

This International Student Edition is for use outside of the U.S.

Tenth Edition **FARM
MANAGEMENT**

**Mc
Graw
Hill**

**Ronald D. Kay
William M. Edwards
Patricia A. Duffy**

Tenth Edition

FARM MANAGEMENT

Ronald D. Kay

*Professor Emeritus,
Texas A&M University*

William M. Edwards

*Professor Emeritus,
Iowa State University*

Patricia A. Duffy

*Professor Emerita,
Auburn University*

**Mc
Graw
Hill**



FARM MANAGEMENT

Published by McGraw Hill LLC, 1325 Avenue of the Americas, New York, NY 10019. Copyright ©2024 by McGraw Hill LLC. All rights reserved. Printed in the United States of America. No part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written consent of McGraw Hill LLC, including, but not limited to, in any network or other electronic storage or transmission, or broadcast for distance learning.

Some ancillaries, including electronic and print components, may not be available to customers outside the United States.

This book is printed on acid-free paper.

1 2 3 4 5 6 7 8 9 LCR 28 27 26 25 24 23

ISBN 978-1-266-27532-6

MHID 1-266-27532-0

Cover Image: *mihalec/Shutterstock*

All credits appearing on page or at the end of the book are considered to be an extension of the copyright page.

The Internet addresses listed in the text were accurate at the time of publication. The inclusion of a website does not indicate an endorsement by the authors or McGraw Hill LLC, and McGraw Hill LLC does not guarantee the accuracy of the information presented at these sites.

mheducation.com/highered

CONTENTS

Preface viii
About the Authors xi

PART I

MANAGEMENT 1

CHAPTER 1

FARM MANAGEMENT NOW AND IN THE FUTURE 5

Chapter Outline 5
Chapter Objectives 5
Structure of Farms and Ranches 6
New Technology 9
The Information Age 10
Controlling Assets 12
Human Resources 12
Producing to Meet Consumer Demands 13
Contracting and Vertical Integration 14
Environmental and Health Concerns 14
Globalization 15
Summary 16
Questions for Review and Further Thought 16

CHAPTER 2

MANAGEMENT AND DECISION MAKING 19

Chapter Outline 19
Chapter Objectives 19
Functions of Management 20
Strategic Farm Management 21
Decision Making 26
Characteristics of Decisions 29
The Decision-Making Environment in Agriculture 30

Summary 32
Questions for Review and Further Thought 32

PART II

MEASURING MANAGEMENT PERFORMANCE 33

CHAPTER 3

ACQUIRING AND ORGANIZING MANAGEMENT INFORMATION 37

Chapter Outline 37
Chapter Objectives 37
Purpose and Use of Records 38
Farm Business Activities 40
Basic Accounting Terms 41
Options in Choosing
an Accounting System 42
Chart of Accounts 42
Basics of Cash Accounting 46
Basics of Accrual Accounting 47
A Cash Versus Accrual Example 48
Recommendations from the Farm Financial
Standards Council 51
Output from an Accounting System 51
Summary 54
Questions for Review and Further
Thought 54

CHAPTER 4

THE BALANCE SHEET AND ITS ANALYSIS 57

Chapter Outline 57
Chapter Objectives 57

Purpose and Use of a Balance Sheet 58
 Balance Sheet Format 58
 Asset Valuation 62
 Cost-Basis Versus Market-Basis Balance Sheet 64
 Balance Sheet Example 65
 Balance Sheet Analysis 70
 Statement of Owner Equity 73
 Summary 75
 Questions for Review and Further Thought 75

CHAPTER 5

THE INCOME STATEMENT
 AND ITS ANALYSIS 79

Chapter Outline 79
 Chapter Objectives 79
 Identifying Revenue and Expenses 80
 Depreciation 83
 Income Statement Format 88
 Accrual Adjustments
 to a Cash-Basis Income Statement 89
 Analysis of Net Farm Income 92
 Change in Owner Equity 98
 Statement of Cash Flows 99
 Summary 101
 Questions for Review and Further Thought 102

CHAPTER 6

FARM BUSINESS ANALYSIS 105

Chapter Outline 105
 Chapter Objectives 105
 Types of Analysis 106
 Standards of Comparison 107
 Diagnosing a Farm
 Business Problem 108
 Measures of Profitability 109
 Measures of Size 113
 Efficiency Measures 114
 Financial Measures 119
 Summary 123
 Questions for Review and Further Thought 123

