## SOIL AND WATER CONSERVATION

## A Celebration of 75 Years

Edited by Jorge A. Delgado, Clark J. Gantzer, and Gretchen F. Sassenrath



Soil and Water Conservation Society 945 SW Ankeny Road, Ankeny, IA 50023 www.swcs.org

© 2020 by the Soil and Water Conservation Society.

All rights reserved.

Project Manager and Copy Editor: Annie Binder

Designer: Jody Thompson

Cover photos: Upper left—Wind-devastated farmland during the Dust Bowl, Kansas, USDA NRCS photo. Upper right—Hugh Hammond Bennett (right), first Chief of the Soil Conservation Service, USDA NRCS photo. Lower left—Landowner and FAMU farm management specialist inspect strawberries grown as U-Pick operation, Campbellton, Florida, USDA NRCS photo by Bob Nichols. Lower right—Post-installation saturated buffer, Story County, Iowa, USDA NRCS/SWCS photo by Lynn Betts.

Printed in the United States of America

54321

ISBN 978-0-9856923-2-2 (print) ISBN 978-0-9856923-3-9 (electronic)

Library of Congress Control Number: 2020948295

The Soil and Water Conservation Society is a nonprofit scientific and professional organization that fosters the science and art of natural resource management to achieve sustainability. The Society's members promote and practice an ethic that recognizes the interdependence of people and their environment.

Justice, Equity, Diversity, and Inclusion: SWCS seeks diverse voices, actively listens, engages in dialogue, thinks critically, and takes meaningful action toward creating institutions and systems that serve and value people equally.

## Contents

	Foreword Clare Lindahl and Annie Binder	vii
	Acknowledgements	ix
	<u>Dedication</u>	х
1	The Soil and Water Conservation Society: The Society's Beginning Clark J. Gantzer and Stephen H. Anderson	1
2	Advancing Climate Change Mitigation in Agriculture while Meeting Global Sustainable Development Goals Rattan Lal	12
3	Ecological Embeddedness, Agricultural "Modernization," and Land Use Change in the US Midwest: Past, Present, and Future J. Gordon Arbuckle Jr.	32
4	Social Understandings and Expectations: Agricultural Management and Conservation of Soil and Water Resources in the United States Lois Wright Morton	42
5	A History of Economic Research on Soil Conservation Incentives Steven Wallander, Daniel Hellerstein, and Maria Bowman	57
6	Ecosystem Services Markets Conceived and Designed for US Agriculture Debbie Reed	70
7	Soil and Water Conservation Society and the Farm Bill: A Historical Review Joseph W. Otto	75
8	Protecting Ecosystems by Engaging Farmers in Water Quality Trading: Case Study from the Ohio River Basin Jessica Fox and Brian Brandt	86
9	Water Availability for Agriculture in the United States Teferi Tsegaye, Daniel Moriasi, Ray Bryant, David Bosch, Martin Locke, Philip Heilman, David Goodrich, Kevin King, Fred Pierson, Anthony Buda, Merrin Macrae, and Pete Kleinman	95
10	Water Optimization through Applied Irrigation Research Matt Yost, Niel Allen, Warren Peterson, and Jody Gale	115
11	Water Quality Jorge A. Delgado	123
12	Agricultural Drainage: Past, Present, and Future Vinayak S. Shedekar, Norman R. Fausey, Kevin W. King, and Larry C. Brown	140

13	Seizing the Opportunity: Realizing the Full Benefits of Drainage Water Management Charles Schafer, Dave White, Alex Echols, and Thomas W. Christensen	153
14	Wetland Conservation in the United States: A Swinging Pendulum David M. Mushet and Aram J.K. Calhoun	162
15	Accelerating Implementation of Constructed Wetlands on Tile-Drained Agricultural Lands in Illinois, United States A. Maria Lemke, Krista G. Kirkham, Adrienne L. Marino, Michael P. Wallace, David A. Kovacic, Kent L. Bohnhoff, Jacqueline R. Kraft, Mike Linsenbigler, and Terry S. Noto	172
16	The Role of Soil Physics as a Discipline on Soil and Water Conservation during the Past 75 Years Francisco J. Arriaga, DeAnn R. Presley, and Birl Lowery	179
17	The Growing Role of Dissolved Nutrients in Soil and Water Conservation Kenneth W. Staver	185
18	From Nutrient Use to Nutrient Stewardship: An Evolution in Sustainable Plant Nutrition Lara Moody and Tom Bruulsema	197
19	Soil Biology Is Enhanced under Soil Conservation Management Robert J. Kremer and Kristen S. Veum	203
20	Soil Health: Evolution, Assessment, and Future Opportunities  Douglas L. Karlen	212
21	Building Resilient Cropping Systems with Soil Health Management Barry Fisher	224
22	Climate Change, Greenhouse Gas Emissions, and Carbon Sequestration: Challenges and Solutions for Natural Resources Conservation through Time Jean L. Steiner and Ann Marie Fortuna	229
23	Conserving Soil and Water to Sequester Carbon and Mitigate Global Warming Rattan Lal	241
24	Modeling Soil and Water Conservation Dennis C. Flanagan, Larry E. Wagner, Richard M. Cruse, and Jeffrey G. Arnold	255
25	From the Dust Bowl to Precision Conservation  Jorge A. Delgado and Gretchen F. Sassenrath	270
26	Developments in Midwestern Precision Conservation Clay Bess	286
27	Cover Crops: Progress and Outlook Eileen J. Kladivko	293
28	Marketing Conservation Agronomy: Cover Crops from Two Practitioners' Points of View Sarah Carlson and Alisha Bower	303
29	The Future of Soil, Water, and Air Conservation	307