Mathematical Models in Agriculture. Quantitative Methods for the Plant, Animal and Ecological Sciences, 2nd edn. Eds J. H. M. Thornley & J. France. 906 pp. Wallingford, UK: CABI (2007). £150.00 (Hardback). ISBN 0 85199 010 X.

The need for predictive mathematical models in agriculture has perhaps never been more important due to a conjunction of several independent factors, including accelerating rates of technological change and the uncertainties posed by climate change and globalisation. The impacts of these issues are best explored by predictive modelling, particularly in light of the current and inexplicable decline in research funding to solve agricultural problems. Because of this, this new edition of ‘Mathematical Models in Agriculture’ is most welcome and timely.

This is a large, challenging and exciting volume, covering a wide variety of topics. The book starts with an elegant introduction into the role of mathematical models and modelling techniques, and then gives a variety of general applications and principles. As well as a description of basic biological processes, including growth functions and models, it then gives simple ecological models and details methods of capturing descriptions of environmental and weather conditions. This is followed by summaries of models applied to crops and animals, in varying levels of detail.

Notable and valuable features are a mathematical glossary, which gives several definitions and derivations to aid the reader, exercises for every chapter and every section within each chapter. However, these exercises are at the level of ‘interesting problem’ or ‘intellectual challenge’. Hence, whilst they will be stimulating to the advanced student they will probably be of little help for introducing a topic to a newcomer.

Some gaps were apparent to this reviewer. Firstly, the restriction of the book to deterministic models, whilst well argued, limits the scope of the book. Whilst stochastic models may be technically complex, we live in a variable world surrounded by uncertainty. When modelling many phenomena, the variability of outcomes may be as important as the expected outcome, and it is variability that determines risk. Therefore, approaches for predicting variability of outcomes would have been welcome. Secondly, a major lacuna is the absence of any reference to population or quantitative genetic models, as these are classic examples of predictive mathematical models that have been successfully applied to many aspects of modern plant and animal production, as well as wildlife ecology. Lastly, a disappointment to me was the treatment of animal diseases, i.e. epidemiology. This is a rich, rewarding and currently active area of modelling, which would have benefited from a development from first principles. These are instructive and lay the way for robust interpretation of more complex models. Instead, three somewhat complex case studies are presented, from which general principles are elusive.

These perceived gaps apart, this is a valuable volume which should serve practitioners in the art of applied mathematical modelling well. The book is thorough, well written, and is of considerable help to people wishing to develop a wide variety of models. Numerous applications can be foreseen, particularly in topics such as predicting the carbon footprint and gaseous emissions from various production systems. The authors are to be congratulated.

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Nitrogen and Phosphorus Nutrition of Cattle: Reducing the Environmental Impact of Cattle Operations, eds E. Pfeffer & A. N. Hristov. 288 pp. Wallingford, UK: CABI Publishing (2005). £65.00 (Hardback). ISBN 0851990134.

Nitrogen and phosphorus excretions from cattle potentially present significant sources of pollution. With increasing legislation to control pollution in many countries, it is vital that environmental impact is considered in all aspects of the design and operation of cattle production systems. Although environmental impact can be reduced by appropriate manure storage, handling and application protocols, there