

**Nutrient  
Requirements  
of Dairy Cattle**  
**Seventh Revised Edition, 2001**

Subcommittee on Dairy Cattle Nutrition  
Committee on Animal Nutrition  
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National Research Council

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# Preface

Dairy cattle production is an important component of the food industry. Nutrition is a key factor in the performance, health, and welfare of dairy cattle. Given the large variation in dairy cattle types and the various environments in which they are maintained, producers must increasingly concern themselves with optimizing feeding programs.

To that end, the Subcommittee on Dairy Cattle Nutrition, which was appointed in 1997 under the guidance of the Committee on Animal Nutrition in the National Research Council's Board on Agriculture and Natural Resources, embarked on a monumental task in the development of a new edition of *Nutrient Requirements of Dairy Cattle*. As we conducted our work, it was our desire to provide users of this volume an accurate, comprehensive, and useful review of the scientific literature and practical experiences that have shaped our knowledge of dairy cattle nutrition over the past decade.

We chose to provide both a written description of the biologic basis for predicting nutrient requirements and a computer model on a compact disk to use for estimating requirements of lactating, nonlactating, growing, and young dairy animals. The subcommittee recognizes that some users of this revision will prefer to apply tables of requirements for an average situation, and we have attempted to provide those tables. Although there is often uncertainty using a modeling approach to estimate nutrient

requirements, we believed that we had a responsibility to move the science forward, so we included a model that was constructed on a substantial amount of data. We believe that the model builds on the work of previous Research Council committees and moves the science forward without reaching so far that estimates cannot be validated. We found that an abundance of new science-based knowledge had surfaced since the last edition, but we also found that our knowledge of many aspects of dairy cattle nutrition is incomplete; we chose not to venture too far from what our knowledge base would allow.

In developing this report, the subcommittee considered current issues in dairy cattle production inasmuch as they affect nutrient requirements and animal feeding management, including new emphasis on environmental considerations in the feeding of dairy cattle. We have attempted in this new edition to focus more than in the past on considerations and criteria for establishing nutrient requirements.

This study was conducted through the concerted efforts of the members of the Subcommittee on Dairy Cattle Nutrition. We began our 3-year task in 1997 and completed this volume in 2000. We hope that it will be used with the same passion and enthusiasm with which it was developed.

JIMMY H. CLARK, *Chair*  
Subcommittee on Dairy Cattle Nutrition





# Acknowledgments

A volume of this magnitude represents the combined efforts of many individuals. The subcommittee thanks all those who shared their insights and knowledge to bring this document to fruition. We would first like to thank everyone who participated in our public sessions and the special sessions that were organized for our benefit during the American Dairy Science Association meetings over the past several years.

During the course of its deliberations, the subcommittee sought advice and special assistance from several people who gave generously of their time to help us complete our task. Very special thanks are due to Carl Davis, University of Illinois; Jim Drackley, University of Illinois; Gale Bateman, University of Illinois; Danny Fox, Cornell University; Brian Garthwaite, Food and Drug Administration; and Normand St. Pierre, Ohio State University. We are extremely indebted to them. In addition, we sought and received guidance early on from R. Lee Baldwin, University of California, Davis; Mark Hanigan, Purina Mills, Inc.; Rick Kohn, University of Maryland; and Dale Waldo, U. S. Department of Agriculture (retired).

The expertise of Vajesh Durbal, Cornell University, is gratefully acknowledged. He was instrumental in programming the computer model, and we could not have accomplished what we did without his skill and patience.

The subcommittee is grateful to members of the National Research Council staff who worked diligently to maintain progress and quality in our work. Through her dedication, guidance, and skill, Charlotte Kirk Baer transformed our spirited verbal pondering and imperfect written drafts into a comprehensive report. Stephanie Padgham provided able assistance and much-needed momentum during the final stages of our study. Melinda Simons supported all of us cheerfully and effectively during the early phases of the study and Laura Boschini shared her skills in preparing the report for publication.

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the NRC's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report: R. Lee Baldwin, University of California, Davis; Paul Chandler, Chandler Associates; Larry Chase, Cornell University; Jud Heinrichs, Pennsylvania State University; Roger Hemken, University of Kentucky; Alois Kertz, Agri Brands International; David Mertens, U.S. Department of Agriculture Dairy Forage Research Center; Jerry Olson, University of Minnesota; Leo Timms, Iowa State University; Michael Van Amburgh, Cornell University; Harold Van Horn, University of Florida; and Michael VandeHaar, Michigan State University. Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations nor did they see the final draft of the report before its release. The review of this report was overseen by Michael Galyean, Texas Tech University, appointed by the Committee on Animal Nutrition, and Robert Wilson, Mississippi State University, appointed by the Board on Agriculture and Natural Resources. These individuals were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring subcommittee and the institution.



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