

AGRICULTURE

2000

A Look at the Future

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A Look at the Future

Sponsored by the
PRODUCTION CREDIT ASSOCIATIONS
on Their 50th Anniversary

A Study by
Columbus Division
Battelle Memorial Institute



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Foreword

Agriculture is America's success story. When this country was established a little more than 200 years ago, a farmer, using mostly handpower and a little horsepower, was barely able to feed himself and his family. Since then, the evolution of agriculture has been nothing short of amazing. Today, through mechanical power and the development and advancement of technology or "science power," the American farmer is now producing enough to feed himself and 78 others.

An hour of farm work today produces 14 times as much as it did in 1919-21. Just in the past 50 years, both crop and livestock production have more than doubled, with close to the same amounts of cropland, breeding animals, and total inputs in use.

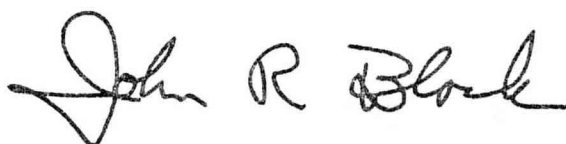
As the nation's biggest industry, agriculture generates an estimated 23 million jobs, more than 22 percent of the entire work force in the United States. The impact of our efficient agricultural production is important not only to us but the world as well. We export more farm products than any other country in the world.

Certainly, the future of our nation depends on the future of our agriculture. We will succeed as a nation and as a people as our agriculture succeeds.

Recognition and acceptance of the need for a healthy, robust agricultural sector makes it all the more important that we look to the future of this vital industry, which is precisely what is done in *Agriculture 2000: A Look at the Future*.

This study, which the Production Credit Associations of the United States have commissioned on the occasion of their 50th anniversary, takes a look at the "science power" or technological innovations we now have and the many possible for the future. From *Agriculture 2000* we can gain insight into what lies ahead for agriculture and how we must carefully chart our way to that future.

I congratulate the Production Credit Associations for the role they have played in building American agriculture during the past half century and for their foresight in undertaking this study so that they may better serve American agriculture in the future.

A handwritten signature in black ink that reads "John R. Block". The signature is fluid and cursive, with the first name "John" being the most prominent.

John R. Block
Secretary of Agriculture

Preface

Little did I realize when I made the first PCA loan that Production Credit Associations would become the great financial organizations they are today. But, then, neither did I realize that as the value of the dollar shrank, agriculture as a great industry would require more capital.

As I recall, we opened the office above a drug store at Champaign, Illinois, on September 27, 1933. We didn't have any forms or supplies. We interviewed five farmers that first day, but none of them qualified for a loan.

We really got going the next day, and later we had an applicant from as far away as Canada. Mr. Ed Bates of Tolono, Illinois, a breeder of beef cattle, became applicant No. 1, for an approved loan of \$600.00 to purchase 20 head of Hereford cows at \$30.00 each.

Actually the first Production Credit Association closed the first loan to applicant No. 4, Mr. Milton W. Warren, of Mansfield, Illinois, for \$830.50. He bought 30 head of 400-pound Angus feeder steers at Kansas City, Missouri, for 3-1/2 cents per pound. He sold them the next June for 9-1/2 cents per pound, which shows how prices were recovering following the Depression. It is good that the first PCA loan was a successful one for us and the member.

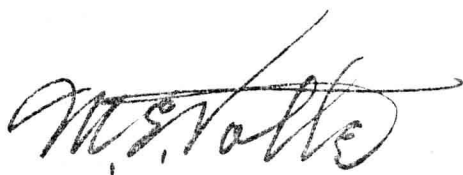
The days of 3-1/2 cent steers are gone. I am proud, however, that Production Credit Associations have grown stronger with each passing year. Now, as we enter our golden anniversary year, there are 422 PCAs with more than \$22 billion in loan volume.

This book about the future tells us that agriculture will change in the years to come. In fact, some of the things you will read here will seem almost impossible. But, then, agriculture has always been good at accomplishing the impossible.

