



The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

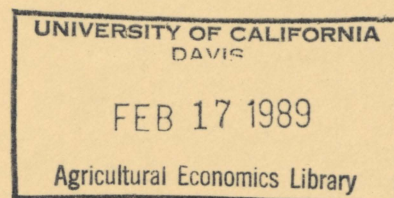
AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

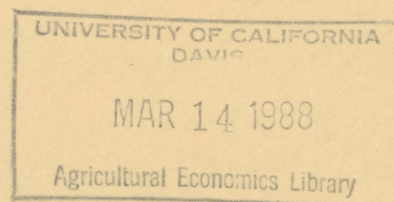
No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.



Maintaining the Cutting Edge

Proceedings of the
American Agricultural Economics Association
Extension Workshop (1987 : East Lansing).

July 31, 1987 - August 1, 1987
East Lansing, Michigan



1987

Agricultural extension



Maintaining the Cutting Edge

Proceedings of the American Agricultural Economics
Association Extension Workshop

July 31, 1987 - August 1, 1987

East Lansing, Michigan

Editors: Cara L. Mitchell
Kim B. Anderson

Produced at Oklahoma State University

Additional funding provided by Agriculture-Agribusiness Program,
Oklahoma Cooperative Extension Service.

FOREWORD

Members of the American Agricultural Economics Association strive to maintain "The Cutting Edge." This requires a commitment to work, study, and the sharing of ideas. Work is required to retain basic economic theory. Study is required to stay abreast of new theory, new hypothesis, new techniques, and new technology. The sharing of ideas enhances the development of new theory, research projects, and extension programs.

The AAEA pre-conference was designed to bring together extension and research economists. The goal was to bridge the gap between extension and research. Topics included identifying problems, selecting appropriate economic theory, identifying research needs, and developing extension programs. Professional economists from academic, government, and industry were included in the planning, organizing, and delivery of the conference material.

These proceedings contain the majority of the papers presented at the East Lansing Conference. Each presenter was asked to provide a copy of the final paper. These papers are included in the proceedings. Papers presented in the Mini-Symposium were summarized by the organizers.

Special gratitude should be extended to a number of people. First should be to Gerald R. Campbell, University of Wisconsin-Madison. Dr. Campbell was not directly involved with this conference. He successfully organized the first AAEA extension conference and his procedures and suggestions were closely adhered to.

The AAEA board of directors not only supported the conference, but, provided input relating to subject matter and potential speakers. Maybe more importantly, the board showed its support by giving the extension committee full control of the conference.

The Farm Foundation supported the conference by providing twenty-one travel scholarships for new extension economists.

The conference was planned by the 1986/87 Extension Committee: David Chicoine - Chairman, Kim Anderson, Harry Ayer, Henry Bahn, Norman Bender, Kenneth Bolen, Earl Brown, Bartlet Eleveld, Sidney Evans, David Holder, Robert Jacobson, Bruce Jones, Gerald Schwab, George Shumaker, and Otto Doering - Board Representative. Each of these economists assisted in planning and implementation of the conference.

Appreciation is given to the conference general sessions, concurrent sessions, and mini-symposium organizers. The general sessions were planned and organized by the conference extension planning committee. The concurrent sessions were organized by Ross Love and Harry Mapp, Darryl Good and Bob Spitze, Gerald Campbell and John Schmidt, and Gary Smith and Tom Harris. The mini-symposia was organized by David Holder. The organizers did an excellent job of finalizing the objectives for each section, selecting final topics, and scheduling the speakers.

Appreciation is extended to the speakers. General session speakers included Charles Browning, W. J. Moline, John Ikerd, William Wood, Jr., Marc Johnson, and Hank Wadsworth. The moderators for the general sessions were Charles Moore, David Chicoine, and Kim Anderson.

The Department of Agricultural Economics, Michigan State University spent long hours to organize the conference facilities. Special recognition is extended to Gerald Schwabb and Sherril Nott.

Many hours work, with little reward or recognition, was put into the success of this workshop by Cara Mitchell. Without Cara's diligent work, everyone else's efforts may have been wasted.

There are others that deserve our appreciation. Each is involved with AAEA. And, it is American Agriculture Economics Association that makes conferences like "Maintaining the Cutting Edge" a success.

Kim B. Anderson
Associate Professor and Extension Economist
Oklahoma State University

AAEA EXTENSION WORKSHOP PLANNING COMMITTEE

David Chicoine, Chairman, University of Illinois
Kim Anderson, Conference Planning Committee Chairman, Oklahoma State University

AAEA Extension Committee Members:

David Chicoine, Chairman, University of Illinois
Kim Anderson, Oklahoma State University
Harry Ayer, University of Arizona
Henry Bahn, Montana State University
Norman K. Bender, University of Connecticut
Kenneth Bolen, Colorado State University
Earl Brown, University of Maryland
Bartelt Eleveld, Oregon State University
Sidney Evans, North Carolina A & T State University
David Holder, ERS, USDA
Robert Jacobson, The Ohio State University
Bruce Jones, University of Wisconsin
Gerald Schwab, Michigan State University
George Shumaker, University of Georgia
Otto Doering, Purdue University

AMERICAN AGRICULTURAL ECONOMICS ASSOCIATION

Extension Workshop Program

MAINTAINING THE CUTTING EDGE

Friday July 31, 1987

8:00 - 9:00 Conference Registration

9:00 - 9:15 Welcome

Moderator: Charles Moore, North Carolina State University

Speaker: *Larry Connor*, Chairperson, Department of Agricultural Economics,
Michigan State University

9:15 - 10:15 KEYNOTE ADDRESS
Extension/Research Interdependencies and Land Grant Universities:
Current and Future

Speaker: *Charles Browning*, Dean, Division of Agriculture, Oklahoma State
University

Comments: *W. J. Moline*, Director, Cooperative Extension, Michigan State
University

10:15 - 10:45 Break, with Refreshments

10:45 - 11:45 Extension/Research Interdependencies and Land Grant Universities:
Current and Future

11:45- 1:00 Lunch

Friday Afternoon

1:00 - 2:45 Concurrent Sessions

1: **Farm Financial Crisis: Extension and Research Programs to
Meet Current and Future Needs**

Organizers: *Ross Love and Harry P. Mapp*, Oklahoma State University

Moderator: Paul Gutierrez, Colorado State University

Title: *"Debt Resolution through Mediation: Extension and Research
Linkages"*

Speaker: Glenn Pederson, University of Minnesota

Discussant: Michael Duffy, Iowa State University

Title: *"Developing Financial Decision Aids: Research and Extension Interactions"*

Speakers: Harry Mapp and Ross Love, Oklahoma State University

Discussant: Alan Baquet, Montana State University

2: Commodity Programs: Extension and Research Efforts to Meet Current and Future Needs

Organizers: *Darrel Good and Bob Spitze*, University of Illinois

Moderator: Robert Spitze, University of Illinois

Title: *What Can the Economist Do and Not Do in the Public Policy Process?"*

Speaker: Neill Schaller, ERS, ESDA

Discussants: Roy Carriker, University of Florida and Craig Infanger, University of Kentucky

3: Management Information Systems, Decision Support Systems, and Expert Systems: Extension and Research Applications

Organizers: *Gerald Campbell and John Schmidt*, University of Wisconsin

Title: *"Decision Support Systems Definition and Overview."*

Speakers: Mike Hudson and Steve Sonka, University of Illinois, and Stephen Harsh, Michigan State University

4: Agricultural Linkages to Rural Communities, Implication for Rural Development

Organizers: *Gary Smith*, Washington State University *and Tom Harris*, University of Nevada

Title: *"Measuring the Interdependencies of Agriculture and Rural Communities."*

Speakers: Gerald Doeksen and Mike Woods, Oklahoma State University

Discussant: F. Larry Leistritz, North Dakota State University

2:45 - 3:15 Break, with refreshments

3:15 - 5:00 Concurrent Sessions Continued

1. continued

Moderator: Allan Lines, Ohio State University

Title: *"Your Financial Condition: A Program on Financial Statements, Analysis, and Legal Aspects of Borrowing"*

Speaker: Thomas Frey, University of Illinois

Discussant: Arlen Leholm, North Dakota State University

Title: *"The Linkage of Applied Financial Analysis and Credit Score to Extension and Teaching Programs."*

Speakers: David Kohl and Gerald Warman, Virginia Polytechnic Institute and State University

Discussant: Danny L. Klinefelter, Texas A & M University

2 . continued

Moderator: Darrel Good, University of Illinois

Title: *"How Can the Policy Models Serve the Farmer Decision Makers?"*

Speakers: Abner Womack and Dave Miller, University of Missouri

Discussant: John Ferris, Michigan State University

3 . continued

Title: *"Cornell, Integrated Dairy Farm Management"*

Speaker: Bob Milligan, Cornell University

Title: *"Integrated Crop/livestock Management"*

Speaker: Dick Schoney, Saskatchewan University

Title: *"Coop-Sim: A Decision Support System for Grain Cooperatives"*

Speaker: David Park, Oklahoma State University

4 . continued

Title: *"Identifying the Financial Stress of Rural Business and Governmental Units and Methods for Assisting Them"*

