Mathematics and Calculations for Agronomists and Soil Scientists

METRIC VERSION

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FOREWORD

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Many natural resource managers have reduced the amount of time doing manual labor and increased the time devoted to problem solving. This change in resource allocation is typical of the information age. However, because natural resource management is a tradition-dominated industry, other managers have only slowly adopted information age technologies. Looking back in history, the transition from horse power to tractor power was truly an inevitable and monumental change. There were, however, a large number of farmers who perceived this change as being a mistake. The first tractors were built in the early 1900s, but did not substantially replace the horse until the 1940s and 1950s. The transition was a generational change as much as a change in thought processes. The transition of agriculture into the information age is happening and is every bit as dramatic as the transition from horses to tractors.

The language of the information age is that of mathematics and computers. Natural resource managers traditionally have been trained in the biological sciences with a focus on developing cognitive rather than mathematical skills. The lack of advanced mathematical skills hinders the ability to fully integrate information age technologies into decision processes. Being able to integrate mathematics and technological advances into decisions requires:

- understanding the scientific method,
- understanding how experiments are conducted and analyzed, and
- knowing how to develop and test conceptual and mathematical models.

Most courses are topic specific and compartmentalized. Even though solutions to many problems require the ability to integrate information using scientifically-based approach, few classes teach students how to accomplish this task. In many situations, natural resource managers are noticeably apprehensive about using mathematics. Managers need to learn how to use this important tool for solving everyday, practical problems.

The goals of this book are to teach current and future natural resource managers how to: 1) integrate information from different disciplines, and 2) run innovative management scenarios using the best available science. The manual is organized into three general sections. In the first section, students are introduced to a number of examples on unit conversions in many different formats. In the second section, general background information about the scientific method is covered. Included are principles of experimentation, sampling approaches, using models as tools to improve understanding of systems, and a review of concepts of economic analysis. In the third section, examples of integrating information from many disciplines are provided in order to show how concepts learned in the two sections can be used to solve real problems. The skills taught in this section have applications at local, regional, and national scales. These chapters increase in difficulty as the student proceeds through the manual. An overall goal of this manual is to teach students how to propose, test, and implement innovative management strategies that are better positioned to improve profiability, productivity, and environmental protection.

–D.E. Clay, C.G. Carlson, S.A. Clay, and T.S. Murrell

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