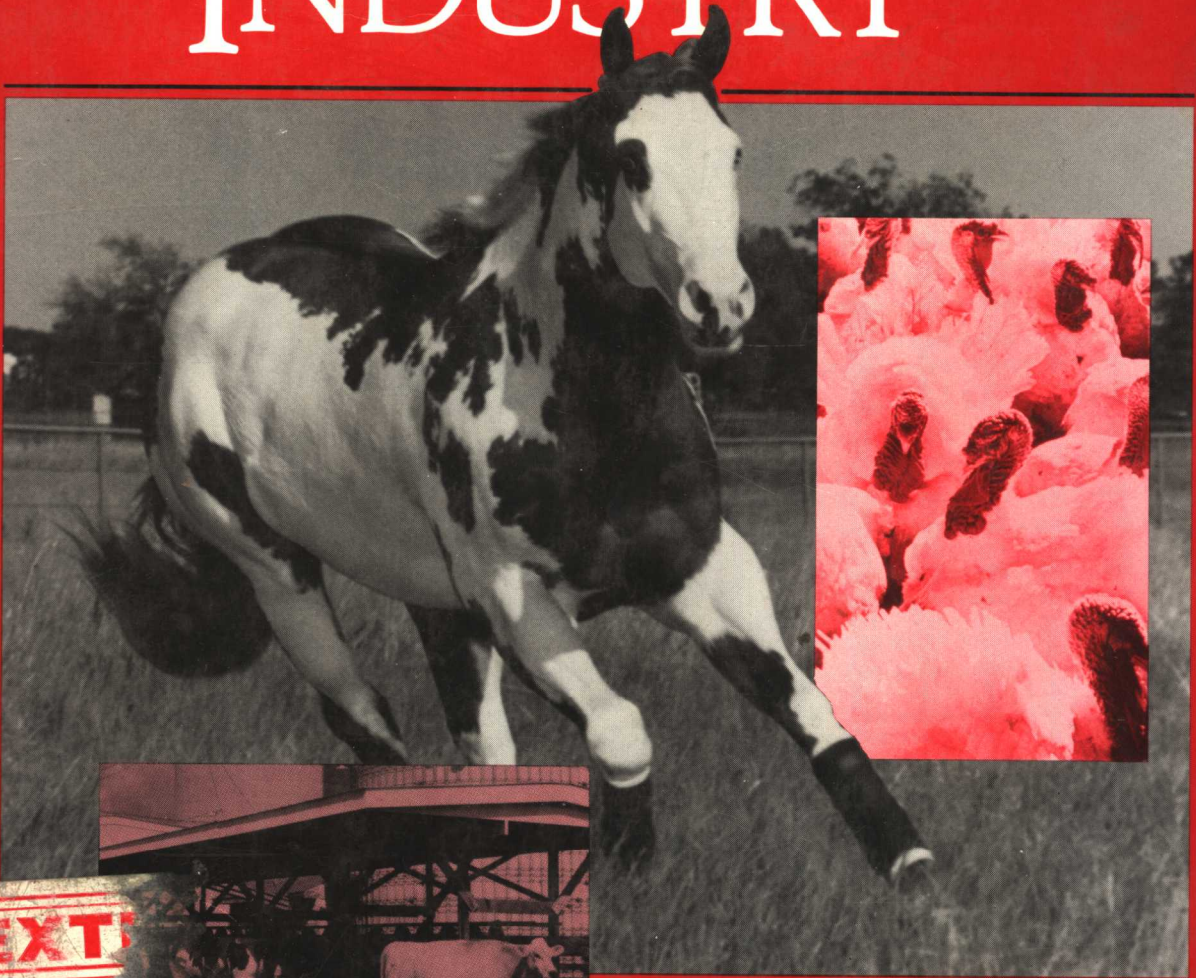


FOURTH EDITION

ANIMAL SCIENCE AND INDUSTRY



Duane Acker · Merle Cunningham

Animal Science and Industry

fourth edition

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PRENTICE HALL, Englewood Cliffs, New Jersey 07632

54K96/02

Library of Congress Cataloging-in-Publication

Acker, Duane

Animal science and industry / Duane Acker, Merle C. Cunningham,
4th ed.

p. cm.

Includes index.

