Book reviews

‘revolutionary’ changes, while change in the UK has been more incremental in nature.

International agricultural policy reform under the aegis of the World Trade Organisation is slowly taking place and there is potential for a convergence of policy design between North America and Western Europe. Where government support to agriculture continues, it is more likely to be justified in more direct ‘purchaser-provider’ terms than ever before. Farmers and others will be contracted by the state to produce the public environmental goods that an increasingly wealthy society demands. This could produce considerable change as subsidies to farmers are argued for in terms of individual merit rather than a collective good. What is this likely to mean for agri-environmental strategies that so far have been based on continued reform of agricultural policy rather than its abolition?

Chapter 6 assesses how far the scaling down of market price support and the ‘decoupling’ of public subsidies are likely to benefit the environment, and compares the American and European cases for retaining some form of government support to agriculture on environmental grounds.

In Chapter 7 the various threads of the book are drawn together to present a comparison of the origins, evolution, and likely development of agri-environmental policy in the US and EU. The chapter reflects on what has been achieved, and seeks to identify what countries can learn from each other.

As with all books of this type there is considerable use of acronyms/initials. They are generally explained but occasional slips occur to mystify the uninitiated — but the good list of abbreviations in the front of the book alleviates the problem.

While the book is written as a text for senior undergraduates and post graduates in agricultural and environmental economics, it is suitable for a broad range of readers who wish detail and analysis of the socio-political element in environmental issues.

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Climate change and global crop productivity

‘This book examines the case for man-induced climatic changes, the role of agriculture in these apparent changes, and the impact of those changes on agriculture.’ (p. 4). Introductory chapters, in parts I and II, discuss the case for and the importance of climatic change and variability as well as agricultural contributions to greenhouse gas emissions. ‘Agriculture provides both sources and sinks of greenhouse gases.’ (p. 37). Significant sources discussed include CH4 from flooded rice paddies and manure ponds associated with intensive animal industries, N2O released from nitrogen fertilizers and CO2 from the burning of crop residues and bare fallowing. Reductions in emissions discussed include reduced energy use through reduction in tillage and elimination of bare fallow. Sinks are increased through introduction of no till and reduced tillage systems which influence soil organic matter levels and increased plantings of woody perennials, in particular trees.

Part III contains chapters developed from a crop ecosystem perspective in which the impact of climate change is discussed. Each of the first 11 chapters of part III deals with a major world food, fibre or forage crop, reviewing the likely impacts of climate change on crop productivity, and then concluding with a useful summary and suggestions for future research. Interesting comparisons are made on the variable impact of climatic change on a wide range of crops belonging to groups exhibiting C3, C4 and crassulacean acid metabolism (CAM) photosynthetic pathways. Within the C3 group, legumes are compared with non legumes. Root and tuberous crops are included, along with trees, grasslands, rangelands, cereals, cotton and vegetables.

The conclusions include the following.

1. Crop legumes are expected to benefit more than non-legumes from increased CO2 concentrations, due to their ability to symbiotically fix atmospheric N2, thus enabling them to cope with the predicted lower levels of tissue protein.
2. Root, tuberous and woody perennial crops have an inherently large sink capacity for CO2 because of their ability to translocate C compounds to their storage organs or woody tissues.
3. C₃ plants are expected to increase their production to a greater degree than C₄ plants which are more efficient in using CO₂ because of their ability to reduce photorespiration.

4. CAM plants are inherently high in water use efficiency, due to their ability to open their stomata at night to take in CO₂ and should extend their adaptive range in a warmer climate.

5. Grasslands and rangelands are most likely to experience a change in species composition in an environment of increased CO₂; legumes may become more prevalent at least in the short term.

6. Grain quality is expected to decline when yields increase under increased CO₂.

The final 3 chapters of part III discuss the changing impact of weeds and pests on crop production, soil organic matter and the interactive effects of a range of greenhouse gases and UV-B. ‘In the final analysis, if climatic change occurs gradually, production agriculture will be able to adapt to such changes.’ (p. 402).

Overall, this section is more comprehensive in its treatment of a wide range of crop types than many other like-publications, most of which tend to concentrate on a narrow selection of crop types. A bonus with this book is its coverage of the complex area of interactive effects associated increased levels of CO₂ and temperature rises. Possibly an area that could have been expanded upon was the influence of global warming on fruit set and fruit quality in fruit trees and vines.

Mitigation strategies are discussed in part IV, with emphasis on the role of plant breeding in providing adaptation to the predicted future climatic conditions. The two chapters in this part include some useful examples of likely interactions between traditional plant breeding and the future role of genetic engineering. Genetic engineering is seen as an aid to plant breeding and not simply as a replacement. ‘Molecular biology tools will never replace the input and role of crop breeders in improving agronomic traits, but these tools will enable them to be more responsive in both time and breadth of environmentally sensitive traits to meet agricultural market needs and opportunities.’ (p. 433).

A range of genes, which can assist in the amelioration of abiotic stresses induced by climatic change, is discussed in both chapters.

Finally, part V deals with likely economic and social impacts of climate change on global, regional and local food production and trade. This chapter uses a series of predictive models that assume a significant increase in world population occurring at the same time as the changes in climate. The main conclusions are that food production will be able to cope with increasing world population in a changed climate and that the major problem will be one of difficulties at the regional and local level where food distribution will be unequal. In addition, the authors note on p. 452, ‘...if farmers are unable to adapt, or adjustment costs are substantial, then impacts could be more severe.’

The editors have succeeded in producing a comprehensive review of recent research on the impact of climate change on agriculture. The book is very well presented and easy to read with extremely useful and extensive reference lists at the end of each chapter. The emphasis on the ecosystem approach makes it useful reading for environmentalists as well as those working in agriculture.

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