

Climate Smart Agriculture in South Asia

Barun Deb Pal · Avinash Kishore ·
Pramod Kumar Joshi · Narendra Kumar Tyagi
Editors

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Technologies, Policies and Institutions

 Springer

Editors

Barun Deb Pal
South Asia Office
International Food Policy Research Institute
New Delhi, India

Avinash Kishore
South Asia Office
International Food Policy Research Institute
New Delhi, India

Pramod Kumar Joshi
South Asia Office
International Food Policy Research Institute
New Delhi, India

Narendra Kumar Tyagi
Formerly, Member Agricultural Scientists
Recruitment Board
New Delhi, India

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Foreword

The declaration on “The Future We Want” produced by the 2012 Earth Summit dreams of a world of happy people and happy ecosystems. But happiness is not possible without ensuring food security. The key global challenge to food security is the increasing threat from the accelerated warming of the Earth—food production systems are finding it difficult to cope with climate change. Though the situation is difficult, options are available to address the problem. In the words of Chair of the Commission on Sustainable Agriculture and Climate Change, Sir John Beddington, agriculture is both part of the problem of and part of the solution to climate change. The global community is aware of the challenges of climate change and has initiated programmes to overcome these challenges across the globe. In this context, evidence-based research that explores the transformative changes needed in agriculture and food systems to meet the Sustainable Development Goals attracts serious attention from the global community.

The edited book *Climate Smart Agriculture in South Asia—Technologies, Policies and Institutions* is a compilation of research studies undertaken in Bangladesh, India, and Nepal. The authors have pioneered research on climate change’s impacts on food production systems and have evolved evidence-based policies and institutions through a variety of policy-oriented research initiatives. The focus of the research is on the Indo-Gangetic Plain, which is vulnerable to climate change and home to many poor and undernourished populations. The recommendations emanating from the research have acted as a catalyst for intensifying country- and regional-level research on issues related to policies and institutions. The efforts have been appreciated by policy makers, who found them useful in framing agricultural development strategies. Together, the studies in this book provide a clear road map from the prioritization of climate-smart agriculture to effective policies and institutions for sustainable development.

I sincerely hope that the book will generate greater awareness about the threat of climate change and the need to reduce the trade-offs between food production and climate change through a well-crafted combination of technologies, policies, and institutions. I congratulate the authors and the editors for bringing out this useful publication.

M. S. Swaminathan
Founder Chairman
Ex-Member of Parliament (Rajya Sabha)
M. S. Swaminathan Research Foundation
Chennai, Tamil Nadu, India

Preface

Agriculture in South Asia is under increasing threat from climate change. To address some of the burning climate-change-induced problems faced by South Asian farmers, a group of scientists from economics and allied agricultural disciplines working on the interconnections between climate change and agriculture were brought together with the aim of producing evidence-based policy findings. These findings are intended to share with policymakers and key stakeholder, in the belief that implementation of the recommended policy interventions will drive a positive shift towards environmentally safe and profitable agriculture.

In the face of increasing demand for food for an ever-growing population with a declining and increasingly degraded natural resource base, adapting to and mitigating climate change impacts has added a big challenge. Agriculture, particularly fertilizer use, flooded rice cultivation, energy use in irrigation, tillage, and enteric emissions from ruminant animals, is among the main contributors of greenhouse gasses—accounting for about one-fourth of the total emissions. The development of climate-smart agriculture (CSA) is the response of the scientific community to this multiheaded Hydra and, in principle, may help achieve higher production with reduced emissions. Climate-smart agriculture would have been the simple answer to the current problem if the issues were simpler. However, the small farmers of South Asia, who were already facing a plethora of non-climatic stresses, have limited capacity to adopt new technologies. A host of barriers in the form of limited access to natural resources, information, finance, and, above all, low human capital stand in the way of technology adoption. Overcoming these barriers requires institutions and policy support. Through the empirical studies in this book, we attempt to understand and decode this technology–institution–policy nexus. We focus on the prioritization of different technologies which suite for varying agroclimatic and socio-economic situations and farmers’ willingness to pay in order to develop recommendations on appropriate policies and institutions for scaling up technology interventions.

