Chapter 1

Pesticides in the Soil Environment—An Overview

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The discovery of the potent power of certain synthetic organic chemicals for controlling unwanted organisms has led to the rapid rise in their use as pesticides. In less than 40 yr, synthetic organic pesticides have become a major element in modern agriculture production practices. The advent of pesticide use has coincided with the tremendous increase in agricultural productivity. Together with the adoption of improved varieties, the use of synthetic fertilizers to increase nutrient supplies, improved irrigation practices for water supplies, and more efficient machineries, synthetic organic pesticide use has been credited as one of the major contributors that modernized agricultural production. These innovations led to dramatic improvement in crop yields and nutritional quality of the products as well as efficiency in production management. Today, <2% of the population of the USA is producing a food surplus for domestic consumption.

The importance of pesticides to modern agricultural production practices is now well-recognized. Synthetic organic chemicals have essentially replaced inorganic chemicals and many tillage and cultural practices as the tool of choice for pest control. The recent trend toward conservation-tillage systems has also meant an increased reliance on chemical pesticide use for insect, weed, and disease control, although other means of pest control are constantly being sought, such as the integrated pest management approach combining nonchemical means with the chemical use for pest control. In this book, the term pesticides will refer to the synthetic organic chemicals now in general use. The term will be used in the most inclusive sense in that any synthetic organic chemicals that are manufactured for use in agricultural production to prevent or reduce adverse effects of pests, whether they are harmful insects, deleterious microorganisms, or unwanted plants, would qualify under this definition. Thus, the term includes all insecticides, fungicides, herbicides, fumigants, and other organic chemicals used for related functions. The advantages of these modern pesticides over other means of pest control include their effectiveness in controlling pests even when the chemicals are applied at such low levels as a few milligrams per hectare concentration. When pesticides are applied under appropriate soil and environ-