ISBN 0-13-037433-4

1. Livestock. 2. Animal industry. I. Cunningham, M. (Merle)

II. Title.

SF61-A3 1991

90-25065

636-dc20

CIP

Aquisitions editor: Robin Baliszewski
Editorial/production supervision: Evalyn Schoppet
Cover design: Lundgren Graphics
Manufacturing buyer: Edward O'Dougherty
Prepress buyer: Mary McCartney



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A Division of Simon & Schuster
Englewood Cliffs, New Jersey 07632

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Printed in the United States of America
10 9 8 7 6 5 4 3 2 1

ISBN 0-13-037433-4

Prentice-Hall International (UK) Limited, *London*
Prentice-Hall of Australia Pty. Limited, *Sydney*
Prentice-Hall Canada Inc., *Toronto*
Prentice-Hall Hispanoamericana, S.A., *Mexico*
Prentice-Hall of India Private Limited, *New Delhi*
Prentice-Hall of Japan, Inc., *Tokyo*
Simon & Schuster Asia Pte. Ltd., *Singapore*
Editora Prentice-Hall do Brasil, Ltda., *Rio de Janeiro*

Preface

The primary objective of this text has always been to make the introduction of the student to animal science an exciting and rewarding experience, one that provides a long-lasting foundation for further learning. This new edition of *Animal Science and Industry* also has two primary goals: first, to provide students who are not majoring in animal science appropriate information in a way that will help them gain a strong appreciation and understanding of the many aspects of the livestock and poultry industry, and second, to provide animal science majors with new and interesting information that enables them to build upon their knowledge and better prepares them for more specialized and advanced courses.

This text emphasizes the principles of animal science and relates these principles to efficient livestock and poultry production. Comprehensive information and discussion focuses upon (1) biological principles of animal function and management; (2) business and financial considerations in efficient animal production systems; (3) appreciation of high-quality animal products—meat, milk, wool, eggs, and use of the horse for work and pleasure; and (4) marketing of animals and processing of their products.

Most biological, business, or management principles apply to all species. Therefore, this book was developed to provide an integrated and comparative presentation of these principles, together with basic information and concepts, and to describe major differences among species where appropriate. Many Animal Science

departments, in teaching the introductory course, have chosen to shift from species orientation to a more integrated presentation of subject matter. This approach supports the proven theory that learning is more efficient and principles learned are more usable when there is a comparative basis for learning. Because of the logic in this approach, and the expressed support of earlier editions, this method of presentation was continued in this new edition.

Current scientific facts and principles are emphasized. *Animal Science and Industry, Fourth Edition*, provides greater scientific depth in important topics than earlier editions, as well as more coverage and updating of a broad number of topics. Because of the competitiveness of animal production and product merchandising businesses, emphasis also is given to these high-priority topics, current practices, and recent refinements. New sections of in-depth material have been added to selected chapters, made possible by concise revision and consolidation of chapter contents.

This new edition recognizes that students enrolled in the introductory animal science course are of diverse backgrounds. Many have had little experience with animals. For some, contact with animals has been limited to companion animals. Other students of animal science have considerable experience with animals, but it is often limited to specialized production and management of one species. Therefore, *Animal Science and Industry* does not assume extensive acquaintance with each of the species, but provides appropriate descriptions and vocabulary in current usage in the animal industry. Each new term is defined or explained, and an extensive glossary for easy reference is provided to aid the reader. This revised edition not only provides thorough coverage of animal agriculture in an easily understood style, but also contains new and challenging material for the student with a strong animal production background.

CHANGES IN THIS EDITION

Reviewers of the third edition of *Animal Science and Industry* cited the following features among its strengths: complete, concise and appropriate reading level; well organized; excellent illustrations; technical aspects of animal science well related to practical application; and excellent balance between science and industry. Every effort was made to retain these strengths while incorporating improvements into the book.

This revision brings the student up to date on technological changes occurring in animal agriculture, the increased specialization in animal production systems, and the application of technology in development of breeding and production herds and flocks. Basic to these areas is the need for understanding biological principles of animal science. Therefore, nutrition and feeding have been given more thorough coverage in Chapters 3–7. Also, Chapter 14, Physiology of Reproduction, has been reorganized to include more technical and comparative information, with improved illustrations and with emphasis on the need for excellence in reproductive efficiency.

Chapter 16, Lactation, has been broadened to provide a greater appreciation and understanding of lactation in all farm mammals. Again, improved illustrations and comparative examples have been incorporated for easier learning and improved retention by the student.

