

University of Washington workers load plane for forest fertilization experiments. A 15-acre tract of low productivity forest land received 100 pounds nitrogen per acre

The Fertilizer Picture

- ▶ Fertilizer sales better in most areas, with possible exception of Midwest, where tonnage took slight dip
- ▶ In West, the push is on fertilizing rangelands; even forests may be getting plant food soon
- ▶ Liquid fertilizers getting mixed reaction in Midwest
- ▶ Where soil moisture has been sufficient, fall applications have been picking up

Record First-Half Sales in West Indicate '55 Will Be Best Yet; NH₃ Solutions on Top

RECORD FIRST-HALF SALES make 1955 almost certain to be the western fertilizer industry's best year in history. Of the three leading states, California, with sales of 603,857 tons in the first half, was up 18% over the same period in 1954. (This figure includes only materials which contain singly or in combination 5% or more of the three major plant food elements.) Washington, with sales of 124,186 tons, was up 22% for the first half. Oregon, with sales of 104,137 tons, was up 24%. To put these figures in perspective it should be noted that 62% of California's fertilizer sales in 1954 occurred in the first half.

More startling than this over-all growth were liquid fertilizer sales in California. In the first half, ammonia solution (20-0-0) at 104,474 tons rose 78% over the like period in 1954, and in the second quarter, for the first time, it nosed out dry mixed fertilizers which nearly always lead the tonnage pack. Neutral fertilizer solutions at 22,624 tons (estimated average analysis 10-10-5) shot up 92% for the first half. While there is still a noticeable trend toward liquids in California, one authority says these spectacular increases reflect this year's supply-demand picture far more than they do the trend. Growers used the fertilizers that were in freest supply.

Profit margins on nitrogen fertilizers, particularly liquids, have decreased significantly this year in the West. All major liquid markets saw wide-spread downward price adjustments, both of-

ficial and unofficial, reflecting free supply and stiff competition. In the opinion of one major producer these price adjustments also reflect maturation of the liquids (other than anhydrous ammonia) business which in prior years has been largely in the hands of small manufacturers who enjoyed wider profit margins. Solid fertilizers of all types fared better. At least two major firms did a great deal of work this year to hold their distributors to the suggested prices and with visible results. Margins on solid "simples" held up well, and while there was some price manipulation on solids during the height of the season it was confined largely to the mixer-distributor level.

Some marketing techniques were changed. Shell announced that it would sell its ammonium sulfate direct to mixers, effective Sept. 15. Shell had marketed the product for some years through Allied's Nitrogen Division and Producer Sales Corp. of San Francisco. After three seasons of fair trading its urea in the West, DuPont discontinued the practice Aug. 1. A large western broker, on the other hand, began fair trading normal super phosphate July 1. In the Imperial Valley, where California's second fertilizer season is now in full swing, the move is reported to be well accepted, and some distributors are faring much better.

Asked about consignment sales, some westerners say there was a slight increase, some say a slight decrease. In any case, the practice is not common in the West, and while it is apparently being used

slightly this year as a sales gimmick and to offset season surpluses, it shows no likelihood of becoming significant.

Shell's announcement that it would build the West's first urea plant at Ventura, Calif., where it now makes ammonia, highlights a by now fully developed western trend toward product diversification. Brea, which started with aqua ammonia, is now a major producer of neutral fertilizer solutions, and in September it brought on stream the first prilled ammonium nitrate plant in the western U. S. Both Northwest Nitrochemical at Medicine Hat, Alta., and Standard Oil-Calspray at Richmond, Calif., will make a range of N and P products in addition to ammonia.

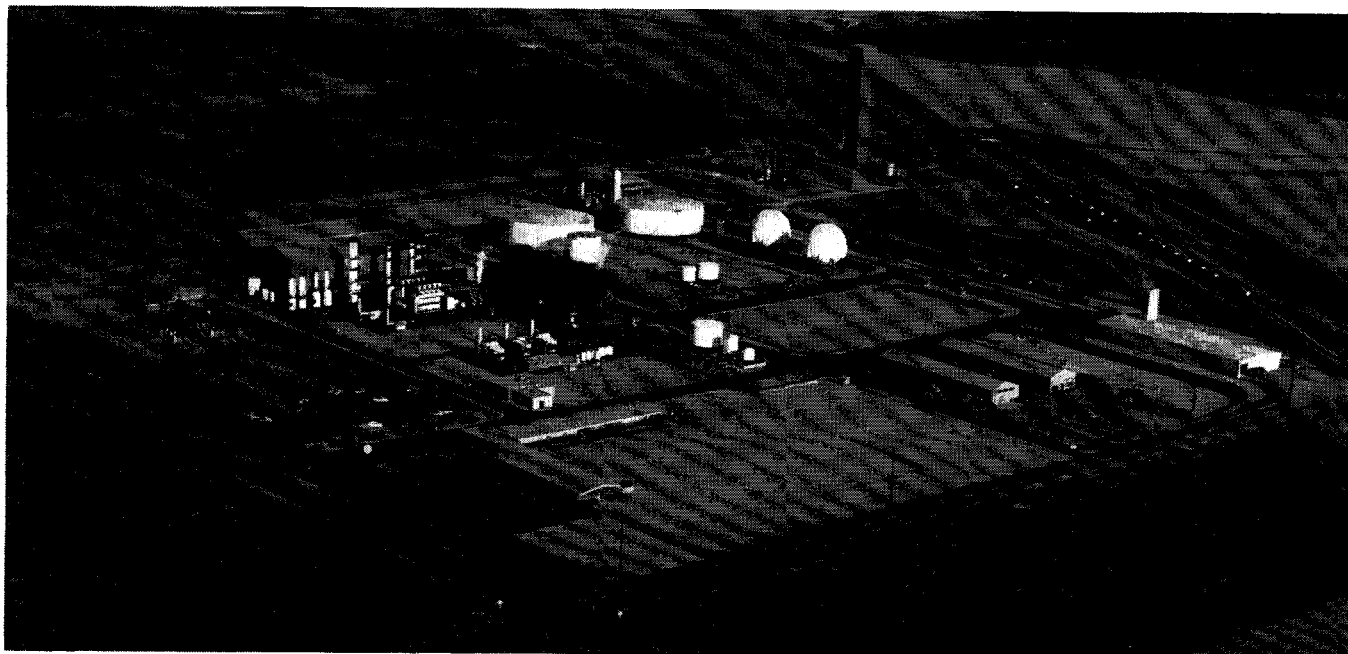
In May, Consolidated Mining & Smelting began moving a 27-14-0 mix into the West. Stauffer's new plant at Vernon, Calif., will be producing 17-7-0, 10-10-10, 10-10-5, and 5-15-0 pellets before year's end. No one has followed Colorado Fuel & Iron's move to diammonium phosphate, but both Kaiser Steel and Shell have made trial runs.

