies that will enable us to improve that outlook.

As a starting point, we need to make some changes in the price support mechanism that will enable the United States to be competitive in world markets. The loan program, for example, could be made more flexible and responsive to changing world conditions if we established non-recourse loans at, say, 70 percent of a moving average of world market prices.

Second, a simplified, limited buffer-stock policy would assure domestic and foreign customers that this country is a reliable supplier of reasonably priced commodities.

Third, annual set-aside and acreage-reduction programs should be eliminated. Instead, a long-term paid diversion should be initiated to move some fragile lands now in cropping back into less-intensive, more soil-conserving uses.

And fourth, a focused program of income and

government aids should be developed to facilitate the transition to the more robust market demand that this policy will stimulate. This program would replace the existing target-price and deficiency-payment systems, which have proven to be costly, ineffective and counter-productive.

#### *Building Stronger Export Markets*

You don't have to be an expert in agricultural policy to recognize that this sort of change will be controversial in some circles. Some people won't like it, especially when they realize that it won't be an easy or painless transition. It will mean greater supplies and lower prices initially. But the long-term gains for U.S. agriculture are real and substantial.

Many of you may be asking, "if it's so controversial, why should the fertilizer industry get involved?" There's one very big reason. The economic prosperity of this industry is directly tied to the health and prosperity of the farm sector. And if we don't make these policy changes—if we don't become more market oriented—both farmers and their suppliers face a continuation of our bleak conditions. But conversely, if we make the switch, we can regenerate world growth in agricultural trade, and the United States can be the chief beneficiary of it. We have the most efficient and productive agricultural system in the world. If we let it compete, we're all going to be the winners—farmer and supplier alike.

I'll even crawl out on a limb and tell you just how much we stand to gain from the shift. An increase of just a half-percent in world grain use can mean an increase of 3-8 percent in annual U.S. grain exports. Look at that in terms of groups of specific buyers. By 1990, exports to centrally planned economies and developing nations could grow by 50 percent under market-oriented policies.

As a result, U.S. grain exports by 1990 could be 20-30 million tons higher every year than they otherwise would be under a continuation of existing policies. That's 10-15 percent more grain exports than we would see as the world's residual supplier. What would another 20-30 million tons do for the farm economy, and for all those who provide the farmer with his production needs? Think about it.

#### *Trade Policy and Long-Term Interests*

I'll climb down off that soapbox for a moment and step onto another that I believe is especially appropriate for this group. This one is labeled "trade policy."

I'm extremely concerned that we recognize the importance of liberalized trade to our economic well-being. Today, one-quarter of the U.S. gross national product is trade related. For agriculture, the figure is closer to 40 percent. None of us can say that trade isn't important to us.

But nonetheless, we're seeing an increasing array of initiatives that smack of protectionism. Many of them stem from legitimate concerns about the actions of our trading competitors. But they all have consequences in the international marketplace, and we had better make darned sure we recognize what those consequences are, and what they could mean for our long-term interests. Let me give you one example of what I'm talking about.

A few months back, the United States and China were locked in a trade dispute involving textile imports from the PRC. After months of negotiation and outright argument, the United States acted to limit imports. That may have helped some of the folks in South Carolina. But it cost U.S. wheat farmers nearly \$700 million when the PRC cut its wheat imports by nearly 60 percent in retaliation.

Another trade issue of great concern to this group involves fertilizer imports and upstream subsidies. If duties on imports are imposed, it will raise the price of fertilizer to U.S. farmers. It also will change the competitive advantage enjoyed by U.S. farmers, particularly when foreign farmers continue to receive the benefits of lower-priced fertilizer. I'm not going to get into the specifics of the case, or argue its merits. My point is much simpler. We are all dependent upon trade, and not just upon the trade that strikes closest to home. Trade policy has important ramifications for all of us—many of them unintended, and many of them unforeseen. We've got to build a sound trade policy that works in all our long-term best interests.

#### *The 1985 Farm Bill*

My time is almost up, and I feel a bit like those Pentagon generals with their papers, charts and graphs. I haven't shown you a fraction of all that I'd like to. At least you've seen some of it. But then and again, you didn't get a bowl of oatmeal to go with it, either.