PART III
 APPLYING ECONOMIC PRINCIPLES 125

CHAPTER 7

ECONOMIC PRINCIPLES: CHOOSING PRODUCTION
 LEVELS 127

Chapter Outline 127
 Chapter Objectives 127
 The Production Function 128
 Marginal Analysis 129
 Law of Diminishing
 Marginal Returns 130
 How Much Input to Use 131
 Using Marginal Concepts 133
 The Equal Marginal Principle 137
 Summary 141
 Questions for Review and Further Thought 141

CHAPTER 8

ECONOMIC PRINCIPLES: CHOOSING INPUT
 AND OUTPUT COMBINATIONS 145

Chapter Outline 145
 Chapter Objectives 145
 Input Combinations 146
 Output Combinations 151
 Summary 156
 Questions for Review and Further Thought 157

CHAPTER 9

COST CONCEPTS AND DECISION MAKING 159

Chapter Outline 159
 Chapter Objectives 159
 Opportunity Cost 160
 Cash and Noncash Expenses 161
 Fixed, Variable, and Total Costs 162
 Application of Cost Concepts 165
 Economies of Size 169
 Long-Run Average Cost Curve 173
 Summary 175
 Questions for Review and Further Thought 175
 Appendix. Cost Curves 176

PART IV**BUDGETING FOR GREATER PROFIT 179****CHAPTER 10****ENTERPRISE BUDGETING 181**

- Chapter Outline 181
- Chapter Objectives 181
- Purpose, Use, and Format of Enterprise Budgets 182
- Constructing a Crop Enterprise Budget 184
- Constructing a Livestock Enterprise Budget 189
- General Comments on Enterprise Budgets 191
- Interpreting and Analyzing Enterprise Budgets 192
- Summary 195
- Questions for Review and Further Thought 195

CHAPTER 11**WHOLE-FARM PLANNING 197**

- Chapter Outline 197
- Chapter Objectives 197
- The Planning Procedure 198
- Example of Whole-Farm Planning 202
- Linear Programming as a Budgeting Tool 204
- Developing the Whole-Farm Budget 208
- Risk, Liquidity, and Long-Run Budgets 209
- Summary 213
- Questions for Review and Further Thought 214
- Appendix. Graphical Example of Linear Programming 214

CHAPTER 12**PARTIAL BUDGETING 219**

- Chapter Outline 219
- Chapter Objectives 219
- Uses of a Partial Budget 220
- Partial Budgeting Procedure 220
- The Partial Budget Format 221
- Partial Budgeting Examples 223

- Computing Changes in Revenue and Costs 226
- Sensitivity Analysis 227
- Limitations of Partial Budgeting 227
- Final Considerations 228
- Summary 230
- Questions for Review and Further Thought 230

CHAPTER 13**CASH FLOW BUDGETING 233**

- Chapter Outline 233
- Chapter Objectives 233
- Features of a Cash Flow Budget 234
- Constructing a Cash Flow Budget 236
- Example of a Cash Flow Budget 240
- Uses for a Cash Flow Budget 244
- Monitoring Actual Cash Flows 245
- Investment Analysis Using a Cash Flow Budget 247
- Summary 249
- Questions for Review and Further Thought 249

PART V**IMPROVING MANAGEMENT SKILLS 251****CHAPTER 14****FARM BUSINESS ORGANIZATION AND TRANSFER 255**

- Chapter Outline 255
- Chapter Objectives 255
- Life Cycle 256
- Sole Proprietorship 257
- Joint Ventures 259
- Operating Agreements 260
- Partnerships 261
- Corporations 265
- Limited Liability Companies 268
- Cooperatives 269
- Trusts 270
- Transferring the Farm Business 271

Summary	275
Questions for Review and Further Thought	275

CHAPTER 15

MANAGING RISK AND UNCERTAINTY	279
Chapter Outline	279
Chapter Objectives	279
Sources of Risk and Uncertainty	280
Risk-Bearing Ability and Attitude	283
Expectations and Variability	283
Decision Making Under Risk	287
Tools for Managing Risk	292
Summary	301
Questions for Review and Further Thought	302

CHAPTER 16

MANAGING INCOME TAXES	305
Chapter Outline	305
Chapter Objectives	305
Types of Income Taxes	306
Objectives of Tax Management	307
The Tax Year	308
Tax Accounting Methods	308
The Tax System and Tax Rates	311
Some Tax Management Strategies	312
Depreciation	315
Capital Gains	319
Summary	322
Questions for Review and Further Thought	322