Speakers: Kenneth Stone and Jack Whitmer, Iowa State University

Discussant: Ted Alter, Pennsylvania State University

Saturday August 1, 1987

8:15 - 9:45 General Session

Moderator: *David Chicoline*, University of Illinois

Achieving Successful Extension/Research Interface: Four Organizational Schemes

- Speaker:** *John Ikerd*, University of Georgia
- Discussant:** *William Wood, Jr.*, University of California
- 9:45 - 10:15 Break, with refreshments
- 10:15 - 12:00 Concurrent Sessions Continued
1. continued
- Title:** *"Crystal Balls, Ouija Boards, and Palm Reading: Views on the Future of Agricultural Finance"*
- Panel:** Michael Boehlje, University of Minnesota
John Brake, Cornell University
Marvin Duncan, Farm Credit Administration
Neil Harl, Iowa State University
Arlen Leholm, North Dakota State University.
2. continued
- Moderator:** Robert Spitze, University of Illinois
- Title:** *"How to Integrate Extension - Research Programs - A Problem Focus"*
- Subtitle:** "Dairy Policy"
- Speaker:** Andy Novakovic, Cornell University
- Subtitle:** "Water Policy"
- Speaker:** George Goldman, University of California, Berkeley
- Subtitle:** "Conservation Reserve Policy"
- Speaker:** Donald Pretzer, Kansas State University
- Subtitle:** Open Discussion on Other Examples of Integrated Extension-Research Programs
3. continued
- Title:** *"Tools for Expert System Development"*
- Speaker:** John Schmidt, University of Wisconsin
- Title:** *"An Expert System for Livestock Marketing"*
- Speaker:** Steve Blank, University of Arizona
4. continued
- Title:** *"Alternative Strategies for Expanded Rural Economic Development"*
- Speakers:** Ron Shaffer and Glen Pulver
- Discussant:** Phil Favero, University of Maryland

12:00 - 1:15 LUNCH -- Promotion, Tenure and the Extension/Research Interface

Speaker: *Marc Johnson*, Kansas State University

1:15 - 3:00 **MINI-SYMPOSIUM**

Organizer: *David Holder*, ES, USDA

Title: *"Identifying The Proper Role for Extension in Educating Debtors and Lenders on Farm Bankruptcy"*

Organizer: Stephen Matthews, University of Missouri

Moderator: Stephen Matthews, University of Missouri

Presenters: Philip Harris, University of Wisconsin-Madison
Paul Wright, Ohio State University
Al Bock, University of Illinois

Title: *"Why Many Extension Economists are Not at 'The Cutting Edge' and What They Can Do About Moving The Edge"*

Organizer: George McDowell, University of Massachusetts

Moderator: Larry Libby, Florida State University

Presenters: George Morse, Ohio State University
George McDowell, University of Massachusetts

Title: *"Comparative Advantage in Competitiveness: New Extension Programs to Teach Old Concepts"*

Organizer: John Ikerd, University of Georgia

Moderator: Coleman Dangerfield, University of Georgia

Presenters: Kevin Moore, University of Missouri
Bob Glover, University of Georgia
Parr Rosson, Clemson University
Johnny Jordan, Clemson University

Title: *"Use of Expert Systems in Agricultural Economics"*

Organizer: J. William Uhrig, Purdue University

Moderator: J. William Uhrig, Purdue University

Presenters: James McGrann, Texas A & M University
Stephen P. Harsh, Michigan State University
William Van Beek, Purdue University
Jerald Fletcher, Purdue University

Title: *"State Initiatives for Agricultural and Rural Development"*

Organizer: Rodney L. Clouser, University of Florida

Moderator: Rodney L. Clouser, University of Florida

Presenters: Michael Green, Council of State Governments
Phillip Baumel, Iowa State University
John Holt, University of Florida
Ron Shaffer, University of Wisconsin

Title: *"International Trade Considerations for Extension Education Programs"*

Organizer: C. Parr Rosson III, Clemson University

Moderator: Earl Brown, University of Maryland

Presenters: Michel Paggi, Texas A & M University
Keith Searce, University of Georgia
C. Parr Rosson III, Clemson University
Kirby Moulton, University of California-Berkley

Title: *"Farm Marketing Practices: What are They and How Can We Improve Them?"*

Organizers: James Mintert and William Tierney Jr., Kansas State University

Moderator: William Tierney Jr., Kansas State University

Presenters: James Mintert and William Tierney Jr., Kansas State University
Roland Smith, Texas A & M University
Henry Bahn, Montana State University

Title: *"Farm Management Associations: Bridging the Information Gap Between Agricultural Producers, Extension Educational Programs and Applied Research Activities."*

Organizer: Richard Trimble, University of Kentucky

Moderator: Buel Lanpher, ES, USDA

Presenters: Buel Lanpher, ES, USDA
Don West, ES, USDA
Don Pretzer, Kansas State University
George Young, Auburn University
Charles Moore Sr., North Carolina State University
Richard Trimble, University of Kentucky

Title: *A Multidisciplinary Systems Approach to Farm and Ranch Management*

Organizer: Jose Pena, Texas A & M University

Moderator: Fred Tyner, Mississippi State University

Presenters: Richard Conner, Texas A & M University
Jose Pena, Texas A & M University
Ashley Lovell, Texas A & M University
Rob Martin, Auburn University

Title: *Continuing Professional Development: Imperatives for the 21st Century*

Organizer: John Kornacki, National Center for Food and Agricultural Policy
Resources for the Future

Moderator: R. J. Hildreth, Farm Foundation

Presenters: Steven F. Matthews, University of Missouri
W. Fred Woods, ES/USDA
John Kornacki, Resources for the Future

3:00 - 3:30 Break, with Refreshments

3:30 - 5:00 General Session

Moderator: **Kim Anderson**, Oklahoma State University

Evaluation of Workshop

Maintaining the Cutting Edge and Enhancing the Extension/Research Interface

Speaker: **Hank Wadsworth**, Director of Agricultural Extension, Purdue University

5:00 Adjourn

Table of Contents

Foreword	iii
AAEA Extension Workshop Planning Committee	iv
AAEA Extension Workshop Program.....	v
 <u>GENERAL SESSIONS</u>	
Extension and Research Interdependencies at Land - Grant Universities: Current and Future	
C. B. Browning, Oklahoma State University.....	1
Achieving Successful Extension/Research Interface: Impacts of Organizational Structure	
John Ikerd, University of Georgia.....	9
Discussion: William Wood, Jr., University of California.....	29
Promotion, Tenure and the Extension/Research Interface	
Marc Johnson, Kansas State University	35
Extension-Research Interface: The Cutting Edge	
Henry Wadsworth, Purdue University.....	41
 <u>CONCURRENT WORKSHOPS</u>	
1. <u>Farm Financial Crisis: Extension and Research Programs to Meet Current and Future Needs</u>	
Organizers: Ross Love and Harry P. Mapp, Oklahoma State University	
Debt Resolution Through Mediation: Extension and Research Linkages Glenn Pederson, University of Minnesota.....	55
Discussant: Michael Duffy, Iowa State University.....	69
Developing Tools to Improve Financial Decisions: Research and Extension Interactions	
Harry Mapp and Ross Love, Oklahoma State University	73
Discussant: Alan Baquet, Montana State University.....	89
Your Financial Conditional: A Program on Financial Statements, Analysis, and Legal Aspects of Borrowing	
Thomas Frey, University of Illinois.....	93
The Linkage of Applied Financial Analysis and Credit Scoring to Extension and Teaching Programs	
David Kohl and Gerald Warmann, Virginia Polytechnic Institute and State University	117
Discussant: Danny L. Klinefelter, Texas A & M University	129