If I leave you with no other thought, let it be this. Conditions have changed in the agricultural marketplace, and they're not likely to improve dramatically in the foreseeable future. But the U.S. farmer, and businessmen such as you and I, nonetheless can look forward to something better, if we build ourselves some farm and trade policies that allow us to compete in world markets and take advantage of our advantages in productivity and efficiency.

If 50 years of experience with farm programs have taught us anything, it should be that attempts to manage supply to guarantee farm income don't work very well. The 70's demonstrated that exports are the growth market for U.S. agriculture. If we can build policies rooted in the marketplace, we can regenerate world agricultural markets, resume our leading role as a supplier and get the farm economy moving again. If we can make those policy changes,



we could be looking at another 20-30 million tons in agricultural exports by the end of the decade.

We have the opportunity to make those changes in the coming months. Congress takes up the 1985 farm bill right after the first of the year. And I suppose it's necessary to use a tried and true cliché in this case: that bill is going to be watershed legislation for U.S. agriculture, and for our industry as well. I hope we have the courage to make the right decisions, and I ask for your help in making them. The fertilizer industry is an important voice in farm-bill debate, and legislators listen when the industry speaks. And I hope I've convinced you today that the industry has a major stake in building market-oriented farm policies.

Thanks once again for the opportunity to be here. If any of this has generated questions, I'd be more than happy to talk with you about them at your convenience. I'll turn the soapbox back over to our host now. Thanks for coming, and thanks for having me here.

## Nitrogen—World Demand and Supply

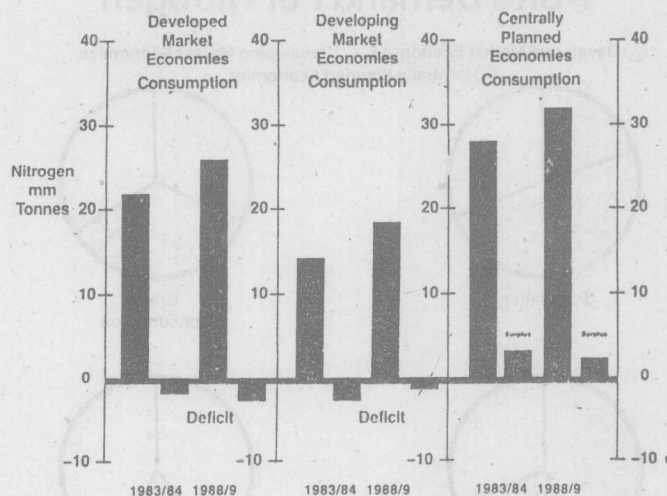
J. Neil Black

Manager—Nitrogen Chemicals  
Agriculture  
C-I-L Inc.

Thank you for the opportunity to share my thoughts on nitrogen with you. C-I-L Inc. supplies North American customers with nitrogen from its major plant in southwestern Ontario. Like all nitrogen producers, C-I-L is affected by the winds of change that blow across the world of nitrogen. No one involved in providing the nitrogen ingredient for agriculture and industry is immune. The challenge for the North American nitrogen industry is to recognize and understand what influences its well-being and to make decisions accordingly.

I will not be presenting any new forecasts as there are many people more adept than myself in that field. There is the work of the World Bank/FAO/UNIDO Fertilizer Working Group available to us. They have published a consensus viewpoint on nitrogen supply/demand through to the middle of 1989. I will use data from it. The Working Group divides countries into three blocs which are: the developed market economies, the developing market economies and the centrally planned economies. For convenience I will refer to these as developed, third world and communist blocs.

My first slide compares estimated 1983-84 nitrogen consumption in each bloc with the projected 1988-89 consumption in the same bloc. Also shown is the nitrogen surplus or deficit in each bloc.



Starting from this nitrogen history and supply/demand projection, I will explore some of the important assumptions behind the data and discuss a number of the issues which arise from it. As we are aware, nitrogen, whether as anhydrous ammonia or its derivative products, is a freely traded commodity in most markets. All producers are affected by the world supply/demand balance for nitrogen. This applies even though governments may impose taxes or grant subsidies during the production, the distribution or the sale of nitrogen products.

