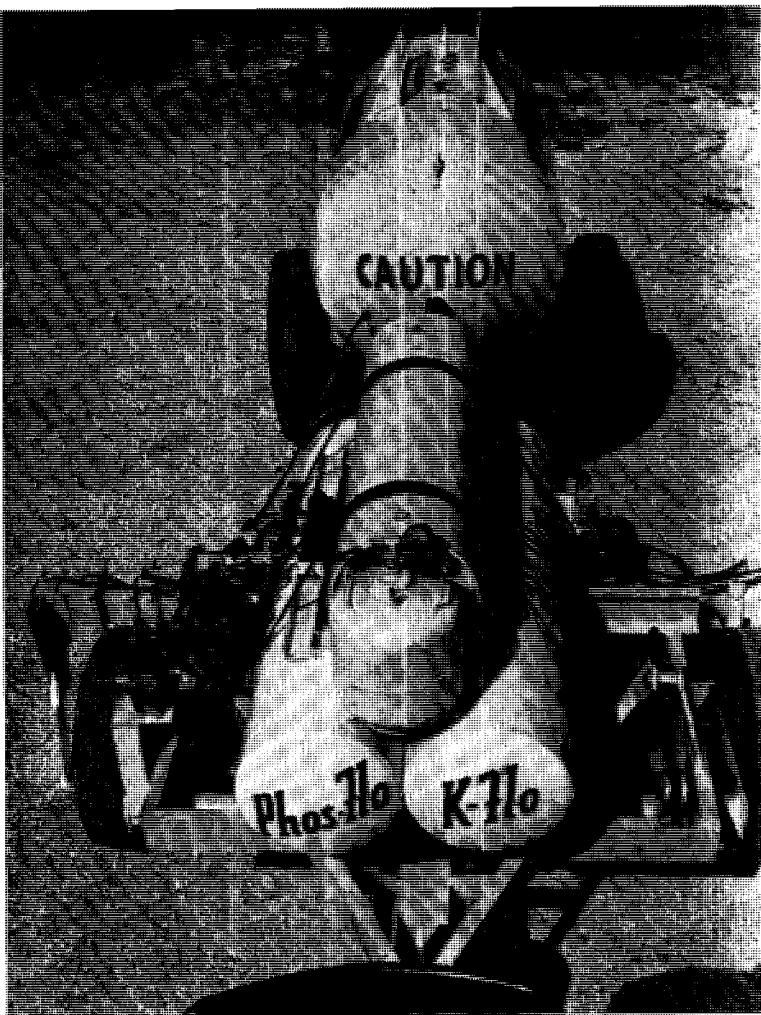


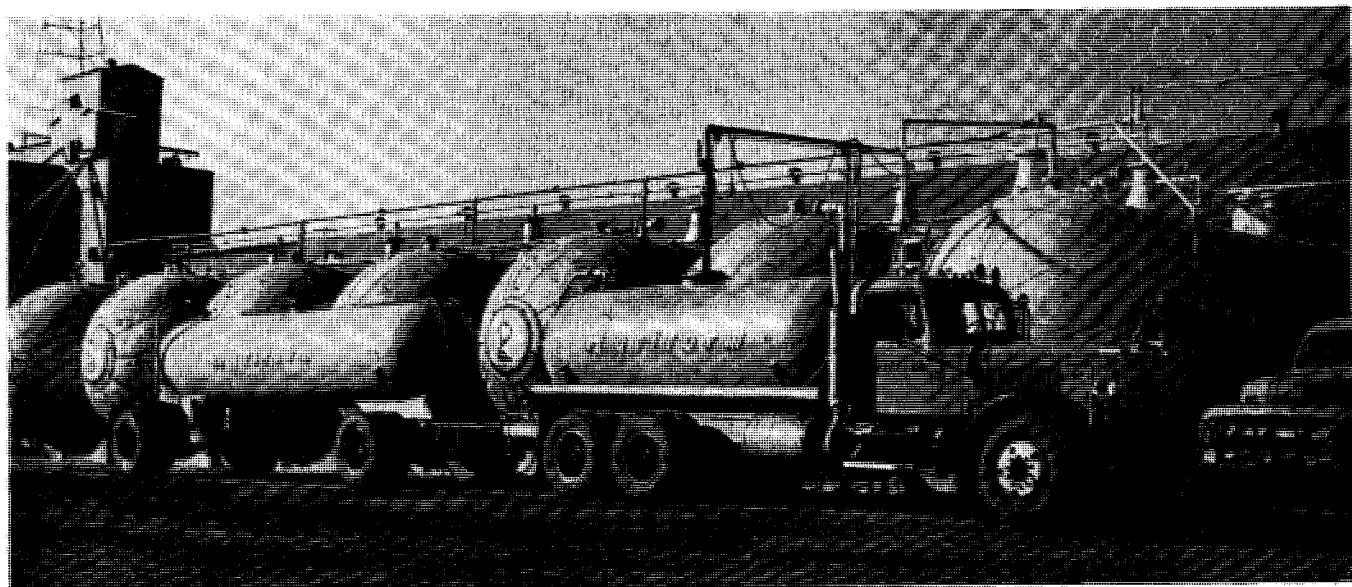
FERTILIZER OUTLOOK



This three-way applicator developed by Plantation Fertilizers Corp. of Houma, La., applies nitrogen, phosphorous, and potassium simultaneously to the soil in liquid form. Flow rate of each material may be regulated independently.

Ag and Food's field editors report on their semiannual survey of the fertilizer situation. They find industry pushing hard on nitrogen, fearing possible oversupplies. Liquid fertilizers getting big play. Autumn drought slows fall applications to a trickle. Dealer education getting more action and thought

Tanker loads up with noncorrosive ammonium phosphate liquid fertilizer at Agriform's Corcoran, Calif., plant, one of four plants the company has for making liquid fertilizers from white phosphoric acid and aqua ammonia or ammonium nitrate



Liquid Phosphates Moving East?

West shifts to other liquid phosphates as phosphoric acid use drops

Midwestern interest in balanced liquid fertilizers fanned by prospect of small but firm supply of white acid

HERE APPEARS TODAY to be some likelihood that phosphoric acid, now a factor in California agriculture, might move across the Rockies into the middle western bread basket. Should the move come, ammoniated solutions seem the most likely possibility. The West has apparently gone through a peak on direct use of phosphoric acid as a fertilizer, is instead putting increasing emphasis on noncorrosive liquid fertilizers. And in the Middle West, where liquids had never been widespread until the advent of anhydrous ammonia, a few relatively small firms are turning out balanced liquid fertilizers based on crude electric furnace acid. Nearly all of these companies have entered the field since spring of 1953, and while the development is a long way from being epidemic, the small surplus of electric furnace acid which has developed in the last year or so, plus the interest of acid producers in agricultural outlets, certainly make it worth considering.

Californians, who account for the bulk of western fertilizer sales, first tried direct application of phosphoric acid in the late 1930's. Use grew steadily, but not spectacularly, during the war and early postwar years. By 1950, sales reached about 6000 tons. The 1952 year was California's peak phosphoric acid year, with nearly 14,000 tons used either for direct injection or for irrigation water application. A sharp decline to 8600 tons followed in 1953, and 1954 will probably see a continuation of that level, 5000 tons having been sold during the first six months.

The bulk of this material is the so-called green acid produced from phosphate rock by the wet process. Several reasons account for the drop in direct use of acid, chief of which are: In recent months it has been easier to move nitrogen solutions, and dealers have lessened efforts on phosphoric acid; green acid is being replaced as practice shifts from direct injection of acid to use of neutral N-P solutions.

Meanwhile, other liquid fertilizers are booming. Use of nitrogen solutions—*aqua ammonia, ammonium nitrate (20%*

N), ammonium nitrate with ammonia (40% N), and urea—has increased a hundredfold in the decade 1944–53, reaching 43,000 tons last year (total fertilizer sales in 1953 in California—solids and liquids—were 805,000 tons). This spectacular growth continues in 1954, with nearly 70,000 tons having been sold the first six months.

The remaining liquid forms, mixed liquid fertilizers (N-P and N-P-K solutions) are likewise growing, though not at anywhere near the rate for nitrogen solutions. 1953 sales were 22,000 tons, up 20% over 1953; 11,000 tons were sold the first six months of 1954. Increases in these types account in part for the drop in use of phosphoric acid alone. (To keep these and other increases in proper perspective, total consumption of all types of fertilizer in California increased 7.6% from 1952 to 1953.)

It is with these N-P solutions primarily that corrosion has been a problem in the past, and it is only recently that noncorrosive N-P solutions have become available that can be handled in mild steel equipment.

While corrosion is not too critical where application is via irrigation water, it figures heavily in direct injection. Liquid injection costs in California run from \$1.50 to \$2.00 per acre, a level at which most dealers report losing money—or at best breaking even—on application. These men think twice, therefore, before investing upward of \$500 per tractor for stainless steel tanks, valves, lines, and pumps. Older dealers, who originally set up for corrosive materials (nothing else then being available), are not quite so concerned, but they, too, will become increasingly so as they replace present equipment.