Lessons From The Financial Crisis in Agriculture Michael Boehlje, University of Minnesota.....	133
Crystal Balls, Ouija Boards, and Palm Reading: Views on the Future of Agricultural Finance Marvin Duncan, Farm Credit Administration.....	137
Issues in Agricultural Finance Neil Harl, Iowa State University	143
2. <u>Commodity Programs: Extension and Research Efforts to Meet Current and Future Needs</u>	
Organizers: Darrel Good and Robert Spitze, University of Illinois	
What Can the Economist Do and Not Do in the Public Policy Process? Neil Schaller, ERS, ESDA.....	149
Discussants: Roy Carriker, University of Florida.....	163
Craig Infanger, University of Kentucky.....	169
Utilizing Econometric Price Analysis Models in Extension Outlook and Marketing Programs David Miller, University of Missouri.....	175
Discussant: John Ferris, Michigan State University	179
How to Integrate Extension - Research Programs - A Problem Focus	
Subtitle: Integrating Extension & Research Programs Andy Novakovic, Cornell University.....	183
Subtitle: Case History of the Salinity/Drainage Task Force, University of California George Goldman, University of California, Berkeley	191
3. <u>Management Information Systems, Decision Support Systems, and Expert Systems: Extension and Research Applications</u>	
Organizers: Gerald Campbell and John Schmidt, University of Wisconsin	
Decision Support Systems Definition and Overview Stephen Harsh, Michigan State University.....	197
Integrated Dairy Farm Management Robert Milligan, Cornell University.....	215
Integrating Producer Workshops Into a Farm Business Management Data Support System R. A. Schoney, Saskatchewan University	229
Coop-Sim: A Decision Support System for Cooperative Grain Elevators David Park & Elton Li, Oklahoma State University	241
Expert Systems for Choosing Livestock Marketing Alternatives Steve Blank and Russell Gum, University of Arizona.....	249

4. Agricultural Linkages to Rural Communities. Implication for Rural Development

Organizers: Gary Smith, Washington State University and Tom Harris,
University of Nevada

Measuring the Interdependencies of Agriculture and Rural Communities
Gerald Doeksen and Mike Woods, Oklahoma State University..... 263

Discussants: F. Larry Leistritz and Arlen Leholm,
North Dakota State University 283

Identifying the Financial Stress of Governmental Units and Methods for
Assisting Them
Jack Whitmer, Iowa State University..... 291

Discussant: Ted Alter, Pennsylvania State University..... 303

Alternative Strategies for Expanded Rural Economic Development
Glen Pulver and Ron Shaffer,
University of Wisconsin-Madison..... 311

Discussant: Phil Favero, University of Maryland 321

MINI-SYMPOSIUM

Organizer: David Holder, ES, USDA 325

Identifying the Proper Role for Extension in Educating Debtors and Lenders on
Farm Bankruptcy
Stephen Matthews, University of Missouri 327

Why Many Extension Economists are Not at 'The Cutting Edge' and What They Can
Do About Moving The Edge
George McDowell, University of Massachusetts 329

Comparative Advantage and Competitiveness: New Extension Programs to Teach
Old Concepts
John Ikerd, University of Georgia..... 331

Use of Expert Systems in Agricultural Economics
J. William Uhrig, Purdue University 333

Subtitle: An Expert System Application to the Financial Analysis of Lender Case
Farm Records
James Phillips & Stephen Harsh 335

State Initiatives for Agricultural and Rural Development
Rodney L. Clouser, University of Florida..... 349

International Trade Considerations for Extension Education Programs
C. Parr Rosson III, Clemson University 351

Farm Marketing Practices: What Are They and How Can We Improve Them?
James Mintert, Kansas State University
William Tierney, Kansas State University 353

Farm Management Associations: Bridging the Information Gap Between Agricultural Producers, Extension Educational Programs and Applied Research Activities Richard Trimble, University of Kentucky.....	355
A Multidisciplinary Systems Approach to Farm and Ranch Management Jose Pena, Texas A & M University Ashley Lovell, Texas A & M University	357
Continuing Professional Education - Imperatives for the 21st Century John Kornacki, Resources for the Future	359

EXTENSION AND RESEARCH INTERDEPENDENCIES
AT LAND-GRANT UNIVERSITIES: CURRENT AND FUTURE

Nineteen hundred and eighty-seven is an historic year. Throughout this year we have celebrated the 100th anniversary of the passage of the Hatch Act which established the Agricultural Experiment Station system. It is most appropriate that we do this, not only for the sake of commemorating an important legislative act from 100 years ago, but also to recognize that what this act has helped to bring about runs deep into the fabric of American life. The Hatch Act was preceded and then followed by other important legislation which set forth the intent and yearning of this nation's leaders to provide opportunities and benefits for our people and to develop our national economy.

This year is also the bicentennial of the framing of the Constitution of the United States. And the Constitution played no small part in the development of a strong agriculture as we know it today.

America, 200 years ago, was a nation of farmers, an agrarian society. In the late 1700's, about 90 percent of the people lived and worked on farms and most owned their land. Historians tell us that parts of the Constitution were written to help solve farmers' problems. And the system of government it created allowed a strong agriculture to develop in this country.

Early Interest in Agricultural Education

Long before the passage of the Hatch Act in 1887 leaders and citizens were suggesting that agriculture was a subject worthy of education and research.

Agricultural societies were formed throughout the East, one of the earliest in Philadelphia in 1785. It was soon followed by other societies in other states. These groups were organized on a county and community basis and functioned for the promotion of education and to promote agriculture in general.

These groups sponsored lectures, fairs and shows, published journals, and initiated the development of what came to be known as farmers' institutes. Community meetings covering a period of two or three days and devoted to a discussion of agricultural problems and subjects relating to the home were held.

The societies were also instrumental in the promotion for a department of agriculture in the Federal government, and the establishment of publicly supported colleges to teach agriculture.

Presented by C. B. Browning, Dean and Director, Division of Agriculture, Oklahoma State University, at AAEA Extension Workshop. "Maintaining the Cutting Edge," July 31, 1987, Michigan State University. Acknowledgement is given to H. C. Sanders, The Cooperative Extension Service, 1966, for information on the history of Land-Grant Colleges and Cooperative Extension.

Higher education in the United States in the 1700 and 1800's was a type modeled after that in England where men were prepared in the practice of law or medicine or for the ministry. With time and need, sentiment for a new and different type of college to prepare men and women for the ordinary vocations of life developed. Finally in 1862, Congress passed and President Abraham Lincoln signed into law the Morrill Act which created our land-grant college system.

The Need for Research is Realized

While the establishment of agricultural colleges was a great idea, it soon became evident that there was not a great deal to teach. There was no curriculum, few agricultural courses, no textbooks and few trained teachers. Little or no research had been done in this country on which to base agriculture teaching. College farms were used to study the plants, the animals, and the soil. These farms became the first laboratories for instruction and simple experiments. The idea of research as a basis for courses of instruction and as a necessity for productive agriculture became common. The pressure grew, until finally Congress responded in 1887 with the Hatch Act establishing the Agricultural Experiment Station system.

Extension - An Outgrowth of Citizens Needs

The formal creation of Cooperative Extension was a logical and almost inevitable outgrowth of the Morrill Act.

By the turn of the century it was becoming evident to many citizens and leaders that a process was needed to extend the knowledge being created by the Experiment Stations. Many land-grant colleges and Experiment Stations began to establish extension work as a part of their regular function. Some States appropriated money specifically for this extending of new knowledge.

Beginning in 1887, the United States Department of Agriculture employed field agents in several states and Seaman A. Knapp was employed as special agent for the promotion of agriculture in the South. Today he is recognized as the father of Extension.

It was Knapp's use of the demonstration technique which created awareness among the public that new ideas could be employed to produce better crops and livestock. It was Knapp also, who recognized the educational potential and the public relations value of boys' corn clubs which eventually grew into the 4-H program.

Slowly, the possibility and potential for a nationwide out-of-school, educational system was developing. Successful programs were functioning in several states. These successful but struggling programs helped to build support for Federal assistance. The passage in 1914 of the Smith-Lever Act which authorized Cooperative Extension work in agriculture and home economics completed the formation of the three function system upon which the land-grant concept has been built.

The System - Designed to Serve

Created in three parts over a 52-year period, the land-grant system is a study in the evolution and creation of an educational research system that is mission-oriented and directed to the economic and social needs of all citizens.

Even though the system evolved over a half-century, the three functions of the land-grant university form a single unit of service. This symbiotic relationship is unequaled as an efficient and practical form of education.

There is no doubt that land-grant colleges were developed by the spirit and vision of a pioneering society willing to create and try new approaches to meet the needs of a young and developing country. While the basic mission has not changed, it has been adapted to the times to serve the needs of people as needs have changed.

This brief historical review probably is not necessary for most of you but for me it sets the stage and, in an oversimplified way, indicates where this system has come from. First, the formation of the agricultural colleges with the 1862 act and little or nothing to teach. Followed by the recognized need for a science base and consequently an agricultural research program to complement the art and folklore. And then, a recognition that the development of this science and technology was of limited value if it was not extended to the people who should be using it.

There have been many significant changes in this system over time. Some good and, in retrospect, some probably not so good. For those critics who say there have been no changes and, this is in fact what is wrong with our system, I would suggest that they have not studied the system very carefully and certainly have not looked at the history. Change has been slow but progress by most any measure has not been slow. I would contend that institutional change generally must be slow and evolutionary rather than revolutionary. Some years ago a friend of mine when looking for an appropriate way of making this statement quoted a British educator, Lord Eric Ashby, as follows, "An institution must fulfill two conditions: it must be sufficiently stable to sustain the ideal which gave it birth, and sufficiently responsive to remain relevant to the society that supports it." I think this is particularly true for Cooperative Extension. If we try to run off and leave those whom we have been serving or whom it is our mission to serve, then we are in real trouble, but we must make changes to be relevant.

