

INTERNATIONAL STOCKMEN'S SCHOOL HANDBOOKS

DAIRY SCIENCE HANDBOOK VOLUME 15

edited by Frank H. Baker



A WINROCK INTERNATIONAL PROJECT
PUBLISHED BY WESTVIEW PRESS

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International Stockmen's School Handbooks

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DAIRY SCIENCE HANDBOOK
VOLUME 15

International Stockmen's School Handbooks

Dairy Science Handbook Volume 15

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The 1983 *International Stockmen's School Handbooks* include more than 200 technical papers presented at this year's Stockmen's School—sponsored by Winrock International—by outstanding animal scientists, agribusiness leaders, and livestock producers expert in animal technology, animal management, and general fields relevant to animal agriculture.

The *Handbooks* represent advanced technology in a problem-oriented form readily accessible to livestock producers, operators of family farms, managers of agribusinesses, scholars, and students of animal agriculture. The *Beef Cattle Science Handbook*, the *Dairy Science Handbook*, the *Sheep and Goat Handbook*, and the *Stud Managers' Handbook* each include papers on such general topics as genetics and selection; general anatomy and physiology; reproduction; behavior and animal welfare; feeds and nutrition; pastures, ranges, and forests; health, diseases, and parasites; buildings, equipment, and environment; animal management; marketing and economics (including product processing, when relevant); farm and ranch business management and economics; computer use in animal enterprises; and production systems. The four *Handbooks* also contain papers specifically related to the type of animal considered.

Frank H. Baker is director of the International Stockmen's School at Winrock International, where he is also program officer of the National Program. An animal production and nutrition specialist, Dr. Baker has served as dean of the School of Agriculture at Oklahoma State University, president of the American Society of Animal Science, president of the Council on Agricultural Science and Technology, and executive secretary of the National Beef Improvement Federation.

A Winrock International Project

Serving People Through Animal Agriculture

This handbook is composed of papers presented at the
International Stockmen's School
January 2-6, 1983, San Antonio, Texas
sponsored by Winrock International

A worldwide need exists to more productively exploit animal agriculture in the efficient utilization of natural and human resources. It is in filling this need and carrying out the public service aspirations of the late Winthrop Rockefeller, Governor of Arkansas, that Winrock International bases its mission to advance agriculture for the benefit of people. Winrock's focus is to help generate income, supply employment, and provide food through the use of animals.

PREFACE

The Dairy Science Handbook includes presentations made at the International Stockmen's School, January 2-6, 1983. The faculty members of the School who authored this fifteenth volume of the Handbook, along with books on Beef Cattle, Horses, and Sheep and Goats, are scholars, stockmen, and agribusiness leaders with national and international reputations. The papers are a mixture of tried and true technology and practices with new concepts from the latest research results of experiments in all parts of the world. Relevant information and concepts from many related disciplines are included.

The School has been held annually since 1963 under Agriservices Foundation sponsorship; before that it was held for 20 years at Washington State University. Dr. M. E. Ensminger, the School's founder, is now Chairman Emeritus. Transfer of the School to sponsorship by Winrock International with Dr. Frank H. Baker as Director occurred late in 1981. The 1983 School is the first under Winrock International's sponsorship after a one-year hiatus to transfer sponsorship from one organization to the other.

The five basic aims of the School are to:

1. address needs identified by commercial livestock producers and industries of the United States and other countries,
2. serve as an educational bridge between the livestock industry and its technical base in the universities,
3. mobilize and interact with the livestock industry's best minds and most experienced workers,
4. incorporate new livestock industry audiences into the technology transfer process on a continuing basis, and
5. improve the teaching of animal science technology.

Wide dissemination of the technology to livestock producers throughout the world is an important purpose of the Handbooks and the School. Improvement of animal production and management is vital to the ultimate solution of hunger problems of many nations. The subject matter, the style of presentation, and opinions expressed in the papers are those of the authors and do not necessarily reflect the opinions of Winrock International.

