Convenience to Farmers Sparks Growing Trend to Liquid Fertilizers

USDA's grassland farming program is catching on in the Pacific Northwest, thanks to Benedict farm

PULLMAN, WASH.—Ammonia solutions and solutions of ammonium nitrate, of urea, of P_2O_5, of potassium chloride—growing availability and use of these is the trend in the fertilizer industry today. That is what R. L. Luckhardt, Agriform Co., Inc. (El Centro, Calif.), told those attending the 4th annual regional fertilizer conference here June 30 to July 2. Although such formulations have been little used in the Northwest heretofore, Luckhardt cautioned experiment station experts to get test programs under way this year to be prepared for farmers' questions next year when the materials become available here in volume.

There are at least three important advantages to these liquid fertilizers, according to Luckhardt. First, drill bands are taken up by plants without either rain or irrigation. To the water-conscious West, especially the dryland farming regions, this is most important. Secondly, drill bands of ammonia solutions have been found to get more nitrogen into plants at first than do bands of dry or gaseous ammonia materials. Furthermore, ammonia solution drill bands have sometimes been found to produce nitrate over longer periods of time than the anhydrous or dry forms. And thirdly, phosphoric acid has frequently been found to produce superior results when compared to superphosphates on such crops as citrus, vegetables, and alfalfa.

Farmers doing their own fertilizing with these materials will mean new opportunities for equipment manufacturers. Needed will be equipment adaptable to both drilling and spraying. Thus, such equipment will be multipurpose—suitable for fertilizing, fumigating, and pesticides spraying. Some equipment meeting these needs is available in the Midwest, but so far little has been available in the West. Luckhardt noted, however, that equipment is not the deterrent to wider use of the materials—to date, it has been limited fertilizer supplies.

Grassland Farming—The Benedict Farm. Government officials, university advisers, and fertilizer and other industry representatives have been telling farmers for years what various programs they should follow to get maximum yields. What may look like bookish theory doesn't always get applied by the farmers, at least in its entirety. So Pacific Northwest Plant Food Association decided demonstration would be necessary if its attempt to sell USDA's grassland farming program here was to be successful.

"How well," wondered a subcommittee headed by Todd Tremblay and George Wickstrom, "will the pasture seeding, fertilizing, irrigation, and management recommendations of Washington State College really pay off when all applied to a given farm?" They paid off dramatically so, according to Lavern M. Freimann, county extension agent at Bellingham, Wash.; so dramatically in fact that nearly every farmer in the region wants a similar farm.

Freimann admits there wasn't much new in the idea; it has been tried elsewhere. But PNPFA wrapped it up in new clothes for the Northwest and put it across. A depleted farm, carrying about "half a cow" per acre and requiring supplemental hay purchases to piece out the pasture, was selected as the demonstration farm (the Benedict farm near Bellingham). Through efforts of Tremblay and Wickstrom, fertilizer was made available by the association; Charles H. Lilly Co. donated seed; and Farmers Equipment Co., Lynden, provided the irrigation system at two thirds of cost. Fertilizer program for the first year, 1952, was 600 pounds of 3-10-10 or a like amount of 5-10-10. This year, they are using 300 pounds of 10-20-20. During the balance of the grazing season they add 70 additional units of nitrogen, an amount calculated to give the best pasture. Recommendations on seeding, irrigation, and pasture rotation have been followed. Results were impressive. For example, milk production of Benedict farm shows no sign of falling this year, while it is generally dropping off on other farms.

Zinc Deficiency. Zinc deficiency is plaguing farmers on newly reclaimed lands of Washington's Yakima valley and in the Columbia Basin project area. Frank G. Viets, USDA's Irrigation Experiment Station, Prosser, Wash., estimates as much as 1 million acres are subject to the problem. As a result, demand for zinc sulfate in the area has been heavy.

Viets said zinc deficiency symptoms were first identified in both field plots and commercial fields of corn in 1949 and beans in 1950. Since then, similar symptoms have been noted in such important area crops as sweet corn, grain, sorghum, soybeans, hops, grapes, flax, and tomatoes as well as on minor crops such as lima beans, Sudan grass, and castor beans. So far, symptoms have not been found on small grains, potatoes, onions, carrots, sugar beets, red clover, safflower, asparagus, peas, mustard, or peppermint. Because of knowledge gained in studying deficiencies on newly irrigated lands, the problem has been spotted on older irrigated lands, too, indicating a more general problem for the region.

During 1951 and 1952 agricultural

B. R. Bertramson (left) of Washington State College, chairman of the program committee, chats over the program with Earl Shaw, Chilean Nitrate Sales Corp., George Scarseth, American Farm Research Association, and Vincent Sauchelli, Davison Chemical

specialists recommended foliage applications of zinc sulfate for beans. This year they are recommending soil applications of $ZnSO_4$ because of its longer effect. Cost of applying the recommended eight pounds per acre is $4.00 an acre, which would be offset by a yield increase of 50 pounds per acre. Where used, zinc sulfate has increased yield about 500 pounds per acre, certainly justifying the cost.

While zinc applications will boost yields, exact understanding of all facets of zinc deficiency are not known. Currently under way are studies to determine how the amount of nitrogen and the carrier used affect zinc availability.