This book begins with a discussion of the duality of the relationship between climate change and agriculture. The impact of climate change on agriculture and the status of agriculture-related greenhouse gas emissions are briefly reviewed to

provide an overview of the nature and magnitude of the problem. Subsequent discussions analyse the research and capacity gaps in policies, institutions, and markets in the Indo-Gangetic Plain of South Asia, including the states of Bihar, Haryana, and Punjab in India, as well as parts of Nepal and Bangladesh. In a separate piece of research, the book also addresses key challenges in the peninsular region of India. Further discussions delve into the dynamic nature of small farms, the preferences of small farmers, and their capacity to move from subsistence to commercial farming. It also explores the identification and the prioritization of several climate-smart technologies for different agro-ecological regions that impart resilience to farming enterprises by increasing the use efficiency of water, fertilizer, pesticides, and energy. At the macro level, a biophysical and socio-economic model has been configured to evaluate climate-smart technologies and develop investment priorities across regions, commodities, and technologies under different climate change scenarios. In the later chapters, a trajectory of policies is outlined to mobilize institutions and resources for faster development of small farms. These include (1) developing a database on the impacts of climate change at a household level; (2) building human capital; (3) exploring linkages between climate change, agriculture, and nutrition; and (4) scaling up the concept of bio-industrial watersheds to reduce dependency on agriculture. The potential of weather index-based crop insurance, including index-based flood insurance in India and a few developing countries, is reviewed to identify specific requirements for scaling up this risk-management tool. The book concludes with an examination of the efficacy of institutional and technological measures in reducing farmers' vulnerability and increasing their adaptation to climatic extremes. Case studies from the Indo-Gangetic Plain form the basis of this assessment. Special attention is directed to the Indian agricultural sector, and a first-order quantitative assessment of the impacts of government policies is made with the help of performance indicators on mitigation, adaptation, resilience, and sustainability of agriculture.

The studies gathered in this book set out recommendations for sustainable development in the South Asia region, beginning with climate-smart agriculture and the institutions and capacity needed to support this change in the Indo-Gangetic Plain. This work has already proved useful to policymakers, and we hope it will find a broader audience through this book.

New Delhi, India

Barun Deb Pal
Avinash Kishore
Pramod Kumar Joshi
Narendra Kumar Tyagi

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About the Editors

Dr. Barun Deb Pal is Program Manager at the International Food Policy Research Institute, South Asia Regional Office (IFPRI-SARO), New Delhi, India. He received his master's in Economics from the University of Calcutta, India, and obtained his Ph.D. from Jadavpur University, Kolkata, India. He has more than 10 years of experience in economic policy modeling with a special focus on climate change policy analysis. He has many research articles and books to his credit. His most recent articles have been published in the *Journal of Economic Structures*, *Economic Systems Research*, and *Journal of Science and Technology*, and his lead-authored book *GHG Emissions and Economics Growth—A Computable General Equilibrium Model Based Analysis for India* was published by Springer.

Dr. Avinash Kishore obtained his master's in Public Affairs from Princeton University, USA, and his Ph.D. in Public Policy from Harvard University, USA. He is interested in agriculture, environment and development economics. At IFPRI-SARO, he is working as Research Fellow and is engaged in research projects that seek to bridge the gap between laboratories and farms in Indian agriculture using action research in collaboration with agricultural universities, agribusiness firms, and farmers. He has published more than 15 articles in journals of international repute like *Water International*, *Water Policy*, *Food Policy*, *Economic Development and Cultural Change*, and *Economic and Political Weekly*.

Dr. Pramod Kumar Joshi is Director of IFPRI, South Asia Region, New Delhi, India. His areas of research include technology policy, market, and institutional economics. He is a recipient of many awards such as the Dr. M. S. Randhawa Memorial Award of the National Academy of Agricultural Sciences (2009–2011), Prof. R. C. Agarwal Lifetime Achievement Award of the Indian Society of Agricultural Economics, D. K. Desai Award of the Indian Society of Agricultural Economics, and RT Doshi Foundation Award of the Agricultural Economics Research Association for outstanding contributions in social science and agricultural economics research. He is Fellow of the National Academy of Agricultural Sciences and the Indian Society of Agricultural Economics. He served as Member

of the International Steering Committee for the Climate Change, Agriculture, and Food Security Challenge Program, led by the ESSP Science Community and the Consultative Group on International Agricultural Research (CGIAR) (2009–2011).