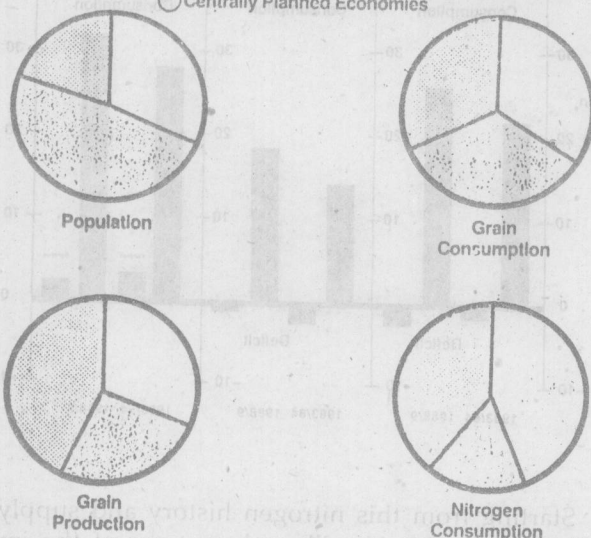
Nitrogen, in turn, is influenced by the supply/demand balance and the prices of two other key commodities. On the nitrogen demand side, grains in general, and feedgrains and corn in particular, dominate trends in demand. In North America, for example, over half the nitrogen applied as fertilizer goes on corn and wheat. On the nitrogen supply side, virtually all ammonia is made from natural gas or other hydrocarbons. The cost of this natural gas to the nitrogen producer is affected by the supply/demand balance for energy. Natural gas is no longer being sold in the developed world as a by-product at 25 cents per Mcf.

As for nitrogen, I will not be presenting new scenarios for grain and natural gas. In 1983 Chase Econometrics did a study for C-I-L Inc. on the future of North American agriculture. I will use information from this study. In addition, I will refer to a 1983 multi-client study by Arthur D. Little, Inc. concerning the relationship between natural gas supply and ammonia manufacture.

I will look first at the demand side for nitrogen, i.e. the future for grain. The basic theoretical model underlying the supply/demand balance for nitrogen is simple. Population growth and economic development in all parts of the world lead to increased grain demand both directly and via livestock. Therefore grain production has to increase to satisfy this increasing demand. Since the supply of land is not

## World Demand For Nitrogen

☒ Developed Market Economies  
 ☐ Developing Market Economies  
☐ Centrally Planned Economies



inexhaustible in most parts of the world, the increase will be achieved by increasing yields. The use of fertilizers, and in particular nitrogen, are key inputs. The reality is we are not dealing with a simple theoretical model but with a massive economic conundrum which is subject to many variables, not the least of which is the weather.

The three economic blocs consume about the same quantity of grain measured as a total of wheat and feedgrains.

While the demand for grain in the third world is the smallest of the three blocs, total demand is growing fastest in this group, largely due to population growth (2.4% per year). In addition, most economists predict that overall economic growth will take place in the third world, leading to increased grain consumption per capita. This higher standard of living would support a projection that the third world will catch up with the developed bloc in total demand for grain by the end of 1989.

Only the developed bloc is a grain exporter. It provides 16% of the third world's current grain demand and 18% of the communist bloc's needs. The third world is frequently unable to purchase all of the grain it requires due to the lack of foreign exchange. How do they earn the foreign exchange to buy grain? This is usually achieved through the sale of commodities such as oil, cocoa, coffee and metals. Oil, however, occupies a central position in that many of the third world countries must purchase all of their oil or its derivatives on the world market. Most of the third world countries which do earn foreign exchange by exporting oil are not major grain importers. If the downwards trend in world oil prices continues, the heavily populated third world countries

will be able to purchase more grain in addition to oil. However, if the relative value of the U.S. dollar remains high, grain prices to these same countries (as well as Japan and other richer importers) will be high, thus restraining demand. In general, the demand for grain is a function of the prosperity of the third world. If the third world becomes more prosperous, both grain farmers and nitrogen producers will be asked to supply more.

