Agricultural Practices and Policies for Carbon Sequestration in Soil

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Preface

In July 1999, the International Symposium, Agricultural Practices and Policies for Carbon (c) Sequestration in Soil, was held at Ohio State University, in Columbus, for about 75 participants from 11 countries. This was the third symposium (eighth in a series of conferences, symposiums, and workshops) organized by the Soils and Global C Cycle Program. Five of these were held at Ohio State University, one in Tunis, Tunisia, one in Belem, Brazil, and one at Las Cruces, NM. This symposium differed from the others in that the goal was to go beyond the scientific understanding of soil's roles in the global change arena; it was designed to bring together scientists, policymakers, economists, industrial representatives, and members of the farming community. The meeting was designed around several different themes with a generous amount of time set aside for discussions from all participants. Two panel sessions were used for discussion on the themes of practical framing perspective and on policy issues, although scientists often do not take part in such debates. The presentations of 43 papers and 19 posters generated discussion and set the stage for the closing panel discussions.

The overall idea of the conference was to create a dialogue between the different groups with the idea of developing common understanding and ideas. This was accomplished; the outcome is in this book, which will enable the ideas and information generated there to reach a wider audience.

There are 48 chapters under nine themed sections to this book, as well as the foreword, give the political perspective of the importance of the symposium and this volume. The chapters in this book are organized under sections concerning 1) historical perspectives, 2) conservation tillage and residue management, 3) monitoring and assessment, 4) soil management, 5) soil structure and C sequestration, 6) economics of C sequestration, 7) policy issues and industrial and farmer viewpoints, 8) regional pools, and 9) the summary. The content in these chapters, when linked to the previous works, will provide information needed for development of policy and options that will allow soil C sequestration to be considered as a serious option in the raging debate on global climate change. Soils change levels of greenhouse gases through sequestration; at the same time this sequestration will have many other positive farm benefits, such as improved yields, reduced erosion, and lower need for external inputs. Environmental and societal benefits will occur as well. The classic win–win scenario is possible, with even more wins.

Many in society look at agriculture as a problem. Although there are issues of nonpoint source pollution, perceived environmental degradation, odor, and unsafe food, at the same time the general population of the world has cheap food and, in most places, adequate supplies. Many times deficiencies are more a result of distribution than supply. This is not to say that agriculture does not contribute to problems; it does, and one of the major contributions has been the loss of soil organic carbon (SOC), which has led to reduced soil fertility, increased erosion, etc. The point is that SOC is a resource, as are other carbon compounds such as oil and gas, but SOC is a renewable resource. We can gain many environmental benefits by increasing its levels. Society needs to look at agriculture as part of the solution to an increasing concern: global climate change.

This symposium was organized with the support of USDA's Natural Resources Service, the Agricultural Research Service, and Ohio State University. The editors thank all of the authors for their outstanding contributions to this volume. Their efforts will allow others to gain from their work and will, we hope, lead to development of new polices to help to mitigate the greenhouse effect while providing many other benefits to agriculture and society. These efforts have led to a merging of science and policy.

Thanks are due to the staff of Lewis Publishers/CRC Press for their timely efforts in publishing this information and making it available to the scientific and the policy communities. In addition, numerous colleagues, graduate students, and staff at Ohio State University made valuable contributions. We especially thank Lynn Everett for her efforts in organizing the conference and in handling all of the papers included here from the first draft through the peer review process to

providing the information to the publisher. We are sure all of the participants and contributors felt that she held their feet to the fire when needed. We also offer special thanks to Brenda Swank for help in preparing this material and assistance in all aspects of the symposium. We are indebted to Dr. Debbie Reed for providing the foreword to this volume, thus putting the book into a context of political debate and showing why the marriage of science and policy is needed if we are going to make progress in addressing the concerns of global climate change. The efforts of many others also were very important in publishing this relevant and important work.