As I did some background reading to prepare for this paper, I became intrigued and also sidetracked from the central issue of research and Extension relationships and involved with some of the history of Cooperative Extension as well as some of the contemporary debates taking place. As an example, the debate about whether Cooperative Extension is a technology transfer agency or an education agency. From the brief reading I did I am not certain there is any real agreement as to what technology transfer really is or whether it can be separated from extension education. Also, I encountered the general theme in several current publications of the "land-grant mission lost" and the relationship of this assertion to Cooperative Extension. The contention, as I interpret this concern, is one of overemphasis on disciplinary orientation and the loss of a service philosophy. And then the debate as to who the most important clientele are for Extension and what group should be most important.

The point I would like to make both about Extension and our land-grant universities is that generally there is no real problem with describing and identifying our mission. There is, however, a continuing problem with perceptions and interpretations of that mission. What should be recognized is that even though we may have the same mission, there often are differences in what Cooperative Extension is in each of the states. Differences that relate to clientele needs and expectations.

I do not believe the land-grant mission is lost in most of our land-grant institutions. I do not believe that the majority of our faculty, either Extension or research, are working only for peer recognition. But I do recognize that there are institutional differences and that there are differences within and among disciplines. The one thing that bothers me the most with some of the current debate about our land-grant agriculture programs occur when various national groups publish statements about the "very few" prestigious land-grant universities. They are generally talking about those who have the greatest amount of basic research, the greatest degree of discipline orientation and who consequently have attracted through the competitive grants process the most extramural funding. I have no problem with these measures of quality or prestige but the other forty or so universities are generally classified as the "have nots" regardless of the quality of their faculty or quality of programs in applied research, teaching, Extension and service to the various clientele within their state.

Let me get to the specifics of the topic I was asked to discuss--that of Extension/Research Interdependencies and the Land-Grant Universities--and start by indicating that I think it is absolutely essential that there be a very close working relationship between the research and Extension functions. This is essential not only for the health and vitality of the system, but also in order to continue effectively serving our various clientele in a world that has become extremely more complex than when the system was developed. This relationship is as important for research as it is for Extension.

To my knowledge there is no one perfect way, administratively or structurally, within our institutions for this to be accomplished. I am sure that we can find examples of excellent working relationships where the two functions of Extension and Research are in separate administrative organizations and examples of poor relationships where they are housed together and administered under the same organization. What is needed is an understanding of the mutual benefits involved so as to insure the development and continuity of harmonious working relationships. The way it happens--and it must happen--will depend on the organization into which it must fit. Of course there is the opportunity for organizational modification to create a better fit and in some cases this is probably needed.

In an effort to make a few points, I would like to respond to several specific questions relating to Extension/research relationships.

1. Should Extension faculty be involved in university research projects?

The short answer is yes. However, this does not imply that every Extension specialist will or should be involved in formal research projects. Participation should be by selection and on a case by case basis as appropriate.

An Extension specialist involved in a research program can help insure that specific problems related to his or her extension program are addressed. This type of involvement can also insure and strengthen the important relationship of problem identification from the field to the research laboratory. The Extension specialist can also be more directly and effectively involved in development, adaptation and implementation of research results in technology transfer and Extension education programs. Involvement can also add a research dimension to the Extension responsibility on a part-time basis that might not otherwise be possible because of budget constraints or other reasons. Also of importance is that research involvement allows the Extension specialists to operate from a position of greater authority and confidence.

However, the involvement of the Extension specialist in research programs is not without cost. The division of time between Extension education activities and research may and, probably in many instances, does cause some "loss of motion," but it is my belief that the synergism more than compensates for any loss in Extension productivity. Also, the extra effort on part of the Extension specialist to maintain a research capability may be a cost but, again, in many instances probably strengthens and helps the Extension specialist maintain professionalism.

There are, of course, many ways for Extension faculty to be involved in research in addition to formal participation in research projects. Extension faculty can and should serve in academic groups responsible for identifying and selecting research priorities. They can make valuable contributions on review committees for Experiment Station research proposals and on review committees for research publications designed to speak to real world problems. The cooperative development of Extension education publications by Extension and research faculty is also a valuable interactive function.

2. Should Extension faculty conduct research independent of the research faculty?

If the question is "can Extension faculty do independent research?" My answer would be yes where this is appropriate. The active involvement and cooperation of a research scientist with an Extension specialist who has a research responsibility is not essential, but probably most times would be very desirable. However, if the question is "should Extension faculty conduct research independent of the research administrative organization?" My answer is no. In my view one of the strengths of our land-grant agricultural system is a division of responsibility with budget support and accountability but with coordinated and oftentimes joint working relationships. In most administrative organizations I do not feel it would be desirable to have two distinct agencies, the Agricultural Experiment Station and the Cooperative Extension Service, responsible for the same function. This could be counterproductive and discourage cooperation and eventually lead to dissension, confusion, and competition.

As I indicated earlier, there is no one administrative organization that is perfect, but in my view, a joint appointment for an Extension faculty member qualified and interested in doing research is the appropriate mechanism. The Extension specialist then operates under the research administrative umbrella for the research appointment and is accountable to and evaluated by that system. He or she in effect becomes a part of the system. Where a research scientist is to be actively involved in an Extension program, I believe that this individual should hold a joint appointment and be responsible to the Extension administration for these Extension functions. I would opt for a system where this administrative responsibility for this relationship takes place at the departmental level.

The motivating force for Extension to be involved in the research program should not be based on the assertion that the Agricultural Experiment Station has given up applied research responsibilities. There are many positive reasons for involvement in research programs by Extension faculty but this is not a positive or acceptable reason. Applied research is essential to the Agricultural Experiment Station and to the Cooperative Extension Service. It should be recognized that it is not going to be done by basic research scientists, and also that there will continue to be an increase in the number of basic scientists in our Agricultural Experiment Stations. This, in my view, is as it should be. Agricultural Experiment Stations for the most part have underinvested in basic research and more must be done, but the applied research that gives us our credibility with important audiences will also be done. It will be done by research scientists employed for that purpose, just as in the past, and also by the Extension specialist with a research responsibility, and by faculty hired into positions designed for joint applied research and extension responsibilities.

To go a step further, I believe it is important for Cooperative Extension staff at the university level to be a part of the departmental academic faculty with academic rank. This helps create from the outset of selection and employment the environment of being a part of the total program and provides mutual respect, understanding, and cooperation. This arrangement of faculty appointment appears to cause difficulty when the department, college, or university uses the same criteria and evaluation standards for all faculty regardless of functional responsibilities. This is a particular problem if the system is overly "enamored with the disciplinary peer review publication process." I am a strong believer in the concept of "Publish or Perish" but with the understanding that a publication should be judged on the basis of appropriateness and quality and not merely on whether it appears in a refereed journal. I further believe a faculty member should be evaluated for reappointment, tenure, and promotion on the basis of quality of performance judged against the purposes for which he or she was employed and not by some standard developed for a basic research program, a practice that does not promote quality Extension/Research relationships, nor allow the land-grant institution to fulfill its mission.

3. How important is it that Extension faculty advise research faculty on 1) needed research, 2) organization of research results, and 3) be able to use the results in Extension programs?

As I have indicated earlier I believe that it is absolutely essential that Extension faculty interact with research faculty both within their discipline and across disciplines on problems that appear to need research attention. This keeps the research scientist current with the needs that exist and also allows the research scientist an opportunity to help the Extension specialist stay up to date on research that has been done that might speak to the problem identified.

One of the challenges to administrators in our land-grant agricultural programs is to help create an environment that promotes this type of interaction and involvement and, indeed, rewards such relationships. We must work to attain a much greater proportion of the potential benefits of cross-function and interdepartmental cooperation. We have many good examples of effective relationships between Extension and research faculty and among faculty members in separate departments but until competition and jealousies are replaced by trust and an understanding of mutual benefit, it will be difficult to make significantly more progress.

Research results can be organized in many different ways, but the Extension specialist ought to be responsible for organizing the results insofar as Extension educational packages are concerned. The research responsibility is to publish results in ways appropriate to the research program. As previously stated, the appropriate publication may or may not be a refereed journal, this being dependent on the research involved, the results obtained and the most appropriate audience. It may have nothing to do with the quality or importance of the research. Extension's responsibility is to help interpret and put these results in materials that can be shared effectively with targeted audiences. Such interpretation and publication often can effectively involve the researcher along with the Extension specialist.

Not all research is directly applicable to problems and opportunities that have been identified by Extension specialists, but most, if not all, Extension education programs should be research based. In an organization where the working relationships between Extension and research are what they ought to be much of the research will be targeted directly or indirectly to state needs and/or problems and opportunities and consequently be Extension useable.

