Raise Efficiency of Utilization to Hold Down Costs of Irrigation, Fertilization

CHICAGO.—Rising raw materials prices and operational costs, and in many areas limitations in supply sources make it increasingly important from the economic point of view that maximum efficiency of utilization be attained in both irrigation and fertilization of agricultural crops. At the winter meeting of the American Society of Agricultural Engineers here Dec. 7 to 9, information secured in laboratory and field test studies was invoked to indicate possible methods of increasing utilization of both water and nutrients in plants.

In a round table discussion on the water requirements of crops, for example, D. R. Shockley, and L. L. Harrold of the Soil Conservation Service, USDA, discussed the availability of moisture in the "root zone" of soils and its effect upon the rate of plant growth. Forty per cent of the moisture taken up by plants from the soil comes from the upper quarter of the root zone, Shockley reported; another 30% comes from the second quarter, 20% from the third, and 10% from the bottom quarter of the zone. All soil moisture is not readily available for plant growth, he advised.

Evidence indicates that in many cases as much as 50% of the soil moisture is not readily available for rapid crop growth. Thus, knowledge of the capacity of various soil levels to hold moisture that is readily available for the maintenance of rapid crop growth is necessary for the design of irrigation systems, and for the formulation of recommendations for improved water application techniques, Shockley stated.

Further information is needed, he said, to indicate how much of the water in a given soil profile is actually very easily available for crop growth. Such information would aid in the classification of irrigated soils, permitting more accurate estimation of the optimum interval between irrigations, and of the maximum allowable moisture withdrawal before irrigation is initiated or repeated.

A study made at the Coshocton, Ohio, research station, according to Harrold, indicated that there is a direct relation between the amount and depth of irrigation and the yield of a given crop. Corn irrigated to a 12-inch depth with 4.30 inches of water yielded 160 bushels per acre, for example, and that irrigated to a 24-inch depth with 3.88 inches of water yielded 155 bushels per acre. Corn receiving no irrigation yielded only 116 bushels per acre, the study showed. It was found that moisture for the plants was withdrawn almost entirely from the top 14 inches of soil.

In view of water supply limitations and water delivery costs, Harrold said, it is essential that the design and operation of irrigation systems be based on the best available data concerning the interrelation of soils, crops, and water. A fundamental approach of this kind, he said, will permit economical operation, and the conservation of valuable water resources.

Plant food application, too, should be based on accurate determinations of the needs of both soil and crop. One method of increasing the efficiency of fertilizer use, according to A. C. Thompson of Thompson's Farms, is band fertilization. This method may in some cases cut fertilizer consumption in half for a given per-acre yield, Thompson said. However, fertilizer application requirements differ from crop to crop, and there is a need for more flexible application equipment which will permit varying the intensity of fertilizer application and its positioning in relation to the plant row. There is also a need for more accurately calibrated equipment for the broadcast application of fertilizers, Thompson declared. Such equipment should be sufficiently accurate that errors could be held to no more than 100 pounds per acre at most. Where subsurface application is employed, the equipment must enable the operator to place the plant nutrient accurately within reach of the roots, but not close enough to damage them by "burning."

A survey of sod crop fertilizer application practices in some 42 states, reported by H. A. Woodle of Clemson Agricultural College, revealed that—contrary to much popular belief—top dressing is probably the best method of maintaining an established sod, and results obtained with subsurface fertilizer application on established sods do not justify the added trouble and expense. There is, he said, general agreement concerning the time and method of applying lime and fertilizers for establishing sod; lime is worked into the top soil prior to seeding, and starting fertilizers are applied in bands just below the seed level, or are broadcast and worked into the upper portion of the seed bed, at the time of seeding.

DDT Residues Found to Be Cumulative in Soil

Quantities toxic to some plants reported at Rutgers conference

NEW BRUNSWICK.—Fields that have been treated with DDT for several seasons retain large quantities of the chemical in the cultivated top few inches of the soil, declared J. P. Reed of Rutgers University. As much as 19 pounds of DDT per acre have been found in corn fields, while over 100 pounds per acre have been found in orchards. Apparently, the compound does not leach but remains where it has been worked into the soil.

DDT may accumulate in potato fields to such an extent that more sensitive crops, such as tomatoes, may find the soil toxic, reported J. Campbell. As a general rule, fungicides, although certainly not without affect, affect potato flavor less than most insecticides. Before any insecticide or fungicide is recommended by Rutgers, the food technology department is consulted to determine the flavor effect on the foodstuff. Every lot of potatoes sprayed with a new insecticide or fungicide is checked by a taste panel.

These findings were reported at the tenth annual conference of New Jersey Insecticide, Fungicide, and Herbicide Retail Dealers, held at Rutgers on Nov. 19. County agents, agricultural chemicals retailers, representatives of the chemical industry, and members of the staff of the university discussed the pros and cons of many agricultural chemicals, and the tentative recommendations of the Rutgers' College of Argiculture for the 1954 season. Members of the staff presented their recommendations and explained them.

The value of methyl bromide for soil fungus control is being investigated with encouraging results, reported C. H. Haenseler. There is no good fumigant at present, chloropicrin being only fair, he said. Complete tomato nematode control was achieved at a level of two pounds of methyl bromide per 100 square

feet. In a lab experiment, using a polyethylene ground cover, one part of methyl bromide to 30,000 parts of soil gave 100% control for a two-foot depth.

Sweet corn wilt, spread by the corn flea beetle, was a serious problem last year, declared Haenseler. The most successful attempts to control the disease have been through the control of the carrier. DDT dust or spray is suggested when the first leaves unfurl.