On a tonnage basis, the major part of this trend represents diversion of western ammonia into other fertilizer forms. There is undoubtedly an agronomic need for these other forms in the West, but strong competition, freight rates, off-season storage, and similar factors are felt by many to be playing a major role in their development.

Among infant fertilizer outlets in the West are the dry-land grain areas of Montana, which offer room for nitrogen expansion. A few new leads on soil deficiencies in Oregon have turned up, although specific recommendations have not yet been made.

Further along in the West is range and

Brea Chemicals plant site where new prilling tower was recently completed





Before year's end, pelletized 17-7-0, 10-10-10, 10-10-5, and 5-15-0 will be coming from this Stauffer unit at Vernon, Calif. Manufacturing Section (center) includes pelletizers, grinders, weighers. Raw material bins at right

pasture fertilization, which may be on the verge of fulfilling its promise. A large western firm which has worked actively with California ranchers for the past few years put its range and pasture program on a fully commercial basis this year for the first time. While the heavy range season is just starting, it reports moving any number of small but significant ton lots. Bits of fact and gossip lead others to the conclusion that this outlet is about to pick up speed in a hurry.

Forest fertilization, another potential outlet, is being tried in the Pacific Northwest, where University of Washington workers started in 1951 by hand spreading nitrogen, phosphorous, potash, magnesium, sulfur, calcium, and boron on one-tenth acre plots of low productivity forest land. Nitrogen gives the best response to date and in the most recent work it was applied by air at a rate of 100 pounds per acre to a 15-acre plot. This was in part a test of application methods, a major problem in the field, and although some fertilizer hangs up in the

trees, it apparently falls or is blown to the ground soon afterward.

Forest fertilization is a very long range project, and results must still be termed preliminary. Responses are evident, however, in increased tree height and diameter and a color change from chlorotic yellow to green. Most immediate practical use would probably be on Christmas trees, where appearance is quite important. Fertilization might also be used to improve seed production which is sometimes critical in Pacific Northwest forests.

Neutral Solution Plants Spring Up

In line with this year's rapid growth in neutral fertilizer solutions, "liquid" plants are springing up all over California. Experienced people feel solutions must have higher analyses if they are to consolidate their position, and while nothing has been made public, higher analyses are rumored to be well along in the development stage. But in another opinion, some solution makers should

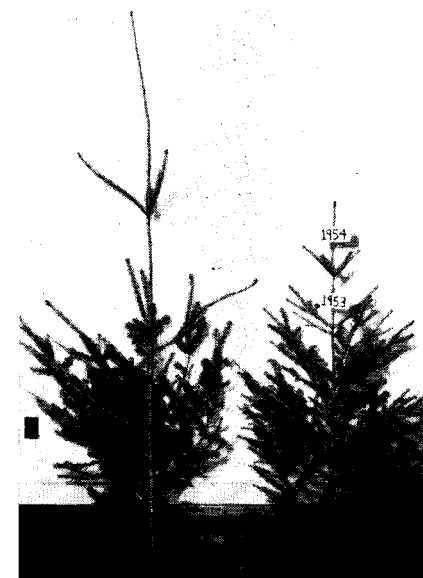
study further the physical and chemical properties of their present products, now found occasionally to be in less than satisfactory condition (crystallization, etc.) upon receipt. Low analyses may offer agronomic and handling advantages but these are frequently cancelled by freight and application costs. In Idaho, for instance, fertilizers containing N and P alone are generally recommended ahead of low analysis complete mixes, both liquid and dry. Finally, one agronomist thinks the industry is paying too much attention to analysis and not enough to ratio. Liquids that fit no particular ratio, he says, are going to be difficult to work into recommendations.

Emphasis on fertilizer placement is coming rapidly in the West, although its coming 20 years late in one veteran's opinion. Noteworthy in California is last year's demonstration that phosphates produce a significant response in rice when drilled to a depth of 4 inches with nitrogen. Phosphates had formerly been broadcast on rice with no economical gain. Recent work on Colorado alkaline soils shows water soluble phosphates are preferred for side dressing or spreading in concentrated bands. If the fertilizer is plowed down or disked into the soil, on the other hand, both low and high solubility phosphates perform about the same.

Application Equipment Wanted

Hand in hand with fertilizer placement comes application equipment, which most in the West feel has kept up pretty well with fertilizing techniques.

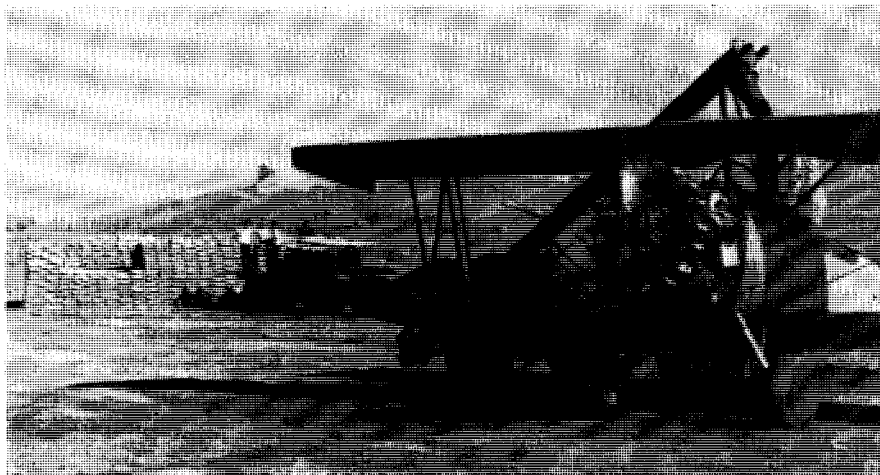
Fertilized Douglas fir (left) shows noticeable height increase over unfertilized tree. University of Washington reports Christmas trees and seed production are most likely outlets, although both are some distance in the future



Some opine, however, that large implement makers have lagged in developing more specialized equipment, particularly for liquids. From another quarter comes the thought that future equipment should be capable of multiple placement (putting part of the fertilizer with the seed, and the rest in a band deeper in the soil) which in this man's opinion is the most important of recent developments in placement. Next on his list of hoped-for implement improvements come lower power needs with narrower openers, which would disturb seed beds less, and more accurate metering.