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CONTENTS

Preface.....	xi
Part 1. A GLOBAL VIEW OF ANIMAL AGRICULTURE	
1. A Global Food-Animal Protein System: Pipedream or Possibility? <u>Charles G. Scruggs</u>	3
2. Foundation of Civilization: Food <u>Allen D. Tillman</u>	9
3. World Livestock Feed Relationships: Their Meaning to U.S. Agriculture, <u>Richard O. Wheeler</u> and <u>Kenneth B. Young</u>	21
4. World Agriculture in Hostile and Benign Climatic Settings, <u>Wayne L. Decker</u>	29
5. The Impacts of Climatic Variabilities on Livestock Production, <u>Wayne L. Decker</u>	39
Part 2. GENERAL CONCEPTS AFFECTING AGRICULTURE AND THE INDUSTRY	
6. Political Challenges for Today's Animal Agriculture <u>George Stone</u>	47
7. An Agri-Woman's View of the Politics of Agriculture: National and International Perspectives <u>Ruby Ringsdorf</u>	55
8. Oregon Women for Agriculture Talk About the Structure of Agriculture, <u>Ruby Ringsdorf</u>	61
9. The Current Status of the Family Farm in American Agriculture, <u>George Stone</u>	69
10. Livestock Production on New England Family Farms <u>Donald M. Kinsman</u>	77
11. Regulation of Agricultural Chemicals, Growth Promotants, and Feed Additives, <u>O. D. Butler</u>	83

Part 3. GENETICS AND SELECTION

12.	The Value of DHIA to Producers and to the Industry <u>Richard S. Sechrist</u>	91
13.	Friesian Cattle Strains Comparison: Dairy Performance, <u>Henryk A. Jasiorowski</u>	105
14.	New Zealand Dairy Cattle Breeding Related to Holstein-Friesian Strain Comparison Results and Use of Embryo Transfers for Genetic Improvement <u>R. L. Baker</u>	117
15.	Dairy Cattle Management by DHI Objectives <u>Jack D. Stout</u>	135
16.	Genetic Indexes Used in Dairy Cow and Sire Selection, <u>Jack D. Stout</u>	145
17.	Form and Function of Dairy Cattle <u>Jack D. Stout</u>	159

Part 4. PHYSIOLOGY, REPRODUCTION, AND MANAGEMENT

18.	Hormonal Regulation of the Estrous Cycle <u>Roy L. Ax</u>	171
19.	Necessary Components for a Successful Heat Detection Program, <u>Roy L. Ax</u>	179
20.	Postpartum Reproductive Management of the Dairy Cow <u>Roy L. Ax</u>	185
21.	Embryo Manipulations, Test-Tube Fertilization, and Gene Transfer: Looking into the Crystal Ball <u>Roy L. Ax, G. D. Ball, R. W. Lenz, and N. L. First</u>	191
22.	Improving Reproductive Performance in Dairy Herds <u>James N. Wiltbank, D. W. Richards, and H. C. Scott</u>	199
23.	Reproduction Management for Dairy Cattle <u>Samuel B. Guss</u>	211
24.	Managing our Dairy Farms, <u>Doyle Waybright</u>	217

Part 5. ENVIRONMENT, BUILDINGS, AND EQUIPMENT

25.	Measuring an Animal's Environment <u>Stanley E. Curtis</u>	221
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26.	Measuring Environmental Stress in Farm Animals <u>Stanley E. Curtis</u>	243
27.	Livestock Psychology and Handling-Facility Design <u>Temple Grandin</u>	255
28.	Design of Corrals, Squeeze Chutes, and Dip Vats <u>Temple Grandin</u>	271

Part 6. FEEDS AND NUTRITION

29.	More Economical Milk Production with Computer Use in Nutrition and Feeding Management <u>Carl E. Coppock</u>	291
30.	Greater Reproductive Performance with Nutrition and Feeding Stratagems, <u>Carl E. Coppock</u>	301
31.	Reduce Heat Stress in High-Producing Dairy Cows with Feeding and Nutrition Management <u>Carl E. Coppock</u>	315
32.	Survive the Cost-Price Squeeze with a Nutrition and Feeding Game Plan, <u>Carl E. Coppock</u>	325
33.	Supplementing Dairy Cows in the Tropics <u>Manuel E. Ruiz</u>	337

