

EARTHSCAN STUDIES IN WATER RESOURCE MANAGEMENT

# Water Management, Food Security and Sustainable Agriculture in Developing Economies

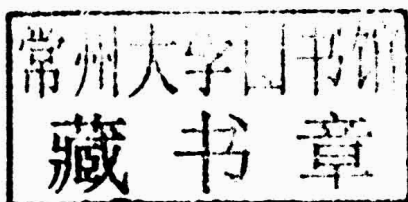
Edited by  
M. Dinesh Kumar, M.V.K. Sivamohan and  
Nitin Bassi

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M. Dinesh Kumar,  
M. V. K. Sivamohan  
and Nitin Bassi



 **Routledge**  
Taylor & Francis Group  
LONDON AND NEW YORK

**earthscan**  
from Routledge

First published 2013  
by Routledge  
2 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN

Simultaneously published in the USA and Canada  
by Routledge  
711 Third Avenue, New York, NY 10017

*Routledge is an imprint of the Taylor & Francis Group, an informa business*

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*British Library Cataloguing in Publication Data*

A catalogue record for this book is available from the British Library

*Library of Congress Cataloging-in-Publication Data*

Water management, food security and sustainable agriculture in developing countries /  
edited by M. Dinesh Kumar, M.V.K. Sivamohan and Nitin Bassi.  
p. cm.

"Simultaneously published in the USA and Canada" -T.p. verso.

Includes bibliographical references and index.

1. Water-supply-India-Management. 2. Water resources development-India.  
3. Food security-India. 4. Sustainable agriculture-India. I. Dinesh Kumar, M.  
II. Sivamohan, M. V. K. III. Bassi, Nitin.

TD303.A1W347 2012

338.10954 dc23

2012014267

ISBN13: 978 0 415 62407 7 (hbk)

ISBN13: 978 0 203 10487 3 (ebk)

Typeset in Baskerville  
by Swales & Willis Ltd, Exeter, Devon



Printed and bound by CPI Group (UK) Ltd, Croydon, CR0 4YY

# Water Management, Food Security and Sustainable Agriculture in Developing Economies

This book addresses strategies for food security and sustainable agriculture in developing economies. The book focuses primarily on India, a fast-developing economy whose natural resource base is not only under enormous stress, but also complex and not amenable to a uniform strategy. It critically reviews issues which continue to dominate the debate on water management for agricultural and food production.

The book examines, using global and national datasets, the validity of the claim that large water resource projects cause serious social and environmental damage. It then explores the potential of these systems for tackling groundwater mining, sustaining well irrigation and reducing the energy footprint of irrigated agriculture through return flow recharge in the command areas. The authors examine claims that the future of Indian agriculture is in rain-fed farming supported by small water harvesting. They question whether water-abundant eastern India could, through a groundwater revolution with the right policy input, become the granary of India. In the process, they look at the less researched aspect of the food security challenge, which is land scarcity in eastern India.

The book analyzes the physical, economic and social impacts of large-scale adoption of micro-irrigation systems, using a farming system approach for north Gujarat. Through an economic valuation of the multiple benefits of tank systems in western Odisha, it shows how value of water from large public irrigation systems could be enhanced. The book also looks at the reasons why the much-needed institutional reforms in canal irrigation have had only limited success in securing higher productivity and equity, using the case studies of Gujarat, Madhya Pradesh and Maharashtra. Finally, it addresses how other countries in the developing world, particularly sub-Saharan Africa, could learn from the Indian experience.

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**We dedicate this volume to the millions of  
undernourished children in the developing world.**

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# Acknowledgments

This volume deals with issues common to a number of Asian and African countries: water, sustainable agriculture and food security issues. The editors are grateful to all of the contributors to this volume, for asserting fresh arguments and ideas about one of the most complex challenges confronting the developing countries of the world today.

Thanks are also due to the Sir Ratan Tata Trust (SRTT), Mumbai, and the IWMI-Tata Water Policy Research Program, Hyderabad, which have supported the Institute for Resource Analysis and Policy, Hyderabad, in undertaking the studies from which two chapters of this book (Chapters 7 and 8) are taken. The editors are also grateful to three anonymous reviewers who have offered very constructive and valuable comments on the scope of the book and some of the chapters in the draft version of the manuscript. The compilation and editing of this academic work required significant co-ordination and orchestration on the part of the editors and contributors, and the comments received helped immensely in sharpening the focus of the chapters.

The editors are indeed grateful to Mr Tim Hardwick, Senior Commissioning Editor, and Ms Ashley Irons, Editorial Assistant, both of Earthscan, as well as to the team at Routledge (part of the Taylor and Francis Group), for their prompt and helpful suggestions in bringing out this volume.

