

PREFACE

Air pollution is a problem which now affects every part of our planet. While the effects of air pollution on human health are the most important concern, the impacts on crop production, forest vitality and biodiversity may also have considerable implications for human welfare. The most serious and most visible air pollution problems across the planet are found in and around major cities and industrial areas. However, secondary pollutants such as ozone tend to reach their highest concentrations at some distance from the urban and industrial centres that are the source of their precursor pollutants. Hence, secondary pollutants may cause significant environmental impacts over large expanses of rural regions.

The major local air pollution problems arising from domestic coal combustion, industry and power generation which historically affected Europe and North America are now largely a thing of the past. However, the pollution problems associated with the dramatic increase in vehicle numbers and emissions over the last 50 years still remain a significant issue which require further action. Over the same period, emissions from industry, energy production and vehicles have increased in many regions of Asia, Africa and Latin America. Furthermore, the climate in these regions is often more favourable than that in Europe and North America for the formation of ozone. Field observations and experiments that are described in this book demonstrate visible leaf injury, declines in forest health, and loss of crop yield as a result

of air pollution problems, in countries such as China, Mexico, Egypt and India.

The effects on crop production and forest vitality due to this shift in the global patterns of air pollutant emissions and concentrations remain poorly understood. In many countries, the amount of research is extremely limited and awareness of the impacts caused by air pollution is very low. Air pollutants are known to cause significant effects on crop and forest yields in the absence of any recognisable injury symptoms. Hence, it is quite probable that significant yield losses are occurring in many regions of the world without the problem having been recognised. Such impacts may have very serious consequences, both for the national economy and for the livelihoods of individual farmers, in many countries where industrial and urban development are associated with a rapidly increasing population.

However, policies to reduce emissions are often technically demanding and costly, and need to be balanced against a range of other economic and social priorities. This means that information is urgently needed in order to fully assess the possible benefits of reduced pollutant emissions in terms of impacts on crops, forests and the wider natural environment, as well as human health. We hope that this book will contribute both to an increased awareness of the problem and to the development of tools to better assess the impacts of air pollution on crops and forests in all parts of the world.

Our aim in this book is to provide the first truly global assessment of the scale of the direct impacts of air pollution on crops and forests. We felt that such an assessment had to be based on the perspectives on the ground from individual countries. Therefore, the core of this book comprises assessments of the problem by experts from 12 different countries on every continent. These contributions describe the evidence of air pollution effects on crop yields and forest vitality in the context of current air pollution emissions and concentrations, and in the context of policies for the management of air quality and natural resources. We are most grateful for the contributions of all these experts in providing a range of different perspectives and views on air pollution problems.

We also wanted to place these studies in a broader global framework. Therefore, the book provides an overview of how

emission patterns have changed over the last 30 years, and attempts to present a global assessment of the scale of both current and future impacts of ozone and sulphur dioxide. This assessment clearly indicates the growing significance of ozone as a global constraint on crop production over the next two decades based on current projections and policies. Finally, we aim to place this issue in a wider socio-economic context. This is achieved by evaluating methods to translate from biological to socio-economic impacts by quantifying the benefits of air pollution abatement, including non-marketable environmental goods and services.

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