CHAPTER 17

INVESTMENT ANALYSIS	325
Chapter Outline	325
Chapter Objectives	325
Time Value of Money	326
Investment Analysis	331
Financial Feasibility	337
Income Taxes, Inflation, and Risk	340
Summary	343
Questions for Review and Further Thought	343
Appendix. An Example of an Investment Analysis	344

CHAPTER 18

ENTERPRISE ANALYSIS	351
Chapter Outline	351
Chapter Objectives	351
Profit and Cost Centers	352
The Accounting Period	353
Types of Enterprises	354
Land Costs	360
Verifying Production	362
Accounting Systems	363
Summary	364
Questions for Review and Further Thought	364

PART VI

ACQUIRING RESOURCES FOR MANAGEMENT 367

CHAPTER 19

CAPITAL AND CREDIT	371
Chapter Outline	371
Chapter Objectives	371
Economics of Capital Use	372
Sources of Capital	373
Types of Loans	375
The Cost of Borrowing	382
Sources of Loan Funds	384
Establishing and Developing Credit	386
Analyzing Liquidity	389
Analyzing Solvency	390
Summary	392
Questions for Review and Further Thought	393

CHAPTER 20

LAND: CONTROL AND USE	397
Chapter Outline	397
Chapter Objectives	397
Factors that Affect Farmland Values	398
The Economics of Land Use and Management	399
Controlling Land: Own or Lease?	401
Buying Land	403
Leasing Land	408
Conservation and Environmental Concerns	418

Summary	420
Questions for Review and Further Thought	421

C H A P T E R 21

HUMAN RESOURCE MANAGEMENT	429
Chapter Outline	429
Chapter Objectives	429
Characteristics of Agricultural Labor	431
Planning Farm Labor Resources	432
Measuring the Efficiency of Labor	436
Improving Labor Efficiency	437
Improving Managerial Capacity	438
Obtaining and Managing Farm Employees	439
Agricultural Labor Regulations	447
Summary	450
Questions for Review and Further Thought	450

C H A P T E R 22

MACHINERY MANAGEMENT	453
Chapter Outline	453
Chapter Objectives	453
Estimating Machinery Costs	454
Examples of Machinery Cost Calculations	458
Factors in Machinery Selection	461
Alternatives for Acquiring Machinery	464
Improving Machinery Efficiency	469
Summary	473
Questions for Review and Further Thought	473
APPENDIX	474
GLOSSARY	480
INDEX	489



PREFACE

Farms and ranches, like other small businesses, require sound management to survive and prosper. The continual development of new agricultural technologies means that farm and ranch managers must stay informed of the latest advances and decide whether to adopt them. Adopting a risky, unproven technology that fails to meet expectations can cause financial difficulties or even termination of the farm business. On the other hand, failing to adopt profitable new technologies will put the farm business at a competitive disadvantage that could also prove disastrous in the long run. Moreover, changing public policies regarding environmental protection, taxes, and risk control tools can make certain alternatives and strategies more or less profitable than they have been in the past. Finally, changes in consumer tastes, the demographic makeup of our population, and world agricultural trade policies affect the demand for agricultural products.

The continual need for farm and ranch managers to keep current and update their skills motivated us to write this tenth edition.

This book is divided into six parts. Part I begins with the chapter “Farm Management Now and in the Future.” It describes some of the technological and economic forces driving the changes we see in agriculture. From this chapter, students will gain an appreciation for the management skills modern farm managers must have or acquire. Part I concludes with a discussion of the concept of management, with

an emphasis on the importance of strategic planning and decision making.

Part II presents the basic tools needed to measure management performance, financial progress, and the financial condition of the farm business. It discusses how to collect and organize accounting data and how to construct and analyze key farm financial statements. Data from an example farm are used to demonstrate the analysis process.

Part III introduces important microeconomic principles and cost concepts. The topics in this part provide the basic tools needed to make good decisions about what to produce, what resources to use, and at what level to use them. The different types of economic costs in both the short run and the long run are defined, and economies and diseconomies of size and their causes are discussed.

The use of budgeting as a planning tool is emphasized in Part IV. The discussion includes chapters on enterprise, partial, whole farm, and cash flow budgets. The format and use for each type of budget, sources of data to use, and techniques for break-even analysis are presented.