Organization of the chapters on genetics, breeding, genetic evaluation, and mating systems (Chapters 17–20) has been maintained. Sections relating to the rules for improvement by selection, heritability and use of heritability estimates, accuracy of trait evaluation, and utilization of mating systems with emphasis on maximizing heterosis in meat animals have been carefully revised to help ensure clarity and ease in learning.

Chapter 21, Breeds, includes recent photographs of animals most representative of the breeds, including several breeds introduced in the United States in recent years.

Each of the chapters on production and management—Chapter 28, The Business of Producing Pork; Chapter 29, The Cow Herd and Ewe Flock; Chapters 30–32, The Business of Dairying, Evaluation and Selection for Milk Production, and Milk Handling and Marketing; Chapters 33–34, The Business of Producing Eggs, The Egg as a Product; Chapter 35, The Business of Commercial Poultry Meat Production; and Chapter 36, Horses and Ponies; as well as Chapters 8–10, Evaluation of Feeder Animals, Animal Growth and Carcass Composition, and The Feeding Enterprise—have been updated with respect to geographic densities, application of current technology for efficient production, and realistic but attainable production standards.

The important chapters on animal environment, animal health, and animal behavior (Chapters 11–13) have been modified, but only to provide clarity in illustrations and examples. Likewise, the chapters on marketing, market classes and grades, processing, and appreciation of meat as a product (Chapters 22–26) have been revised to reflect latest trends, changes in grades and grading, and current aspects of slaughtering and processing.

Each chapter introduction includes a list of those tasks the reader should be able to do—define, describe, calculate, list, differentiate, explain—upon completion of that chapter. To add emphasis to subject matter within each chapter, questions for review and discussion are provided at the end of each chapter.

Drawings of animal anatomical features have been greatly improved in detail and labeling.

The glossary has been expanded to include new terminology used in sections added to the book.

CHAPTER SEQUENCE

The rationale for organization of chapters in this text is based on the belief that learning best occurs when new subject matter can be related to the learner's existing knowledge, interests, and experiences.

The first two chapters provide a familiarization with animal agriculture and the animal industry. Then a sequence of chapters follows on nutrients, ruminant and nonruminant digestion, and appropriate feeds and feeding of common species. Each person who has cared for animals has fed and managed them at one time or another and is likely to be intrigued by how feed and feed formulation can efficiently provide nutrients for animal growth and performance, milk, or eggs.

Topics related to the comfort, responsiveness, and therefore performance and efficiency of production—growth, the feeding enterprise, and animal environment, health, and behavior—are presented in the next sequence of chapters.

Equally important to success in breeding and management of herds and flocks are the topics of reproduction and lactation (Chapters 14–16). The chapter on reproduction emphasizes the structures and normal function of the male and female reproductive system and the need for synchronization of events for successful fertilization, pregnancy, and parturition. With adequate numbers of offspring born, an understanding is needed of the mammary system, milk synthesis, and milk let-down to ensure desired quantities of milk for thrifty, growing offspring or for sale for human consumption.

The important chapters on genetics, genetic improvement, animal evaluation, and mating systems (Chapters 17–20) have been written so the student can learn and understand the basic principles without difficulty. Introduction of this material at this section of the text—and of the course—allows time for students to more freely accept facts and concepts from the scientific literature; for some, to reevaluate earlier beliefs; and to more logically perceive how significant improvement in animal production can be achieved by applying the genetic principles. Presentation of breeds (Chapter 21) introduces the student to both traditional breeds and those newly introduced into the United States.

Most animal science students have developed their interest through animal care and handling. Few have had the opportunity to become well acquainted with the marketing process. Hence, Chapters 22–26 emphasize marketing of meat animals, terminology and procedures of marketing, humane handling and slaughtering of animals, and important aspects of meat processing and merchandising.

This text places emphasis upon learning the principles of animal science and then explains how they apply to efficient animal production and management. Therefore, Chapters 27–35 are devoted to the businesses of wool and mohair, pork, beef, sheep, dairy, and poultry (egg, broiler, and turkey) production and management. Emphasis is placed on current recommendations, including recent technological developments and practices that improve efficiency of production. In addition, Chapter 36 addresses important business and management aspects unique to the horse and pony industry.