First "Neutral" Solutions Introduced in 1952

Agriform, which handles about 60% of liquid fertilizers moved in California (and which plans expansion to the Pacific Northwest), introduced the first "neutral" liquid ammonium phosphate to the West in January 1952, a development

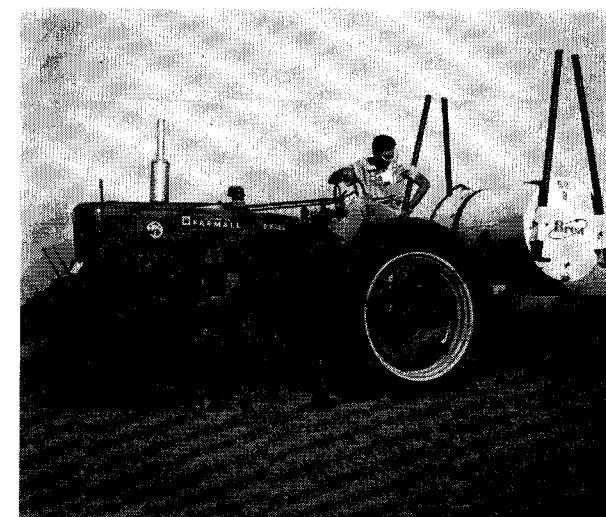
which hinged on Westvaco's white phosphoric acid becoming available then for the first time in the West. Others have since followed Agriform, one of the latest being Brea Chemicals, which brought the first of three liquid ammonium phosphate plants on stream at Brea, Calif., in September (others at Brawley and Fresno are to be completed early next year, giving a combined capacity for the three of 50,000 tons per year).

"The greatest significance of our aqua ammonium phosphate program," says Homer Reed, president of Brea, "is that it marks another step in the direction of balanced plant nutrients in solution form, with labor saving advantages of liquid bulk handling and increased effectiveness of plant nutrients already in solution."

Brea makes its 8-24-0 solution by blending white phosphoric acid with aqua ammonia, providing phosphate in completely soluble form which can be applied with the same equipment it uses for aqua ammonia. Where injection is used, phosphate and nitrogen solutions can be applied simultaneously with dual injection equipment, or they can be applied in separate passes if this method fits crop needs better.

This apparent shifting of emphasis in the West does not mean direct application of phosphoric acid will not continue to be a very vital part of total fertilizer sales in the region. Anaconda Copper Mining produces 18,000 tons of green acid per year at Anaconda, Mont., will complete in early 1955 an expansion of its sulfuric acid plant. This, in turn, will permit further expansion in green phosphoric acid (as well as

Injection of 8-24-0 solution with same rig used for aqua ammonia. Aqua and 8-24 may be applied in separate passes with single tank equipment or simultaneously using dual injection equipment with separate tanks and shank feeder lines. This tank can also be used for application via irrigation water when stood up on the legs



solid phosphate fertilizers produced there). Other western green acid producers are Western Phosphates at Salt Lake City and J. R. Simplot in Idaho, although their marketings are so far a minor part of the total for green acid.

Green acid, suitable for direct injection or for application via irrigation water, will be overshadowed as a liquid phosphate source, however, by white acid made from elemental phosphorus. White acid can be used to make ammonium phosphate solutions by reaction with aqua ammonia or ammonium nitrate solutions. Green acid, however, has not been used for such reactions where free ammonia is present, as in aqua ammonia or ammonium nitrate with ammonia (40% product), because colloidal precipitates form from residual metal ions in green acid. But green acid cannot be ruled out, as research being devoted to it may result in an economical method for its use with ammonia solutions. And one western white acid producer expects to see a resurgence of demand for white acid for direct injection.

370,000 Tons Per Year Prospect For Elemental-Based Fertilizers in NW

Perhaps only a glimpse of the potential facing the West's elemental phosphorus producers is given by the U. S. Army Engineers. In analyzing Columbia River Basin prospects, they estimate consumption of phosphate fertilizers from elemental phosphorus alone in the Pacific Northwest (Washington, Idaho, Oregon, and parts of Utah and Wyoming) by 1960 to be between 221,000 and 370,000 tons. Consumption of phosphates from phosphate rock by the wet process they estimate to be 170,000 tons by 1960. There seems little doubt but that California, already the prime

fertilizer consumer in the West, will consume even more than this.

It is interesting to note that the estimate for elemental and the Pacific Northwest is predicted on 2.5-mill (0.25 cent) power being available. Industry, however, is already supplying elemental phosphorus for fertilizers to California on 4- to 5-mill power at prices nearly competitive pound for pound with other phosphates.

Elemental producers in the West are Westvaco at Pocatello, Ida. (four furnaces), Victor at Silver Bow, Mont. (two furnaces), and Monsanto at Soda Springs, Idaho (two furnaces). With completion by Monsanto of its second furnace in October, combined total capacity of these three is estimated now at 120,000 tons per year, with Westvaco accounting for slightly over half.

Westvaco ships its elemental to Newark, Calif., where it burns to the acid (Westvaco has two other burners, one in Kansas and one in New Jersey). Victor's product goes to its A. R. Maas Chemical Division at South Gate, Calif., where its acid is made. Latest western addition to acid manufacture is Monsanto, which, backed by a long-term contract with Brea, is constructing a burner at Long Beach, Calif., for acid production.

Each company likewise produces a line of phosphates such as are used to build detergents. The entire elemental production in the West is a very recent development, and the area undoubtedly can look forward to further expansions in elemental production in the phosphate mineral areas of Idaho and Montana.

While liquid fertilizers are growing by leaps and bounds, expansion would probably be even more rapid if there were not a slight price differential in

Liquid Fertilizer Sales in California, 1940 to 1953

Year	Liquid Phosphoric Acid	Mixed Fertilizers	Nitrogen Liquid	Solutions
1940	235	
1941	408	
1942	1,237	
1943	1,101	967	...	
1944	1,532	2,170	422	
1945	2,552	4,310	1,722	
1946	3,574	5,189	3,978	
1947	5,170	7,744	8,883	
1948	3,233	10,732	11,997	
1949	4,962	6,930	13,461	
1950	5,785	8,699	21,906	
1951	9,674	13,468	31,926	
1952	13,718	17,770	34,023	
1953	8,575	22,234	48,544	

SOURCE: California Department of Agriculture, Bureau of Chemistry Special Publication No. 251, "Fertilizing Materials, 1953."

favor of solid forms. Phosphoric acid (54%), for instance, is currently quoted in California at \$120 per ton at the farmer level, equivalent to \$2.12 per P_2O_5 unit. Single super (19%) in small lots runs \$42 per ton, or \$2.15 per unit. In large lots, single super is \$37 per ton (\$1.96 per unit) in bags, \$33 per ton (\$1.75 per unit) in bulk. Biggest markets in California for phosphorus are grains, alfalfa, and vegetables where purchases are mostly in bulk or large bag lots. (Cotton is potentially the largest single user, but to date little phosphate from any source is used on it in California.) Acid must, therefore, compete with a 15-to-40-cent-per-unit differential as a phosphate source.

Price comparisons between solids and other liquid forms, such as liquid ammonium phosphate, are more complicated because of two or more major

A variety of rigs have been developed for economical placement of liquid fertilizers. This monstrous 50-foot injection rig is used in California's Imperial Valley where farming is on a vast scale



nutrients being involved. However, firms like Agriform and Brea feel that any price disadvantage of liquids vs. solids on a straight pound-for-pound purchases basis is more than offset by savings in handling and application and by more efficient utilization of the phosphate by the crop.

Considering Investment Costs

Likewise to be considered are investment costs. Gil Miller, who heads Westvaco's agricultural chemicals development program and who is one of the prime exponents for white acid in the West, says capital requirements for liquid mixing plants for producing N-P solutions are in general "very much less" than an equivalent plant for producing dry mixed fertilizers, with its requirements for bins, bagging equipment, pelletizing equipment, and warehousing facilities.

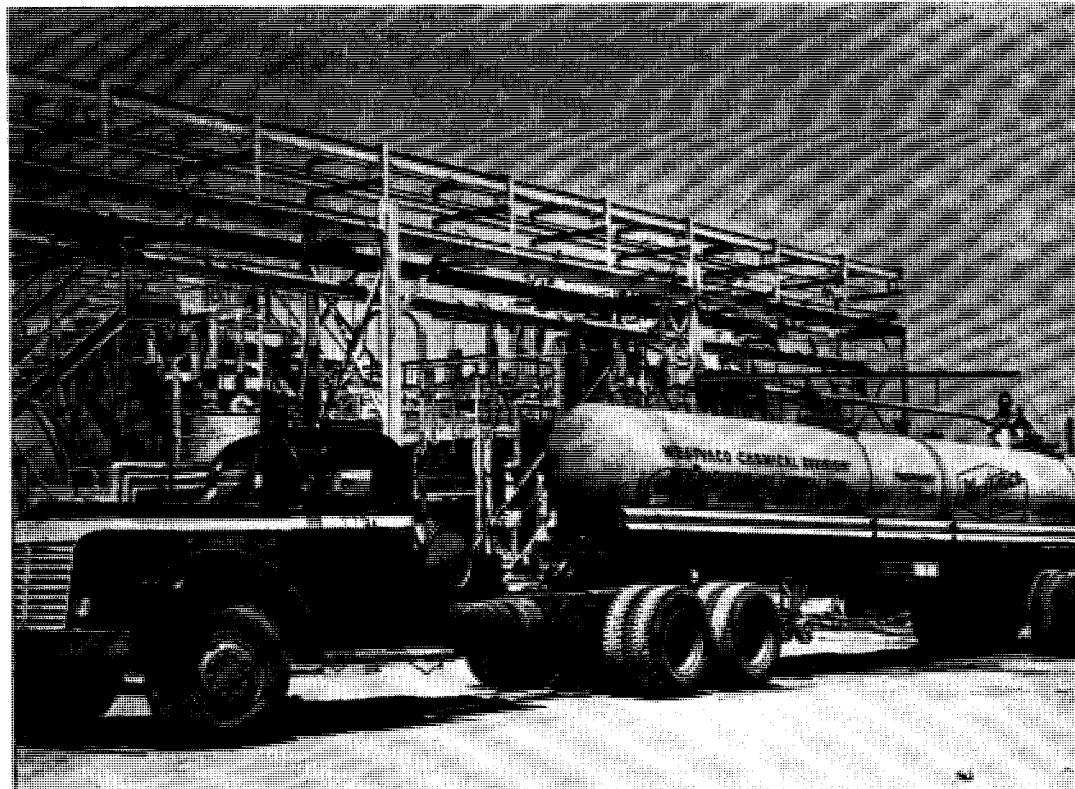
On smaller unit sales, liquid phosphates are pushing single super hard. In California's Salinas Valley, for instance, a major vegetable producing area of the nation, liquid phosphates are proving keen competition for single super as a phosphate source. This is due to closer competitive prices plus, in the words of liquid dealers, "better control of fertilizer placement for the highly specialized farming of the area."