4. How can Extension faculty best fulfill the mission of the land-grant system?

First, by understanding the Cooperative Extension mission of the land-grant system. I find there is confusion and disagreement as to the mission. There are definitely differences in emphasis and interpretation among groups within a state and between states. The Extension mission is not to be a research agency nor does the mission

include the responsibility for resident instruction. However, Extension can best fulfill its mission if it understands research and resident instruction and there is a cooperative working relationship where one plus one plus one equals something greater than three. The mission as stated by the National Joint Committee in the Report "Extension in the '80s--A Perspective for the Future of the Cooperative Extension Service" is as follows: "The basic mission of Cooperative Extension is to disseminate and encourage the application of research-generated knowledge and leadership techniques to individuals, families, and communities."

So in response to the question of "fulfilling the mission" my response is to perform this mission in a positive, enthusiastic, high quality manner so that those served feel their investment has been worthwhile. Without this evidence--this belief at the family, farm, county, community, and agribusiness levels there will not continue to be a Cooperative Extension Service at any level--local, state or national.

SUMMARY

The Colleges of Agriculture, State Agricultural Experiment Stations, and the Cooperative Extension Service combined in our land-grant college system have a history of important working relationships going back to the 52-year period of establishment. Our founding fathers through their wisdom or by a combination of wisdom and good luck put together an educational and research system that has helped make possible a U.S. agricultural enterprise and a quality of rural life that has made tremendous progress in the past 100 years, accomplishments many would judge as being second to none.

While the basic mission of this education and research system has not changed, programs and audiences have. Flexibility and adaptability within the basic mission have been important for success and will continue to be important if the system is to serve as effectively in the future as it has in the past. There will continue to be debates, studies, and questioning with regard to mission and priorities. The system has always been in transition and probably always will be. The challenge for our teachers, our research scientists, our extension professionals, and our administrators will be to make the best judgements possible to serve these varied needs in ways that will continue to promote the type of support necessary at the local, state and federal level so that this uniquely American land-grant endeavor will prosper and continue to serve as it was first envisioned over 100 years ago.

The need for a close, cooperative, harmonious working relationship between Cooperative Extension and scientists in the Agricultural Experiment Station is obvious. The "uncoupling" perceived by some, if true, should be corrected. In addition steps should be taken to insure that the mutual benefits become so evident that stronger and more effective relationships are developed throughout our system.

ACHIEVING SUCCESSFUL EXTENSION-RESEARCH INTERFACE: IMPACTS OF ORGANIZATIONAL STRUCTURE

John E. Ikerd
University of Georgia

The survival of agricultural economics as a credible profession depends on an effective interface of extension and research. Agricultural economics extension without relevant, research based information is just another continuing education program. Agricultural economics research without an effective outreach program is just another area of specialization within the discipline of Economics.

The validity of these assertions depends to a great extent on the definitional distinction between a profession and a discipline. There is no consensus among agricultural economists concerning this distinction. But, I will use the term discipline to refer to a body of knowledge made up of a unique set of basic principles and concepts (Ikerd). A profession utilizes discipline based principles and concepts in solving problems or exploiting opportunities. Agricultural economists utilize principles and concepts from economics, statistics, mathematics and other disciplines to address problems and opportunities of agriculture and related sectors of the economy. Thus, agricultural economics is a profession rather than a discipline.

Extension must have relevant, research based information if it is to address real world problems and opportunities of producers, agribusinesses and rural communities. Similarly, research results must be disseminated or extended if they are to be of benefit in solving problems or realizing opportunities. This interdependence of research and extension, coupled with interdependences of each with teaching, represents the essence of the land grant philosophy. Extension, research and teaching all are essential elements of the agricultural economics profession.

Agricultural economics extension without relevant research will become nothing more than off-campus teaching. Agricultural Economics research without effective extension will become nothing more than another area of specialization within economics. Agricultural economics cannot survive as a credible profession without an effective interface between research and extension.

The Weakening Extension-Research Linkage

Concerns regarding the extension-research interface in agricultural economics appear to be increasing. Ed Schuh, in his much discussed article in Choices, contends that there is a serious malaise in the land grant university system. He points to a pervasive attitude that applied work is not important and

that publishing for peers and consulting for high paying firms or government agencies takes precedence over the tradition social mission of land grant research. Researchers who write more experiment station bulletins and applied research reports and fewer journal articles may be viewed as less scholarly than those who concentrate on writing for their peers in refereed journals. Extension specialists who shun the professional journals also may have their scholarly credentials questioned by their research colleagues.

Extension traditionally has provided a linkage between research based information and problems of society. The underlying assumption of extension work has been that research based information was practical and useful. The trend toward a discipline orientation in the agricultural economics profession raises serious questions regarding the extension-research interface. Who will conduct the applied research which is essential to the profession? Some have concluded that extension specialists must take greater responsibility for conducting their own research to maintain their professional credibility and to support their educational programs (Wood).

What is the role of the extension economists in the 1980s and 1990s? Can we depend on researchers to provide useful and practical information? Or, should we become more involved in conducting applied research for ourselves? How can we gain and maintain credibility as professional agricultural economists without abandoning the land grant mission of extension? The extension-research interface is a critical consideration in all of these questions.

This paper does not provide conclusive answers. However, it does provide an historical perspective on the evolving status of extension agricultural economists within the agricultural economics profession. Current organizational schemes of land grant universities and the perceived impacts of these schemes on the extension-research interface are examined. And finally, some alternative strategies are outlined for achieving a more successful interface between extension and research in agricultural economics.

The Evolution of Agricultural Economics Extension

Many of the current conflicts between extension and research in our profession can be traced to differences in the evolution of academic standards for extension and research faculty in agricultural economics. Even a subjective summary of these evolutionary processes may provide insights into prerequisites for achieving a more successful extension-research interface.

Extension specialists have been a part of the Cooperative Extension Service since its beginning. However, specialists increased dramatically in numbers with growing land grant

university budgets during the 1950s and 1960s. Many specialists in agricultural economics hired during this period were former county agents seeking professional advancement. Most had Masters degrees in agricultural economics or obtained Masters degrees as a prerequisite for their employment as specialists. Extension economists with Ph.D. degrees in Agricultural Economics were a distinct minority during the 1950s and early 1960s.

During the late 1960s and early 1970s, emphasis was placed on upgrading the academic credentials of extension specialists. Many universities provided paid study leave and encouraged specialists to complete Ph.D. degree programs. Strong preference was given to those with Ph.D. degrees in filling new or vacant specialists positions. Many specialists in agricultural economics took advantage of opportunities to obtain their Ph.D.s and agricultural economics departments were successful in recruiting new Ph.D.s to work in extension. But, extension economists without Ph.D. degrees were not at all uncommon, even during the 1970s.

During the 1980s, however, extension economists without Ph.D.s have become a distinct minority. Many who were hired as specialists in the 1950s and 1960s have reached retirement age. Others without Ph.D.s have foreseen difficulties in professional acceptance or advancement and have moved on to other occupations. Vacant extension positions have been filled with new Ph.D.s who have identical academic backgrounds and are professional equals to those hired for research and teaching positions.

The evolution of agricultural economics research is similar to that of extension. However, the progression to full staffing with research faculty holding Ph.D.s was one to perhaps two decades ahead of extension. Research economists without Ph.D.s were a distinct minority in most departments by the 1950s. There have been few if any non-Ph.D. research faculty employed in agricultural economics in the last 25 to 30 years.

Basic differences in attitudes of extension and research faculty can be traced directly to differences in the professional evolution of the two areas of work. Even the younger extension workers, with full academic credentials, have been tutored by older extension faculty who have seen themselves as extension workers in agricultural economics rather than agricultural economists working in extension.

Most of us in the profession today consider ourselves to be agricultural economists working in extension. But, we still have a strong sense of mission. We are agricultural economists with a specific task to perform. We inform and we educate with a purpose. We help people solve their problems and realize their opportunities. This sense of mission is much more deeply rooted in our extension experiences than in our academic backgrounds.

We have been educated in Agricultural Economics but tutored in the land grant philosophy by those who were more extensionists than economists.

Many researchers view extension economists as something less than full members of the profession. Even those who appreciate the essential role of extension in the profession may see extension work as somehow less academic than research or resident instruction. Many older researchers grew up professionally with extension colleagues who were academic "retreads" or did not have a Ph.D. Many of the older specialists did not belong to the AAEA, saw little value in most journal articles and econometric models and said so to anyone willing to listen.

Many younger researchers were the more discipline oriented graduate students trained and tutored in modeling and quantitative methods. They were lead to believe that their training was superior to that of their colleagues who choose more applied or profession oriented training. Those graduates with a sense of mission and an applied orientation were more likely to be offered and to accepted extension positions.