The prosperity of the grain farmer is dependent on the grain supply/demand balance. There has been a dramatic growth in supply of grain from the developed market economies over the last decade. The U.S., for example, exports over four times as much feedgrain today as it did at the beginning of the 1970's. Grain exports have not increased in the 1980's due to recession and the resulting slowdown in world trade activity. If grain exports do grow, it is likely to be at a much lower level of annual growth. We do not yet know what permanent structural changes will result from the recent recession nor what dampening effect these may have on a resurgence of overall world trade activity.

The nitrogen demand data shows nitrogen consumption increasing dramatically in the third world. The ability of third world farmers to convert this increased nitrogen into increased crop yields will have a significant effect on world grain trade. Failure on their part to increase crop productivity to feed ever-increasing populations within their own countries will lead to increases in demand on the developed world's grain exports. On the other hand, success beyond current expectations would lead to lower demand for grain from the developed countries.

The Working Group is projecting a major increase in nitrogen capacity. The largest portion of this increase will occur in the third world, at an annual rate of 7%. The developed bloc is shown increasing capacity by less than 1% per year. The communist bloc is showing increases in nitrogen capacity of less than 2% per year, now that the major round of Russian expansions started in the mid-1970's is largely complete. If Russia's objective is to improve its agricultural performance, much of the nitrogen now being exported should be retained for domestic use. If Russian farmers can utilize Russia's increased nitrogen supply efficiently, the world grain supply/demand balance will be dramatically affected. While it is unlikely they can match the efficiencies of North American and western European grain farmers, the productivity of Russian agriculture is certain to improve. You will note on the above slide that the efficiency of nitrogen utilization is much greater in the developed countries than in the communist bloc.

• The additional nitrogen required to grow more grain will be produced as ammonia with natural gas as the feedstock. The fixing of nitrogen directly by growing plants will not significantly affect the nitro-



gen supply/demand balance in this century.

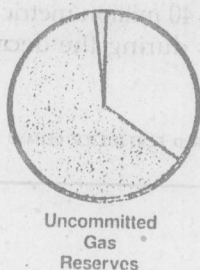
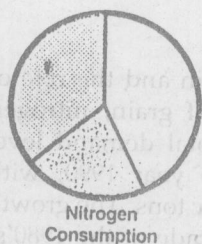
The major growth in nitrogen capacity is forecast for the third world. Huge amounts of capital will be required to pay for the nitrogen expansion projects, whether the projects are financed under private or state auspices. This requires a demand for the nitrogen products at prices which are high enough to earn a margin over the input natural gas to justify the investment. The cheaper this natural gas is, the more likely the project is to proceed. In countries with large quantities of uncommitted gas reserves, feedstock for a new ammonia plant could be priced very cheaply.

Where are these reserves in relation to current nitrogen consumption and production? This slide has been developed from Arthur D. Little, Inc.'s work.

Three quarters of this natural gas is found in the USSR, Iran, Indonesia and in Qatar. Pipelines are now in place to move Russian natural gas to western Europe, and this may increase the marginal value of their gas.

## World Supply of Nitrogen

● Developed Market Economies ○ Developing Market Economies  
○ Centrally Planned Economies



Iran's uncommitted gas is about a quarter of the world's total. Whether it could utilize this to become a major source of nitrogen is questionable because of political instability. Indonesia is self-sufficient in nitrogen, and will provide regional exports. Qatar, and other Gulf states, will continue to make investments in export based nitrogen projects. Economics generally favour manufacturing nitrogen products close to the market in which they are to be consumed, provided that natural gas is available at market-related energy values.

The state-owned proportion of world nitrogen capacity has increased in recent years. Nevertheless, the basic economics of converting natural gas to ni-

trogen through ammonia will continue to directly influence the provision of new ammonia capacity. Thus, so long as nitrogen is perceived to be freely available on world markets, at a relatively cheap price, there is no incentive for either state or private enterprise to invest in an import substitution project. As the supply/demand balance tightens, however, the world price must inevitably rise to restrain consumption. This in turn will prompt both state and private enterprise to look for opportunities to invest profitably in the nitrogen business.

