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Foreword

Drought pervades dryland farming globally, with major impact on crop productivity, but it is not a constant. Every season is different and its detail not predictable. Seasonal climate variability generates diversity in incidence, timing, and severity of water limitation during each crop cycle, compromising simple approaches to optimising effective use of available water. Climate trends associated with anthropogenic climate change are exacerbating these risks and uncertainties. In dryland farming, improving the effective use of water can be considered by interventions across a range of scale – from cropping system, to crop, and to plant. **The InterDrought-IV Conference** (9–13th September 2013) served as a platform for presenting and debating key issues and strategies relevant to increasing the yield and stability of crops under drought conditions by system, crop, and plant manipulation approaches. There is an increasing demand in both public and private research sectors for connectivity among the diverse set of disciplines involved with the diverse approaches operating across this range of scale in order to advance practical solutions to drought prone farming.

The conference was structured into sessions to consider opportunities at system, crop, and plant scale plus some specific regional case studies. A selection of eight papers that were presented at the conference constitute this special issue. In the first two papers, Kirkegaard *et al*. and Vance *et al*. present studies on maximising water productivity via manipulations at whole farm and cropping system scale for grain crops in Australia and Bangladesh, respectively. The studies highlighted the significant gains in water productivity possible by modifying factors such as efficacy of fallow weed control, sowing technology and timing, use of break crops, and N management. In the subsequent two papers, Hammer *et al*. and Sprigg *et al*. focus on adaptations at crop scale and seek optimal combinations of genotypic attributes and management systems for specific environments for sorghum in north east Australia and wheat in south west Australia, respectively. They highlighted significant yield and production risk advantages associated with specific adaptation. Breeding improved varieties for water-limited environments is a critical avenue for increasing yield and stability of crops under drought and the focus topic of the next two papers. Trethowan and Mitchell *et al*. present studies on aspects of enhancing delivery of advanced varieties for wheat and rice respectively. They consider efficiencies possible from better exploitation of genetic resources, more relevant phenotyping, better ensuring farmer acceptance, and better leveraging of the materials generated by international centres. The final two papers present case studies on crop adaptation to water-limited environments for common bean in Sub-Saharan Africa (Beebe *et al*.) and wheat in Australia (Richards *et al*.). In the former, the focus is on genetic means and the importance of harvest index to sustain yield under drought stress, while needing to address simultaneously soil fertility and other constraints that limit expression of drought resistance. In the latter, yield advance is analysed and it is observed that improvements have come from both changed management and genetics, which have enhanced water use efficiency and harvest index.

The **InterDrought-IV Conference** offered a unique and timely platform to explore the state of the science on crop

adaptation to water-limited environments and the possibilities for improvement. The intent was to obtain an integrated view of progress across disciplines (agronomy, physiology, modelling, breeding, genetics, molecular biology) in order to facilitate the needed connectivity among disciplines for effective advance. We anticipate that this selection of eight papers from the conference, published as a Special Edition of **Crop & Pasture Science**, along with associated special issues from the conference published in **Functional Plant Biology** and Journal of Experimental Botany, will help the trans-disciplinary connectivity required to advance the practical solutions to drought-prone farming that will be needed to support the critical global endeavour on securing sufficient food production.

Issue Editors

Graeme Hammer
The University of Queensland, Brisbane

Robert Belford
Curtin University, Perth

Richard Bell
Murdoch University, Perth