Many researchers hold totally out-of-date perceptions of extension economists. I have found this to be a major problem in professional acceptance of extension economists by many of those in leadership positions in agricultural economics departments and in our national and regional associations. Opportunities are growing for extension economists in administrative positions and in professional leadership roles. But, many biases remain that are based on what extension used to be and not what it is today. These biases can be erased. But, it will take time and continuous exposure of researchers to the reality of extension work through extension and research economists working together.

The more difficult problems of extension-research interface relate to differences that are real rather than illusionary. Extension economists and research economists in general may have quite different opinions concerning the agricultural economics profession, of what it is and what it ought to be. These differences will not be resolved until we agree on and begin to work toward a common mission. Or, we can agree to disagree and to go our separate ways.

Alternative Organizational Structures

Different administrative or organizational schemes have been used by different land grant universities at different times in coordinating the extension-research-teaching triad. These organizational schemes reflect a variety of philosophies among university administrators. Presumably, the objective of any organizational scheme is to facilitate the overall effectiveness of the organization. Many differenced among institutions undoubtable reflect historical differences related to custom and

tradition. However, persistent differences in organizational schemes imply the absence of consensus among administrators on a single best organizational structure for a land grant university.

Experiment stations and Cooperative Extension Services became part of the land grant university system as a result of the Hatch Act of 1887 and Smith-Lever Act of 1914 respectively. Research and extension were added as separate administrative units because funding for these activities came from new and different sources. Over time, however, teaching, research and extension functions have become consolidated under comprehensive boards which govern overall activities of land grant universities.

Research and extension functions have been integrated into overall university administrative structures even though they are still separate line items in many state budgets. However, these integrated administrative structures differ widely from university to university, even within the land grant system.

Johnson outlines three basic administrative structures which reflect different philosophies for integration of extension, research and teaching functions. All three organization charts begin with a university president or chief administrator with a similar title.

In some institutions, the three functions are separated immediately below the level of president with vice presidents for extension, research and resident instruction. With this structure, the three functions are integrated administratively only at the level of president. Directors of research, extension and resident instruction follow their respective vice presidents in the chain of responsibility and in turn are followed by separate department heads for extension, research and teaching programs.

In other institutions, deans rather than vice presidents are just below presidents in the organizational charts. Deans may be followed by separate directors for research, extension and resident instruction programs. In such cases, integration of the three basic functions occurs at the level of dean rather than president. Research, extension and teaching are more likely to be integrated into academic departments under a single department head with this structure. But, such departments often have separate program leaders for extension, research and teaching who are accountable to their respective directors as well as their department heads.

With the third administrative structure, deans serve also as directors of extension, research and resident instruction. The functions are separated administratively through associate deans or directors for each of the functional areas. Research, extension and teaching functions typically are integrated at the

departmental level in such cases with a department head who coordinates all three functional responsibilities. The associate directors attempt to coordinate research, extension and resident instructional programs among departments.

Who Has the Budget?

A key question in any administrative structure is: "Who has the budget?" The perception is that whoever has the budget has the real power. Those of us who have a budget to administer know that it is easy to overstate the power of the budget. But at the same time, we must admit that even limited power to reflect our evaluation of personnel and programs in salaries and support funds enhances our ability to influence program philosophy and direction.

A division of power between academic departments and functional units is an inherent characteristic of any land grant university system. Academic departments are basic organizational units of any university. The need for strong academic departments to support research and extension programs is generally recognized by extension, research and teaching faculty. Extension economists, for example, tend to identify with and support a strong agricultural economics department even if they are housed off-campus and have neither tenure nor academic rank. However, coherent programs in extension, research and teaching also are an inherent part of any land grant university. And, these functional programs, in many cases, must transcend departmental boundaries (Woeste).

Extension and research programs may suffer if too much power is vested in the academic departments. Academic departments may suffer if too much power is vested in separate research and extension programs. The system would seem to function best with an approximately equal balance of power. A near equal balance encourages coordination of functional and academic programs because neither functional program is strong enough to dominate the other or to stand alone.

A key factor in the balance of power seems to be control of the budget. Any structure with separate departments, and thus separate budgets, for extension, research and teaching would seem to tip the balance of power in favor of functional rather than academic programs. This would be more typical of the vice president, director, department head organizational scheme. Separate department heads receive their total budgets through their respective functional directors.

An organizational scheme in which department heads answer directly to deans would seem to tip the balance of power in favor of an academic rather than functional orientation of programs. The department head negotiates with one person, the dean, for a budget which includes extension, research and teaching

components. Department heads may have considerable discretion in use of funds within the department without violating technical budgetary guidelines.

The balance of power is less clear under organizational structures with deans and separate directors of extension, research and teaching. Departmental budgets may be integrated at the departmental level but each director has a definite interest in, and power over, budgets for teaching, research and extension. The department head is likely to have less discretion in use of funds than if a single budget comes from a single person. The power of the department head may be diminished even further by assistant heads or program coordinators for teaching, research and extension. The balance of power under such an organizational scheme may depend more on personalities of deans, directors and department heads than on the university organizational chart.

Organizational structures change over time. A basic trend in recent decades seems to be toward integration of extension, research and teaching programs at lower levels within administrative structures. At the university level, such changes may be reflected in fewer vice presidents, or vice presidents with less actual influence on programs and budgets, for teaching, research and extension. At the departmental level, the trend is reflected in fewer universities with departments for extension separated from those for research and resident instruction. This trend also may mean less autonomy for extension program leaders within Agricultural Economics departments if not more department heads who manage all three program areas directly.

Organizational Schemes and the Extension-Research Interface

The total variety of organizational schemes includes several variations of each of the three basic structures with assistant and associate deans and directors here and there, department chairmen rather than department heads, various degrees of budgetary, personnel and program authority at various levels, and even a division chairman system at my own university of Georgia.

Agricultural economics department heads were surveyed in early 1987 to obtain their assessment of the impact of their organizational scheme on working relationships among extension and research faculty in their departments. The survey form is included as an appendix to this paper. Department heads and chairmen were asked to classify their departmental structure as either a.) completely separate departments for extension and research programs, b.) an integrated department with a separate coordinator for extension programs or c.) a completely integrated department under one department head.

Respondents were asked to rate the working relationship among extension and research faculty in their programs using a five point scale: highly productive, good, acceptable, deficient or

counter productive. Factors other than structure affect working relationships. Therefore, respondents were asked also to assess the contribution of their organization structure to the effectiveness of the extension-research interface using a five point scale: highly positive, positive, neutral, negative on highly negative. Respondents were asked to conclude the survey by giving any suggestions they might have for developing more productive working relationships between research and extension programs in agricultural economics.

An identical survey form was mailed to a sample of extension economists. It was hypothesized that assessments of department heads and extension faculty in their departments might differ in some respects. Extension Service, USDA lists for farm management and marketing contacts at each university were used for this latter survey. No attempt was made to match economists' responses with those of their department heads but comparisons were made between responses of department heads and extension economists in general.

Structure and Productivity. A total of 109 survey forms were completed and returned, 40 from department heads and 69 from extension economists. The AAEA directory was used to obtain a list of department heads, which excludes at least some heads of separate extension departments. At least a few of the responses from extension specialists came from program leaders in extension. Thirty-nine of the total responses came from universities with separate departments for extension and research (18 from extension specialists and 9 from department heads). The only department with a division structure was combined with the group for completely separate departments. Thirty-four responses came from economists in integrated departments with separate program leaders for extension and research (22 from specialists and 12 from heads). And, 48 responses came from totally integrated departments (29 specialists and 19 heads).

Values were assigned to extension-research productivity ratings as follows: Highly Productive = 5, Good = 4, Acceptable = 3, Deficient = 2, and Counter-Productive = 1. Zero-one dummy values were assigned to a variable representing department head versus extension economist and for each of the three different departmental structures. The dummy variables for position and structure were regressed on the 1 to 5 productivity scale.

$$1.) \text{ PROD} = 3.89 - 0.20 \text{ EE} - 0.5 \text{ CSD} + 0.14 \text{ CID} \quad \text{Rs}^2 = .078$$

$$(1.02) \quad (1.97) \quad (0.64) \quad \text{SE} = .99$$

Where: PROD = Productivity Rating
 EE = Extension Economist
 CSD = Completely Separate Department
 CID = Completely Integrated Department
 (t values in parentheses)

The analytical model with parameter estimates are shown in equation 1. The constant value represents the average productivity rating for department heads of integrated departments with separate program leaders for extension, which I will refer to simply as integrated departments to distinguish them from completely integrated departments. The coefficient of 3.89 indicates an average ranking just below the "Good" level for these departments. Completely separate departments averaged a full one-half ranking lower, between "Acceptable" and "Good." Completely integrated departments averaged slightly higher than integrated departments, just over the "Good" ranking. Extension economists ranked their working relationships slightly lower on the average than did department heads but only by two-tenths of a rank. Rankings would still average from acceptable to good for all structures, even for extension economists.