Meanwhile, speculation is mounting in western fertilizer circles as to "what Shell Chemical will do." Shell, pioneer in anhydrous ammonia, will no doubt find its dealers facing stiffer competition from Brea dealers and from independents who are prepared to offer anhydrous and aqua ammonia, as well as the various ammonium nitrate and ammonium phosphate solutions. Shell, however, still remains the largest single ammonia producer on the West Coast, is backed by nearly two decades of experience in ammonia application.

A likely prospect for the immediate future is that Shell dealers will begin offering simultaneous injection (i.e., same tractor, different injection shanks) of anhydrous and phosphoric acid to meet competition from the various ammonium phosphate solutions being offered by others. Should this occur, the present drop in direct application of acid in the West would be reversed.

On the other hand, it must be remembered that Shell also has a strong position in solids via its ammonium sulfate. Its position could lead them to offer single super or triple super or one or more of the solid ammonium phosphates, and this could have an opposite effect on direct acid application.

Whatever the outcome, all agree that both phosphoric acid and ammonia (aqua and anhydrous) are highly necessary for fertilization in the western states. Whether these two basic ele-



White phosphoric acid being loaded at Westvaco's Newark, Calif., plant. With such trucks, Westvaco gives virtually overnight service to mixers and dealers throughout California. Direct injection of acid has dropped in California the last year or two, with most of the white acid now going in increasing quantities into neutral ammonium phosphate solutions

ments are applied as noncorrosive liquors or individually will probably be a matter of economics, but the elemental phosphorus industry should have little fear about outlets for its production.

Midwest Agriculture Eyed as Supply Draws Abreast of Demand

Middlewestern customers for electric furnace phosphoric acid have been standing in line for nearly 10 years now. Victor Chemical, a major producer, says the industry has been scrambling since World War II to keep up with demand from the food and detergent industries. The last year or so, however, has seen both a relatively small surplus of electric furnace acid in the Middle West and active producer interest in developing agricultural markets. Comparatively small amounts of acid are going into balanced liquid fertilizers at scattered points in the area, but the situation right now must be considered embryonic.

Monsanto, with burners at St. Louis and Trenton, Mich., first offered acid to middle western agriculture two years ago, and today is perhaps the most aggressive acid producer in this field. The company's balanced liquid fertilizer pilot plant at Dayton, Ohio, is used actively in formulator education. Victor

offers acid from Chicago, Nashville, and Morrisville, Pa., but feels the development is still too new to warrant a big push. Westvaco at Lawrence, Kan., and Virginia-Carolina with a new Fernald, Ohio, plant appear to be in the same position. Shea Chemical, producing at Columbia, Tenn., and within the last three months at Jeffersonville, Ind., is another contributor. Blockson Chemical near Chicago may offer some hitherto captive wet process acid soon.

The agricultural product is a crude, 70 to 75% electric furnace acid (about 55% P_2O_5) priced at about \$80 a ton, f.o.b. works. Shipped as "phosphatic fertilizer solution," it rates a lower freight charge than food grade acid, and reaches midwestern fertilizer plants with a P_2O_5 unit cost of about \$1.60. Triple superphosphate carries a P_2O_5 unit tag of about \$1.30. Cost varies with location, of course, but the differential between acid and triple super exists generally throughout the area.

On a cost basis, then, phosphorus alone in liquid form is not in a strong position relative to phosphorus in solid forms. Furthermore, and in contrast to the Far West, acid soils prevail in large areas of the Middle West. Application of phosphorus alone calls for a step-up in potash. The upshot is a fairly strong case against



Solutions—ammonium phosphate, phosphoric acid, aqua ammonia—are as easily adaptable to metering to irrigation water as to direct injection. Application via irrigation water is the major outlet for green phosphoric acid in the West

direct application of phosphoric acid. It was tried briefly by one firm in 1952, and Farm Service Cooperative of Harlan, Iowa, is experimenting now in an area where potash is not a pressing need, but the method does not show promise for most parts of the Middle West.

Balanced Liquid Fertilizers Getting Most Attention

Complete liquid fertilizers—ammoniated phosphoric acid with potash added—are the alternative to direct application of acid, and nearly all midwestern activity is in this field. Apart from the corrosion problem and the need for a complete blend, ability to formulate rather easily with a relatively cheap nitrogen source erases much of the cost disadvantage inherent in using phosphoric acid alone. Shrock Bros. Co. of Congerville, Ill., which has been making balanced liquids at Bern, Kans. since August of this year, says its liquid products can compete price-wise with solids at up to 150 to 200 miles from the plant if a small profit margin is acceptable. (Aylward Feed Co., operating within a 100 mile radius of Sullivan, Ill., has offered balanced liquids in similar circumstances since March 1954 and is building its second manufacturing unit about 100 miles from the first.)

Service and Handling Angles

Liquid fertilizer makers are hitting service and materials handling angles hard. Liquilizer Corp., producing at Vincennes, Ind., since spring of 1953, is selling in ton lots to local farmers at prices competitive with solid products.

And for spring of 1955 the company plans to deliver to farms with storage capacity of 6000 gal. or more at no extra charge. (Liquilizer sold originally for custom application, but farmers were shifting to their own or rented equipment before the 1953 fall season was over, and custom application this year has accounted for less than 5% of total volume.)

Spray booms for broadcast application to the soil, and drums and hoses for side dressing are used by Liquilizer customers, and complete equipment, including tractor rigs, 50-gallon application tanks, and 500-gallon field tanks, is said to be obtainable for about \$1000. The liquid can be spread at a rate of about 20 acres an hour (40 foot swath) including hauling and turning time, compared to about four acres an hour for solid fertilizers.

Probably the chief technical problem in ammoniated phosphoric acid solutions is "salting out." This becomes more troublesome when a third ingredient, potash, is added, and when temperature goes down, an upper limit is put on the analysis that can be made. Manufacturers now offer 8-8-0, 4-10-10, 6-18-6, and a number of others in this range. But in the 1-1-1 ratio which might be desirable for corn or some types of pastures, 10-10-10 seems about the best that can be done.

Shifting Fertilizer Trends Must Be Considered

Migration of fertilizer customs from one area to another, as with anhydrous ammonia, should perhaps be considered. Direct application of phosphoric acid

has moved from its California birthplace as far east as Colorado. American Fertilizer & Chemical of Denver has been applying green acid and anhydrous ammonia simultaneously (same injection shank-separate outlets) on most types of Colorado crops for about five years, and reports a gradual increase in business, limited somewhat by the supply of acid available. Service and materials handling advantages allow American to compete at a P_2O_5 cost of 12 cents a pound compared to 9 cents a pound in solid phosphorus carriers.

Attention in Louisiana and Texas

Direct application of acid is getting attention in Texas and the Louisiana rice belt, but is still in the evaluation stage. Texas universities are looking into simultaneous application with anhydrous ammonia, and aerial spraying and use in irrigation water have been considered.

Equipment for simultaneously applying anhydrous ammonia, phosphoric acid, and muriate of potash was introduced recently by Plantation Fertilizers Corp. of Houma, La. Accurate control of each ingredient is claimed, and the "salting out" problem met with solutions is not a factor. Also, the ammonia loss encountered when injecting in hard soils is handled by blanketing with the potash solution or a stream of water.

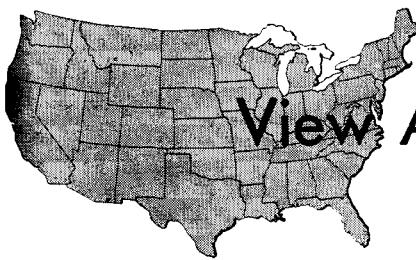
Cautious View

Despite these border area developments, and scattered, though apparently flourishing local activity, phosphoric acid in the Middle West must be viewed cautiously. Farmers in this area generally are neither equipped for nor accustomed to liquid fertilizers, and since little agronomical work has been done on them, there is no solid evidence showing an advantage for liquids over solids in the Midwest.

There is always the possibility, however, that the strong growth of anhydrous ammonia, the use of nitrogen solutions, particularly common in Iowa, and the established use of balanced starter solutions on such crops as tomatoes could combine to make liquids in general more appealing.

Kansas Indicator

The situation at Lawrence, Kan., site of Consumers Cooperative Association's new ammonia plant and Westvaco's acid facilities, might or might not be an indicator. Thought of making solutions would naturally occur here, but according to company spokesmen, official discussion has not been considered. Many disinterested agricultural workers say that balanced liquids are not a factor in the Midwest. Most, however, say nothing definite about the future.



