

## Preface

Arid and semi-arid zones comprise approximately 40% of the world land surface. Plant productivity in these zones is limited by water. For instance, the annual production of dry matter ranges from 25 to 400 g/m<sup>2</sup> in the arid zones, and from 250 to 1000 g/m<sup>2</sup> in the semi-arid zones (Fischer and Turner 1978). These values are much less than those of up to 3000 g/m<sup>2</sup> for areas with abundant water (Fischer and Turner 1978). The Mediterranean environment is one of the four climatic regions of the arid and semi-arid zones. Mediterranean environments are characterised by cold, wet winters, and hot, dry summers. The main environmental constraints to the productivity of crops, pastures, and trees in these environments are high temperatures and water deficits during the summer and, on some soil types, transient waterlogging during early winter. The Mediterranean climatic region of Australia contributes about 60% of the cereals, 50% of the oilseeds, 90% of the lupins, and 60% of the pulses produced in Australia. With the potential change in climate through global warming, the impact of waterlogging, high temperatures, and water deficits on the productivity of crops, pastures, and trees are set to increase for the foreseeable future. Without new management practices together with breeding strategies, annual crop, pasture and tree productivity could be reduced by half.

There is no doubt that the major challenge for agriculture in the near future is to supply enough food for a growing world. With increasing population growth, agriculture and agro-forestry are increasingly being pushed to marginal lands, where water availability is the most important limiting factor. An understanding of plant adaptation to water-limited environments is essential to tackle these challenges in a sustainable way. During the last 15 years, major advances have been made in our understanding of the agronomic, morphological, and physiological mechanisms of plant adaptation to water-limited environments. In particular, there is greater understanding of the interaction and integration of these mechanisms on productivity and yield and their significance in breeding and selection for drought tolerance. These advances motivated us to organise a symposium that evaluated strategies that land managers and researchers can undertake to improve the productivity and sustainability in semi-arid Mediterranean climatic zones. This symposium

was held during 20–24 September 2004 at the CSIRO Centre for Environmental and Life Sciences, Perth, Western Australia, and this volume reports the selected proceedings with relevance to agriculture. The symposium brought together leading researchers and farmers as well as consultants and policy makers to integrate research on plant adaptation to water-limited environments with the view to improve the productivity and sustainability in Mediterranean climatic regions. A second feature of the symposium was that it led to the identification of areas for future research. The symposium used the occasion to pay tribute to Dr Neil C Turner for his distinguished contribution to research and grain industry development in water-limited environments of Australia and other parts of the world.

The papers in this special issue originate from presentations at the symposium, revised to include comments and suggestions made during discussion, and all are peer reviewed. This publication represents the combined wisdom of all 108 attendees at the symposium, and provides a snapshot of current thinking of the ways in which environmentally sustainable and profitable farming systems may be developed in order to improve the productivity and sustainability in Mediterranean climatic regions.

The symposium organisers would like to thank the Grains Research and Development Corporation, the Rural Industries Research and Development Corporation, the Australian Academy of Science, the Department of Agriculture of Western Australia, The University of Western Australia, the Australian Wheat Board, the Australian Society of Plant Scientists, The Centre for Legumes in Mediterranean Agriculture, the Export Grain Centre and Alcoa World Alumina Australia for financial support, CSIRO Centre for Environment and Life Sciences for providing the facilities, Ms Christiane Ludwig, Ms Renee Buck, and Ms Mavis Dias for their assistance with the symposium.

Jairo A Palta

*CSIRO Plant Industry, Centre for Environment and Life Sciences  
Private Bag No. 5, Wembley, Perth, WA 6913, Australia  
Tel.: +61-8-9333-6611; fax: +61-8-9387-8991  
Email: jairo.palta@csiro.au*