Topics necessary to further refine a manager’s decision-making skills are included in Part V. Farm business organization and transfer, risk control, income tax management, investment analysis, and enterprise analysis are discussed. The chapter on income tax management has been updated with the latest changes available. The chapter on investment analysis includes

a discussion of how to compare investments with uneven and dissimilar cash inflows and outflows over time. The final chapter discusses how to separate the whole-farm analysis into specific profit centers and cost centers.

Part VI discusses strategies for acquiring the resources needed on farms and ranches, including capital and credit, land, human resources, and machinery. The human resource chapter includes sections on improving managerial capacity and bridging the cultural barriers that may be encountered in managing agricultural labor.

The authors would like to thank the instructors who have adopted previous editions for their courses and the many students who have used it both in and out of formal classrooms. Your comments and suggestions have been carefully considered and many were incorporated in this edition. Suggestions for future improvements are always welcome. A special thanks goes to the McGraw-Hill reviewers for their many thoughtful ideas and comments provided during the preparation of this and past editions.

New to this edition:

- 2 new tables
- 33 revised tables
- 16 revised figures
- 4 new boxes
- 9 revised boxes
- 14 new glossary terms

Updated material about:

- Example farm (I. M. Farmer) throughout
- Partial budgeting examples
- Cash flow budget example
- Crop and livestock insurance programs
- USDA commodity programs
- Land values and farm rental rates
- Agricultural labor laws
- Federal income tax rules and brackets

New or expanded discussion of:

- High-value producers
- Profitability indices
- Management ability and credit worthiness
- Loan programs for underserved and beginning farmers
- Effects of the COVID-19 pandemic on agriculture
- Net present value analysis of breeding livestock purchases
- Special programs for beginning farmers
- On-farm versus off-farm employment decision

INSTRUCTOR RESOURCES

Instructors, are you looking for additional resources? Be sure to visit www.mhhe.com/kay10e for the Instructor's Manual (which includes the answers to the end-of-chapter questions), Lab Exercises, an Electronic Testbank, and accessible PowerPoint Presentations.

Access is for instructors only and requires a user name and password from your McGraw-Hill Learning Technology Representative. To find your McGraw-Hill representative, go to www.mheducation.com and click the dropdown for "Support & Contact," select "Higher Education," and then click the "GET STARTED" button under the "Find Your Sales Rep" section.

Need help? Contact the McGraw-Hill Education Customer Experience Group (CXG). Visit the CXG website at www.mhhe.com/support. Browse our frequently asked questions (FAQs) and product documentation and/or contact a CXG representative.

Ronald D. Kay
William M. Edwards
Patricia A. Duffy



REVIEWER ACKNOWLEDGMENTS

Suggestions have been received from instructors throughout the country. This is vital feedback that is relied upon for product development. We thank each individual for their comments and suggestions. The efforts of many people are needed to develop and improve a product. Among these people are the reviewers and consultants who point out areas of concern, cite areas of strength, and make recommendations for change. In this regard, the following instructors provided feedback that was enormously helpful in preparing the book and related products.

Georgeanne M. Artz
Iowa State University

Christian Boessen
Iowa State University

Pierre I. Boumtje
Southern Arkansas University

Donald G. Chafin
Wilmington College

Larisa Cioaca
University of Maryland, College Park

Stephen Davis
Southwest Minnesota State University

Cheryl DeVuyst
Oklahoma State University

Carl Dillon
University of Kentucky

Rachel Kroepflen
Lakeshore Technical College

Stephen D. McGary, Ph.D.
Brigham Young University-Idaho

Alejandro Plastina
Iowa State University

Penny Raspotnik-Jones
Eastern Oklahoma State College

Adam Raub
Southeastern Community College

John Ritten
University of Wyoming

Dr. Margaretha Rudstrom
University of Minnesota-Crookston

Tyler Schau
Bismarck State College

Charles Steiner
University of Wisconsin-Platteville

Lori Van Overbeke
Southwest Minnesota State University

Barry Ward
The Ohio State University

Star Waters Jackson
James Sprunt Community College

ABOUT THE AUTHORS



©Ronald D. Kay

Ronald D. Kay is Professor Emeritus in the Department of Agricultural Economics at Texas A&M University. Dr. Kay taught farm management at Texas A&M University for 25 years, retiring at the end of 1996. He was raised on a farm in southwest Iowa and received his B.S. in agriculture and Ph.D. in agricultural economics from Iowa State University. He has experience as both a professional farm manager and a farm management consultant, and he maintains an active interest in a farming operation. He is a member of several professional organizations, including the American Society of Farm Managers and Rural Appraisers, where he was a certified instructor in their management education program. Dr. Kay received the Society's Excellence in Education award for 2002.