View Across the Nation

A direct-contact gathering of significant information by
AG AND FOOD's editors

Possible Surplus of Nitrogen, Lower Sales of Dry Phosphates Sums up Western Picture

INCREASING COMPETITION, continued expansion in nitrogen use, possible nitrogen surplus, and a drop in dry phosphate sales about sums up western fertilizer activity and prospects at this time.

In California, which takes the bulk of fertilizer sold in the 11 western states, 1953 sales showed only a 7.6% gain over 1952. While nitrogen use continues to grow as in the past, dry phosphates, excepting dry mixed fertilizers and 11-48-0, were either the same as, or down from, 1952. This trend is continuing into 1954, with only ammoniated superphosphate showing a resurgence. Even dry mixes are down for the first half of this year compared to 1953.

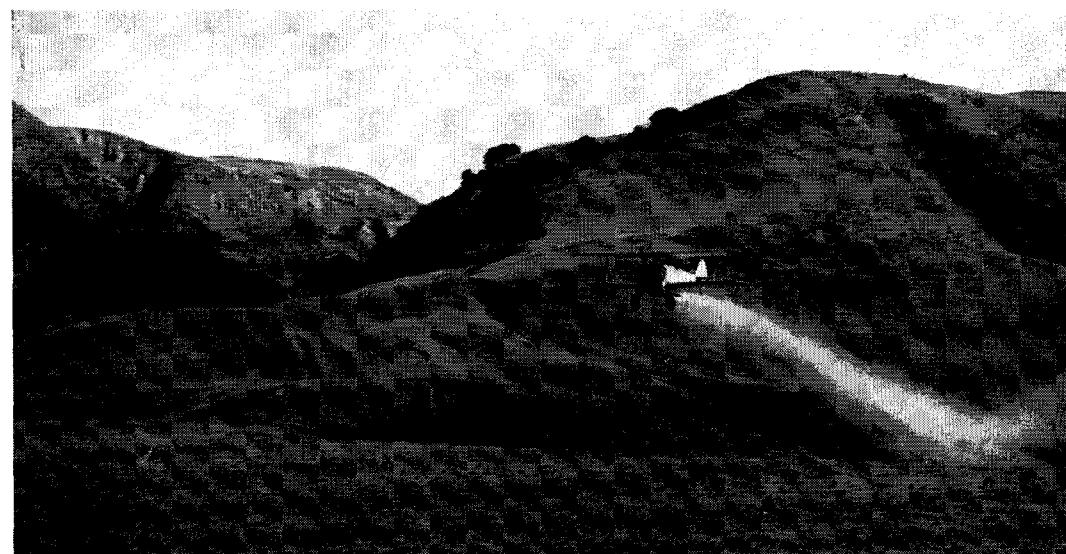
In Colorado, the picture is slightly different—use of all fertilizers is down materially in 1954. Lack of rainfall, coupled with irrigation water shortage, appears to explain the drop in that area. When rainfall increases, fertilizer use is expected to continue an earlier upward trend. Greater use of dry phosphates is predicted by Colorado fertilizer men; they also see phosphates and most other types to be in adequate supply for their state's needs.

Dry phosphates are down slightly in Oregon, and the trend continues into 1954. Price reduction on forage cropseeds and dairy products is said to be partially responsible. A slight increase in fertilizer sales is expected next year.

Looking back to California, where straight phosphatic fertilizers in all categories were down during 1953, phosphates are down more than in the Northwest. Explanation appears to be a general tightening in the farm market. Use on pastures is also down. Another explanation is the fact that higher analysis materials are gaining in consumer popularity. A particularly bright spot has been 11-48-0, one broker noting he sold every pound he could get and could have done even better had supplies been better.

In contrast to this short-term view (phosphorus down but nitrogen and potash continuing to grow), phosphorus is expected in coming years to enjoy the greatest proportionate growth of the three major nutrients. Because of constant nitrogen promotion by county commis-

sioners and experiment station workers and because of greater availability of nitrogen compared to phosphorus, the West has traditionally been a high nitrogen, low phosphorus area. Nitrogen therefore, is now used virtually to its economic limit, where it is used at all, in the opinion of some. University and



state agronomists are beginning to swing over to what has been the position of the western fertilizer industry for some time and plug phosphorus which is beginning to show up as the limiting factor. Thus, P_2O_5 long term outlook is bright. Nitrogen growth in coming years in the West will be more a result of its use on new land brought under cultivation and of its use in new fertilization programs where none now exist—ranges and dry pastures, for instance.

Outlook for solid phosphates for next six months? Better, most people think, and many companies are putting in extra sales efforts. Californians are giving lot of attention to pasture and range fertilization. While the trend toward higher analysis is expected to continue, the volume of fertilizer used in all categories will increase, according to California Fertilizer Association. Others think dry phosphates will definitely decline further during the next six months, pointing to the growth of ammonium phosphate solutions as the reason.

The nitrogen fertilizer picture is quickly summed up by a look at changes for various types in California for first half of 1954 as compared to same period last year:

Aqua ammonia	+ 230.0%
Nitrate solutions	+ 51.0
Ammonium sulfate	+ 15.6
Miscellaneous	+ 4.9
Calcium nitrate	+ 4.3
Ammonium nitrate	- 5.2
Urea	- 6.3

Airplane application of Shell ammonium sulfate to western range land

Continuing higher use of nitrogen fertilizers and a pickup in relative use of urea and ammonium nitrate is expected in California. Tremendous increase in aqua ammonia is result of Brea Chemicals' new plant going on stream. Demand was greater than supply up to June. Since midyear, a continuing surplus has existed as result of inflow of a slug of aqua from the deep South. This supplementary supply has been easier to get because of freight equalization for ammonia. Question is: Will freight equalization be in effect after first of year?

While there has been a discount trend for ammonia in large farm areas—100-ton-order discounts in grain areas, for instance—such is not expected after the first of the year as a result of an expected end to freight equalization. One large producer of ammonia points out that seasonal prices occur only at dealer

levels in the West. In the Pacific Northwest, seasonal price schedules have little effect in stimulating movement of nitrogen. In that area, too, greater appreciation for sulfur in ammonium sulfate seems to have developed.

For nitrogen fertilizers, a good year appears in the offing. However, one large producer says opening months of the fertilizer year will be slower than last.

Generally, there should be no significant shortages of nitrogen on the coast during the coming year, with large quantities of aqua and anhydrous available. As one distributor says: "There may be surpluses in some areas—depending on distributing facilities. On paper, there appears to be plenty." Sulfate may be spasmodically short and some forms of ammonium phosphate may be short in some areas, but there should be an ample supply of single super.

The old problem of seasonal purchasing will again show its effect. Any shortages of ammonium fertilizers will develop after the first of the year—now there is surplus. The Pacific Northwest expects a shortage of ammonium sulfate in March and April when producers have trouble shipping materials fast enough to meet peak demands.

Nitrogen Surplus?

Big question in the West today continues to be: Will there be more ammonia plants, and, if so, will a surplus develop as a result? Many western fertilizer men believe that nitrogen will be in slight oversupply in coming months, now that Brea Chemicals is running at a rate of about 81,000 tons of ammonia per year and Shell Chemical's Ventura plant exceeding its design capacity of 55,000 tons. In addition, Cominco has expanded ammonia production at Calgary and two months ago sent anhydrous into the Pacific Northwest for the first time. Although it appears likely that there will be a nitrogen surplus in the West in contrast to recent years of tight supply, most expect the surplus to be temporary. Some—though by no means all—believe there is room for another ammonia plant in the West. Still in various stages of planning are Salt Lake City Chemical and Utah Chemical in the Salt Lake City region, Columbia River Chemicals and Cominco in the U. S. Pacific Northwest. U. S. Steel has been rumbling about producing "coke oven ammonia" at Geneva, Utah, and two plants have been discussed off and on in California for some years. Several others have been considered for southern Alberta.

In Washington, use of nitrogen has increased tremendously during last year, and university spokesmen are enthusiastic over growing demand for nitrogen in the state's agricultural program. A large part of the acreage in wheat producing area of eastern Washington will



Nitrogen in solution form—Brea Aqua Ammonia—is pumped into tankships at the Wilmington, Calif., terminal of Brea Chemicals, for overwater transport to Pacific Coast ports and Hawaii. Since first shipment of Brea Aqua Ammonia by tanker to Hawaii in November 1953, 10 large sugar cane plantations representing 75,000 acres have been making regular use of Brea aqua

have a dominant effect on the total amount of nitrogen used within the state. An effective demonstration program along with soil testing is being conducted throughout the area. Nitrogen fertilizers are expected to expand tremendously in the next few years as a result.

In terms of market, a plant in the Pacific Northwest would seem to have the edge, since one in the Salt Lake City area would have to look to the expanding agriculture of the Columbia River Basin to absorb a goodly share of its production. After causing a flurry of excitement in Pasco and environs earlier this year, Columbia River Chemicals has been somewhat quiet. AG AND FOOD now understands that Cominco, which earlier this year was reported to be considering four different sites in Washington and Oregon, has narrowed its sights on Columbia City near St. Helens, Ore., on the Columbia River. Should either of these or one of the two in Utah actually get to the pipe-fitting stage, that will probably be the limit of ammonia expansion in the 11 western states for the next five years.