Use of agricultural chemicals on forage crops is increasing and is being encouraged, according to R. S. Filmer. Spraying forage crops, even last year when infestation was not particularly severe, resulted in an average crop increase of almost 30%. For the greatest efficiency, the fields must be examined closely to determine the best time for spraying. For example, the number of spittle bugs in a field may be estimated by the wild carrot, which has a wide distribution in New Jersey and seems to be a favorite plant for this insect.

The speed of various insecticides varies widely and must be taken into account in evaluating their effectiveness, Dr. Filmer told the dealers. Lindane and oxychlor are fast killers, and dead insects may be observed within a half hour or so after application. Other chemicals, such as technical chlorinated camphene, are slow, and results may not be observable for several days. Farmers must realize that the slow acting chemicals may have a longer lasting effect than the others, and be more economical in the long run.

Parathion is not being recommended this year on the apple spray schedule, because it is suspected of impairing finish and lowering the efficiency of fungicides. Neither of these charges has been definitely proved, declared B. F. Driggers. The effect of dieldrin on finish is also in question, and methoxychlor and lead arsenate are to be recommended for curculio control.

Two spray schedules may be recommended for peaches in 1954. The Parathion schedule is considered more effective for the control of curculio, scale mites, and oriental fruit moth. The alternate consists of two benzene hexachloride treatments and a final spray with lead.

Peach Canker. Peach canker is becoming a serious problem in New Jersey, reported R. H. Daines. This disease attacks mostly the current season's wood, at the bud region. Another fungus frequently follows, infecting the healthy wood on each side of the canker. If the first fungus infection doesn't kill the branch, the second almost certainly will. Monocalcium arsenite, Bordeaux, and oil give good control of peach canker, Daines said. Ferbam, which is also used for peach leaf curl control can also fit into the canker schedule.

Variations in varietal response may cause some changes in the recommendations for control of apple scab, warned Dr. Daines. A combination of Captan or Crag 341 with a phenyl mercury fungicide will probably be recommended. Carbamates were found to be weak in last year's severe attack.

Fly Control. Bad sanitation can make the best chemical fly control ineffectual, said E. J. Hansens. Malathion plus sugar, lindane, and methoxychlor are recommended for houseflies. If these chemicals do not give complete control, space sprays containing pyrethins or allethrin plus synergist are an alternative. There are many places where DDT-, lindane-, or methoxychloro-resistant flies do not exist, and these materials will give the best and cheapest control in farm buildings. Diazanone, manufactured in Switzerland, gave six to eight weeks control with a 1% spray, but the material will not be available in this country until next year.

Although Lindane is relatively expensive, it may be more economical to use on poultry pests in the long run, since it controls poultry mites, lice, and feather mites. Some less expensive chemicals do not have the same range, and so may be more costly.

Chickweed. Chickweed, the major weed pest throughout central and southern New Jersey alfalfa fields, is becoming an increasing nuisance in the northern half of the state. A new alfalfa stand was reduced 30% in places where chickweed was not controlled. Yield increases of a half to three quarters of a ton per acre have been obtained when chickweed control was practiced.

The dinitros (4,6-dinitro-*o*-sec-butylphenol), Chloro-IPC (isopropyl-*N*-3-chlorophenyl carbamate), and IPC (isopropyl-*N*-phenyl carbamate) have been most satisfactory for chickweed control. The ammonium and amine salts and the parent acid of the dinitro are being used.

Chemical Residues. Since there are no residue tolerances on the new organic insecticides, it is important that the farmer utilize proved materials and apply them according to application schedules which will result in the lowest possible residue levels at harvest. B. B. Pepper pointed out that in some instances it might be more appropriate to accept some insect injury and maintain a low chemical residue level.

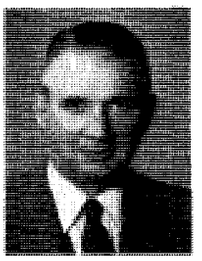
Early experience with some of the organic chlorinated compounds clearly demonstrated that improper use of these materials could result in a very undesirable quality of food, particularly with some of the root crops. At the present time, research indicates that a great majority of the insecticides used experimentally give a flavor difference between treated and untreated crops, declared Dr. Pepper. The formulation of the insecticide, especially solvents and possibly emulsifying and other conditioning agents, may affect the quality of the crop.

There is also a relationship between taste and quality of fruits and vegetables and the fertilization program, soil types, irrigation, and weather conditions. There may be a correlation between plant nutrient levels and insecticide applications on the flavor changes, Dr. Pepper said.

Industry

Shell Chemical Forms Ammonia Division

Shell Chemical Corp. has announced formation of a new ammonia division with headquarters in San Francisco. The new division will handle manufacture, distribution, and sales of ammonium sulfate, ammonia, and related products for agriculture and industry. George Monkhouse, vice president of Shell, will head the division. L. M. Roberts, general manager of manufacturing in Shell's New York headquarters, will go to San Francisco as the division's operations manager in charge of manufacturing, distribution, and marketing engineering.



George Monkhouse

Mr. Roberts will be in charge of the company's two ammonia plants—the older one at Pittsburg, Calif., and the recently completed one at Ventura, Calif. (AG AND FOOD, Dec. 23, 1953, page 1184).

V. C. Irvine has been named sales manager of the ammonia division.

R. C. McCurdy, president of Shell Chemical, said the decision to put all phases of the company's ammonia business under a unified management was made in view of the growing demand for ammonia fertilizer.

Reorganization of Monsanto's Inorganic Chemicals Division

More details on the reorganization of Monsanto's new inorganic chemicals division, which incorporates the company's former phosphate and Merrimac divisions, have been announced by the general manager, J. L. Christian.

Four operating departments—develop-