Yes, agriculture will change. And, the farmers and ranchers of this great nation will change along with it. Production Credit will change too, because our common goal has always been to keep up with and a little ahead of the industry we serve.

One thing that won't change, though, is the underlying philosophies on which PCA was founded 50 years ago—to provide a dependable source of credit for those close to the land.

Thank you, Production Credit, for inviting me to contribute the preface to this book which is your gift to agriculture in your half-century year. There may be other men more deserving of this honor, but I assure you no one else is more dedicated to Production Credit and American agriculture.

A handwritten signature in dark ink, reading "M. E. Volle". The signature is stylized with a large, sweeping initial "M" and a long, horizontal flourish extending to the right.

M. E. (Merv) Volle
Former Manager
First Production Credit Association
Champaign, Illinois

Acknowledgments

Traditionally, when people or organizations celebrate an anniversary they receive gifts. Production Credit Associations on their 50th anniversary are reversing this custom. More than a year before this book went to press, when planning for the PCA anniversary began, a small group of people sat around a table in Denver to consider an appropriate gift to agriculture. That is when the idea was born for a research study which would explore the future of agriculture in the United States. Battelle Memorial Institute's Columbus Division was selected to conduct the study. This book is a summary of a more detailed research report on the study results.

The help of many people made this book possible. Special thanks:

To Public Relations Advertising and Training (PRAT) Committee members, Howell Hughes, president, Farm Credit Banks of Springfield, and Ben Hauenstein, president, Federal Intermediate Credit Bank (FICB) of Wichita, who worked hard to get to this final product.

To former PRAT Committee members, Burgee Amdahl, president, Federal Intermediate Credit Bank/Bank for Cooperatives of St. Paul, and Alton Cook, president, FICB of Louisville, who were a part of the original concept.

To all the FICB presidents who supported this effort and envisioned its contribution to agriculture.

To Don Edson, chairman, PRAT Subcommittee, who spent many long and successful hours overseeing the project and ensuring that it was a success.

To the other PRAT Subcommittee members, Gus Simpson, assistant vice president, FICB of Spokane, and Marsha Martin, senior vice president, FICB of Texas, who labored over manuscripts and saw the book through to its completion.

To Rex Schultz, senior vice president, FICB of Omaha; Rick McCarty, director of communications, Farmbank Services; and Christine Quinn, public affairs division, Farm Credit Administration, for their advice and counsel throughout.

To George M. McClure, assistant director, and William E. Riddle, Ph.D., agricultural research leader, of Battelle Memorial Institute's Columbus Division, who ensured that the study continued the high professional standards of Battelle and of Production Credit Associations.

To Thomas A. McClure, Ph.D., senior agricultural economist, who coordinated the Battelle research study and is largely responsible for the quality of information contained in the report and in this book.

To Mary Bucher, senior writer, who condensed the technical research study into a readable and understandable book, and to Will Chenoweth, artist, both of Battelle.

To Battelle researchers Robin L. Gatz, Nancy D. Gregorich, Cathy W. Moody, Ph.D., Charles S. Peet, Jeffrey L. Ruckman, Cynthia K. Wagner, and Pierrette G. Woodford, who combed the nation to obtain the study data.

And finally to the farmers and ranchers who are Production Credit Association members. Their success has allowed this project to be completed. Whenever we talk about agriculture, now or in the future, it is the individual producer—the PCA member—who enables agriculture to progress.

A stylized, handwritten signature in black ink, appearing to read "Keith Kennedy". The signature is written over two horizontal lines that extend across the width of the signature.

Keith Kennedy
President
FICB of St. Louis
and
Chairman
FICB PRAT Committee

Introduction

Agriculture 2000: A Look at the Future takes a very broad and qualitative look at prospective U.S. agricultural developments over the next two decades. The book focuses on evolving technologies and trends that will affect how farmers and ranchers grow crops, raise livestock, market their output, purchase supplies, and finance their operations. A wide sampling of information is provided with limited depth devoted to any single topic.