There are those who think existing plants in the West plus what is being brought from other areas will take care of the full market. Among the "one-more-plant" people, however, is a group which sees a lag now as result of Brea's retail organization not being fully set-up, and because of terrific interest in aqua, believes another plant will probably be required. They also point out that a survey made some time ago indicated that with

Brea on stream and one additional plant, only two thirds of the West Coast requirements would be met. After one more, however, additional requirements would be met by increased output of existing plants rather than additional new plants. So it appears a rather sure bet that some of the proposed plants will never reach materialization.

Shell says nothing of plans to build additional plants, instead is concentrating on increased storage and distribution facilities (storage spheres in several areas and barge movements of anhydrous ammonia to Portland and Pasco). However, earlier and more recent speculation is that when another plant is justified, Shell would be a logical builder, with its ready supply of hydrogen at the big new refinery approaching completion in Anacortes, Wash.

Topic of next importance in the West is current battle between aqua and anhydrous. General feeling is definitely that both will continue to be used but that competition, which has already resulted in a downward adjustment in price, will be keen. As agronomists point out to us, there seems to be little reason for showing preference of one over the other from a soil chemistry standpoint, and flexibility and versatility of both ensure them a good position in the fertilizer business for some time to come.

One of our contacts well acquainted with the situation says that aqua is definitely going to cut further into anhydrous—perhaps even surpass it. His

reason is what he terms a simple economic advantage in aqua. Although anhydrous has some advantage in application, he thinks that in a few years consumption will be 20% anhydrous, 80% aqua.

Next to hassle between aqua and anhydrous is: What looms for "neutral" ammonium phosphate solutions in West? (For a more detailed history of liquid fertilizers in the West, see page 1157.) Brea has completed one of three plants to produce these materials (it is making an 8-24-0), and some interested in the fertilizer industry think the whole matter of introducing nutrients to California soils in a one to three ratio is "untraditional, uneconomical, and unsound." What about the requirements for nitrogen, needed in most of our western soils, they ask.

However, from viewpoint of others, Brea is off on a sound project. We talked with some who say that these solutions will see the biggest growth in fertilizer materials. Several reasons are given: response realized, economics of use, and noncorrosiveness. They lend themselves to use by people already in the ammonia business. Phosphoric acid, as a P_2O_5 source, requires expensive dual equipment.

And in answer to the one to three ratio of N to P_2O_5 they point out that some crops do not need high nitrogen—hay, for example. Legumes in general and sugar beets (in the California delta region only) require P and not N.

After justifying the 8-24's, they go further, point out many other ratios are possible in ammonium phosphate solutions before problems are experienced with crystallization—for example, 17-7-0 can be made satisfactorily. Actually, almost any practical ratio can be made with proper knowhow, they say, although concentration may have to be reduced over that in corresponding dry material.

Another important factor is that solution is neutral, making nutrients more available to highly calcareous soils, such as in the Imperial Valley of California, according to solution people.

It is speculated that within 10 years, 75% of fertilizer will be in solutions. Reasons: 20% more material out—\$10 per ton less (no cost of bag, expensive handling, and the like).

Liquids Enlarging Total Market

Much of the liquid material being sold today is thought by some to be going primarily to farmers who have never been big fertilizer users in the past (in other words, there is no appreciable shift from solids to liquids as such), although this opinion is not unanimous. Those holding such a view, feel that this is good for the fertilizer industry in toto, for it contributes to expanding fertilizer use.

A word of caution comes from one large broker, however, who notes that in

turning to "wet" nitrogen sources farmers may overlook a good fertilizing material in ammonium sulfate. While no drop in sulfate is showing up yet (first half of 1954 in California is up 15.6% over first half of 1953) there could be one. This he sees as potentially unfortunate, since many California soils require sulfur, and ammonium sulfate could in reality be worth more to the farmer than its straight nitrogen content alone.

When we last surveyed the fertilizer industry, there was great fear that cotton restrictions would markedly decrease fertilizer requirements in California. Has this proved to be true? Most generally expressed opinion is that restrictions have not been factors in drop in fertilizer usage. Controlled crops are being fed more fertilizer in order to reduce unit costs of production and net more profit to grower. High applications are being used on new cash crops, such as corn—little grown in California in the past. This year, corn yields will be 52 bushels per acre in Kern County. However, farm advisors in area say that as result of fertilizer test work being conducted, corn production of 140 bushels to the acre is possible.

In the Pacific Northwest, too, indications are that acreage restrictions in effect at present will not interfere with fertilizer usage. Reduced wheat acreage in Colorado is not expected to affect use of fertilizer.

Generally, westerners feel fertilizer dealers are the weakest link in the marketing chain from basic manufacturer to grower. University and state agronomists have historically preached nitrogen, P_2O_5 , and potash, pointed out to the farmer that what he wants is N, P, and K and that the particular form they might be in is relatively unimportant. Thus, dealers in general in the fertilizer industry can perform no real recommending function, much to the distress, no doubt, of aggressive fertilizer sales managers.

Many dealers have brought about critical price cutting programs, and margins to dealers in many areas have become too low. A number have dropped out of the fertilizer business, a move thought by some to be to the detriment of the fertilizer trade. In California, however, only about half of fertilizer sold goes through a dealer as he used to be known, and predictions are that this may be further reduced by half. The "order takers" who do not render a real service to purchasers are dropping out, and, as one distributor says, "The business has become too complicated for a sideline." Others counter that the dealer need perform no recommending function, serves his purpose by being a point of supply for the farmer.

In the Pacific Northwest, there is marked interest among fertilizer dealers and the industry to carry on an intensive education program to strengthen dealers

in their ability to serve the farmer's need for fertilizer. This is thought to be a healthy sign both for the success of the dealer business and the expansion of fertilizer use throughout the region.

The fertilizer industry, at the mixer level, can be seen, at long range, to be going through another change in its structure. It first consisted of large, centrally located companies. It later evolved into numerous small companies, each serving a rather limited area. Now the fertilizer industry is learning to make better products and its operations are becoming more complex, requiring relatively high investments. Smaller mixers are finding it harder to make change alone and are tending to combine or be absorbed by larger ones.

Granulated and pelleted fertilizers, one of these improved products, are much less developed in the West than the East. This would imply, therefore, that as the western fertilizer industry turns more and more to these complex operations, in keeping with a similar and earlier shift in the East, there will be more of these mergers between mixers.

Need for Better Financing

There is a definite need for better fertilizer financing programs. California Fertilizer Association is working with University of California and NFA on a hard hitting bankers educational campaign which will be placed in effect during the coming year.

A considerable part of the program of the Pacific Northwest Plant Food Association meeting in Sun Valley, Idaho, early last month was devoted to seasonal fluctuations in sales, the resulting headaches of the fertilizer industry, and the role of credit. It was pointed out that one of the hitches in early fertilizer application lies in the matter of credit. Obviously, a farmer isn't interested in tying up thousands of dollars for six months earlier than necessary in order to accommodate the industry—unless there is some advantage to himself. Interest on \$2000 for that period of time would cost him \$60. The need exists for price concessions for odd-time applications.

Storage space for aqua and anhydrous ammonia and for liquid fertilizers is constantly expanding and seems to be keeping pace with production and use. One major producer notes that as far as ammonia is concerned, the problem of distribution has been reduced to minor importance.

But dry fertilizers are not so well off. While programs to increase off-season farmer purchases have been unsuccessful so far (but are continuing), leases for storage in strategic locations throughout the consuming areas, particularly California, are on the upswing. There is no doubt, says a major western broker, but that primary producers will have to provide more storage if farmers continue

to concentrate their buying in the spring, as it is just physically impossible to move required tonnages during that four-to-five-month period.

One step that will be necessary will be for railroads to grant primary producers in-transit rates for material shipped in the off-season to strategic storage locations. (In-transit rates permit material to be shipped from point of production, unloaded, warehoused temporarily, and then reshipped to final consumer for a small additional cost.)

Many a fertilizer man in the West recalls "the good old days" of a decade ago when wartime restrictions severely limited the number of fertilizer grades. All would like to return to such a situation, but few see much likelihood of that occurring. Indeed, some see more grades coming, rather than fewer, because of an impending period of close competition. Smaller mixers especially are likely to add grades to meet competition and tailor production to farmer desires and prejudices. As these smaller fellows drop out with the trend to bigger mixers, noted in the foregoing, the number of different grades can be expected to decrease.

California is the prime "offender," if it can be called that, leading the parade with some 300 different grades (next closest state has about 100). Four or five grades account for about 60% of yearly sales, however and there are no concerted efforts to reduce the total number. In Oregon, a small reduction in the number of grades might be reasonable and practical, says a western university man. He notes, however, the bulk of fertilizer sold in Oregon is made up of a relatively few grades, and he does not feel that grade reduction is as important in Oregon as it has been in many of the older fertilizer using areas.

The California Department of Agriculture points out that there is a rather widespread effort to promote use of fertilizers containing minor elements. Some are intended to compete with "ground rock" containing small amounts of manganese, iron, zinc, and copper. There seems to be little evidence that general use of fertilizers containing these minor elements will be beneficial and efforts are being made to prevent misrepresentation in connection with the sale of these materials.

On custom application of fertilizing materials, opinions varied. Some think that custom application is only answer for solids meeting competition of liquids. As of now, the practice is not widespread being confined primarily to the Salinas Valley in California, where competition has developed to the extent that it is hard to dispose of fertilizing materials for the farmer's own application. While the trend is developing in other areas—it is at an extremely slow rate, suggesting that it may never be a general practice.