Washington dry-land wheat farmers would like to see equipment which would put spring applications of nitrogen 4 to 6 inches deep on fall-sown wheat without tearing up too much of the crop. This would allow more efficient use of soil moisture. At present, these farmers must predict the winter rainfall and apply nitrogen in the fall, or use less nitrogen in the fall and make additional, less efficient surface applications in the spring.

There is talk of a nitrogen surplus in the West and it can be borne out statistically. "Bulls," however, discount statistics. One veteran fertilizer man remarked recently, however, that he could not define "nitrogen surplus" and was not sure anyone else could. Says another: "It's hard to figure these things on paper." And it is true that California, major factor in the Western market, uses roughly half of the recommended amount of fertilizers. In the West (and probably across the nation) such thoughts add up



Stack of fertilizer in background is remainder of three carloads of Cominco's 27-14-0 being applied by California rancher at 300 pounds per acre. Balfour, Guthrie, Cominco broker, put range program on full commercial basis this year, reports growing interest

to growing awareness of the need for long term action.

What's Being Done?

For 20 years the University of California at Riverside has been making lysimeter studies aimed at determining the effect of agricultural practices on soil fertility and leaching loss of all major soil elements, optimum supply of these elements, and the amounts withdrawn by crops. A spokesman says this work will very likely show that under some conditions farmers are adding excesses of certain elements which may gradually become detrimental, and that they are not adding enough of certain other elements, lack of which will also become detri-

mental in the long run. California's fertilizer industry is interested in this work and there is hope that it will be expanded.

Public education, another facet of long term development, is at a high level in the West. A somewhat different picture exists in formal education. One Western educator says that while industry support of graduate study and research is quite good, little is being done to encourage undergraduate study. Says another, "I am convinced that many companies could get excellent returns in the long run by giving more attention to certain aspects of research education and constructive agronomic advice."

Stiffer Competition in South; Buyers Value Service More Than Discounts

FERTILIZER SALES in the South were good this past season. Most producers expect a banner year for 1955-56; part of the sales gain will be due to greater emphasis on education and advertising.

Nitrogen fertilizer producers predict the great oversupply of ammonia will dwindle rapidly this year because of new overseas markets and increased domestic demand. One large ammonia user questions whether there is a surplus at times. (During the fertilizer season, spot shortages occurred this past year.) Ammonia distribution is still mainly an economic problem. High initial cost and amortization of storage facilities forces some distributors to maintain insufficient tankage for heavy seasonal demands. Complaints of shortage arise. Demand is extremely variable, say producers. Farmers seem to think alike; they postpone purchases until the last

minute; then they all need ammonia at the same time. It's either an "up" or "down" business.

Ammonium phosphate is becoming a better seller in the Texas Rio Grande valley. As stainless steel equipment for handling phosphoric acid becomes more readily available, ammonium phosphate solutions prepared by acid neutralization with anhydrous ammonia find increased use. Rio Grande farmers use little potassium because soil and crops require only small amounts. One valley distributor now has a rig for putting ammonium phosphate solution and anhydrous ammonia in the soil in a single operation.

Manufacturers of fertilizer solutions and producers of anhydrous ammonia say competition between them, while significant, has only slightly affected sales of either product. They suggest that solid fertilizers may have lost

ground, but new business for solutions more than makes up for inroads by ammonia. The general feeling is that each type of fertilizer has enough particular uses so that no one type will displace any other from the market. With a trend toward mixed solutions, producers of each ingredient will always have a steady market for part of their production.

Firm Prices

Late in the 1954-55 fertilizer year, prices generally were firm. In a few selected instances minor price reductions did occur. Industry leaders call these reductions "fringe benefits"—longer terms to dealers and salesmen's incentives.

Fertilizer prices are closely allied to basic chemical prices. For the long term, prices are expected by most producers to inch upward as the trend of chemical prices goes higher. Freight increases will affect fertilizer prices in the coming season if expected rate increases come into effect, says one basic producer.

Influence of foreign prices on southern fertilizer manufacturers is not great. Ammonium sulfate producers point to a definite rise in German and Belgian prices for material exported to our oriental markets.

Considerable quantities of domestic anhydrous ammonia are being sold overseas, easing the surplus condition in the U. S. Overseas markets helped hold domestic ammonia prices firm in recent months. Local ammonium sulfate producers, not closely attuned to the effects of overseas sales, have some apprehension about the future of ammonium compounds. Should possible price increases overseas attract more German and Belgian fertilizers, they ask, will this reduce exports of anhydrous ammonia from the U. S. and push ammonia back into domestic markets? Opinion seems to be that anhydrous ammonia still has some profit that can be squeezed out—which will move ammonia on the domestic market—while ammonium salts have practically no margins for cuts.

Actually, in place of price cuts, large producers and distributors are emphasizing better service to their dealers. Some organizations have developed staffs well experienced in application, formulation, and recommendation of fertilizers to farmers. Services rendered by these people are thought to be the deciding factor should competition get stronger, and if further price reductions are impossible.