In summary, the nitrogen demand forecasts assume population growth and increasing standards of living leading to greater grain demand and production and hence nitrogen demand. This increased nitrogen demand can only be provided by an increase in nitrogen capacity world-wide. Recent history has shown that the projected tightening of the nitrogen supply/demand balance will not occur in an orderly fashion once the now idle North American production capacity is operating again. After that, because the pace of new nitrogen investment has slowed considerably since the U.S. and USSR rounds of expansion in the mid-70's, the world appears to be approaching a time of nitrogen shortages. This will not occur for at least two reasons. Firstly, the price of nitrogen will rise to match consumption with available supply. Secondly, the perception of possible nitrogen product shortages will encourage opportunistic investment in the industry. As Arthur D. Little points out, major investment is required to upgrade or replace obsolete plants. This vital reinvestment is more likely to occur when returns are good.

I believe that world and North American demand for nitrogen will increase both in spite of and because of the variables I have discussed. I further believe that the North American industry will be an active participant in meeting this demand. To do this successfully we require the following:

1. an assured supply of natural gas, the price of which is established by unfettered market forces
2. an expanding world economy which fosters trade in both agricultural and nitrogen products
3. the availability of capital at a cost which reflects the real value of money
4. exchange rates which will permit developing countries to purchase North American products
5. the application of improved nitrogen manufacturing technology and finally,
6. consistent government policies which support the export of grain from North America.

# The World Outlook For Phosphates

Eugene B. Graves

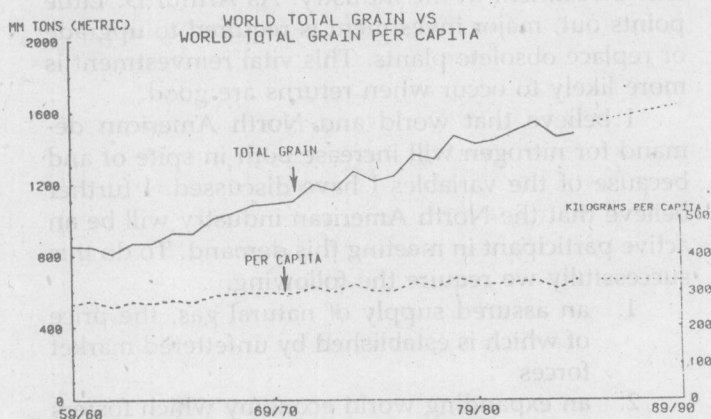
Vice President-Planning & Economics

Agrico Chemical Company

The following charts cover the highlights on a worldwide basis for  $P_2O_5$  and more specifically, the U.S. outlook for the 1984/85 Fertilizer Year. The data is shown on a metric ton basis for the world, while the U.S. data is in short tons. Most of the data is on a fertilizer year basis, that is, from July 1 of one year to June 30 of the next. Some countries, however, report on a calendar year basis. In that case, the calendar year data is generally incorporated with the fertilizer year data so as to best reflect the data on a year-to-year comparison.

## World Grain Data

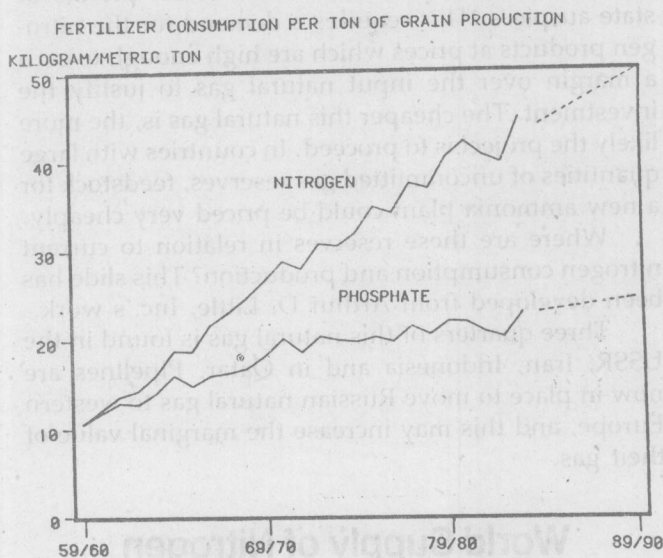
The underlying demand for fertilizer is based on grain to feed a growing population. During the past 20 years, grain consumption per capita has increased by about 50 kilograms per person, from 275 kilograms to 325. Virtually no increase is expected for the remainder of this decade. As a result, total grain consumption is expected to grow with the rate of population, reaching about 1.7 billion metric tons by the year 1990.



