This page intentionally left blank
Contents

About the Author vii
Preface ix

1 Introduction 1
2 Components of Irrigation and Drainage Systems 11
3 Management 36
4 Operation of the Main System 64
5 Operation at the On-Farm Level 122
6 Maintenance 180
7 Training 218
8 Irrigation Management Transfer and Organizational Restructuring 248
9 Performance Assessment, Monitoring and Evaluation 293

References 347
Appendix 1. Scheduling Irrigation Water Exercise 351
Appendix 2. Checklist for Assessing the Performance of Water Users Associations or Federations of Water Users Associations 359
Index 369
My interest in irrigation management stems back to an assignment in 1977 as a junior professional on the East Java Design Team, Indonesia, working as part of a team helping to modernize the operation and maintenance (O&M) procedures for the East Java Irrigation Service. For 18 months I worked with an experienced Indonesian colleague, Arief Effendi, in the Mojokerto office inspecting all irrigation and drainage systems in the 32,000 ha command area, and then worked with the O&M engineers and technicians to introduce updated O&M procedures for these systems. At the same time we worked with the Juru Pengairan (Irrigation Service water master), village leaders and the jogotirto (village water master) of the 108 ha Blendren tertiary unit on measures to improve on-farm operation and maintenance. I am indebted to Arief Effendi and our colleagues in Mojokerto for sharing their knowledge and experience with me, and hope that in some small way this book repays the debt I own them.

This interest in irrigation and drainage management developed over the years with various assignments as an O&M Engineer and a return to East Java as the Training Officer on the World Bank-funded East Java Irrigation Project, where I again worked with Arief Effendi and two colleagues, Bin Yali and Satrio, on organizing training courses for Irrigation Service sub-section office staff and water masters in one irrigation district of 140,000 ha command area. This training programme was novel at the time in its focus on practical classroom exercises and practical fieldwork, with the trainers travelling to work with the staff in their offices and on their systems rather than the trainees travelling to a central training centre. The concept was considered to be successful and expanded under subsequent World Bank projects to other regions in Indonesia.

In 1986 I joined the staff of the Institute of Irrigation Studies at the University of Southampton to lecture in management, operation and maintenance of irrigation and drainage schemes on the MSc Irrigation Engineering course. I quickly learnt that not everyone shared my enthusiasm for irrigation and drainage management, and that designing and building schemes was considered more interesting and challenging. It was, however, noticeable over the 14 years I spent at the University how this attitude changed, and how those attending the MSc course and associated short courses had a growing concern and interest in improving the management of irrigation and drainage schemes.

While teaching at Southampton I was aware that I needed to better understand general management, and therefore studied for an MBA at Henley Management College. This developed my awareness and understanding of management and administration systems, and

About the Author
led to work in restructuring of government-run irrigation and drainage agencies. I am sure that this is an area where we will see significant changes in the coming years, as government agencies modernize to meet the challenges we are facing in irrigation and water resources management.

Acknowledgements are due to many people over the years. To Robert Chambers in the initial instance for his work in the 1980s on irrigation management, and the identification of 'blind spots', which included main system management, night irrigation, and incentives and motivation for managers. Also thanks to my many professional colleagues in consulting engineers Mott MacDonald and later at the University of Southampton in the Institute of Irrigation and Development Studies. I am grateful to Alan Beadle, Mike Snell, Melvyn Kay and Tim Jackson for comments on initial drafts of this book, and to Masood Khan, Ian Smout, Don Brown, Mark Svendsen, Ian Carruthers, Rien Bos, Hector Malano, Charles Abernethy, Flip Wester, Laurence Smith, Jerry Neville, David Molden, Hammond Murray-Rust, Ian Anderson, Sam Johnston III and Joop Stoutjesdijk for their contribution over the years to my understanding of irrigation management. I am indebted to Dr Safwat Abdel-Dayem for never letting me forget that it is irrigation and drainage, and that for many schemes drainage is sometimes the central issue for sustainable irrigated agriculture.

Martin Burton
Itchen Stoke
July 2009
There is increasing pressure worldwide on available water resources. These pressures arise from a number of factors, including growing populations, increased wealth and urbanization, increased industrialization, and demands from society and environmental groups for safeguards to protect water resources and the aquatic environment. In many locations climate change is adding to these pressures.

In many countries irrigated agriculture consumes a large proportion of the available water resources, often over 70% of the total. There is considerable pressure to release water for other uses, and as a sector, irrigated agriculture will have to increase its efficiency and productivity of water use. A new era is dawning for water management in the irrigated agriculture sector, where the management effort and returns to management are required, recognized and rewarded.

This book draws on the author’s experience and work over 30 years and in some 28 countries in the management, operation and maintenance of irrigation and drainage schemes. The book provides knowledge for management of irrigation and drainage systems in the 21st century, covering the traditional technical areas related to system operation and maintenance and expanding managerial, institutional and organizational aspects related to the changing political, social and economic environment. It lays emphasis on the management of irrigation as a business enterprise, moving management thinking out of traditional public sector mindsets to more customer-focused, performance-oriented service delivery.

A significant proportion of the irrigation and drainage systems worldwide are manually operated gravity systems managed by government agencies with large numbers of water users farming relatively small landholdings. The total area worldwide in this category is over 165 million ha, which is over 60% of the total area irrigated worldwide. It is in such systems where improvements in management are most required, and in which the most substantial benefits can be obtained.

The book seeks to provide practical guidelines to improve the three key processes of management, operation and maintenance of such systems. In the management context it deals with institutional issues, such as water law, and management structures and management processes, including establishing and working with water users associations, restructuring irrigation and drainage agencies, fee setting and cost recovery. In the operation context the book provides practical guidance on key operation processes, including irrigation