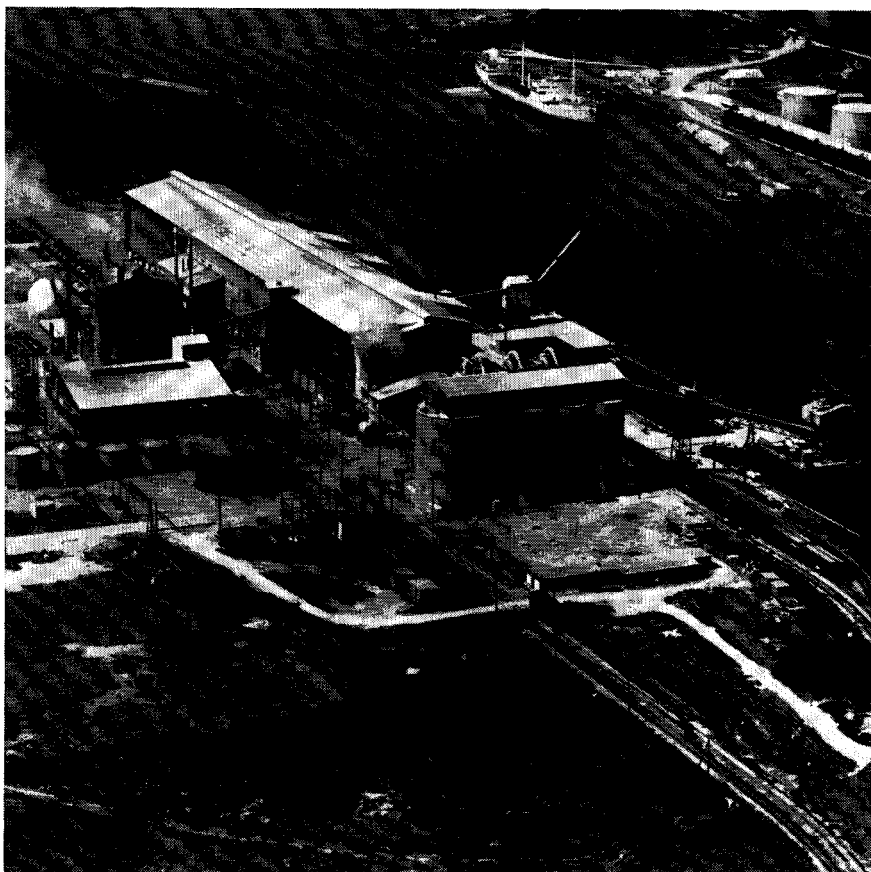
Producers place more emphasis on fall marketing every year. Yet very few admit to offering discounts or other price concessions in order to accelerate fall purchases. Ammonia receives more attention than other types of fertilizer ingredients, says one producer. Again, the cost of storage causes producers to stress fall selling.

Nitrogen Surplus?

The oversupply of nitrogen, mainly as excess ammonia production capacity, seems not to be taken seriously. Southern producers have ways of getting around this excess—selling aqua ammonia to industrial consumers, consignment selling, thus allowing dealers to use capital to build or buy tanks, and export marketing.

Most people are optimistic over the increasing demand for ammonia. Southern soils in general are considered nitrogen deficient and this alone helps to sell farmers on anhydrous ammonia and nitrogen solutions.

Phosphate supply seems now to be in balance with demand. Apparently the only serious shortage in phosphate fertilizers has been in phosphate rock used for direct application. Strikes at Florida phosphate mines and plants came after the season's greatest demand



Olin Mathieson's Texas Ammo-Phos plant uses water transportation for raw materials and finished goods

was over, and did not cause great unbalances in supply and demand. Supervisory personnel operated some plants, production did not halt entirely.

Limited use of potassium compounds in fertilizers compared to nitrogen is found in the Southwest. Formulations for applications in the Rio Grande valley often contain no potassium. A typical formulation for vegetable or citrus crops would be 8-24-0, a neutral solution.

The Southeast differs from the Southwest in that some areas require potassium. South Carolina is one state where mixtures run high in potassium. In the following table increasing use of higher potassium and phosphorous is evident. The shifting pattern in popularity is shown as use of 3-12-12 grows and 5-10-5 drops.

Fertilizer solutions continued their trend toward even higher analysis this past year and many formulators expect a demand for higher analysis in the future. With a few spotty exceptions, most farmers are applying high analysis fertilizers. In Texas during the past five years, the average total nutrient content has increased from 24.09 to 31.16%.

The trend toward more granulation has continued this past year. Spreading equipment has become well accepted for granular fertilizers.

Most producers think formulations are prepared correctly. Poor formulating practices are recognized quickly by distributors and dealers. If anything happens to a crop, it is the fertilizer that is considered first.

Mixed goods sales in Texas dropped

Annual South Carolina Mixed Goods Sales by Grades

FISCAL YEAR	FERTILIZER GRADES IN ORDER OF POPULARITY					
	1	2	3	4	5	6
1945-46	4-10-6	3-9-9	3-9-6	5-10-5	3-12-6	4-8-8
1946-47	4-10-6	5-10-5	3-9-6	3-9-9	3-12-6	4-12-4
1947-48	4-10-6	5-10-5	3-9-6	3-12-6	3-9-9	4-8-8
1948-49	4-10-6	3-9-9	5-10-5	3-9-6	4-8-8	3-12-6
1949-50	4-10-6	3-9-9	3-9-6	5-10-5	4-8-8	3-12-12
1950-51	4-10-6	3-9-9	3-9-6	5-10-5	3-12-12	4-8-8
1951-52	4-10-6	3-9-9	3-9-6	3-12-12	5-10-5	4-8-8
1952-53	3-9-9	4-10-6	3-12-12	3-9-6	5-10-5	4-8-8
1953-54	3-9-9	4-10-6	3-12-12	3-9-6	5-10-5	4-8-8



An Ocean-going barge is nosed into Houston Ship Channel terminal to load anhydrous from Phillips Chemicals 465-ton per day ammonia plant

6% for the January 1 to June 30 period, compared to last year. But sales of certain high analysis types increased significantly. Examples reported by J. F. Fudge, state chemist, are the 1-1-1 ratios of grades higher than 10-10-10, and 1-1-0 ratios greater than 10-10-0.

In Louisiana this year sales of nitrogen solutions have decreased. The difficulty with nitrogen solutions is the need to apply them under ideal weather conditions. Solutions do not work very well in dry soils.