Although agriculture is still a "way of life," it is also an increasingly sophisticated business. Tomorrow's farmers will be better businessmen as well as better production technicians. They will benefit from a rapidly growing array of electronic technologies which will provide more information, on a more timely basis, with more analytical capabilities. How well farmers manage this information will be an important factor in business success.

Changes also are occurring not only at the farm level, but in rural communities, as more people move away from urban areas, creating a greater mix of urban and rural lifestyles.

Agriculture 2000 was written for farmers, ranchers, agribusiness leaders, businessmen, high school agriculture students, and other members of the general public who want to know more about the future of U.S. agriculture. The book is based on recent findings of a major 8-month research project conducted by Battelle's Columbus Division, the original research center of Battelle Memorial Institute, one of the world's largest sponsored-research organizations.

The research project was founded by the Production Credit Associations of the nation and coordinated by the PRAT Committee of the Federal Intermediate Credit Banks. Findings of the study were made public at the 50th anniversary national meeting of the Production Credit Associations, held March 11, 1983, in Kansas City, Missouri.

Production Credit Associations are agricultural credit cooperatives whose main purpose is to provide short- and intermediate-term loans and closely related services to people involved in production agriculture. More than 400 PCAs serve borrowers/members through 1,500 offices nationwide. As credit cooperatives, PCAs are controlled by boards of directors elected by and from their voting members/borrowers. The Federal Intermediate Credit Banks (FICBs) and PCAs are part of the Farm Credit System which also includes Federal Land Banks, Federal Land Bank Associations, and Banks for Cooperatives. Because the PCA goal is to improve the income and well-being of U.S. farmers, ranchers, and commercial fishermen through the extension of sound and constructive credit, the associations have a keen interest in what the future holds. The findings of this study, therefore, are PCA's gift to the U.S. agricultural industry as part of the 50th anniversary celebration of their founding.

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1 Current Agricultural Trends

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Facts show that U.S. agriculture is going through a restructuring period. Although the application of new technology is the most likely way to achieve higher agricultural production, current trends will affect the development and acceptance of such new technologies. Examples of these trends are larger farm size, modern management methods in agriculture, greater care of natural resources, increased use of credit, higher inflation rates and interest, changing food processing and distribution patterns, and changing government farm policy.

2 Regional Agricultural Characteristics

21

Urban encroachment threatens farmland in the Northeast. Serious water depletion worries farmers in the irrigated Great Plains. A changing mix of crop and livestock production affects farmers in the South. Strong impacts from the unstable export trade concern North Central and Southwestern farmers, and technological advances in processing and storage interest those in the Northwest. Six maps show how the important commodities and other key agricultural characteristics vary from region to region.

3 Developing Agricultural Technologies

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This summary discussion of the developing agricultural technologies is the heart of the study. In thousands of agricultural research projects now under way, scientists are discovering new and better ways to grow crops, to manufacture more efficient farm machinery, to produce superior livestock and poultry, and to more effectively communicate and manage agricultural information. But even more importantly, because of "technology synergism," the total effect of combining two or more technologies may be far greater than the sum of each technology considered by itself.

4 Marketing

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Changes in agricultural marketing practices will be just as important as development of new technologies. Farmers must market omelettes instead of milk and eggs, ready-to-heat precooked chicken parts instead of whole chickens. More emphasis will be placed on developing branded differentiated products tailored to consumer tastes, undertaking joint ventures between private companies and marketing cooperatives, coordinating agricultural supply and demand more precisely, exporting, and futures trading.

5 Agricultural Inputs and Finance

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Agribusiness faces some big challenges. Farm input suppliers must meet new service needs, not just supply products. They must teach farmers how to keep up with the new technologies. As a consequence, well-managed agribusiness firms will use a new mix of assets—more equipment, fewer buildings, more management dollars, better management systems, better paid employees, and more technically trained people. Farmer debt will continue to increase over the next two decades. Agricultural lending institutions will provide a greater array of services and innovative financing methods for their customers. In farm-related employment, demand for college graduates will go up and graduate degree shortages are foreseen. There will be a demand for management people trained in finance, marketing, personnel work, and planning, and for various specialists and technicians.