## Fertilizer Consumption Per Ton of Grain Production

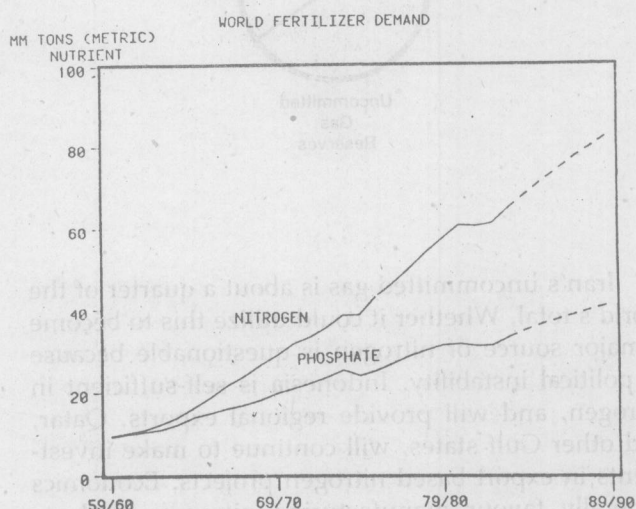
A second factor in determining the total level of fertilizer consumption is the rate of fertilizer applied to grow a ton of grain. Over the past 20 years, the rate of phosphate application per ton of grain production has doubled from about 10 kilograms per metric ton to slightly in excess of 20. This trend is likely to continue. As a matter of interest, nitrogen use per ton of grain production has more than quadrupled from 10 kilograms to more than 40 during the past 20 year period, and is expected to reach about 50 kilograms per metric ton of grain by 1990. This

indicates that the world is moving further up on the response curve; that is, it takes an increasing amount of fertilizer to grow the next ton of grain.



## World Fertilizer Demand

Based on the total level of grain and the rate of fertilizer used to grow each ton of grain, nitrogen fertilizer is expected to reach a total demand level exceeding 80 million tons by the year 1990, with phosphates at about 40 million metric tons. The growth rate for phosphates during the decade of the 1980's, is about 3%.

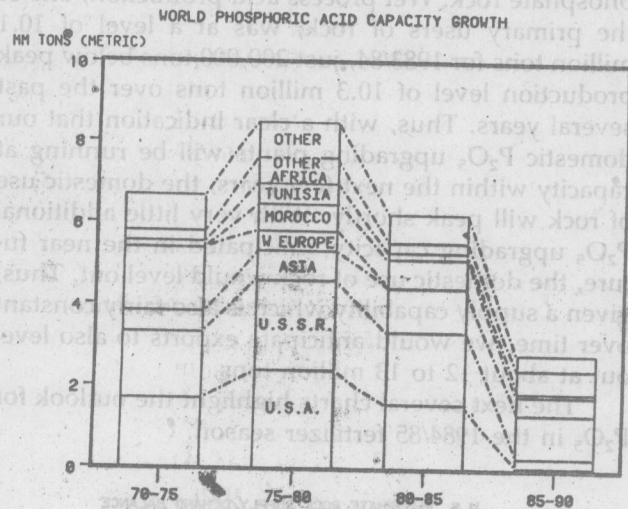


## World Phosphoric Acid Capacity Growth

This shows new capacity in five year increments. During the 1970's, new capacity kept pace with the



increasing demand levels, with particularly large increases in the U.S.S.R. and the U.S. However, for the decade of the 1980's, the rate of new capacity has slowed, with new capacity for the period 1980/85 at a rate of only about 70% of the previous five year period and much further declines for the 1985/1990 period. There are a number of reasons for this slow down, but perhaps the overwhelming reason was the worldwide depression of the past several years and the corresponding depressed prices for fertilizer materials. As a result, bankers were less anxious to provide the funds to expand capacity.