For sugar cane, nitrogen solutions face another limitation. They do not supply phosphorus and potassium. Sugar cane farmers can get good yields from applying nitrogen, but for higher yields, they must begin to add phosphorus and potassium as mixed fertilizers.

Placement of fertilizer also has received more attention this year from extension workers and technicians employed by distributors. They cite a trend to increased use of airplane spreading as one which may revive the slipping demand for solid fertilizers.

Applications for fertilizer-pesticide combinations are being approached from two angles. Where possible, emulsions made of fertilizer solutions and hydrocarbon carriers containing pesticides have been experimentally applied. Another technique, separate equipment operated in tandem for above-ground applications, is getting attention.

Stiffer competition was the rule for fertilizer selling this past year and is expected to be the rule for this season also. Solid fertilizers have been hurt most by the big increase in anhydrous ammonia usage. New customers have helped take the sting out of ammonia's competition, but its present price advantage and relatively large profit margin make the future for solids look dark.

Consignment selling is here to stay. Several large producers of fertilizer chemicals say formulators and distributors have now come to expect consignment selling.

Ammonia producers point to one bright cloud in the picture. Consignment selling has helped them with storage problems and to cope with seasonal and local shortages. Dealers and distributors are developing more and more storage facilities as economics force them to meet competition. Those who operate in a reasonably large territory must compromise between trucking costs, storage costs, and service to their customers, by establishing local tankage away from their main facilities.

Generally the South has lagged behind other areas in consignment selling. The advantages to both dealers and distributors and to producers are becoming more evident. Competition has made it desirable for producers to accept consignment selling as a way to keep their products always available to farmers.

Should a dealer be temporarily out of a particular fertilizer, then a farmer will buy whatever is available and become a steady customer for that fertilizer.

Consignment selling has shifted the burden of tying up capital in stock from the dealer to the manufacturer. This has put more dealers in business who are weak financially. Some producers are making efforts to strengthen their dealer organizations to face competition. Underlying this move is the anticipation that weaker dealers will be forced out leaving holes in the producers' distribution program.

Expanding Potential Markets

From every corner the future for chemical fertilizers receives publicity. Many producers of fertilizer chemicals have accepted the responsibility for development of fertilizer acceptance and for helping farmers keep in contact with all recent advances in agriculture. They do this in several ways. Field selling staffs now reach the farmers directly and are well trained. Advertising aims at being more general. And most formulators supply their distributors with promotional material.

Fertilizer salesmen no longer just take orders. Larger companies hire only men with at least a bachelor's degree in some type of agricultural training. They seek men who understand all farmers' problems yet who are capable of dealing with well educated farmers. They attend and promote meetings to present advances in agricultural chemicals and fertilizers.

Promotional material emphasizes that fertilization is a good thing. Because many different products are going into many different applications, less space is given to specific products. Signs to distinguish fertilized fields are distributed to farmers. Films and photograph displays have been circulated through distributors to point out successes in fertilizing.

Success of this program may be noted by softening of the resistance to high analysis fertilizer use by older farmers and smaller operators.

Problems in the South

The fertilizer industry is not without problems; neither are farmers. Probably the largest faced by all is education. Producers want farmers to know how to use their products and farmers want producers to know what farms need.

Next most important problem is the usual competition-price problem. Older ammonium sulfate producers point specifically to their low profit margins as compared with those of anhydrous ammonia. All manufacturers report stronger competition. Service and de-

livery are important factors in the selling of highly standardized fertilizers.

Dealers think their biggest problem is that of having to sell with personnel who know little about fertilizers. Many dealers aren't acquainted with high analysis fertilizers, the new forms of solutions, and pressurized ammonia. The "seed seller" previously handled solid fertilizers by telling farmers to read the directions on the sack. Now a farmer expects technical information on application methods, plus storage and handling data from his dealers.

Formulators' problems may be boiled down to a question of existence. Many manufacturers are selling directly to dealers under their own labels; the trend is increasing. Price justification is difficult. Farmers need to be educated about higher priced formulations which actually result in smaller production costs, compared with cheaper low analysis fertilizers.

East Faces Year of Abundant Supplies of Most Materials; Nitrogen Prices Stable

IF FERTILIZER producing and sales interests in the Eastern states are correct we face a year of abundant supplies of most materials, particularly nitrogen products. The erection of new facilities for anhydrous ammonia over the past year or two has led to a situation where capacity for nitrogen may run in excess of demand during 1956, 1957, and 1958, in the opinion of some observers.

This view is not fully shared in the industry, of course. Some well-informed factors predict continued increased demand and believe we will be faced by overproduction only for about one year ahead. For the long pull, according to one Eastern manufacturer, the outlook is satisfactory.

As to phosphates and potash, which lack the large-scale expansion witnessed in nitrogen, the chances are that supplies will be ample but not burdensome in this respect. Consumption of both is expected to increase.

The Price Headache

Fertilizer sales in the New England and Atlantic States area were evidently in better volume this year, with the usual exceptions. A large cooperative reports that its sales were up some 17%, while a New England distributor thought his tonnage was a few percentage points under last year.

But the price situation continued bad. Prices were unsatisfactory in 1955 and the trend is downward. Some of the prices quoted, according to the views

Ammonium phosphate solutions enriched with more ammonia are easy to prepare. Some farmers in the Rio Grande valley who operate large acreages are beginning to make their own neutral solutions to save shipping costs on water.

Farmers claim their biggest problem is how to find the correct information about fertilizers among the mass of conflicting data and claims offered them. Naturally seeking the most for his money, the farmer needs more education in the use and value of the newer higher analysis fertilizers. Proper and efficient methods for application must be given him. He needs to know the place of fertilizer in raising crops and not be swayed by exorbitant claims. Results of incorrect information become well known to sellers of fertilizers when they approach farmers the next year for more sales.

expressed, barely covered the cost of the raw materials.

"The worst competition," said one manufacturer, "is from Canadian producers who are shipping into northern New England, and from producers outside of New England who are apparently intent on regaining lost tonnage."

Some of the prices quoted were less than dealer's normal cost.