Dr. Narendra Kumar Tyagi is Independent Researcher in Land Water and Environment Engineering. He is Fellow of the Indian National Academy of Engineering and the National Academy of Agricultural Sciences. He has been honored with several recognitions, including Rafi Ahmed Kidwai Award for outstanding research on ‘Irrigation Management,’ Basantrao Naik Award for ‘Dry Land Farming,’ and Jawahar Lal Nehru Award for his doctoral thesis. He received Senior Fulbright Fellowship for postdoctoral research in environmental planning for salinity control. He was on CIGR Board as Member (Land and Water) from 2000–2012. During his long professional career, he served in various key positions in ICAR, including that of Director of Central Soil Salinity Research Institute, Karnal, India, from 1994 to 2004, and Member of Agricultural Scientists’ Recruitment Board (ASRB), New Delhi, India, from 2005 to 2011. Presently, he is associated with the International Development Centre (IDC) Foundation in Ghaziabad, Uttar Pradesh, India, as Program Leader of *Climate Change and Farmer*.

Acronyms

AFC	Agricultural Finance Corporation
AIBP	Accelerated Irrigation Benefits Program
AIC	Agricultural Insurance Corporation
ATMA	Agricultural Technology Management Agency
BADC	Bangladesh Agricultural Development Corporation
BGREI	Bringing Green Revolution to Eastern India
BIGWIS	Bihar Groundwater Irrigation Scheme
CBGA	Centre for Budget and Governance Accountability
CCAFS	Climate Change, Agriculture and Food Security
CCIS	Comprehensive Crop Insurance Scheme
CRFSI	Climate-resilient farming systems intensification
CSA	Climate smart agriculture
CWC	Central Water Commission
DEM	Digital elevation model
DSR	Direct seeded rice
FAO	Food and Agriculture Organization of United Nations
FGDs	Focus group discussions
FOEI	Friends of Environment International
GDP	Gross domestic product
GHG	Greenhouse gas emissions
GIS	Geographical information system
GoB	Government of Bihar
GoI	Government of India
GoWB	Government of West Bengal
GSDP	Gross state domestic product
IBFCI	Index flood crop insurance
ICICI	Industrial Credit and Investment Corporation of India
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IFPRI	International Food Policy Research Institute

IGP	Indo-Gangetic Plains
IPCC	Intergovernmental Panel on Climate Change
IRDA	Insurance regulation and development authority
KCC	Kisan Credit Card
KVK	Krishi Vigyan Kendra
LAPA	Locally appropriate program for agriculture
LLL	Laser land leveling
MFI	Micro-finance institution
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MNAIS	Modified National Agricultural Insurance
MSP	Minimum support price
MSTWP	Million Shallow Tube Well Program
NABARD	National Bank for Rural Development
NAIS	National Agricultural Insurance Scheme
NAPA	Nationally appropriate program for agriculture
NARES	National Agricultural Research and Extension System
NCDM	Nepal Centre for Disaster Management
NDVII	Normalized difference vegetation index insurance
NFSM	National Food Security Mission
NGO	Non-government organization
NMMI	National Mission on Micro-Irrigation
PTW	Private tube well
RCT	Resource Conservation Technologies
RKVY	Rastriya Krishi Vikas Yojana
RWM	Rainwater management
SRES	Special Report on Emissions Scenario
SRI	System of rice intensification
STFBA	Special Task Force on Bihar Agriculture
SWID	State Water Investigation Directorate
TPDS	Targeted public distribution system
UNEP	United Nation Program for Environmental Protection
WBCIS	Weather-based crop insurance scheme
WEAI	Women Empowerment in Agriculture Index
WIBCI	Weather Index Crop Insurance
WIBCIS	Weather index-based crop insurance scheme
WTP	Willingness to pay