Trace Elements via Chelates. While zinc sulfate is helping Pacific Northwest farmers beat a trace element problem, work with iron and zinc complexes of ethylenediamine tetraacetic acid show promise for stone fruit growers of California. Nearly every California county has orchards or vineyards which can benefit from applications of zinc, boron, iron, manganese, or copper, according to C. E. Scott, University of California, Berkeley. Present methods are satisfactory for correcting boron, manganese, and copper deficiencies. But for iron, trunk injections are the only (and high cost) solution at present in calcareous soils, while more efficient methods than zinc sulfate sprays are needed for cherry, walnut, and grape.

Economic Guidance Needed. The economic analysis of various rates of fertilizer application can serve not only to increase the farmers income on the crops he is currently growing, according to W. R. Allstetter of the National Fertilizer Association, but also it can furnish a guide as to the crops he should grow to increase his net return. For the farmer with limited capital, such analyses may tell him how to ration his capital or help him to borrow more.

Guidance in the economic use of fertilizers is urgently needed by many farmers, said Mr. Allstetter. Fertilizer recommendations based on sound economics can probably do more to improve farming efficiency quickly than can any other factor.

High Fertilizer Use Predicted. The estimate that by 1965 our agriculture will consume about 40 million tons of fertilizer or 10 million tons of actual plant food is not at all fantastic, declared Vincent Sauchelli, Davison Chemical Corp. In the 1920's it would have been considered lunacy to predict a consumption of 22 million tons of fertilizer in 1953, he said, but that was what happened; in addition, about 30 million tons of lime was used. Sights should be set high, said Mr. Sauchelli, then let creative salesmanship hit the target.

MCP Use Increase Expected In Canada

2,4-D will remain most popular, however, because of its already strong position

SASKATOON, SASK.—MCP (2-methyl-4-chlorophenoxy acetic acid), older by approximately one year than its better known counterpart 2,4-D, has been used more in England and Europe than in North America, but its use here is expected to increase as farmers become more familiar with its potentialities. It is unlikely that its use will equal that of 2,4-D, however. These are the conclusions G. R. Fraser, Chipman Chemicals, Ltd., Winnipeg, related to those attending the 33rd annual convention of Agricultural Institute of Canada here June 22 to 25.

MCP's use overseas as contrasted to the use of 2,4-D on this side of the Atlantic stems from several reasons. 2,4-D's faster kill means a greater saving in moisture, an important factor in many regions here. Also important is the fact that Americans are satisfied with results from low dosages of 2,4-D whereas the British, for instance, prefer higher dosages permissible with MCP which give better control of semiresistant weeds. Likewise important is the cost of basic chemicals—phenol, a 2,4-D raw material is more plentiful here while Europeans have more *o*-cresol for MCP.

In tracing the development of MCP, Fraser noted that interest in it increased sharply when Minnesota workers demonstrated in 1949 the wider tolerance crops had to it. This wider tolerance is particularly true of flax, a highly susceptible crop that requires careful control of weedicide application. With the wider safety margin afforded by MCP, a greater number of weeds can be controlled, although flax is still considered susceptible and reasonable caution need be exercised.

One deterrent to wider use of MCP is its higher cost—nearly twice that of 2,4-D. Greater use should bring that cost down, he said. The high cost, however, is already offset to some extent by greater increases in yield; MCP in many cases provides greater return per dollar invested. It may not be as spectacular a chemical as 2,4-D, he concluded, but its use should gradually increase as farmers gain confidence in it.

Oil Seeds Stability Desired. While Canadian officials are urging farmers to step up oil seed production (AG AND FOOD, June 24, page 496), here are some of the possibilities B. C. Jenkins, University of Saskatchewan, sees for improvements in the industry: Sunflower, although introduced in the 30's to Canada but only recently of commercial importance, should gain in importance when better rust-resistant varieties become available. The photoperiodic response of soybean makes it unsuitable for western Canada; unless this is changed or the seeds are made to mature more rapidly, soybean will not be an important western Canada crop. Rape seems assured a place in the industry, especially if edible and other uses are developed for the oil in addition to its present use in marine lubricants.

An extensive program is under way—including radiation-induced mutation—to produce new strains of safflower. Present varieties used in the U. S. are not suited for the shorter season of Canada. Flax, mainstay of the industry, will have a better chance of competing with the other oil seed crops provided a large-seed variety high in oil having a low iodine number is developed. Taken together, these improvements Jenkins sees as lending to a more stable oil seed economy in Canada.

Free Energy Change Influences Uptake of Cations by Plant Roots

The free energy change in the ion exchange reactions between plant root and the substrate has a decided effect on the uptake of certain cations by the plant. The competition between the plant root and its environment for the available cations can now be placed on a quantitative basis. This was the opinion expressed by C. E. Marshall, University of Missouri, at the ACS Division of Colloid Chemistry's 27th National Colloid Symposium held at Iowa State College June 25 to 27.

Within the last several years it has become generally accepted that ion exchange is the first step in the passage of a cation from the substrate to the root. It is thought that three factors govern the exchange reaction against hydrogen at the root surface. These are the activity of the cation in the substrate, the corresponding activity of the hydrogen ion, and the free energy change for the exchange reaction. By growing soybean plants in several substrates in which the first two conditions were held essentially