Foreword

One of the major challenges facing mankind is to provide an equitable standard of living for the present and future generations: adequate food, water and energy, safe shelter, and a healthy environment. Human-induced climate change and increasing climate variability, as well as other global environmental issues such as land degradation, loss of biological diversity, and stratospheric ozone depletion, threaten our ability to meet these basic needs.

The WMO co-sponsored Intergovernmental Panel on Climate Change (IPCC) has concluded that human activities—primarily burning of fossil fuels and changes in land cover—are modifying the concentration of atmospheric constituents and their capacity to absorb or scatter radiant energy. Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. At continental, regional, and ocean basin scales, numerous long-term changes in climate have been observed. These include changes in Arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns, and aspects of extreme weather including droughts, heavy precipitation, and heat waves.

Eleven of the last 12 years (1995–2006) rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850). The total temperature increase from 1850–1899 to 2001–2005 is 0.76°C. More intense and longer droughts have been observed over wider areas since the 1970s, particularly in the tropics and subtropics.

Climate change and variability, drought, and other climate-related extremes have a direct influence on the quantity and quality of agricultural production, and in many cases, they can adversely affect it, especially in developing countries, where technology generation, innovation, and adoption are too slow to counteract the adverse effects of varying environmental conditions. For example, inappropriate management of agroecosystems, compounded by severe climatic events such as recurrent droughts in West Africa, have tended to make the drylands increasingly vulnerable and prone to rapid degradation and hence desertification. Even in the high rainfall areas, increased probability of extreme events can cause increased nutrient losses due to excessive runoff and waterlogging. Projected climate change can influence pest and disease dynamics, with subsequent crop losses. Improved adaptation of food production, particularly in areas where climate variability is large, holds the key to improving food security for the global population.

The range of adaptation options for managed systems such as agriculture and forestry is generally increasing because of technological advances, especially seasonal to inter-annual climate forecasting, thus opening the way for reducing the vulnerability of these systems to climate change. However, some regions of the world, particularly developing countries, have limited access to these technologies and to appropriate information on how to implement them.

Seasonal to inter-annual climate forecasts are expected to further improve in the future providing a better understanding of dynamic relationships. However, the main issue at present is how to make better use of the existing information at the farm level. The Regional Climate Outlook Forums now offer an outstanding opportunity to focus on these regional and local issues. Ensemble predictions appear to show the most promise, but the spatial scales need to become even smaller, in order to promote field applications of these forecasts. Pilot projects demonstrating the application of such information have great potential, so direct participation by the farming communities in these pilot projects is essential to determine the actual value of forecasts and to identify the specific user needs. Different communication techniques, when adapted to local applications, may assist in the dissemination of potentially useful information to the farmers and to decision makers.

It is with this background that WMO organised a meeting of its Expert Team on the Impact of Climate Change/Variability and Medium-to-Long-Range Predictions for Agriculture, which was established by the WMO's Commission for Agricultural Meteorology (CAgM) at its thirteenth session (Ljubljana, Slovenia, 10–18 October 2002). The meeting was co-sponsored by the Queensland Department of Primary Industries and Fisheries, and it was held in Brisbane, Australia, from 15 to 18 February 2005.

The Expert Team comprised 10 international experts from the broad disciplines of agriculture and climatology. In order to add further value to this international meeting, the agenda was broadened, thereby allowing the team to share its insights with a group of Australian and New Zealand scientists working in the field.

This Special Issue of the *Australian Journal of Agricultural Research* brings together 8 papers presented at the Expert Team meeting. I hope that they may serve as a useful source of information for all agencies and organizations interested in strategies to cope with climate change/variability and in the applications of seasonal to inter-annual climate forecasts at the farm level. I wish to thank all the authors for their valuable contributions and the editors for their assistance in highlighting this issue.

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