

Methods for Measuring Greenhouse Gas Balances and Evaluating Mitigation Options in Smallholder Agriculture

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Springer



Springer Open

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ISBN 978-3-319-29792-7

ISBN 978-3-319-29794-1 (eBook)

DOI 10.1007/978-3-319-29794-1

Library of Congress Control Number: 2016933777

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Printed on acid-free paper

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The registered company is Springer International Publishing AG Switzerland

Foreword

In this book, the author team describe concepts and methods for measurement of greenhouse gas emissions and assessment of mitigation options in smallholder agricultural systems, developed as part of the SAMPLES project. The SAMPLES (Standard Assessment of Agricultural Mitigation Potential and Livelihoods) system adapts existing internationally accepted methodologies to allow a range of stakeholders to assess greenhouse gas (GHG) emissions from different agricultural activities, to identify how these emissions might be reduced (i.e., mitigation), and to provide data through an online dataset that can be used to aid in these efforts.

The book is divided into three sections: (1) designing a measurement program to allow users to identify what measurements are needed and how to go about taking the measurements, (2) data acquisition, describing how to deal with complex issues such as land use change, and (3) identifying mitigation options, which deals with scaling issues, how to use models, and how to assess trade-offs. Within each section is a series of chapters, written by leading experts in the field, providing clear guidelines on how to deal with each of the issues raised.

The work was begun at an international workshop in 2012, and the authors have since produced this synthesis. Through this work, the authors provide a comprehensive and transparent system to allow stakeholders to calculate and reduce agricultural GHG emissions, and assess other impacts. Since it builds on established and internationally accepted methodologies it is robust, yet the authors have managed to break down the complex and potentially overwhelming concepts and methods into bite-sized chunks. Difficult subjects such as inaccuracy and uncertainty are not avoided, yet the authors manage to make these topics accessible and the process manageable.

Potential users include, but are not limited to, national agricultural research centers, developers of national and subnational mitigation plans that include agriculture, agricultural commodity companies and agricultural development projects, and students and instructors. Anyone with an interest in agriculture, greenhouse gas emissions, and how to minimize these emissions will find the book immensely useful.

Pete Smith

Preface

In October 2011, we faced a problem. We knew that the greenhouse gas (GHG) emissions from smallholder agriculture contributed to climate change and could present a climate change mitigation solution; however, we had no idea by how much. Experts at a workshop on farm and landscape GHG accounting organized by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the Food and Agriculture Organization of the UN (FAO) quickly realized that there were few data to support GHG quantification in smallholder systems. Compounding the issue, everyone seemed to use different approaches for estimating emissions and mitigation impacts. This meant that even if data were available they could not easily be compared. We needed to harmonize methods. However, the available measurement protocols typically focused on singular farming activities, such as soil fluxes or biomass. This contrasted with the realities of diverse smallholder farms, which have multiple greenhouse gas sources and sinks. We needed a more holistic approach that could capture the diversity and complexity of smallholder systems.

To meet these challenges, workshop participants conceived the idea for the SAMPLES (Standard Assessment of Agricultural Mitigation Potential and Livelihoods) project, which CCAFS initiated in 2012, in collaboration with partners at FAO's Mitigation of Climate Change in Agriculture (MICCA) program, the Global Research Alliance for Agricultural Greenhouse Gas Emissions (GRA), and multiple universities worldwide. The goal of SAMPLES was to increase and improve the availability of data on greenhouse gas emissions and removals in smallholder agricultural systems and to design ways to reduce the cost and improve the quality of future data collection efforts for these systems, especially to quantify the impacts of low emissions practices. SAMPLES has worked toward these objectives through four interrelated activities: (1) global emission hotspot analysis, (2) estimating emissions and potential reductions in a whole-farm context, (3) capacity building around GHG quantification, and (4) policy engagement.

This volume is the product of 3 years of work toward creating a coherent approach and dataset on smallholder farm emissions and mitigation options. The SAMPLES quantification framework was developed during an expert workshop on

GHG quantification held in Garmisch-Partenkirchen, Germany, in October 2012 and hosted by the Karlsruhe Institute of Technology. Following the workshop, authors reviewed the available “best practice” in greenhouse gas quantification methods and in some cases developed new methods to adapt the approach to the research constraints found in developing countries. Methods described herein are based on internationally accepted methods and have been reviewed by experts in the field.

These guidelines are intended to inform the field measurements of agricultural GHG sources and sinks, especially to assess low emissions development options in smallholder agriculture in tropical developing countries. The methods provide a standard for consistent, robust data that can be collected at reasonable cost with available equipment. They can be used to support improved emissions factors for country inventories, to assess the mitigation impacts of projects, or as methods for scientific studies. The accompanying website (<http://samples.ccafs.cgiar.org/>) provides additional resources such as links to step-by-step guidelines, scientific publications, and a database of agricultural emission factors.

We acknowledge with gratitude the following individuals who helped conceive this volume at a workshop in Garmisch-Partenkirchen, Germany, in October 2012:

Alain Albrecht, Institut de Recherche pour le Développement (IRD), France

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(CIMMYT), Mexico

Barbara Nave, BASF, Germany

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Susan Owen, Center for Ecology and Hydrology, UK

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Eva Wollenberg, University of Vermont and CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), USA
Xunhua Zheng, Institute of Atmospheric Physics-Chinese Academy of Sciences (IAP-CAS), China

We also acknowledge the following individuals and organizations that provided feedback on all or part of the guidelines during the review process:

Juergen Augustin, Leibniz Centre for Agricultural Landscape Research, Germany
Rolando Barahona Rosales, National University of Colombia (Medellín), Colombia
Ed Charmley, Commonwealth Scientific and Industrial Research Organisation, Australia
Nicholas Coops, University of British Columbia, Canada
Nestor Ignacio Gasparri, National University of Tucumán, Argentina
Jeroen Groot, Wageningen University and Research Centre, Netherlands
Ralf Kiese, Karlsruhe Institute for Technology, Germany
Brian McConkey, Agriculture and Agri-Food Canada
Eleanor Milne, Colorado State University, USA
Carlos Ortiz Oñate, Technical University of Madrid, Spain
David Powelson, Rothamsted Research, UK
Philippe Rochette, Agriculture and Agri-Food Canada
Don Ross, University of Vermont, USA
Sileshi Weldesmayat, World Agroforestry Centre, Kenya
Jonathan Wynn, University of South Florida, USA
Christina Seeberg-Elverfeldt, German Federal Ministry of Economic Cooperation and Development (BMZ), Germany
Marja-Liisa Tapio-Biström, Ministry of Agriculture and Forestry, Finland
Kaisa Karttunen, Agriculture and Development Consultant, Finland
The Mitigation of Climate Change in Agriculture (MICCA) Program of the United Nations Food and Agriculture Organization.

This work was undertaken as part of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), which is a strategic partnership of CGIAR and Future Earth. This research was carried out with funding by the European Union (EU) and with technical support from the International Fund for Agricultural Development (IFAD). The views expressed in the document cannot be taken to reflect the official opinions of CGIAR, Future Earth, or donors.

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is supported by Australia (ACIAR), the Government of Canada through the Federal Department of the Environment, Denmark (DANIDA), Ireland

(Irish Aid), the Netherlands (Ministry of Foreign Affairs), New Zealand, Portugal (IICT), Russia (Ministry of Finance), Switzerland (SDC), the UK Government (UK Aid), the European Union, and carried out with technical support from the International Fund for Agricultural Development (IFAD).

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