Although the main goal in the presentation of the sequence of chapters is to capitalize on the student's previous knowledge, interests, and experiences, the organization of the book allows for flexible usage. For example, some instructors may prefer to teach a section on animal products or species production systems earlier in the course, prior to the more in-depth areas of animal genetics, physiology, nutrition and behavior. For these course presentations, the book is presented so that chapters or specific sections can be referenced easily by both instructor and student.

ACKNOWLEDGMENTS

Among the most appreciated features of earlier editions of *Animal Science and Industry* is the consistency in writing style, terminology, use of illustrations, flow of chapter contents, and relating of content to subsequent chapters. This new edition improves upon these features, yet adds more technical material in an easy-to-learn manner. This book has been a combined effort of Prentice Hall, the principal authors, and many well-respected scientists, teachers, and industry leaders through their suggestions and assistance in writing certain parts of the book.

Most of the contributors to *Animal Science and Industry* have significant responsibility for the introductory animal science course at their university or college. These outstanding people have shared our dedication to provide pertinent and accurate material. The authors are highly appreciative of the efforts of these persons.

Those who have been especially helpful in achieving the completeness, accuracy, and effectiveness of the text through their reviews are: Dr. Ronnie Edwards, Texas A & M University; Dr. Lemuel Goode, North Carolina State University; Dr. David Holzgraefe, University of Illinois; Dr. Don Hargrove, University of Florida; Dr. Douglas Kenealy, Iowa State University; Dr. J. L. Perkins, University of Arkansas; Dr. Boyd Ramsey, Texas Tech University, Dr. Kenneth McMillin, Louisiana State University; J. Fred Stephens, Ohio State University; and Dr. John Ward, University of Nebraska.

Special recognition is owed to the following scientists, who were involved in the outlining and drafting of chapters and sections of the book: Drs. Calvin Drake and Earl Farmer, Kansas State University; Dr. Ted Friend, Texas A & M University; Dr. Phillip George, University of Wisconsin; Drs. Berl Koch, Don Kropf, David Nichols, John Noordsy, Dennis Sigler, and Cliff Spaeth, Kansas State University.

Intensive review of individual and groups of chapters was done by Dr. James Bailey, South Dakota State University, and R. John McCoy, Kansas State University.

Among the highly qualified faculty who reviewed specific chapters in their areas of expertise and gave constructive assistance were the following: Drs. Bill Able, Al Adams, Gary Allee, Keith Bolsen, Ed Call, James Craig, Duane Davis, Kansas State University; Dr. Edward DePeters, University of California, Davis; Drs. Mike Dikeman and Richard Dunham, Kansas State University; Dr. Dennis Hallford, New Mexico State University; Drs. Charles Norton and Harold Roberts, Kansas State University; Dr. Richard Saake, Virginia Polytechnic Institute; Dr. Paul Sanford, Kansas State University; Dr. Edward Uvacek, Texas A & M University; Dr. William Vinson, Virginia Polytechnic Institute; Dr. George Ward, Kansas State University; Dr. Dale Weber, Oregon State University; and Dr. John Wheat, Kansas State University.

Other members of the Kansas State University faculty gave general assistance on the project, including Drs. David Ames, Don Good, Miles McKee, and David Mugler, and Ms. Janet Woodward.

For their encouragement and suggestions, appreciation is extended to Drs. B. G. Harmon and R. B. Harrington, Purdue University, and Dr. John Knesel, Northeast Louisiana University.

Appreciation also goes to colleagues in the animal industries, fields of animal production, and other universities and colleges, who provided photos and printed materials from which data and illustrations were drawn. Persons in numerous USDA agencies were especially helpful. Appreciation also is extended to the publishers of the scientific journals frequently cited in the book, and to the breed associations, livestock and breed journals and periodicals, commodity exchanges, industry organizations, and others who provided illustrations, photographs, data, and materials.

Efforts have been made to properly cite sources of illustrations data and other materials, and to give proper credit to individuals, institutions, and organizations. If proper credit has not been given, it is unintentional and sincerely regretted.

Special thanks go to the many students who have used earlier editions of *Animal Science and Industry* and who have given suggestions for improved clarity and consistency.

Robin Baliszewski, Prentice Hall, and Evalyn Schoppet, Sterling Editorial Services, are appreciated for their determined efforts in producing a well-edited and attractive fourth edition.

Merle Cunningham
Purdue University

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