As to consignment selling which is generally frowned upon, it cannot be said that the practice is gaining to any extent. Crop time credit, however, appears to be increasing. There was a considerable increase this year in the practice of offering discounts for early fall purchase, but not for all fall purchases.

Which brings us around once more to the matter of fall marketing and the hope that this may level out the peaks and valleys in fertilizer demand. A short while ago it was just a hope. This year manufacturers find that the emphasis on fall marketing is slowly increasing, and the cooperatives said it was "greater than in recent years."

Nitrogen Prices

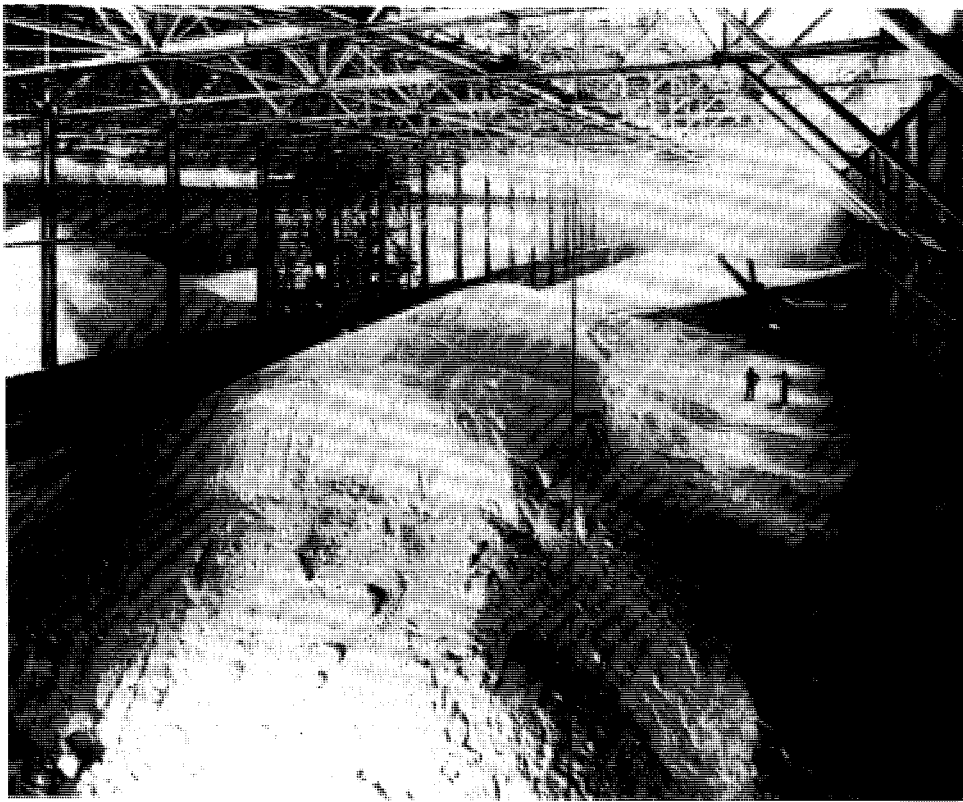
Manufacturers are undoubtedly in back of any move that would spread fertilizer shipments over a wider period. Selling efforts were directed this year to that end, but were not pushed intensively. Some companies indicate that farmers' buying habits would have to change, for one thing, and this is almost too much to hope for.

The farmer will not plan ahead in the matter of fertilizer requirements, hence will not show much concern over forward shipments. But regardless of these buying habits, efforts to smooth out the shipment curve will continue.

It is worth noting at this point that the expected decline in nitrogen prices as the result of expanded capacity has failed to materialize. Nitrogen con-

Loading a tank car at Allied's Hopewell, Va., plant





Stockpile of sodium nitrate at Allied's plant at Hopewell, Va.

sumption is expected to increase in this area, although probably not at the same percentage rates shown during the past 10 years or so.

Band Placements

The importance of fertilizer placement is becoming better understood. Much study and experimentation is under way in the East. Band application of fertilizer and seeding over the bands seems to have a real future in the establishment of forage crops, said the research director of a large eastern cooperative. He goes on to warn that this should vary with soil, climate, crop, fertilizer, and the rate of application.

An agronomist in Connecticut points out that band placement of fertilizers, particularly phosphates, is very effective in giving young plants a quick start. The Rhode Island Experiment Station, while suggesting band fertilization for forage crops, comments that better application equipment is needed.

In New Jersey, probably the only single crop fertilized entirely by placement machinery is the potato crop. But band placement for corn and small grains has been on the increase.

Methods of fertilizer application in Northern New England are also changing. It looks as though band seeding will be the newest technique for using fertilizers more efficiently, said one extension agronomist. The better farmers are already doing a fair job with split applications and they are using more

nitrogen in the form of ammonium nitrate or urea for side dressing corn silage. A few in this area are beginning to experiment with plow-down applications of nitrogen before planting corn.

The fertilizer-pesticide combination is not developing very fast in the East. In some Northern New England states mixtures are almost unknown; use has been limited to custom mixing on a small batch basis. New Jersey has ruled out the mixtures for the time being. Custom mixing is done sporadically in Delaware and agronomists there report many of these fertilizers are being applied as band placements.

What Are the Problems?

Our survey of Eastern agricultural experts, both in commercial and technical positions, brought out a number of problems the industry is facing today. Manufacturers, formulators, dealers, and farmers were anxious to tell their problems but not many solutions were proposed.

The president of a small eastern fertilizer company reported that the toughest problem facing the basic producer and formulator is condition. Condition is first but prompt delivery runs a close second. "Almost 50% of our sales comes in one month and that causes a very bad load factor, making it difficult for us to give good service during our busiest season," he said.

Another New England company official had this to say: "The toughest problems

for the formulator are the multiplicity of grades and the difficulty obtaining a compensatory price for goods." He went on to describe the dealer's problem as two-fold. First, manufacturers are selling his customers direct, and, second, collections are sometimes difficult on the one hand, and on the other he must take his own discounts.

The response was mixed to the suggestion that a nationally recognized formula for determining the relative dollar value of fertilizers based on analysis be adopted. One company official said it would tend to increase the use of high analysis fertilizers and save the farmer a considerable amount of money. Another said such a formula would be impossible to arrive at and impossible to use if it were worked out. One agronomist predicted that there would be some simplification, at least, within a year or two. He referred to the change from the P_2O_5 and K_2O to a straight P & K basis.