Part 7. HEALTH, DISEASE, AND PARASITES

34.	Infectious Livestock Diseases: Their Worldwide Toll, <u>Harry C. Mussman</u>	351
35.	Impact of Animal Diseases in World Trade <u>Harry C. Mussman</u>	359
36.	Biology and Control of Insect Pests of Dairy Cattle, <u>R. O. Drummond</u>	365
37.	Potential and Actual Economics of a Herd Health Program, <u>Jenks Swann Britt</u>	375
38.	A Health Program for Dairy Cattle <u>Samuel B. Guss</u>	389
39.	Achieving a Profitable Calving Interval Through a Reproductive Health and Management Program <u>Jenks Swann Britt</u>	401

Part 8. MASTITIS AND RELATED TOPICS

40.	Somatic Cells: Their Origin and Function and an Interpretation of Their Numbers, <u>Don G. Rollins</u>	413
41.	The Effect of Machine Milking on Mastitis in Dairy Cows, <u>Jerry O'Shea</u>	427
42.	Mastitis Control in Dairy Cows, <u>Jerry O'Shea</u>	437
43.	The Essential Criteria for the Components of a Milking Machine and for Component Testing <u>Jerry O'Shea</u>	449
44.	The Range and Performance of Conventional Milking-Machine Clusters, <u>Jerry O'Shea</u>	463

Part 9. COMPUTER TECHNOLOGY

45.	AGNET: A National Computer System for Cattlemen <u>Harlan G. Hughes</u>	475
46.	Rancher-Owned Microcomputer Systems: What's Available, <u>Harlan G. Hughes</u>	485
47.	Six Steps for a Cattleman to Take in Buying a Computer, <u>Harlan G. Hughes</u>	493
48.	Direct Delivery of Market Information Through Rancher-Owned Microcomputers: A Research Report <u>Harlan G. Hughes</u> , <u>Robert Price</u> , and <u>Doug Jose</u>	497

Part 10. THE FUTURE OF THE DAIRY INDUSTRY

49.	A Glimpse at Dairying in the Year 2000 <u>Robert E. Walton</u>	511
List	of Names and Addresses of the Lecturers and Staff.....	519
List	of Other Books of Interest Published by Westview Press and Winrock International.....	527

Part 1

A GLOBAL VIEW
OF ANIMAL AGRICULTURE

A GLOBAL FOOD-ANIMAL PROTEIN SYSTEM: PIPEDREAM OR POSSIBILITY?

Charles G. Scruggs

Throughout the long ages of man, meat has been his primary food. Further, a surface study of archaeology seems to indicate that those civilizations that primarily depended on meat have been the most advanced. The telltale signs of man dating back as far as 10,000 years ago indicate that man was primarily a hunter--and thereby a meat consumer. Today, we marvel at the drawings of muscular bulls and heavy bison found on cave walls, drawings indicating the high regard early man had for meat animals.

Approximately 9,000 years ago, man began to domesticate animals. "At Zauri Chemi, dated 9000 B.C., many wild sheep had been killed when immature, as if the inhabitants had either fenced in the grazing grounds of wild sheep, penned herds, or even tamed sheep to the extent that they could control the age at which they were killed."

The earliest evidence of tame cattle is dated approximately 7000 B.C. By 2500 B.C. to 2300 B.C., the Egyptians were milking cows.

Again, a quick observation seems to indicate that civilizations that depended most heavily on cereals were often the least advanced. When animals were not present and man was forced to depend on cereals alone, the civilizations failed to flourish and often disappeared.

As man began to concentrate in cities, he still desired--indeed, seemed to prefer--meat. And meat animals were a lot easier to transport to the cities than were cereals. Meat animals had four legs. They could be driven to people. And so they have been for thousands of years.

As man moved into new territories, he often took his meat animals with him. Cattle and sheep have traveled with the armies of invaders and in the trains of the missionaries. These animals helped civilize the world. Some of the cargo on the earliest ships was live animals--incredible, when you think about the tiny vessels and harsh long voyages made as long as 2,000 years ago. And even 200 years ago.

The earliest hunters and travelers discovered that by drying or salting they could preserve and transport meat more easily. In fact, it comes as something of a shock to