Autumn Drought Slows Fertilizer Sales in Midwest; Dealers Optimistic That Slow Start Will Improve

IN THE MIDWEST, fertilizer consumption has generally continued to be good in spite of a major drought in some areas. In Iowa, where fertilizer consumption is going up at a rapid rate, tonnage during the first six months of 1954 increased 11.5% over the corresponding period in 1953 to 485,000 tons. Wisconsin reports a 4% total tonnage increase, with concentration increasing by the greatest margin in recent years; the average Wisconsin fertilizer now contains 34.7 units of plant food per ton. Usage was up also in Indiana, Missouri, Kansas, Nebraska, and Minnesota. Illinois and Ohio, two of the largest fertilizer consuming states, however, had lower sales. Mixed fertilizers were down about 3% in Illinois for the year ending June 30. In Michigan too, tonnage was down slightly.

Large dealers in the Midwest appear somewhat more optimistic than experiment station staffers regarding prospects for the next six months. Neither group expects a drop in consumption, but the dealers seem to see some increase in sales while the experiment station people think sales probably will level off. Most important factor affecting sales appears to be rainfall. A dry autumn will slow up movement considerably. In Indiana, which along with Ohio and Illinois is one of the largest markets for fertilizers in the Midwest, sales are expected to drop somewhat because of low rainfall. Three dry years with poor crops and undiminished operating costs have made money scarce for farmers. In Missouri some areas are as much as 50 inches short of moisture in the last 36 months. In Wisconsin, where rainfall has been approximately normal, total consumption will probably stay about the same, plant food content continuing to rise.

Nitrogen is affected more than other materials with respect to rainfall, because nitrogen response is more dependent upon moisture. Government acreage controls will affect fertilizer sales relatively less than moisture. To some extent a cutback in acreage increases fertilizer sales as farmers try to improve efficiency, but there is a point beyond which this ceases to be true.

Fertilizer supplies for the coming year appear ample, although as always temporary shortages are expected during the height of the seasons because of last-minute buying habits. Solid ammonium nitrate and nitrogen solutions will be subject to such local shortages during the spring planting season. A dealer from Ohio puts urea for direct application on the shortage list as well. In some instances, farmers may not be able to get

the particular grades they want; 10-10-10, for example, is difficult to make and store.

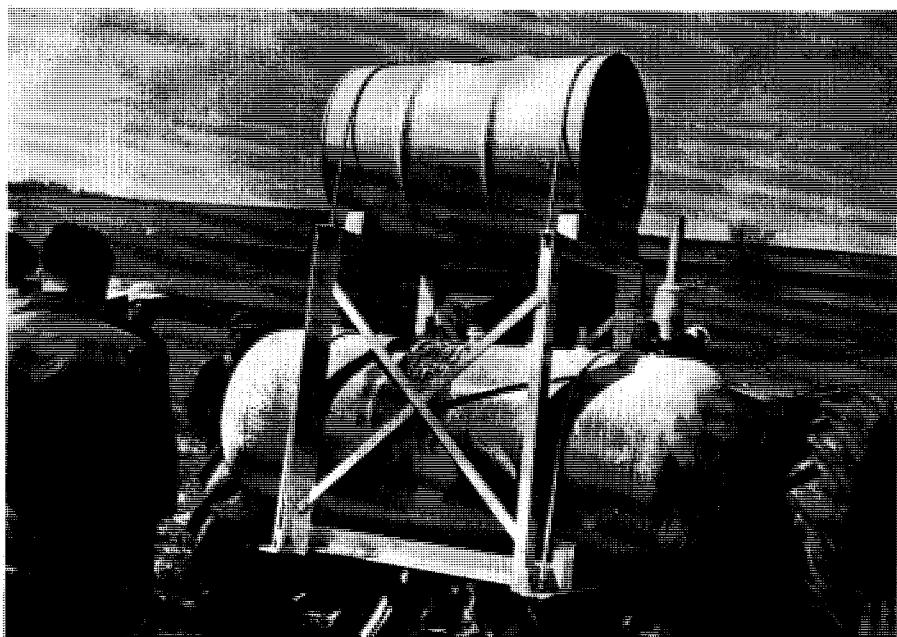
Some of the big synthetic ammonia manufacturers and others foresee some excess of anhydrous ammonia this year. The trend to high analysis mixed fertilizers will cause some low analysis grades to go begging. In fact, "price wars" already prevail with a number of mixed grades in some localities. Rock phosphate and ammonium sulfate may also be in some excess. There has been a drop in buying of rock phosphate in Missouri where it is used on pasture.

There is an almost uniform belief in this area that nitrogen capacities are being overexpanded—at least temporarily. How long "temporarily" will be is anybody's guess. One major nitrogen producer predicts a surplus for several years. The unrealized potential for nitrogen usage is still great, but production facilities are going up faster than increased application is being adopted. According to George Scarseth, American Farm Research Association, capacity is "not overexpanded if we use the nitrogen which is consistent with lowering costs of production and building soil. We have overexpanded if we are to use nitrogen only as a stimulant to mining the soil further for all plant food elements.

The greatly increased number of mid-western nitrogen plants will help distribution somewhat; a new nitrogen plant in an area means lower freight costs and quicker delivery to farmers, although delivery at peak season is likely to continue to be a problem. Of course, some states, such as Kansas with its two nitrogen plants, two in adjoining states, plus several others in nearby states, have not had much of a problem in this regard. Considering that in many respects the possibilities of nitrogen have only been slightly exploited, increased competition may be good for all.

Use of anhydrous ammonia is certainly not slackening. Almost everyone predicts great over-all use next year, although there are some signs for a leveling off in Ohio, as well as in Iowa and Nebraska. Usage in Wisconsin last spring was double that of 1953 and a further increase is expected. Lower prices and a great deal of promotion will combine to increase its use in Missouri. In Indiana it is thought that while early application before or shortly after planting will increase, side dressing of cultivated crops with anhydrous will be decreased.

Use of nitrogen solutions is expected



The characteristic high pressure tank, lower, for anhydrous ammonia application has been joined by a conventional lined drum which makes it possible to apply phosphatic fertilizer solution at the same time. This rig is one of several being tried by a Farm Service Cooperative in Iowa corn country

roughly to parallel that of anhydrous in the coming year, and in some areas—Iowa and Nebraska, for example—it is expected to rise as anhydrous levels off.

Fall purchase of nitrogenous fertilizers is increasing in most of the midwestern states. While the increase is generally slow it is definite. It is generally accepted as sound farming practice to use nitrogen in the fall, especially in non-leachable forms such as ammonia or the ammonia forming types. In Kansas fall fertilization has always been high because Kansas is a winter wheat state. Increase in fall movement is not universal however; in Wisconsin there was a decrease this year.

A great deal more promotional work will have to be done to increase fall tonages. A number of producers are setting up seasonal price schedules in order to encourage fall purchase of nitrogen. A typical schedule might offer discounts of 4% in November, 3% in December, 2% in January, and 1% in February. By March regular prices prevail for the spring season. Many producers, on the other hand, are making no great effort to publicize their seasonal price schedules. At least one company offers its dealers special credit terms for fall distribution. Often the farmer may have a valid reason for not wishing to apply his fertilizer in the fall. When he does so, the money he has invested in fertilizer is tied up all winter; in many cases this means borrowed money, and unless the saving inherent in fall application is great enough to pay his interest costs, there is no economy to be realized.

As for prices, schedules at the dealer

level will probably drop slightly for 1955. There has been some official downward trend this fall, and apparently a great deal of "unofficial" price cutting. Although most basic producers deny it, it seems inevitable that there will be some small price cuts in basic materials, especially with certain forms of nitrogen and superphosphate. The trend toward triple or concentrated superphosphate and away from normal superphosphate is continuing as it has for the last several years. Superphosphate is still used in considerable amounts, however, for both direct application and mixing.

Fertilization of pastures offers a high potential for fertilizer application, but farmers' acceptance of this idea has been slow in the Midwest as elsewhere. The lack of interest in pasture fertilization is illustrated by the very poor response to a recent Wisconsin contest, in which a prize was to be given for the highest alfalfa production per acre. There were only about 15 entries; by contrast, several hundred entered a contest for improving corn yields. While response in corn production per acre may mean an immediate return, the added variable of live stock management is placed between fertilization and the dollar return in pasture treatment. Furthermore, most farmers have traditionally considered pasture as a salvage for waste land rather than as a crop.

Research on pasture fertilization has been inadequate. Farmers simply are not convinced of the value of this practice. The outlook for beef and dairy enterprises affects the farmer's outlook, too. Dry weather, coupled with low

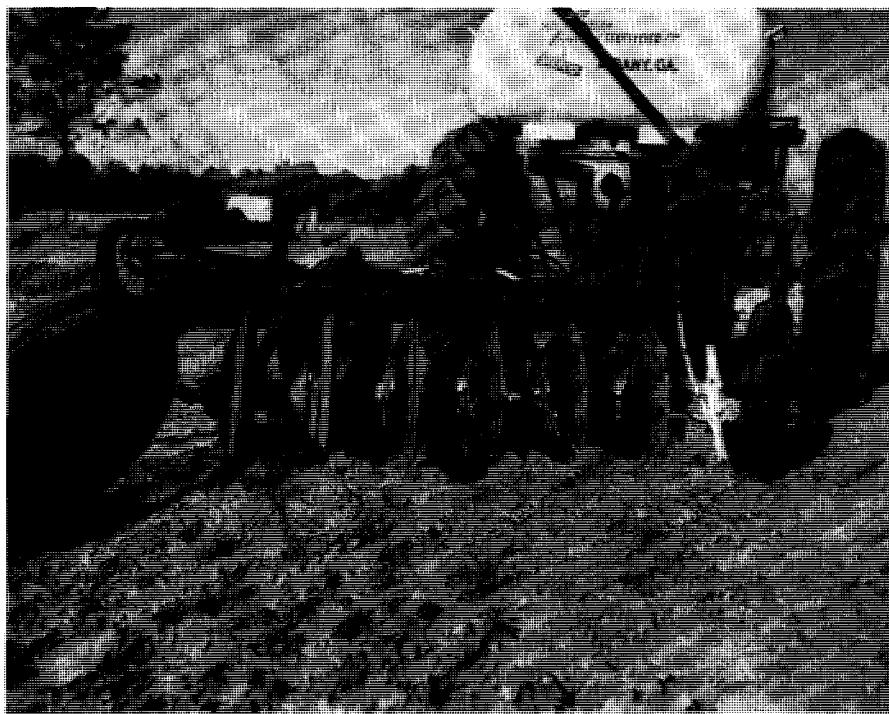
prices, has dissuaded many from further effort to expand livestock operations.