©Iowa State University

William M. Edwards is Professor Emeritus of Economics at Iowa State University, from where he received his B.S., M.S., and Ph.D. degrees in agricultural economics. He grew up on a family farm in south-central Iowa. He worked as an agricultural economist with the Farmers Home Administration and as a Peace Corps volunteer with the Colombian Agrarian Reform Institute. From 1974 through 2013, he taught on-campus and distance education courses and carried out extension programs in farm management at Iowa State University. In 2013, he received the Distinguished Service to Agriculture Award from the American Society of Farm Managers and Rural Appraisers. Dr. Edwards served as president of the Extension Section of the Agricultural and Applied Economics Association in 2006–2007.



©Patricia Duffy

Patricia A. Duffy is Professor Emerita in the Department of Agricultural Economics and Rural Sociology at Auburn University, where she taught farm management beginning in 1985. She grew up in Massachusetts and received her B.A. from Boston College. After finishing this degree, she served as a Peace Corps volunteer for 2 years, teaching basic agriculture sciences in a vocational secondary school in Zaire (now the Democratic Republic of the Congo). She received her Ph.D. in agricultural economics from Texas A&M University. Her research papers in farm management and policy have been published in a variety of professional journals. In 1994, she received an award from the Southern Agricultural Economics Association for distinguished professional contribution in teaching programs. In 2001, she received Auburn University's College of Agriculture teaching award. In 2011, she received the Lifetime Achievement Award from the Southern Agricultural Economics Association.

MANAGEMENT

Good management is a crucial factor in the success of any business. Farms and ranches are no exception. To be successful, farm and ranch managers need to spend more time making management decisions and developing management skills than their parents and grandparents did.

This is because production agriculture in the United States and other countries is changing: more automation, increasing farm size, continued development of new production technologies, growing capital investment per worker, more borrowed or leased capital, new marketing alternatives, and increased consumer demands. These factors create new management problems, but also present new opportunities for managers with the right skills.

These trends will likely continue throughout the rest of the twenty-first century. Farmers will make the same type of management decisions as in the past, but will be able to make them faster and more accurately. Advances in the ability to collect, transfer, and store data about growing conditions, pest and disease problems, and product quality will give managers more signals to which to respond. Moreover, future farm and ranch operators will have to balance their personal goals for an independent lifestyle, financial security, and rural living against societal concerns about food safety, environmental quality, and agrarian values.

The long-term direction of a ranch or farm is determined through a process called strategic planning. Farm operators establish goals for themselves and their businesses based on their personal values, individual skills and interests, financial and physical resources, and the economic and social conditions facing agriculture. They can choose to emphasize wider profit margins, higher volumes of production, or production of special services and products. After identifying and selecting strategies that will help them achieve their goals, farm and ranch operators employ tactical management skills to carry them out. Many decisions need to be made and many alternatives analyzed. Finally, the results of those decisions must be monitored and evaluated and control measures implemented where results are not acceptable.

Chapter 1 discusses factors affecting the management of farms and ranches now and in the coming decades. These factors will require a new type of manager who can absorb, organize, and use large amounts of information—particularly information related to new technologies. Resources will be a mix of owned, rented, and borrowed assets. Products will need to be more differentiated to match consumer tastes and safety standards. Industrial uses of agricultural products may increase relative to food uses. The profitability of a new technology must be determined quickly and accurately. A modern manager may also need new human resource skills as the number and diversity of employees and consultants increase.

Chapter 2 further explains the concept of management, including strategic planning and tactical decision making. What is management? What functions do managers perform? How should managers make decisions? What knowledge and skills are needed to be a successful manager? Answers to the first three questions are discussed in Chapter 2. Answers to the last question will require studying the remainder of the book.



USDA/Natural Resources Conservation Services

FARM MANAGEMENT NOW AND IN THE FUTURE

CHAPTER OUTLINE

Structure of Farms and Ranches
New Technology
The Information Age
Controlling Assets
Human Resources
Producing to Meet Consumer Demands
Contracting and Vertical Integration
Environmental and Health Concerns
Globalization
Summary
Questions for Review and Further Thought

CHAPTER OBJECTIVES

1. Discuss how changes in the structure and technology of agriculture will affect the next generation of farm and ranch managers
2. Identify the management skills that future farmers and ranchers will need to respond to these changes

What will future farm managers be doing as we progress through the remaining decades of the twenty-first century? They will be doing what they are doing now, making decisions. They will still be using economic principles, budgets, record summaries, investment analyses, financial statements, and other management techniques to make those decisions. What types of decisions will managers be making in future decades?