The average ranking for all respondents was 3.70 and the standard deviation was 1.00. This average ranking was toward the good side of the acceptable-good range. On the average, there would appear to be no serious problem with extension-research working relationships. However, the standard deviation of 1.00 indicates a wide range of opinions among individuals, and possibly wide differences among departments, with respect to the extension-research interface.

The low R-square value, 0.078, indicates that departmental structure explains a very small proportion of the total variation in extension-research productivity among departments. The standard error of the estimate of 0.99 indicated a great deal of variability in extension-research working relationships that cannot be explained by differences in organizational schemes.

Separate models were estimated for department heads and extension economists to detect any differences in their assessments of working relationships among organizational schemes. Parameter estimates for the extension economist model are shown in equation 2 and department head parameter estimates are shown in equation 3.

$$\begin{array}{llll} 2.) \text{ PROD} = 3.77 - 0.33 \text{ CSD} - 0.15 \text{ CID} & \text{Rs}^2 = .014 \\ \text{(ee)} & (0.99) & (0.51) \end{array}$$

$$\begin{array}{llll} 3.) \text{ PROD} = 3.75 - 0.86 \text{ CSD} + 0.62 \text{ CID} & \text{Rs}^2 = .36 \\ \text{(dh)} & (2.44) & (2.10) \end{array}$$

The average rankings of extension economists and department heads of integrated departments are nearly identical, 3.77 and 3.75. However, several differences in preceptions of department heads and extension economists are striking. Extension economists in completely separate departments rank their departments over one-half rank higher than department heads of

completely separate departments, $-.33$ compared with $-.86$. The difference is even greater for completely integrated departments which are ranked more than three-fourths of a rank higher by department heads than by extension economists, $+.62$ compared with $-.15$.

The R-square value for the extension economist equation indicates that departmental structure explains almost none of the variation in their evaluation of working relationships with research counterparts. On the other hand, departmental structure explains nearly one-third of the variability in department heads' ranking of extension-research relationships in their departments.

Structural Contribution to Interface Effectiveness. Values were assigned to rankings of the contribution of organizational structure on effectiveness of the extension-research interface as follows: Highly Positive = 5, Positive = 4, Neutral = 3, Negative = 2 and Highly Negative = 1. Zero-one dummy values were assigned to other values as indicated previously. The three different models with parameter estimates are shown in equations 4, 5 and 6. Equation 4 is based on data for department heads and extension economists, equation 5 reflects extension economist responses only and equation 6 reflects responses of department heads only.

$$4.) \text{CONT} = 3.99 - 0.26 \text{EE} - 1.19 \text{CSD} + 0.21 \text{CID} \quad \text{Rsqu} = .28$$

$$(\text{all}) \quad (1.38) \quad (4.79) \quad (0.22) \quad \text{SE} = .96$$

$$5.) \text{CONT} = 3.82 - 1.09 \text{CSD} - 0.06 \text{CID} \quad \text{Rsqu} = .17$$

$$(\text{ee}) \quad (4.03) \quad (0.20)$$

$$6.) \text{CONT} = 3.83 - 1.39 \text{CSD} + 0.64 \text{CID} \quad \text{Rsqu} = .52$$

$$(\text{dh}) \quad (4.03) \quad (2.22)$$

Where: CONT = Contribution of Structure to Interface
(All other variables as in previous models)

Analysis of the contribution of structure of effectiveness of the extension-research interface seems to confirm several tentative conclusions from the previous analysis. Higher R-square and t values indicate that factors other than structure affect working relationships within departments. However, R-square value are still relative low, 0.28 , and the standard error for regression was $.96$. These values indicate considerable difference of opinion among economist regarding the nature of contributions of various organizational schemes on the extension-research interface.

Extension economists and department heads seem to agree quite closely on their average rankings regarding the effect of an integrated departmental structure on extension-research relationships. They seem to agree also that totally separate

departments make a successful interface more difficult to achieve, although extension economists are somewhat less pessimistic on this point. However, department heads were clearly more optimistic than extension economists regarding the positive contribution of totally integrated departments to a more effective extension-research interface. Department heads give an average rating of 4.47 to completely integrated departments, about half-way between positive and highly positive rankings. Extension economist rate completely integrated departments at 3.74, somewhat less than a positive ranking.

Suggestions for More Productive Relationships. Nearly all of those responding to the survey made suggestions for improving the extension-research interface. The two most frequent suggestions for improvement were more joint appointments, mentioned by 30 respondents, and more extension input in research planning and vice versa, mentioned by 31 respondents. These proposals were common for both extension economists and department heads but had greater than proportional support among extension economists.

Changes in administrative structure or leadership were mentioned by 16 respondents but ranked nearly as high as joint appointments and coordinated research in popularity among department heads. Department heads seem to have more confidence in solving problems through administrative means. Eight economists, only 1 department head, indicated that administrative changes wouldn't make much difference. Nine respondents indicated that more integrated departmental structures may detract from a department's ability to fulfill its extension responsibilities.

Several respondents volunteered that the effectiveness of the extension-research interface depends on one-on-one working relationships between individual faculty. I doubt that any of the respondents would have disagreed with this particular point. However, the focus of this analysis was on how departmental structure, or other factors, might encourage such one-on-one relationships to develop and grow.

Fourteen respondents indicated that communications was the key to better working relationships. Eleven suggested interspersed offices for research and extension faculty, 5 mentioned membership of extension faculty on graduate committees and 5 suggested integrated faculty teams or task forces. All of these suggestions, 51 in total, presumably would promote better communication and understanding among extension and research faculty.

Fourteen respondents indicated that extension economists should change their attitudes or activities to encourage better relationships with their research counterparts. Nine respondents suggested that extension economists should do more applied

research or should be more scholarly and professional in their extension activities. Several of these respondents indicated that researchers could benefit also from doing more extension work.

A return to the land grant mission was mentioned specifically by 12 respondents as a way to improve the extension-research interface. Ten respondents indicated that institutional research biases with respect to faculty status, tenure and promotion and a failure to appreciate the mission of extension were impediments to better extension-research relationships. Those who felt that departmental structure could not solve the problem or saw dangers in complete integration also alluded to the distinctly different roles of extension and research in the overall departmental mission. And, those who expressed a need for greater extension input in research planning were reflecting the mission oriented land grant philosophy as well.

Combining responses related to mission and research planning, a total of 88 respondents suggested, directly or indirectly, that working relationships between extension and research would be enhanced by a return to a mission orientation in agricultural economics programs. A mission orientation requires that research and extension programs be coordinated in order to give society practical and useful information that can be used in addressing problems and opportunities.

A mission oriented agricultural economics program requires mutual understanding and respect between extension and research faculty regarding the essential nature of both functions in fulfilling their joint mission. Joint appointments and better communications can enhance the effectiveness of coordinated research and extension programs. However, neither joint appointments nor better communications will improve the ultimate effectiveness of programs of research and extension that share no common mission.

The extension-research interface in many departments of agricultural economics seems to be working well. Other departments have obvious problems in coordination of research and extension programs. The survey did not reveal why some programs seemed to be working better than others only that organizational structure was not a dominant factor. Respondents did suggest, however, that there is considerable opportunity for improvement in the extension-research interface in the agricultural economics profession.

Mission Oriented Strategies for Agricultural Economists

A more successful extension-research interface is essential in developing more effective and productive programs in agricultural economics. The success, and quite possibly survival, of agricultural economics as a credible profession

depends on a return to the land grant philosophy. This was my basic attitude when I agreed to write this paper. That attitude has been reinforced and strengthened by the survey results, the literature review and thought processes represented in the finished product.

Some economists question why we need to feel constrained by philosophies reflected in Acts of Congress passed in 1864, 1890, 1887 and 1914. The answer is: for the same reason we feel constrained by a document written and adopted in 1787. The basic values of the U.S. Constitution are as widely held today as they were when the Constitution was written. Likewise, the values reflected in the two Morrill Acts, the Hatch Act and Smith-Lever Act are as widely held today as they were when these acts were written.

Most of us still hold the value that higher education in practical matters should be available to common men and women of all races. We still believe that society benefits from public investments in agricultural research that improve the efficiency of the food and fiber system and free resources for uses other than providing basic necessities for domestic consumption. We still believe that dissemination of practical and useful information and the giving of instruction in agricultural and related subjects to those not in residence on college campuses is a legitimate use of tax dollars.

The Southern Extension Directors were confronted with the possibility of large budget cuts in the spring of 1986. They met to plan a strategy to restore their budgets. Their first step was to develop a written justification for continued funding. In 1986, challenged to justify their existence, the Southern Extension Director reaffirmed their dedication to the mission of extension as stated in the Smith-Lever Act. I, for one, could not have suggested any stronger statement of mission.

