Grazing Research: Design, Methodology, and Analysis
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FOREWORD

Grazing of pasture and range lands by livestock is an integral component of livestock production systems in the USA and many other countries. Grazing management includes critical decisions concerning the animals and the plants upon which they feed. Profound long-term effects of grazing can be manifested in the classical fence-row photographs of overgrazed and properly grazed range or pasture. Thus, grazing management strategies influence conservation of soil, water, and biological organisms. There is a call for greater diversity as a component of long-term sustainability of agriculture. A livestock component in sustainable agricultural systems contributes to greater options in crop rotation, utilization of forages, and improvement of soil structure and fertility.

Proper methodology is a critical issue in conducting research to develop production management practices for livestock grazing. The interacting effects of animals and plants of various species, age, and condition pose one of the most complex research design problems in agriculture. It is timely that this topic be given special attention as new problems require solutions and new technology becomes available to the researcher. We compliment the organizers of the symposium that resulted in this book. A modern assessment of the technical challenges in conducting grazing research is presented. We expect this book will stimulate additional development in research design and better understanding on how to conduct, interpret, and report results from this important research area.

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Grazing experiments with livestock are required to define input-output relationships that cannot be provided by laboratory, greenhouse, or small field plot studies. Inputs are considered treatments in the design of grazing experiments and may include grazing systems, stocking rates, kinds of pasture plants or animals, pasture fertilization levels, and other alternatives or combinations. Outputs include animal, plant, and/or economic responses. Almost without exception, grazing experiments constitute mission-oriented research and usually should produce results that are directly or indirectly relevant to the livestock producer.

Conducting a proper grazing study poses a considerable challenge. Grazing experiments are usually expensive in terms of land, livestock, equipment, and time. Thus, questions concerning cost and efficiency are relevant and must be addressed by researcher and research administrator alike.

The major concerns in grazing research are to design an experiment that (i) provides for valid comparisons among treatments, (ii) provides a valid error term for evaluating treatment effects, (iii) explores relevant interactions, (iv) provides the data that are useful in extending the applicability of results, (v) provides a reasonable basis for economic assessment of the worth of selected inputs, and/or (vi) defines the relevant input-output relationships in a manner useful to the producer.

Input-output relationships at the plant-animal interface cannot usually be satisfactorily defined without appropriate measures to characterize the dynamics of the sward as well as the response of animals grazing the sward. These relationships must be understood to facilitate mathematical modelling of the grazing ecosystem.

This special publication encompasses the papers from a symposium held at the annual meeting of the Crop Science Society of America in Anaheim, CA, in November 1988. The symposium and this special publication were cosponsored by the Crop Science Society of America, the American Society of Agronomy, the American Forage and Grassland Council, the Society for Range Management, and the American Society of Animal Science.

The participants in the symposium were all experts in their subject. Thus, this special publication will be useful to those involved in the design and execution of grazing research in pasture and range and the interpretation of data derived from grazing experiments. It should also be helpful to those who have responsibility for the review, publication, and/or application of the results from such research.

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