They will still be deciding input and output levels and combinations and when and how to acquire additional resources. They will continue to analyze the risks and returns from adopting new technology, making new capital investments, adjusting farm size, changing enterprises, and seeking new markets for their products.

Will anything about management decisions in the future be different? Yes. While the broad

types of decisions being made will be the same, the details and information used will change. Technology will continue to provide new inputs to employ and new, more specialized products for production and marketing. Management information systems, aided by electronic innovations, will provide more accurate and timely information for use in making decisions. Farmers and ranchers will have to compete more aggressively with nonagricultural businesses for the use of land, labor, and capital resources. As in the past, the better managers will adapt to these changes and efficiently produce the commodities that consumers and industry want.

STRUCTURE OF FARMS AND RANCHES

The number of farms in the United States has been decreasing since 1940, as shown in Figure 1-1. The amount of land in farms and ranches has been relatively constant. This means the average farm size and production per farm have increased considerably, as shown in Figure 1-2. In both figures, the most dramatic changes took place in

the period from 1940 through the early 1970s. Several factors have contributed to these trends.

First, labor-saving technology in the form of larger agricultural machinery, more efficient planting and harvesting systems, automated equipment, and specialized livestock buildings has made it possible for fewer farm workers to produce more crops and livestock. The decrease in farm numbers, along with the corresponding increase in farm size, was especially precipitous in the decades following World War II, owing to mechanization.

Second, employment opportunities outside agriculture have become more attractive and plentiful, encouraging labor to move out of agriculture. Also during this period of change, the cost of labor has increased faster than the cost of capital, making it profitable for farm managers to substitute capital for labor in many areas of production.

Third, farm and ranch operators have aspired to earn higher levels of income and to enjoy a standard of living comparable to those in other sectors of the economy. One way to achieve a higher income has been for each farm

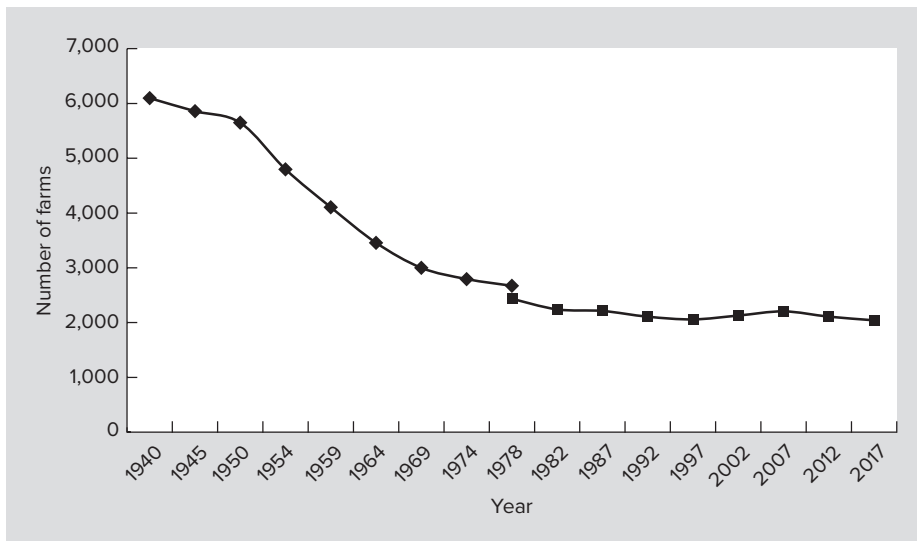


Figure 1-1 Number of farms in the United States (1000s).