The dealer today has a tough decision to make as to what grades he should carry. There are too many confronting him and he does not have the information necessary for the best choice, said a New England agronomist.

An extension service agent capsulized the situation when he commented that economics is the key to the success and progress of the fertilizer industry. The farmer's toughest problem today is how to pay for the fertilizer he needs and the biggest problem for the extension services and producers is to show the farmer how the fertilizer he needs can help him carry on a more efficient and profitable business.

Liquid Fertilizers Gaining Slowly

Use of nitrogen solutions directly as fertilizers made further gains during the past season. It was anticipated earlier that there would be a substantial increase in the East, however, our survey of state agricultural experiment stations in these areas indicates that the liquid fertilizers registered only slight gains during the past season.

The experiment stations point out that nitrogen solution demand should show some definite increases in the future. These will probably come first in the Mid-Atlantic area, then gradually work up to New England. Most gains should be on small farms and lawn use in urban districts at least next year.

From Vermont, for example, came the comment that to date, there has been no use of fertilizer solutions with the exception of two or three custom lawn spraying services around the Burlington area. A spokesman for the College of Agriculture in that state expressed the opinion that the future for fertilizer solutions in his state would be limited because of the small fields and relative

difficulties in handling the liquid materials.

Agronomists at the University of Delaware say that the only form of liquid fertilizer being used to any extent and the only liquid fertilizer being recommended is nitrogen solution. The people at Rutgers report a significant but small increase in the use of fertilizer solutions in New Jersey.

Nitrogen solutions for direct application—both low pressure and non-pressure types—contain no more than half as much nitrogen as does anhydrous ammonia. Apparently, from the survey results, formulations of this general type are being made on a sound technical basis. This seems to be true particularly of the larger formulators. It was noted that some of the smaller outfits are using more expensive materials and methods resulting in higher costs.

Solutions a Good Competitor

By their nature, fertilizer solutions are limited as high analysis products. This is believed to be a factor limiting the growth of increased use of solutions.

In the present competition between anhydrous ammonia and fertilizer solutions, it is generally conceded that solutions are slightly ahead. In particular this is true around small farms. Most likely, this is because less expensive equipment is required for the trans-

portation, storage, and distribution of nitrogen solutions. Also, problems in handling and application to soil are less complicated than with anhydrous ammonia. Since there are many areas in which nitrogen solutions have a good potential, it would not be surprising if consumption of a nitrogen basis eventually is comparable to that of anhydrous ammonia.

On the other hand, the trend towards granulation in this area has increased. The experiment stations surveyed did not offer any concrete data to substantiate this. One source believes the increase is more noticeable in parts of the United States other than the northeast sections of the country. Even so, one large eastern cooperative has gone all out for granulation to such an extent that the major portion of its fertilizers is marketed in that form.

Expanded Activities

Several of the basic suppliers of nitrogen, phosphorous, and potassium now own and operate mixed fertilizer plants. Basic suppliers have also been distributing fertilizers directly to the farmer, all in an effort to increase fertilizer use.

One agronomist made a plea for more co-ordination between the fertilizer industry and research extension groups. In addition, use of qualified men employed by industry and trained to interpret soil tests results for prospective customers, would help.

Midwest's Sales Off Slightly Because of Drought; Next Year Expected About Same

SALES OF FERTILIZER for the past year have dropped a little in the Midwest, although there has been a slight increase in plant food units. Fertilizer tonnage has dropped an estimated 2%, compared to an approximate drop of 4% nationally, while in some instances a rise of as much as 2.8% in plant food units has been observed. It appears that most of the drop in sales has been due to the prolonged drought plaguing much of the area. Parts of Kansas and Nebraska have had three to four years of drought; and even though sufficient moisture is received in the near future, normal volume of fertilizer may not return for at least another year.

Next year's sales should be approximately the same as during 1955, according to best estimates. Earlier, a slight increase was expected. However, because of some very dry spots, farmers may be reluctant to apply fertilizer because they feel there will be fair carry-over for next year.

As with sales, fertilizer prices were down only slightly, with a few exceptions

where they were all over the board and very unstable. The existence of a more than normal supply of nitrogen commodities made for a "soft" market, but the situation is not considered serious by most of the producers queried. Anhydrous ammonia prices have definitely dropped in Iowa, Nebraska, and Missouri—from \$15 to \$30 a ton. But again, this is not a serious condition, as margins were high. The current price may continue through the next year, but another \$10 drop in anhydrous is quite possible; to a level of \$130 to \$140.

Ammonium nitrate prices dropped approximately \$6.00 a ton during the summer, but a dollar a month rise since then is expected to recover \$4.00 of this loss by November. Mixed fertilizer prices have been rather steady since last fall, and satisfactory margins are expected to continue through next spring.

Anhydrous ammonia may be in for some competition if early signs are indicative of a trend. Comparison of solid vs. anhydrous ammonia forms of nitrogen from one source shows a drop in 1954-

55 tonnages for direct application. During the past fiscal year, sales of ammonium nitrate in this area jumped to 48,204 tons, compared with only 25,821 tons the previous fiscal year. During the same time ammonia sales dropped from 9048 tons for 1953-54 to 8530 tons for 1954-55. The last figure includes some 1500 tons of ammonia sold to a manufacturer of ammonium nitrate, which was later made into the solid. This decline is considered significant.

In Missouri, anhydrous also lost ground to the solid fertilizer form.

Liquid Fertilizer Potential

Another potential competitor to anhydrous in some areas is liquid fertilizer. There is a wide difference of opinion on the future of liquid fertilizers, based on use in individual Midwestern states. Estimates vary from no influence in fertilizer markets to an eventual 25% to 50% (for nitrogen solutions) of the total market in Wisconsin. By state, current use and predicted trends are:

Illinois. Some increase in use of complete solutions is evident, coupled with a substantial increase in nitrogen solutions. Further increases in aqua ammonia use are expected. Anhydrous ammonia use has continued to expand, and it is doubtful that the three-nutrient solutions will ever fulfill all of the nitrogen needs.