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The quality of rural life will continue to be influenced by major national and regional trends such as repopulation of the countryside, decentralization of employment, higher income and educational levels, greater mixing of rural and urban lifestyles, better community services, larger and fewer farms, and electronic linkages among rural and urban areas.



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Advanced irrigation technologies conserve water and energy. Crop production will benefit from more sophisticated seed treatment methods. Plant growth regulators are another avenue to higher crop yields, once their reliability is established. Salt-tolerant crop varieties are being developed for areas with saline soil and water. Recombinant DNA, plant tissue culture, and other techniques of biotechnology will speed development of improved plant varieties. Hydroponics, an example of controlled environment agriculture, can increase food production where productive land is scarce.

8	Mechanization Technologies	115
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More sophisticated tractors and engines are being designed. Some tractors will be steered by on-board sensors and computers guided by signals from buried wires. Advanced custom prescribed tillage systems and computer-controlled planting are also under development. Fruit and vegetable harvesting will become more mechanized, and future grain combines will transfer control responsibilities to the machine itself. New harvesting equipment also may do in-field processing. Satellite data will help predict crop yields as well as monitor problems such as soil erosion and pest and disease infestations. Futuristic robot-type automated agricultural equipment may be developed that can plow, irrigate, and apply pesticides simultaneously.

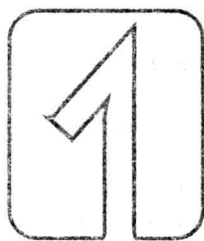
9 Technologies in Animal Agriculture 135

Tomorrow's livestock (including dairy and beef cattle, sheep, poultry, and swine) will be superior as a result of today's advanced research. Animals will grow faster, be more disease resistant, use less feed per unit of production, produce more milk, meat, and eggs at specified quality levels, and produce more offspring per animal, each with more desirable genetic characteristics. Fishing and aquaculture also will become sophisticated in terms of feeding practices and energy utilization.

10 Communications and Information Management 169

The ability of farmers to effectively utilize information pertinent to their business is essential. The next generation of farmers will use computers to their fullest. Farmers will depend on home computers to store and analyze data, control automated processes, and buy farm supplies. Computers will help farm managers increase profits and farm efficiency through better record keeping and analysis of alternative courses of action. Better marketing information, improved market and pricing efficiency, equitable market access, and better sale prices for the farmer are promised by electronic marketing systems such as teleauctions, computer auctions, video auctions, and videotex.

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TRENDS IN AGRICULTURE

Agricultural production in the year 2000 will grow from today's trends. What size are farms and ranches? How are they managed? Who works on them? How are producers taking care of the environment, especially soil and water? What are the trends in agricultural purchasing and marketing? What about farm income and inflation? How will government policies on taxation, credit, conservation, and labor affect the future? Chapter 1 answers such questions and shows that all indicators of change point toward greater mechanization and other agricultural uses of technology.

Because the six regions of the United States (the Northeast, the South, North Central, Great Plains, the Southwest, and the Northwest) are so diverse, their needs differ. Chapter 2 compares and contrasts land characteristics, climate, crops, problems, population base, and access to markets, showing that farming will differ in response to regional requirements.

The heart of the study, as summarized in Chapter 3, concentrates on the expected synergistic impacts of research work to discover new and better ways to grow crops, to manufacture more efficient farm machinery, to produce superior livestock and poultry, and to more effectively communicate and manage agricultural information. Changes in agricultural marketing practices (Chapter 4) will be just as important as development of new technologies.

Agribusiness supply firms are shifting emphasis toward providing packages of services as well as supplies, and will need even more highly trained scientists, technicians, financial experts, and others to work directly with farm operators (Chapter 5). Agricultural lending institutions will also provide a greater variety of services. Sociological trends will be important in determining the quality of rural life (Chapter 6).

This overall picture of the agricultural system and the impacts of technology in Part 1 provides the setting for Part 2's specific details about the technological research that is making all the change possible.