Published 1993

Soil Specific Crop Management

Research and Development Issues

Proceedings

of

Soil Specific Crop Management

A Workshop on
Research and Development Issues

Editors
P. C. Robert, R. H. Rust, and W. E. Larson

April 14-16, 1992
Sheraton Airport Inn
Minneapolis, MN

Conducted by the
Department of Soil Science and Minnesota Extension Service
University of Minnesota

Published by:
American Society of Agronomy, Inc.
Crop Science Society of America, Inc.
Soil Science Society of America, Inc.
Madison, Wisconsin, USA

American Society of Agronomy, Inc.
Crop Science Society of America, Inc.
Soil Science Society of America, Inc.
677 South Segoe Road, Madison, WI 53711, USA

Library of Congress Cataloging-in-Publication Data

Proceedings of soil specific crop management : a workshop on research and development issues : April 14-16, 1992, Sheraton Airport Inn, Minneapolis, MN / editors, P.C. Robert, R.H. Rust, and W.E. Larson ; conducted by the Department of Soil Science and Minnesota Extension Service, University of Minnesota.
p. cm.
ISBN 0-89118-116-4
1. Crops and soils--Congresses. 2. Soil management--Congresses. 3. Agronomy--Congresses. I. Robert, P. C. (Pierre C.) II. Rust, Richard H. (Richard Henry), 1921- . III. Larson, William E., 1921- .
IV. University of Minnesota. Dept. of Soil Science.
V. Minnesota Extension Service.
S596.7.P76 1993
631.4--dc20 93-12790
CIP

Printed in the United States of America

CONTENTS

SECTION III. ENGINEERING TECHNOLOGY

SECTION IV. PROFITABILITY

SECTION V. ENVIRONMENT

PREFACE

Historic agronomic practices have been developed with the farm or field as the area of management. The advent of soil conservation began to lead soil management toward topographic and soil-specific features. Even so, agronomic practices and recommendations have largely been made on a field basis rather than on soil-specific properties that might influence tillage, seeding, fertilizing and weed control practices. The near completion of detailed soil surveys nation-wide, particularly in the intensive agricultural areas, has provided a database of great magnitude. The advent of computer processed spatial data together with geostatistical analysis enables the display of those soil, hydrologic, and micro-climate features relevant to agronomic practices. With the further development of positioning systems suitable to on-site applications, the capability now exists, or can be feasibly developed to deliver real-time, real-space changes in almost any agronomic procedures. There is also much current research in sensor technology applicable to the soil condition or property, such as organic matter content, moisture content, tilth, nitrate content, and crop yields.

Given the capability to assess soil spatial variability and modify agronomic practices accordingly, we now add two other considerations, economic and environmental. Historically, application of inputs, whether seed, fertilizer, or pesticide, has been driven by maximum yields. More recently, emphasis has become maximum economic yields. Soil specific management provides the specific needed inputs on each soil and prevents over and under application of inputs resulting from uniform field applications. The realization of maximizing economic returns will encourage the adoption of this new technology.

If further incentive or justification for soil specific management were needed, the national incentive to reduce the potential for environmental contamination is of concern to all of agriculture. To the extent that application of agri-chemicals can be modified on-the-go according to the potential for retention and transmission of these materials in specific soil conditions, there can be a reduction in ground and surface water contamination and general maintenance of soil quality.

The objectives of this workshop were to: (i) review recent and current knowledge and application technology with respect to soil specific management, (ii) outline the necessary research that will enable adoption of the full range of agronomic practices (tillage to harvest) for soil specific management, and (iii) identify development and technology transfer needs.

The workshop consisted of invited position papers on the topics of soil resources variability, managing variability, engineering technology, profitability, environment, and technology transfer. They were followed by several invited presentations detailing current research and development in each of the six areas. Participants were divided in six working groups corresponding to the same general topics and responded to discussion papers written prior to the workshop.

The workshop also had several poster sessions presenting a variety of specific research and application project results.

This book contains the keynote address papers, session technical papers, working group discussion papers, and recommendations made by the six working groups. It also includes abstracts of most poster presentations.

On behalf of all participants, we wish to express our gratitude to sponsoring organizations for their support and to ASA-CSSA-SSSA for publishing this document. We also wish to express our appreciation to all speakers for their excellent presentations and to all participants who made the workshop a success. We look forward to implementing recommendations, creating an electronic bulletin board system that will facilitate the exchange of information and development of specific management concepts and associated systems, and preparing a second workshop for 1994.

P. C. Robert, co-editor
R. H. Rust, co-editor
W. E. Larson, co-editor

ACKNOWLEDGMENTS

Organizing Committee

Daryl Bucholz
Jonathan Chaplin
H. H. Cheng
Dean Fairchild
Thomas Gilding
C. Steven Holzhey
Richard Johnson
William Larson
Robert Munson
Gerald Nielsen
Charles Onstad
Pierre Robert, Chair
Richard Rust
Berlie Schmidt
John Schueller

Editorial Committee

Bert Bock
Paul Fixen
William Larson
Pierre Robert, Chair
Richard Rust
John Schueller

Co-Sponsors and Contributors

Deere and Company, Moline, Illinois

Environmental Protection Agency

Precision Land and Climate Evaluation Systems (PLACES)
Bozeman, Montana

University of Minnesota, Department of Soil Science and
Minnesota Extension Service

U. S. Department of Agriculture
Agricultural Research Service
Cooperative State Research Service
Soil Conservation Service

Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the sponsoring organizations.