

SYMPOSIUM ON FERTILIZER USE AND WATER QUALITY

Introduction

Public concern for cleaner air, water, and soil has reached a level of extreme fervor. This concern is a vigorous extension of the philosophy of Thoreau and the conservation movement of the 1920's. The present campaign for a cleaner environment is likely to find infinitely more supporters than did the earlier movements of this nature. For one thing, there are many more people now and environment affects everyone. And more people cause an ever increasing demand for manufactured goods of all kinds, as well as more food and fiber. The efforts to meet the needs of our steadily increasing population tend to destroy the environmental values that we seek. This is the problem: production without pollution.

The economic production of food and fiber is largely dependent upon the use of agricultural chemicals. Probably $\frac{1}{3}$ to $\frac{1}{2}$ of our present agricultural production depends upon fertilizers. Since our agricultural land acreage is expected to remain essentially constant during the next half-century, each acre of cropland will have to produce more; it is certain that judicious use of fertilizers will play a vital role here. A great deal has been written in the popular press asserting that fertilizer use is a major contributor to the increased nutrient content of the nation's water supply. Unfortunately, research data on the subject is virtually non-

existent, and these claims can neither be substantiated nor refuted at this time.

Much is known about ion movement in soils, but most of this type of research has been directed toward efficiency of fertilizer use from the standpoint of crop yields. Transport of plant-available nutrients in surface runoff and groundwaters as related to modern fertilizer use has been virtually neglected. There is probably little cause for alarm in this respect, but research in this area is urgently needed. A number of watershed studies are presently being conducted by state and federal agencies that will provide limited data on the relationship (or lack of relationship) between fertilizer use and water quality. Much more research, involving a wide variety of soil, crop, and climatic situations will be needed to provide reasonable answers. The papers presented here are a part of a symposium organized for the purpose of presenting objective data and viewpoints on the subject. All of the symposium participants are highly respected professionals in their fields. Their words merit the attention of a concerned public.

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The Fate of Applied Nutrients in Soils

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Fertilizers are usually inorganic salts containing cations of potassium, ammonium, and calcium with anions of phosphates, nitrate, chloride, and sulfate. Much nitrogen is applied as anhydrous ammonia and as urea, the only organic compound important in the fertilizer trade. Fertilizers do not appreciably modify the kinds of cations in drainage water. Cations from fertilizers undergo exchange reactions so that calcium remains the dominant cation in the leachates from well-limed, agricultural soils. Among the anions, phosphates react with

soils and remain near the point of application. Nitrogen, regardless of fertilizer source, is normally transformed to nitrate which is not strongly held in the soil. Nitrate is the major concern in contamination of ground waters by fertilizers. Chloride and sulfate are not expected in harmful amounts. Anions in drainage water are accompanied by equivalent amounts of calcium and magnesium. All fertilizers even phosphates, may leach from very sandy soils.

What is fertilizer? What is in fertilizer that prompts concern about it as a source of pollution or contamination? What is the toxic principle in fertilizer?

If fertilizers are to be regarded as pollutants, they have to be considered in a special category. Fertilizers are not waste materials, combustion products, smogs, or garbages that are

discarded across the landscape as a means of disposal. Fertilizers are not applied to poison or to destroy or eradicate. The only suspected health hazard from fertilizers is nitrates. Our major concern with pollution from fertilizers is in the possible contamination of waters by nitrate.

Fertilizers are plant foods. They are usually inorganic salts containing mineral elements that are essential for the life and growth of living organisms. These are the same essential mineral elements that are already present in soils under natural conditions, and are necessary for growth of wild plants as well as for cultivated crops.

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