The Editors

The Editors

Dr. John M. Kimble is a research soil scientist at the United States Department of Agriculture (USDA) Natural Resources Conservation Service National Soil Survey Center in Lincoln, NE, where he has worked for the past 20 years. Previously he was a field soil scientist in Wyoming for 3 years and an area soil scientist in California for 3 years. Dr. Kimble has received the International Soil Science Award from the Soil Science Society of America. While in Lincoln, he worked on a U.S. Agency for International Development Project for 15 years helping developing countries with their soil resources and still maintains an active role in international activities. For the last 10 years he has focused more on global climate change and the role soils can play in this area. His scientific publications deal with topics related to soil classification, soil management, global climate change, and sustainable development. Dr. Kimble has worked in many different ecoregions, from the Antarctic to the Arctic and all points in between. With the other editors of this book, he has led efforts to increase the overall knowledge of soils and their relationship to global climate change. In collaboration with Dr. Lal, Dr. Follett, and others, he has produced 11 books related to the topic of global climate change and the role of soils in climate change.

Dr. Rattan Lal is a professor of soil science in the School of Natural Resources at Ohio State University. Prior to joining Ohio State in 1987, he served as a soil scientist for 18 years at the International Institute of Tropical Agriculture, Ibadan, Nigeria. In Africa, Professor Lal conducted long-term experiments on soil erosion processes as influenced by rainfall characteristics, soil properties, methods of deforestation, soil tillage and crop residue management, cropping systems (including cover crops and agroforestry), and mixed and relay cropping methods. He also assessed the impact of soil erosion on crop yield and related erosion-induced changes in soil properties to crop growth and yield. Since joining Ohio State University in 1987, he has continued research on erosion-induced changes in soil quality and developed a new project on soils and global warming. Dr. Lal has demonstrated that accelerated soil erosion is a major factor affecting emission of carbon from soil to the atmosphere. Soil erosion control and adoption of conservation-effective measures can lead to carbon sequestration and mitigation of the greenhouse effect. Professor Lal is a fellow of the Soil Science Society of America, American Society of Agronomy, Third World Academy of Sciences, American Association for the Advancement of Sciences, Soil and Water Conservation Society, and Indian Academy of Agricultural Sciences. He is the recipient of the International Soil Science Award, the Soil Science Applied Research Award of the Soil Science Society of America, the International Agronomy Award of the American Society of Agronomy, and the Hugh Hammond Bennett Award of the Soil and Water Conservation Society. He is the recipient of an honorary degree of Doctor of Science from Punjab Agricultural University, India. Dr. Lal is past president of the World Association of the Soil and Water Conservation and the International Soil Tillage Research Organization. He is a member of the U.S. National Committee on Soil Science of the National Academy of Sciences. He has served on the Panel on Sustainable Agriculture and the Environment in the Humid Tropics of the National Academy of Sciences.

Dr. Ronald F. Follett is supervisory soil scientist with the Agricultural Research Service (ARS) of the USDA with 35 years of research experience. For the past 15 years he has been research leader with the ARS Soil–Plant–Nutrient Research Unit in Fort Collins, CO. He previously served for 10 years as a national program leader with ARS headquarters in Beltsville, MD, and has also been a research soil scientist with ARS in Mandan, ND, and Ithaca, NY. Dr. Follett is a Fellow of the Soil Science Society of America, American Society of Agronomy, and the Soil and Water Conservation Society. He has twice received USDA's highest award, the USDA Distinguished Service Award, and in June of 2000 he received an Individual USDA Superior Service Award "for promoting sensible management of natural, soil, and water resources for an environmentally friendly and sustainable agriculture." Dr. Follett organized and wrote the ARS strategic plans for Ground-Water Quality Protection — Nitrates and Global Climate Change — Biogeochemical Dynamics.

He has edited several books, most recently, *The Potential of U.S. Grazing Lands to Sequester Carbon and Mitigate the Greenhouse Effect*. Dr. Follett has co-authored *The Potential of U.S. Cropland to Sequester Carbon and Mitigate the Greenhouse Effect*, and served as a guest editor for the *Journal of Contaminant Hydrology*. His scientific publications include topics about nutrient management for forage production, soil-N and -C cycling, groundwater quality protection, global climate change, agroecosystems, soil and crop management systems, soil erosion and crop productivity, plant mineral nutrition, animal nutrition, irrigation, and drainage.

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