Bright spot in pasture fertilization is Ohio. During the past few years, many good dairy farmers in Ohio have been pasturing alfalfa meadows, usually containing grass in the summer. There has been an increase in the production of grass silage and this is the best method of saving the feed value of a meadow in early June. Farmers have begun to fertilize alfalfa meadows, with 0-20-20 the most widely used grade. Potash is apparently the most important constituent of this fertilizer. There has been a noticeable increase in the acreage of alfalfa in Ohio and in the length of life of the stands. This is also due to the use of wilt resistant varieties such as Ranger and Buffalo. Pasture fertilization is stressed by extension workers.

For many years there lived a tradition that the rich black soil of the Midwest would never need fertilization. In fact, there was a fairly general belief that fertilizers were harmful—they were like narcotics; once you started using them you would have to keep on using them to produce a crop. This whole idea has been overthrown to a great extent and the Midwest now consumes large quantities of plant food. Ohio, Indiana, and Illinois have been the largest users, but the rate of increase promises to be even greater in other states. The state in which fertilizer consumption seems to be rising most rapidly at the moment is Iowa. There perhaps 25% of the fertilizer is applied by bulk spraying, to be plowed down. This takes twice as much material but it is economical in Iowa because of the farm labor situation there.

Consumption of fertilizer in the Dakotas is extremely low. Some agronomists think these states could profitably use three times as much nitrogen as they do now. The number of fallow years interspersed among the wheat planting years could be drastically reduced by use of more nitrogen. Although Dakota soil contains a good deal of potash and phosphorus, some response also is obtained by application of phosphates. Nitrogen - phosphorus combinations should find a good market there. The Red River Valley supports an agricultural system entirely unique in the area; beets and potatoes, rather than wheat, are grown in this region, and potash can be used with good results.

Consumption in Michigan will probably rise. Only fairly recently has the value of fertilizing field crops such as corn, wheat, and alfalfa been realized there. Muck crops which are raised on substantial acreages in Michigan (as well as in Indiana) will continue to use large amounts of fertilizer. The intensively cultivated muck land requires such large expenditures in labor for draining and soil preparation that the cost of fertilizer is small in proportion.



Southwestern Liquid Fertilizer Co. of Albany, Ga., developed equipment for applying anhydrous ammonia during soil tilling. More equipment of this type is needed, that of combined operations for efficiency and economy

Nitrogen Increases as Tonnage Drops Throughout the South; Excess Nitrogen Capacity Anticipated

LOOKING BACK to the latter part of 1953, when drought reduced fertilizer consumption throughout the Southwest and mid-South, the first half of this year looked golden by comparison. There were times when some producers couldn't meet demands. Consumption, however, began to slow down in July and has been slightly below normal, apparently because of drought conditions in some areas and the general feeling that adequate supplies of materials (particularly nitrogen) will be available next spring. Even so, many producers anticipate a very high demand during the first six months of 1955.

Although tonnage movements have decreased, nitrogen consumption (applied separately from mixed goods) is definitely upward, particularly anhydrous ammonia. Phosphoric acid and potash seem to be holding rather steady.

Reports from the Southeast indicate the next six months of fertilizer consumption are likely to be affected by the farmer's decreased purchasing power brought on by drought, reduced farm prices, and in some cases, reduced acreage allotments. One source said we need an adequate credit structure to assist the farmer in purchasing the

amount of fertilizers shown to be economically profitable.

It is universal opinion throughout the South that all fertilizer production will be adequate to meet next year's requirements. Some say nitrogen will definitely be in excess, based on current capacity. Phosphates, particularly normal superphosphate, will apparently be in adequate supply, but there may be some cases where shipments of triple superphosphate won't meet the peak demands during the spring. It is still possible that mixed goods and potash could get tight during the peak season, even though the year's supply will be adequate.

The Big Problems

The immediate problem facing the fertilizer industry during the next six months is an old one, that of being unable to supply its goods at the peak of the spring season as the farmer wants them. The industry is still faced with having to do a year's business in a period of two to three months. Any solution to the storage problem is likely to be slow in its development. Better education, encouraging the farmer to apply his fertilizers more evenly throughout the

year, may be one way out of the storage dilemma. Some incentive, perhaps in the nature of deferred payment, will be needed to encourage more fall application.

Distribution will continue to be of major concern, even though the increasing number of nitrogen plants will tend to diminish this problem. Some states in the Southeast still don't have any nitrogen plants and are generally outside the practical shipping range of new installations which have gone on stream this year. Leasing of storage space by basic fertilizer producers hasn't increased noticeably over prior years. It has continued to be spotty.

As more nitrogen plants are built and dispersed throughout the South, shorter hauls to destination may be involved. It must be remembered, however, that many of these plants will be limited basically to ammonia production, or to only a few products. It will still be essential to move such primary products as ammonium sulfate and ammonium nitrate over great distances to obtain ultimate distribution. With the developing policy of equalizing delivered cost of ammonia against competitive plants, there will be much criss-crossing of deliveries.

Over the longer period, the next five years, industry faces another important problem, that of determining whether capital investment should go into higher analysis, mixed goods plants, or into plants for formulating solutions which contain all the necessary N, P, and K in various ratios.

Liquids Gain Ground

Anhydrous ammonia consumption is expected to increase for at least another year; ammonium nitrate solutions may gain ground. It appears that ammonia for direct application will constitute 16% or more of the total nitrogen applied, whereas it was only about 11% during the 1952-53 season. Some projections indicate it may reach 20% by 1956-57.

One reliable estimator says ammonia consumption will increase by 10% in the South next year. Ammonia usage has already grown to the point where it now exceeds the amount of nitrogen supplied by all grades of ammonium nitrate.

Because ammonia is the fundamental product manufactured in nitrogen fixation, and since it has a high nitrogen content, many experts believe its use will grow extensively. They seem to think that nitrogen solutions, because of their corrosive nature and other factors, will be relegated to a secondary position.

While some indicate nitrogen will be in excess next year, others indicate a temporary excess for two or three years, and one said he thought an excess would last for five years. Good planning and salesmanship, some say, should bring supply

and demand into balance before long. One large producer of anhydrous ammonia in the Southwest is now actively promoting fall application. It has supplied advertising and promotional literature, and is offering deferred payment to increase sales.

Currently, there is a great deal of speculation on the combinations of fertilizer materials to be applied in liquid form. In the opinion of one producer, "matters of this nature still represent a very small percentage of the total and may continue to be limited to specialty products."

To promote the sale of anhydrous ammonia, more attention is being given to applicating equipment, with the purpose of combining farm operations in the interest of efficiency and economy. Southeastern Liquid Fertilizer Co. of Albany, Ga., for example, has developed a tiller-applicator. Ammonia hoses are mounted on a standard disc tiller so that ammonia is applied at the same time the land is broken. It is reported to be most efficient on light soils. For heavy soils, the firm has made the same type of improvisations on a moldboard plow.

Like most of the innovations in anhydrous ammonia equipment, it can't lend itself to package retail sales by equipment manufacturers, because plows differ considerably from one manufacturer to another. It must be worked out on the farm or in a "job shop" at the nearest crossroads. Similar cases such as this point out the need for standardized, mass-produced equipment to expedite ammonia application.

A new applicator which applies nitrogen, phosphates, and potash, all in liquid form in one operation, is creating considerable interest in the Southwest. Complete fertilizer requirements, in exact amounts, can be put down by adjusting the flow of each material separately. The elements are mixed by the machine as it moves through the field. The manufacturer, Plantation Fertilizers Corp. of Houma, La., says it has been several years developing this equipment.

Price Outlook

At the dealer level, the margin on primary materials has been lower since July than during the last several years. Because of the sluggish market this fall, some dry mixers are reported to be consigning nitrogen already purchased from the producer, an unusual practice. Many mixers have tried hard to meet their contracts with the nitrogen producer, but have been unable to do so. Price reductions have been made by the mixer, \$1.00 to \$1.50 a ton, but this has not been successful in inducing dealers and farmers to buy.

At least one producer thinks the situation here will improve, and that there will be no price cuts in 1955 by pro-

ducers. Prices at the dealer level will apparently remain fairly constant unless producers cut their prices.

Dealers are still considered to be the weakest link in the marketing system, although there are some excellent dealers. Many, however, do not have the time, or the knowledge, to explain fertilizers and their use to the farmers. They are likely to keep on hand what the farmer asks for, to supply his requests with the least amount of trouble and fanfare. In some states, dealers carry fertilizer only as a sideline.

