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# Book reviews

**Crop–soil Simulation Models: Applications in Developing Countries**
R.B. Matthews, W. Stephens, CABI Publishing, Wallingford, Oxon, UK, 2002, 304 pp. Price: US$ 100 (hardback). ISBN 0-85199-563-2

In recent years crop–soil simulation models have gained acceptance in agricultural research and development and have been put to several uses in the developing countries. This book presents the review of the literature on past and current applications of crop–soil simulation models in general, identifies limitations of such models, characterizes groups of end-users of the models, and attempts a synthesis of where such models might be useful in the future in contributing to system-based, poverty oriented research projects in developing countries. The subject matter of the book is divided into five parts comprising 16 chapters. In chapters 2–7, the models are discussed as tools in research. In these chapters, the authors describe how models may contribute to genotype improvement and crop management and to fitting of crops into overall farming system, and how crop models have contributed or could contribute to the policy-making process at the national and international levels. Under crop genotype improvement, it is suggested that increasing the availability of a large number of crop models will provide the opportunity to improve the efficiency of the crop improvement process. Several examples are cited in the book where crop models have been used in crop improvement. However, the authors point out that there may be issues faced by plant breeders where modeling may be of limited value.

The authors have also looked at how researchers have used crop models for crop management. Starting with the examples on analysis of potential yield and yield gaps, they describe that models have been used for decision making in agronomic management of crops such as soil surface management, planting, water management, nutrient management, pest and disease management, weed management, and for predicting optimal harvesting dates for crops. In the section on the application of crop models in cropping and farming systems, they describe the literature on fitting crops into the cropping systems and into the overall farming systems and they also describe the attempts made to use crop simulation models in association with models of other farm components. In the subsection on evaluating sustainability, they give interesting and useful examples where long-term C and N changes have been studied in response to cropping systems management. It is highlighted that the main limitation in using crop simulation models for analysis of long-term trends is that they have not been thoroughly validated and in most cases need upgrading to incorporate soil processes needed for evaluating sustainability. They also mention that modeling will become

an increasingly important tool for the study of sustainability and environmental problems because there are no other reasonable approaches to quantify the complex processes involved.

In chapter 6, several examples have been given where linear programming and dynamic simulation approaches have been followed for regional and national level planning. However, the use of models at the policy making level in developing countries has not gained acceptance as yet and would require more time to see any impact. In the chapter on global level processes, the authors have described the work on the effects of climate change on likely impact on food production in the world. Progress made in modeling the emission of greenhouse gases particularly from the rice-ecosystem is also being presented. Effects of ENSO on food production in the world and how the information on ENSO could be used for agricultural decision making to minimize climatic risks using crop models have also been described.

Part 2 of the book (chapters 8–11) deals with the application of models as decision support tools. After introducing the subject of decision theory and decision support systems, the authors review how the crop models have been used for operational decision making and they give examples of pest management, irrigation scheduling, and optimizing fertilizer application to the crops in the various environments. For multiple decision support the extensive use of GOSSYM/COMAX expert system operated in the USA has been cited as a successful application of a cropping system model for advising growers. In chapter 10, the authors describe the use of crop models to support strategic decision making to formulate long-term policies on plans at farm, regional or national level. Use of simulation models in land-use planning, planning for climate change, crop forecasting, planning of irrigation, and assessing the benefits of new technologies are described and how models have been used in collaboration with farmers and extension agents for developing farm management strategies. In chapter 11, the authors analyze why the uptake of decision support systems been so poor. The constraints for poor adoption may relate to poor model construction, marketing and support constraints, technical and operational constraints, and user constraints.

In part 3 (chapter 11), the authors discuss the best use of the models for computer-aided learning (CAL). Examples are presented of crop models that have been used in the past as a tool for teaching and deliberate efforts were made for transferring systems approach to less developed countries through collaborative research projects. Limitations and constraints of models in educational context are also presented. In chapter 13, the authors discuss in detail the group of people who might be expected to benefit from the use of crop simulation models. These include researchers, consultants, educators and trainers, policy makers, extensionists and the farmers. The potentials and limitations for using the crop models by various stakeholders are also presented. Many of the stakeholders, such as farmers especially in developing countries, may not be able to use crop models. In such cases, it is suggested that the objectives of decision making and its uptake could be achieved more by interacting with them.

In chapter 14, the authors identify the cases where they think crop–soil models have made some impact and they discuss various factors that have contributed to

the impact. In chapter 15, key areas are highlighted where models could play a useful role within the natural resources systems approach. It is suggested that a shift in thinking towards a more people centered approach is required which considers the totality of the ways in which people make their livelihoods. This chapter makes an interesting reading for the future direction of work in modeling and its applications. In the concluding remarks the authors summarize all the issues related to the soil–crop models and decision support systems and suggest future directions for the development and applications to benefit the rural communities and to protect the environment.

The subject matter of the book is organized in a very logical and lucid manner which makes the reading interesting. There are 30 pages of references. I consider this book to be a very useful reference for various stakeholders involved in agricultural research and development in the developing countries, especially the young scientists interested in simulation modeling applications. It will also be useful for the investment donors looking for more efficient ways of using their funding resources for improving rural livelihoods. Because the book is costly it is expected to find a place in the libraries of the developing countries.

Piara Singh
*International Crops Research Institute for the Semi-arid Tropics (ICRISAT)*
*Patancheru 502 324*
*Andhra Pradesh*
*India*
*E-mail address:* p.singh@cgiar.org

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**Sustainable food and agriculture**
I.G. Malkina-Pykh and Y.A. Pykh. WIT Press, Southampton, Boston, 2003, UK, 376 pp. Price: $183 (Hardcover). ISBN 1-85312-937-2

With an increasing human population and its subsequent demand for food, clothes, and housing, this planet is currently experiencing an accelerated worldwide degradation of the natural resource base, including soil, air, water, plants, and animals. Although "Green Revolution" has enabled global agriculture to keep up with increasing demand for food over the past few decades, land degradation, frequent droughts, flooding, and other agriculture-related factors have negatively contributed to global food supply, and the problems of food shortages, malnutrition, and starvation are widespread. Moreover, the global food supply has also increasingly been threatened by terrorism, political unrest, and social disruptions. Ensuring a sustained supply of wholesome, fresh, and healthy food while maintaining ecological or environmental integrity and social and political harmony has become a major challenge for the present and the future generation.