Ecophysiology of Tropical Intercropping

By H. SINOQUET and P. CRUZ (Editors), Institut National de la Recherche Agronomique (INRA), Paris, 1995. 483 pp. Price 195 francs. ISBN 2-7380-0603-5 ISSN 1159-554 X.

Intercropping is a common practice in the tropics, and often has an advantage over sole cropping for improved crop productivity and land sustainability. This book describes an ecophysiological framework for tropical intercropping in order to improve the productivity and sustainability of intercropping systems. Based on the framework, the book is divided into 5 sections: (1) Manipulation of micro-climate and soil resources by intercropping; (2) Resource partitioning between mixture components; above and below-ground interactions; (3) Plant responses to changes in resource availability; physiological and morphological responses; (4) Analysis and simulation models of mixed crop growth and development; and (5) Tropical case studies. The book is a collection of papers selected from communications presented at the First International Meeting on the Ecophysiology of Tropical Intercropping, held in Guadeloupe, French Antilles, in December 1993. Of the 38 papers contained in the book, some are invited reviews of several key areas in intercropping, while others describe findings of the authors from their own research. As the editors admitted, some papers do not fit well into the overall framework, although they may make important contributions in other areas of ecophysiology. Some other papers cover a wide range of topics and would be difficult to be assigned to any of the 5 sections mentioned above.

The book covers different types of intercropping, including annual crop mixtures, agroforestry and grass-legume pastures. The strength of the book is that productivity and sustainability of different intercropping systems are compared and explained in various physiological terms (*e.g.* paper by Ong to compare soil resource aspects of intercropping of annual crops and agroforestry). A particular emphasis is given to the utilisation of solar radiation. Radiation interception and radiation use efficiency (biomass produced per unit radiation intercepted) are examined for different intercrop systems in a number of papers (*e.g.* cereal-legume, multipurpose tree species-annual crops, crop-weed, shrub-grass and forage crops). Simulation models on radiation interception have been described by different authors for some of these intercropping systems.

Another strength of this book is the excellent descriptions of experimental and analytical methods useful for intercrop research. These methods include experimental techniques of isotopes, phytometers and radiation balance. A paper by Howard *et al*. describes methods of partitioning both radiation interception and water use between components of leucaena-maize agroforestry. These techniques have a wide applicability to different intercropping systems. The book demonstrates that recent advances in experimental techniques and simulation modelling have improved our understanding of intercrop productivity.

The book also highlights areas of deficiency in ecophysiology of tropical intercropping. One area is the long-term use of soil nutrients in intercropping, as pointed out in a paper by Horst. He mentions several long-term advantages in nutrient use of intercropping systems over rotation of sole crops, including reduced nutrient loss, higher biological nitrogen fixation and more efficient mobilisation of soil nutrients. Long-term experiments are rare, but are required to monitor changes in soil nutrients under different cropping systems.

The book is well presented, and most papers are easy to read, considering that a number of authors are from non-English speaking countries. It is useful for agronomists and physiologists interested in intercropping systems, particularly radiation interception and simulation modelling.

Shu Fukai
Department of Agriculture
The University of Queensland