Indiana. Anhydrous ammonia and fertilizer solutions are close enough in price that individual farmer preference will govern future sales. Use of liquids has increased substantially here, and next year should see an even greater use.

Iowa. Use of fertilizer solutions has increased in Iowa during 1955, and it is highly probable that there will be a moderate increase in tonnage of these materials distributed to Iowa farmers during the coming year. Nitrogen solutions are not expected to become an important factor in fertilizer sales in Iowa. In the next two to five years, mixed solutions are expected to affect materially the volume of sales in standard mixing plants.

Kansas. No great increase in solutions use during the past year. As a matter of fact, it appears that almost none of this form of fertilizer was used. The same will probably be true next year because satisfactory methods for application of starter fertilizers in the solution form for wheat are generally unavailable, and the continued drought has made increases in the use of any fertilizers a doubtful prospect. Recent rains, ranging from 1.5 to 7 inches, are currently generating some optimism, but over-all picture has not changed much.

Kentucky. Liquid fertilizers have not become important enough in Kentucky to warrant particular attention. Use of anhydrous has increased from 482 tons



A rig such as this can apply liquid fertilizer and seed 320 acres a day. Units (left to right) are: tractor, 1000-gallon supply tank, 40-foot tool bar to which injection shanks are attached, tricycle towbar, and dual drill seeders

four years ago to over 18,000 tons in 1954-55.

Michigan. Use of fertilizer solutions has not increased rapidly here. There has been a considerable amount of solution nitrogen used, but very little in the way of complete fertilizer solutions. No great increase in use of the complete materials is expected.

Minnesota. Nitrogen solutions have enjoyed a considerable increase, and it is believed that this trend will continue in the future. Liquid fertilizers are only now appearing in the state and should generate considerable initial interest; however, the complete solutions will most likely be limited to starter fertilizer.

Missouri. Nitrogen solutions as well as anhydrous are losing out to solid fertilizers, but use of solutions is expected to increase next season.

Nebraska. Tonnage of fertilizer solutions used in Nebraska in 1955 has decreased about $\frac{1}{3}$ from 1954, but the trend next year is toward a moderate increase. Several new plants have been set up in the state recently, and should have an influence.

North and South Dakota. Liquid nitrogen has increased slightly; not much fertilizer solution has been used on small grain. Generally, very little anhydrous ammonia has been used, but price advantage may prompt wider sales.

Ohio. Where price has been competitive with dry fertilizer, liquids containing P and K or N, P, and K are off to a good start.

Wisconsin. It appears the use of fertilizer solutions will increase slowly. For the most part, the fertilizer solutions have been complete mixed fertilizers. The straight nitrogen solutions will probably offer quite a bit of competition to anhydrous ammonia.

Over-all, fertilizer solutions have not made any serious inroads on the midwestern anhydrous market. There are opinions that solutions are a "gimmick" type of thing and will move initially because of novelty. However, straight nitrogen solutions promise to compete with anhydrous ammonia, particularly if farmers acquire equipment designed

for the application of liquid fertilizers. A drop in the price of phosphoric acid would also result in greater use of mixed solutions.

Because of the limitation of grades that can be produced in liquid fertilizer, the formulations would not be satisfactory for all uses. Currently, the main grade produced is a 9-9-9. This has undoubtedly been used in places where higher potash fertilizer should have been used. Agronomic misuse of fertilizer is easy because of the farmer's lack of knowledge of the fertilizer he should use.

Fall Application

There has been a great emphasis on fall marketing this year. However, only in the sections where there has been sufficient rainfall does there seem to be any movement. If there is sufficient moisture in other sections, the year may see fairly good fall movement of plant foods.

Many areas can use nitrogen well when it is applied in the fall, but application of most fertilizers when the crops are planted is definitely favored. Nitrogen top dressing for wheat can be done in the fall as well as in the spring, but some of the best results have been obtained when done early in the spring. A considerable amount of work is currently being performed on nitrogen application in the fall for such crops as corn and sugar beets. Farmers like to apply fertilizer for corn deep under the rows at the time the corn is planted; therefore, it may not be best to fertilize in the fall. Recommendations are that land be plowed and corn planted immediately thereafter, with subsequent tillage that cannot be done if the land is plowed in the fall. Good results have been obtained by plowing and planting sugar beets immediately, eliminating fall plowing and subsequent fertilizer application.

The great bulk of alfalfa will be benefited by applications of high potash, high boron fertilizers. In Wisconsin, it is estimated that this fall about 75% of the alfalfa fields show a lack of boron and potash. A good fall application of fertilizer means the difference between

good alfalfa in 1956 and none at all in many cases. Such applications go a long way toward preventing winter-killing of the alfalfa.

Recent rains have helped fall fertilizer movement, but not enough to show much of an increase for this year. The trend toward granulation may help sales, and the farmer will tend to buy fertilizer in the fall at a saving if he knows it will not cake before he uses it.

Problems Must Be Faced

Of the many problems facing the fertilizer industry, number one is educational work as a means to increase markets and improve fertilizer efficiency. According to one industry spokesman, a large number of farmers do not use any fertilizer, particularly in the North Central States.

According to USDA statistics, the greatest potential for increasing fertilizer consumption in any region of the country lies in the midwestern area. This region contains about 225 million acres of crop land, some of which must eventually be taken out of field crop production and returned to pasture or forage use. The analysis of this data, by K. C. Berger of the University of Wisconsin, points to increased fertilizer requirements within this region. The states in the area reveal a production potential with full fertilization of more than an additional billion bushels of corn. Wheat production could be expanded by nearly a half billion bushels, and oats by nearly three quarter billion. This goal presents a constant target to the plant food industry.

According to one experimental station worker, there is too large a proportion of mixed goods. He predicts a larger proportion of straight materials will be used, and numerous mixing plants may have to go out of business.

The midwestern farmer is faced with two main problems in regard to fertilizer. One is drought. He has had three or four years of dry weather, and frequently he does not know if he should invest in fertilizers because of prospects of continued drought. Second, the farmer may be short on necessary cash to buy fertilizer because of poor crops.