Source:

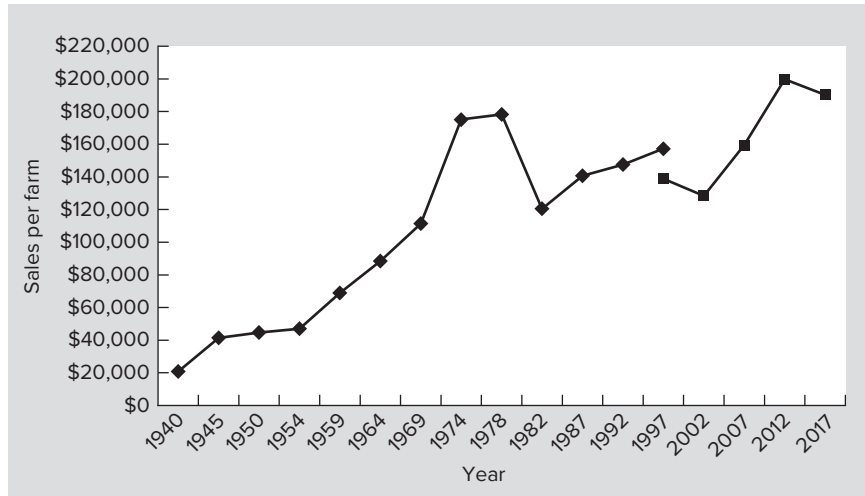


Figure 1-2 Total sales per farm in 2017 dollars.

Source: U.S. Census of Agriculture, USDA, definition adjusted in 1997.

operation to control more resources and produce more output while holding costs per unit level or even decreasing them. Other managers, though, have worked to increase profit margins per unit while keeping the size of their business the same. The desire for an improved standard of living has provided much of the motivation for increasing farm size, and new technology has provided the means for growth.

Fourth, some new technology is available only in a minimum size or scale, which encourages farmers to expand production and spread the fixed costs of the technology over enough units to be economically efficient. Examples include grain drying and handling systems, four-wheel drive tractors, large harvesting machines, confinement livestock buildings, and automated cattle feedlots. Perhaps even more important are the time and effort required for a manager to learn new skills in production, marketing, and finance. These skills also represent a fixed investment and thus generate a larger return to the operator when they are applied to more units of production. Chapter 9 contains more discussion about economies of size in agriculture.

Operators who do not wish to grow their individual businesses will look for alliances and

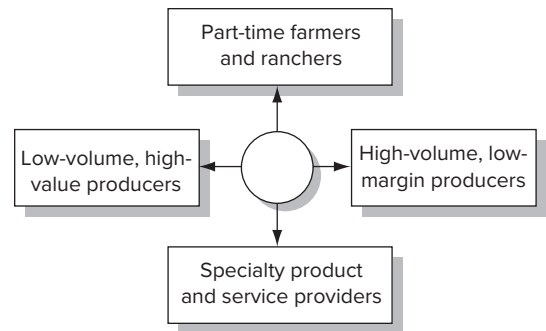


Figure 1-3 Alternative strategies for farm and ranch businesses.

partnerships, both formal and informal, with other producers that will allow them to achieve the same economies as larger operations. Examples include jointly owning machinery and equipment with other producers, outsourcing some tasks such as harvesting or raising replacement breeding stock, and joining small, closed cooperatives.

As illustrated in Figure 1-3, farmers and ranchers can choose among four general business strategies: low-volume, high-value producers; high-volume, low-margin producers; specialty product and service providers; and

Low-Volume, High-Value Producers

Lack of access to additional land, labor, and capital effectively limits the potential of many growers for expanding their businesses. For them, the key to higher profits is producing higher valued commodities. Some look for nontraditional enterprises such as emus, bison, asparagus, or pumpkins. Promotion, quality standards, and marketing become critical to their success. Others try variations of traditional commodities, such as organically grown produce, tofu soybeans, free-range poultry, or seed crops. Margins may be increased even more through added processing and direct marketing. Such enterprises often involve high production risks, uncertain markets, and intensive management, but can be quite profitable even on a small scale.

Other strategies are possible for farms surrounding urban areas. Consumer interest in purchasing locally grown foods has led to an increase in both community-supported agriculture, in which consumers buy shares in a local operation, and farmers markets, where consumers buy directly from the producers. Farms may also sell products directly to local restaurants or other food service organizations, such as school cafeterias. According to the most recent Census of Agriculture, direct marketing of agricultural products accounted for about 3 percent of the value of total agricultural sales in 2017. About 8 percent of all U.S. farms were involved in direct sales.

High-Volume, Low-Margin Producers

There will always be a demand for generic feed grains, oil seeds, fruits and vegetables, cotton, and livestock products. Many producers choose to stick with familiar enterprises and expand production as a means of increasing their income. For them, squeezing every dollar out of production costs is critical. Growing the business usually involves leveraging it with borrowed or rented assets. Profit margins are thin, so it is critical to set a floor under market prices or total revenue through insurance products and marketing contracts.