Under the present marketing system, wherein the basic supplier sells his materials to fertilizer manufacturers, the basic supplier has little or no contact with the dealer. He must depend almost entirely on the fertilizer mixer to educate the dealer. More dealer education seems to be coming, because it is the only solution to the dilemma.

Some of the basic producers are going more direct to the fertilizer dealer for distribution of their products. In the anhydrous ammonia field, several companies are more inclined to own storage and distribution outlets for their product. Shall Chemical, Brea Chemical, both on the West Coast, and Mathieson Chemical, have retail outlets for ammonia.

Phillips Chemical recently offered ammonium sulfate for distribution through its filling stations to the home gardener. The volume of material through these outlets has been small by the usual standards, but it has apparently resulted in quite a bit of sales promotion and advertising on fertilizer materials in general. Many people are talking about fertilizer use as a result of this program.

Fewer Grades, Shifting Markets

Fundamentally, most Southern states could get by with a smaller number of mixed grades. In North Carolina the number has generally been reduced to a minimum except for high analysis materials such as 12-12-12, 13-13-13, and 14-14-14. The general trend will probably be toward fewer grades and higher analysis. Because of personal opinions and preferences, it may be difficult to reduce the number of grades to a reasonable minimum.

Normal superphosphate use appears to be declining in many areas because of the inroads being made by triple superphosphate, availability of which has increased appreciably during the past several months. In many areas, however, normal superphosphate is still a good buy, and in many cases it shows better results than more concentrated forms, apparently because it contains other elements essential to plant growth. Triple super for fertilizer mixing purposes will probably continue to grow at the expense of normal superphosphate.

Granulated products seem to be get-

ting more and more important in all areas except the Southeast. It is developing rapidly in some areas, with large suppliers (Mathieson and Allied) producing high analysis materials such as 12-12-12, 16-20-0, 11-48-0, 13-39-0, etc. It appears that most fertilizer plants must eventually move in the direction of granulation to meet an ever increasing demand by the farmer for these products.

While the use of pesticides in fertilizer mixes continues to grow, it has done so in spite of a certain amount of reluctance by the fertilizer industry. The potential hazards and liability associated with this procedure, plus manufacturing difficulties, have discouraged the industry.

Acreage and the Future

Government acreage control will reduce fertilizer use on some farms, but it is not expected to affect materially the over-all amount used in the South. Where substitute crops are permitted, and if machinery is available on the farm, some of the substitute crops may take as much or more fertilizer than the originally allotted crops. The general tendency is to use more fertilizer to get more production on smaller acreage.

The small amount of attention given to pasture fertilization is in part due to beef bringing about 50% of what it was two years ago. Although fertilization of pastures at the present beef prices is still profitable, the farmer hasn't recovered from the shock of the severe price reduction. As soon as he does, he will begin using more pasture fertilization. Like any other education program in the fertilizer industry, it will be as low process.

Adequate equipment in the early stages somewhat retarded the growth of anhydrous ammonia sales, as did availability and storage. Storage is still a problem and there is still need for good application equipment, although this factor isn't the bottleneck it formerly was.

The recent move by Chemical Enterprises to acquire ammonia distributor installations was fundamentally a financial one, but it is likely to be followed by others. Major producers may decide to control more directly some of the distribution outlets.

Although no really new sales techniques have been developed recently which are outstanding, there seems to be a trend toward more Ph.D.'s on the payrolls in the fertilizer industry. In some cases these men are holding educational meetings generally confined to a better understanding of the fertilizer picture. One extension worker said he anticipated that fertilizer sales will gradually be based more on facts and less on propaganda, from the long-term outlook.

Consumption Down in Northeast; Increasing Interest in Granular Products

CONSUMPTION OF FERTILIZERS in the East, New England, and the Middle Atlantic States, was down somewhat this year.

In New England this reflects the fact that the potato crop, a large user of fertilizer, has not been good recently. Potato acreage was down and general farm income was also down. In the Middle Atlantic region the decline in fertilizer sales is probably due more than anything else to the summer drought.

Total tonnage for the U. S. was down about 1.5% this year. However nutrients were up about 2-3%. In New England total decline in tonnage may have been slightly greater than the national average.

The New England region has traditionally been above the national average in fertilizer consumption; in 1940 application averaged 118 pounds per acre compared to 29 pounds per acre for U. S. In 1950 pounds per acre rates were 245 for New England and 77 for the nation. Although the region is above national average the use is not increasing at the same rate as some other regions.

Little Use of Liquid

In contrast with some other areas the northeast uses very little liquid fertilizer. Some persons in the area believe that liquid application is too expensive for the type of agriculture in New England. Capital investments necessary for liquid application and storage facilities are not readily available from the small area farmers of the region. Anhydrous ammonia and ammonia solutions must be applied below the surface of the ground and some farms in New England can't count on going six inches below the surface without hitting stones. Also a tank car of anhydrous ammonia contains enough nitrogen to treat about 600 acres. For reasons of economics three tank cars is usually the minimum profitable shipment of anhydrous. There are few areas in New England which would be profitable for depending upon custom application of 1800 acres of land with liquid fertilizer from one railroad siding.

It appears that the Northeast will continue to depend on mixed fertilizers for some time to come.

Ammonium sulfate remains a major source of nitrogen for the area, the steel mills of Pittsburgh and Baltimore providing a ready source of supply. This ready availability of ammonium sulfate, used in traditional powdered fertilizer mixtures, means that small mixing plants will continue to supply powdered fertilizer mixtures for some time to come.

Use of ammonium nitrate, on the other hand, has made it possible for the large manufacturer, to produce a high analysis granular product.

There is increased interest in the northeast in granular fertilizers.

As an example, considerable work has been done on the development of ammonium nitrate mixtures with superior flowing characteristics. During the year, allied's South Point, Ohio plant got into production of an improved granular fertilizer. This free flowing material simplifies the job of handling, which sometimes can be seriously aggravated in the case of materials that cake readily.

Pelletizing or prilling will probably become more widespread in industry because of advantages in handling, storage, and application. Some manufacturers of fertilizer nitrogen products take the stand that screening to coarse sizes in some cases meets not only the needs of the grower but also requirements at the plant, in ease of handling and storage.

There is increased recognition of the fact that pelletized products are easier to pack and that they "lay out" more evenly in the field.

Prices are expected to remain stabilized at present levels for nitrogen materials, and the industry seems to have based this expectation on some definite indications. First, ammonium sulfate (coke oven) will remain firm in the absence of a large supply at \$42 to \$47.50 per ton at steel centers, in bulk.

When Chilean natural sodium nitrate was reduced from \$49.50 per ton recently to a bulk price of \$47.75, Allied Chemical & Dye maintained its price for synthetic sodium nitrate of \$47 per ton at Hopewell, Va.

According to marketing agencies, competitively imported calcium ammonium nitrate was not reduced in price following the action on the Chilean product. Calcium ammonium nitrate is brought into this country from Europe by several importing interests and sold under various trade names.

Standard grade of superphosphate continues to lose ground slowly to the more concentrated types. The standard superphosphates run about 20%, the "normal" about 18%, and concentrated is now considered to have around 45% although it may range from 42 to 47%.

Olin Mathieson reports growing interest in their intermediate 30% superphosphate, particularly on the part of growers in the Coastal Plain states. A high rate of rainfall in that area has resulted in sulfur-deficient soils. At the same time there is increased interest in ammonium phosphate.

Higher use of concentrated superphosphate is reflected in current plant food formulas. The use of 10-20-20 is being increasingly utilized in corn and potato sections. Various parts of the Atlantic States are calling for ratios as high as 13-13-13 and 12-24-12.

No storage space problem is expected during the 1954-55 fertilizer season as far as synthetic or coke-oven ammonium sulfate is concerned. Production is not expected to be that pressing during the pre-consumption period of July to December 1954. Steel operations which govern production of coke-oven by-product ammonium sulfate recently have turned upward but are still materially below the steel rate of 1952 or 1953. In former years of large production sellers of the product have entered into lease arrangements for storage space. They can be expected to do the same thing again should supplies get out of hand.

Ammonia producers are still without adequate storage facilities of their own for their dry products, due to the simple fact that construction of new storage has not kept pace with postwar expansion in producing facilities.

Seasonal Purchasing Back

With today's ready availability of fertilizers, farmers have tended to return to seasonal purchasing.

Fertilizer producers are making strenuous efforts to encourage the early buying of fertilizers. Efforts are being made to encourage farmers, wherever practical, to apply their fertilizers in the fall rather than in the spring. In many cases, this can be done just as effectively in the fall.

Fertilizer manufacturers are still offering farmers significant price reductions for early purchases. Some people say it is of little value to reduce the price of fertilizers in the fall to encourage early purchases. One argument is that farmers don't have the money to buy fertilizers at that time anyway. However, farmers can usually borrow money from banks to finance fertilizer purchases. Furthermore, many companies are willing to sell fertilizers in the fall under the arrangement that payment is made in the spring.

More and more, the basic producers of fertilizers are taking on the job of education. Some companies such as the Nitrogen Division of Allied Chemical have tried informative literature and exhibits at state fairs, scientific kits, and even balloons for the youngsters to sell the fertilizer idea.

Previously, the emphasis was on educating the dealers so that they, in turn, could educate the farmers. As one company spokesman put it: "After all, when it comes to the selling of soap and cigarettes, it's the manufacturer who has to do the selling job, much more than the dealer."