

Preface

Enormous increases in agricultural productivity can properly be associated with the use of chemicals. This statement applies equally to crop production through the use of fertilizers, herbicides, and pesticides, as to livestock production and the associated use of drugs, steroids, and other growth accelerators. There is, however, a dark side to this picture and it is important to balance the benefits which flow from the use of agricultural chemicals against their environmental impacts, which sometimes are seriously disadvantageous. Within this volume we explore a variety of issues which currently are subject to wide-ranging debate and are of concern not only to the scientific establishment and to students but also to farmers, landowners, managers, legislators, and to the public at large.

In the first article, T. M. Addiscott of the Rothamsted Experimental Station examines the use of nitrogen fertilizers to increase growth rates of agricultural crops and the problems associated with nitrate leaching from soils. He reviews the potential health hazards constituted by high nitrate levels, details a number of case studies such as winter wheat production, and discusses both the science and the politics of the nitrate problem. The role of agricultural fertilizers in promoting excessive growth of aquatic weeds in rivers and of algal blooms in lakes is then discussed by A. J. D. Ferguson and M. J. Pearson of the National Rivers Authority Centre for Toxic and Persistent Substances, together with C. S. Reynolds of the Freshwater Biological Association. Their article describes problems experienced with algal blooms caused by eutrophication and examines the sources of nutrients, demonstrating that phosphate levels commonly impose a controlling influence.

The impact of agricultural pesticides on water quality is next reviewed by K. R. Eke, A. D. Barnden, and D. J. Tester, also of the National Rivers Authority. Their article outlines the legislation governing the use of pesticides in the UK and provides information on the most used chemicals, their functions, toxicities, and routes for entering water courses. The article covers recent pesticide developments and considers how pesticides will be managed in the future so as to protect the aquatic environment. D. Fowler, M. A. Sutton, U. Skiba, and K. J. Hargreaves of the Institute for Terrestrial Ecology, Penicuik, show in their article on agricultural nitrogen and emissions to the atmosphere how airborne pollutants can result from agricultural practices. They examine the conditions which lead to emissions of nitrogen oxides, mainly NO and N₂O, from soils in which vegetation

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and an active microbial community are present, as well as the scale of emissions of reduced nitrogen as NH_3 from animal waste. These emissions make a major contribution to the pollutant burden of the atmosphere.

Drugs and dietary additives, their use in animal production, and potential environmental consequences are discussed by T. Acamovic of the Scottish Agricultural College and C. S. Stewart of the Rowett Research Institute, both in Aberdeen. Intensive systems of livestock production for food involve major inputs of chemicals which help to preserve the health and welfare of the animals by preventing nutritional deficiencies and inhibiting disease. Some dietary additives, such as growth promoting steroids and probiotics, are designed to enhance muscle mass and to produce leaner tissue as increasingly is demanded by consumers. The residues and metabolites of such additives may be innocuous, harmful or beneficial to man and the environment and these issues are examined in depth here.

The final article, by S. G. Bell and G. A. Codd of the University of Dundee Department of Biological Services, is concerned with detection, analysis, and risk assessment of cyanobacterial toxins. These can be responsible for animal, fish, and bird deaths and for ill-health in humans. The occurrence of toxic cyanobacterial blooms and scums on nutrient-rich waters is a world-wide phenomenon and cases are cited from Australia, the USA, and China, as well as throughout Europe. The causes, identification and assessment of risk, and establishment of criteria for controlling risk are discussed.

We believe that this collection of reviews provides an excellent treatment of some of the most important issues connected with the use of agricultural chemicals and their environmental impacts. The authors all are recognized as experts in their subjects and together they provide an authoritative and critical overview of this highly topical area of concern. The issue as a whole will be an extremely valuable source of information for all students, scientists, agricultural practitioners, consultants, managers and legislators with interest in agriculture and the environment.

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