Specialty Product and Service Providers

A third strategy is to specialize in just one or two skills and become one of the best at performing them. Examples are custom harvesting, custom cattle feeding, raising seed stock or replacement breeding stock, repairing and refurbishing equipment, hauling and applying manure, and applying pesticides and fertilizers. Even *agritourism* can be considered a special service to consumers. Often a key component of this strategy is making maximum use of expensive, highly specialized equipment and facilities and being a low-cost provider. Marketing the services of the business and interacting with customers are also important ingredients for success.

Part-Time Operators

Many farmers hold other jobs in addition to farming. According to the latest U.S. Census of Agriculture, about 53 percent of all primary agricultural producers report that farming is not their major occupation. Part-time farming is especially prevalent on smaller farms. Over 70 percent of all operators on farms with combined sales and government payments of less than \$10,000 report a primary occupation other than farming. Many of these small-scale operations are *lifestyle* farms run by people who enjoy producing crops and livestock even when the potential profits are low. Their primary management concerns are to limit their financial risk and balance farm labor needs with off-farm employment. A combination of farming and nonfarm employment may provide the most acceptable level of financial security and job satisfaction for many people involved in farming.

Farms of all sizes will continue to find their niche in U.S. agriculture. Naturally, the largest farms contribute the highest proportion of total sales of farm products, as shown in Table 1-1. The consolidation of small- and medium-sized farms and ranches into larger units will likely continue, as older operators retire and their land is combined with existing farm units.

TABLE 1-1 Distribution of Farm Sales, United States

Economic class	Percent of farms	Percent of sales
Less than \$10,000	55.5	0.6
\$10,000–\$99,999	26.1	4.3
\$100,000–\$249,999	6.6	5.3
\$250,000–\$999,999	7.9	20.5
\$1,000,000 or more	3.9	69.3

Source: 2017 Census of Agriculture, National Agricultural Statistics Service, USDA.

Management and operation of farms either by individuals or by family units will continue to be the norm, though. This is especially the case for agricultural enterprises that cannot concentrate production into a small geographic area, such as grain and cotton production or extensive grazing of cattle or sheep. Enterprises that can centralize production, such as poultry and hog production or cattle feeding, can be more easily organized into large-scale business entities. Management of these farms will be segregated into several layers, and areas of responsibility will be more specialized. Most managers of centralized production enterprises will be salaried employees rather than owner-operators.

Some farm businesses will find that by cooperating with their neighbors and relatives they can achieve many of the same advantages that larger-scale operations enjoy. Decades ago, farmers formed grain threshing or haying crews to take advantage of new harvesting technology. Today, several farmers may join together to guarantee a constant, uniform supply of livestock or crops in a quantity that can be transported and processed efficiently. As the number of input suppliers and processing firms diminishes, producers must collaborate to maintain their bargaining position. This is one example of how a cooperative effort or *strategic alliance* can provide economic benefits. Another example is several operators forming an input

purchasing group to achieve quantity discounts or purchasing large equipment jointly. A small amount of managerial independence must be sacrificed to conform to the needs of the group. However, personal ownership and operation of each business is preserved.

NEW TECHNOLOGY

Agricultural technology has been evolving for many decades and will continue to do so. The field of biotechnology offers possible gains in production efficiency, which may include crop varieties engineered to fit growing conditions at particular locations, to be resistant to herbicide damage or to certain insects and diseases, or to have a more highly valued chemical composition such as higher protein or vitamin content. Livestock performance may be improved by introducing new genetic characteristics or by improving nutrient use. New nonfood uses for agricultural products, such as biodiesel and ethanol, will open new markets, but may also cause changes in the desired characteristics or composition of products grown specifically for these uses.

One example of a recent technology is the use of global positioning systems (GPS) to pinpoint the exact location of equipment in a field. By combining satellite reception with a yield monitor on harvesting equipment, the crop yield can be measured and recorded continuously for every point in the field. Variations in yield due to soil type, previous crops, different tillage methods, and fertilizer rates can be identified quickly and recommendations made to correct problems. Soil testing by grid sampling can fine tune nutrient recommendations. This technology is now being used to automatically adjust the application rates of fertilizer and chemicals as the applicator moves across the field. Fertilizer and chemicals are applied only at the rates and locations needed, which improves efficiency and lowers costs.

Automated GPS can also keep crop production machinery on a consistent course, when