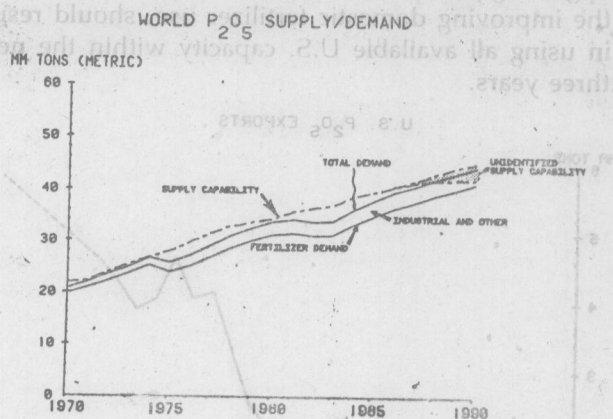


#### World P<sub>2</sub>O<sub>5</sub> Supply/Demand

Taking into consideration some delays, the P<sub>2</sub>O<sub>5</sub> supply/demand balance should be tightening fairly soon. However, because of the uncertainty regarding operating rates that can be achieved in various parts of the world, it is impossible to either ascertain the exact quantity that could have been produced had the demand been there, nor to predict precisely what can be produced in the future. The key, however, is to look at trends.

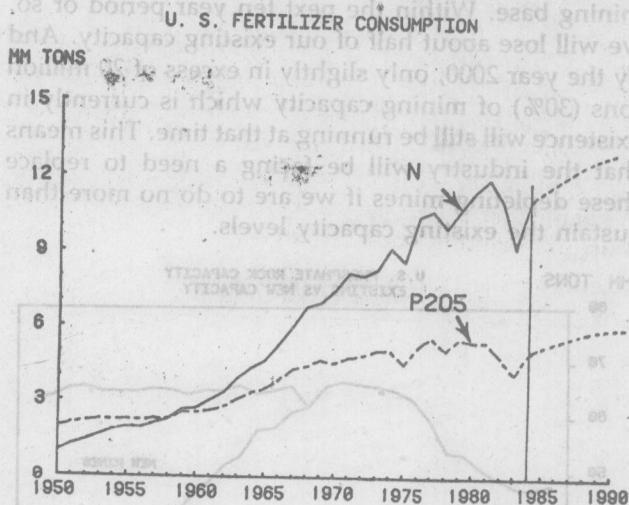
This shows that the surplus in supply capability that the industry is currently experiencing, was more a function of a slowdown in demand than it was an increase in new capacity. In 1974, the data clearly shows a very tight supply/demand balance. However, the slowdown in demand in 1975, coupled with some increasing capacity, led to rather substantial surpluses during latter half of the 1970's. By 1980, demand had again more or less caught up with supply capability and as a result, pricing was substantially improved. The slowdown in demand during the early 1980's resulted in a substantial imbalance. The recovery in P<sub>2</sub>O<sub>5</sub> demand, which began late in 1983, is expected to result in an improving supply/demand balance over the next several years.

By the late 1980's, additional plants will have to be built in order to meet the continuing growth in demand. These are shown by the shaded area and labeled "unidentified supply capability."



#### U.S. Fertilizer Consumption

Turning now closer home, U.S. P<sub>2</sub>O<sub>5</sub> consumption has increased from a level of about 2.5 million tons to a high of just about 6 million tons in the early 1980's, before dropping off to about 4.2 million tons in 1983. Demand has subsequently rebounded to a 5 million ton level in 1984/85 and is expected to increase to a level of about 6 million tons by 1990.



#### U.S. P<sub>2</sub>O<sub>5</sub> Exports

This shows the long term trend in U.S. exports of P<sub>2</sub>O<sub>5</sub>. The U.S. is a major supplier of P<sub>2</sub>O<sub>5</sub> to countries that do not have an adequate supply of their own. During the latter half of the 1970's, exports increased rather dramatically, from about 1.5 million