# Acronyms and abbreviations

ACF	Ambuja Cement Foundation
ADB	Asian Development Bank
AKRSP-I	Aga Khan Rural Support Programme (India)
AP	Andhra Pradesh
BC Ratio	Benefit–Cost Ratio
BCM	Billion Cubic Metres
CAD	Command Area Development
CAZRI	Central Arid Zone Research Institute
CBIP	Central Board of Irrigation and Power
CF	Consumptive Fraction
CGWB	Central Ground Water Board
CROPWAT	A computer programme devised by the Food and Agriculture Organization of the United Nations, for the estimation of crop water requirements and irrigation requirements, based on climate and crop data
Crore	1 crore equals 10 million Indian rupees
CWC	Central Water Commission
DFID	Department for International Development
DSC	Development Support Centre
ECOBEN	Economic Benefit
ET	Evapo-transpiration
$ET_0$	Reference Evapo-transpiration
EU	Emission Uniformity
FAO	Food and Agriculture Organisation of the United Nations
FV	Flow Variation
GBM	Ganga-Brahmaputra-Meghna
GCA	Gross Cropped Area
GDP	Gross Domestic Product
GEC	Gujarat Ecological Commission
GHARP	Great Horn of Africa Rainwater Partnership
GHI	Global Hunger Index
GOG	Government of Gujarat
GOI	Government of India

GOM	Government of Maharashtra
GOO	Government of Odisha
GR	Government Resolution
GSDA	Groundwater Survey and Development Agency
Ha/ ha	Hectare
HDR	Human Development Report
HHs	Households
HP	Horsepower
ICAR	Indian Council of Agricultural Research
ICEF	Indo-Canada Environment Facility
ICOLD	International Commission on Large Dams
IDE	International Development Enterprises
IFPRI	International Food Policy Research Institute
IIPA	Indian Institute of Public Administration
IMPACT	International Model for Policy Analysis of Agricultural Commodities and Trade
IMT	Irrigation Management Transfer
INR	Indian Rupee
IPC	Irrigation Potential Created
IPU	Irrigation Potential Utilized
IRAP	Institute for Resource Analysis and Policy
IRMA	Institute of Rural Management Anand
IWMI	International Water Management Institute
KARI	Kenya Agricultural Research Institute
Kg/kg	Kilogramme
km <sup>3</sup>	Cubic Kilometre
kWh	Kilowatt hour
Lac	1 lac equals 1,00,000 (100,000 in the Western numbering system); 1 lac hectare equals 1 billion square metres
Lpcd	Litre per capita per day
Lt/lit	Litre
M	Metre
M ha m/M ham	Million Hectare Metre
M & R	Maintenance and Repair
M.tonne	Million Tonnes (metric, unless stated otherwise)
m <sup>3</sup>	Cubic Metre
MAF	Million Acre Feet
MCM	Million Cubic Metres
MI	Micro Irrigation
MI	Minor Irrigation
MJ	Million Joules
Mm	Millimetre
MOU	Memorandum of Understanding
MP	Madhya Pradesh
MSSRF	MS Swaminathan Research Foundation

MUS	Multiple Use Systems
NA	Not Applicable
NCAER	National Council of Applied Economic Research
NCIWRD	National Commission on Integrated Water Resources Development
NGI	North Gujarat Initiative
NGO	Non-Governmental Organization
NI	Net Income
NIA	Net Irrigated Area
NREGS	National Rural Employment Guarantee Scheme
NRAA	National Rain-fed Area Authority
PET	Potential Evapo-transpiration
PIF	Public Interest Foundation
PIM	Participatory Irrigation Management
PPP	Public-Private Partnership
Qt/ qt	Quintal
RWHS	Rain Water Harvesting System
RWH	Rain Water Harvesting
SC	Scheduled Caste
SMS	Short Messaging System
SOFILWM	Society for Integrated Land and Water Management
SOPPECOM	Society for Promoting Participative Ecosystem Management
Sq. km/km <sup>2</sup>	Square kilometre
Sq. m/m <sup>2</sup>	Square Metre
SSP	Sardar Sarovar Project
ST	Scheduled Tribe
SWUI	Sustainable Water Use Index
TEV	Total Economic Value
TFP	Total Factor Productivity
TMC	Thousand Million Cubic Feet
TMI	Traditional Method of Irrigation
TOI	The Times of India
TP	Treadle Pump
UNDP	United Nations Development Programme
UNICEF	United Nations Children Fund
UP	Uttar Pradesh
US	United States
USA	United States of America
WALMI	Water and Land Management Institute
WFP	World Food Programme
WH	Water Harvesting
WST	Water Saving Technology
WUAs	Water Users' Associations



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