Restoring the Mission Orientation in Our Profession. The preferred strategy for enhancing the extension-research interface would be to return the profession to a mission orientation. Research and extension economists who agree that their basic mission is to help society solve its problems and realize its opportunities are much more likely to agree on the problems to be addressed at any given point in time.

Peter Drucker repeats the old story of three stone cutters in his book, Management. A passer-by ask each of the three what he was doing. The first replied, "I am making a living." The second kept on hammering and said, "I am doing the best job of stone cutting in the country." The third looked up with a visionary gleam in his eyes and said, "I am building a cathedral."

We lack a common perception of what we are doing in agricultural economics. Some of us are trying to do something useful while others are just trying to make a living and others are preoccupied with developing their scholarly credentials. Those just trying to make a living can be found in extension as well as research. And, we may have some extension economists in the last category as well. But, scholarly preoccupation seem much more common among researchers. Our dissatisfaction with our research counterparts does not reflect scholarly disrespect but rather our frustration with the lack of applied research on which to build useful extension programs. We in extension are trying to build a cathedral while our researchers are preoccupied with impressing each other by making fancy cuts in the stone.

Ultimately, the Agricultural Economics profession must return to its mission orientation. Knutson lists full restoration of "the tradition of extending research results and working with experiment station scientists" as a change essential for the survival of extension. Sprott, contents that "Research is first among equals; promotion and tenure require publications refereed journals. Our work is directed to and written for peers within our disciplines; and, our relevance has never been at a lower ebb." He ends his comments with the question: "Is there anyone out there with guts enough to forestall a taxpayer revolt by doing something about it?"

What can we do about it? First, we can stop blaming ourselves for all our problems. Most of the professional exposure of extension in recent years has been discussion of our problems and of changes we must make to survive. Extension sessions at the AAEA meetings in 1982 and 1986 and at the SAEA meetings in 1987 were, for the most part, critical of extension. Constructive self criticism can be useful. We in extension must make changes in our organizational structure and delivery systems to adjust to the current social environment. But, our mission is still valid. We have not lost our way. It is our research counterparts who have gone astray. We in extension have been lonely voices demanding relevance in research until Choices gave a voice to dissident researchers and administrators.

We must, however, go beyond saying "I told you so." We must work aggressively and actively within our departments, within our universities and within our professional associations to restore the mission orientation to our profession. However, the disciplinarians have a strong grip on our profession. The discipline orientation is particularly strong in the professional associations and is strongest in the AAEA. The American Journal of Agricultural Economics defines the standards of our profession for most researchers. The AAEA is clearly dominated by those with a disciplinary rather than professional orientation. The regional journals have found it difficult to stray too far from publication standards set by the AJAE.

Returning the entire profession to its historic mission will be a long and difficult, if not impossible, task. A tax payer revolt may not wait that long. So, what do we do in the meantime? We have at least two alternative strategies. We in extension can do our own applied research in support of our extension programs. Or, we can help restore professional credibility to those researchers who choose to support the land grant mission through applied research.

Extension economists, for the most part, were trained in the same institutions, taking most of the same graduate courses under the same instructors as our research counterparts. We are capable of doing our own research. Most of us already do some applied research and would prefer to continue. However, we feel that our comparative advantage is in extension. The question is not whether we can or will do research, rather it is how much research we should do and how much we should leave to others.

I worked for a time in earlier years with the "Wilson Six Horse Hitch," a team of six Clydesdales. We used the horses for promotional purposes, but similar teams hauled meat through the hilly streets of cities in the early 1900s. Six horse teams were made up of three pairs of horses, two lead horses in front, two swing horses as the middle team and two big wheel horses next to the wagon. Each pair of horses had different functions to perform. But, the three pairs of horses all had to work together or the wagon didn't go anywhere. Extension, research and teaching is not unlike a six horse hitch. Each of us has a different function to perform, we work in pairs but we also must work as a team, we are all hitched together, and we either work together or we don't go anywhere.

Even two Clydesdale horses could pull a loaded wagon. So if your Clydesdales wouldn't work together, you could unhitch them and have three teams of two. But, there were a lot of hills that two or even four horses couldn't climb with a heavy meat wagon. Apparently beer wagons were even heavier and required eight horses rather than six. The little lead horses couldn't pull a whole lot, the big wheel horses were too slow for light loads and the swing horses were just horses. And, there really isn't anything very special about a two horse hitch.

We can unhitch extension from research and teaching. We can do our own research and teach the undergraduate courses in agricultural economics. This is precisely the trend taking place in more than a few Agricultural Economics departments today. But, extension alone can't do all the things that we can do with extension, research and teaching all working together. There will be work that should be done that won't have the expertise to do. It will take us longer to do other things. And, there will be only a third as many of us to do the same job.

If the only choice becomes either to unhitch or remain entangled in our traces, then we should unhitch. There is no useful role for extension in a purely discipline oriented department. A discipline can communicate with itself, which is its only significant communication need, through refereed journals and meetings of peer groups. We in extension cannot become discipline oriented and continue to function as extension economists. Extension will survive only as a part of a profession, not a discipline, even if we have to do our own research. But if we fail to restore an effective extension-research interface, we will have lost the special part of our profession. Extension will be just another pair of horses with a heavy load.

The choice is not a choice between a totally disciplinary orientation or a total mission orientation directed only toward solving problems or realizing opportunities. A disciplinary base is necessary for good applied research. Medical doctors and engineers do some basic research in biochemistry and physics even though medicine and engineering are clearly professions rather than disciplines. We must continue to do some disciplinary research but the question is one of balance. But as Schuh points out, only a few people really are on the frontiers of knowledge. Society can't afford very many purely discipline oriented agricultural economists.

Restoring professional credibility to applied research would seem the more logical strategy for short run productivity and long run restoration of the profession. The recent mission versus discipline controversy indicated potential support for this strategy among researchers and administrators as well as among extension professionals.

Many researchers apparently feel estranged by the disciplinary trend in the profession. But, they may feel powerless to do much about it. They have to publish in the refereed journals to get promoted, earn tenure and gain status in the profession. The refereed journals are discipline oriented. Any time they spend on applied research is likely to be viewed as a cost to their professional advancement.

Many researchers conduct useful, applied research without significant professional incentives. Some may be sufficiently motivated that they would make a contribution to society regardless of the reward system. In most cases, deans, experiment station directors and even department heads support applied research even if the disciplines do not. However, these researchers quite likely would do even more applied research if they were rewarded professionally for this type of work.

How do we generate professional rewards for applied research? One alternative would be to reorient the professional journals. Presumably, rewards for peer-reviewed applied research could count just as much as peer-reviewed discipline research, other things equal. However, the AJAE and even the regional journals seem firmly in the grips of discipline oriented agricultural economists.

The most promising, definitive first step toward restoring professional credibility to mission oriented research might be a new national journal of applied agricultural economics. This has been suggested by various economists at various times over the past several years. Such a journal conceivable could be edited by the AAEA. However, the AAEA would likely see another journal as competitive with the AJAE.

The leadership of the AAEA likely will point to new journals such as Agribusiness and The Journal of Production Agriculture as being adequate outlets for applied agricultural economics research. These journals may prove to be valuable research outlets in the future. However, they are not journals of agricultural economics and thus can never attain the professional status of an AJAE. An American Journal of Applied Agricultural Economics could become the journal of our profession but probably would need to be a totally new venture outside current professional association structure.

The publication criteria for such a journal would have to be strictly controlled to insure that published articles provide information of use in supporting extension, undergraduate instruction or other problem solving applications. Discipline oriented articles, those making contributions to theory or methodology of primary use to research peers and graduate students, would be directed to the AJAE.

I have contended throughout my career that our best chance for restoring professional credibility for extension work was to work with researchers and teachers within our professional associations. However, the time may be at hand to join researchers and teachers with whom we can share a common mission to do what needs to be done regardless of whether the associations approve or disapprove. We can be much stronger and more productive working together than we possibly can be going our separate ways. But, we should not allow our institutions or associations to prevent us from doing those things that need to be done.

If key to attaining a more successful extension-research interface is to restore the credibility of applied research. A new journal of applied research could be a constructive first step. Joint appointments and integrated departmental structures can facilitate more effective working relationships among

research and extension economists who share a common mission. One-on-one working relationships will develop and grow much more easily among professionals in mission oriented departments.

Extension and research are working together successfully in many Agricultural Economics departments at present. But, the extension-research interface is not effective in many other departments. And, there is growing controversy within the profession regarding the roles of applied research and extension work.

With the exception of tax payers, we in extension may have the most to lose from the failure of the land grant system of teaching, research and extension. Thus, it is up to us to initiate the process of restoring professional credibility to the applied research which is essential to survival of the land grant concept. We in extension can unhitch and go our separate way if we are forced to do so. But, we should first try in every way we can to keep the team together. We might survive alone. But with extension, research and teaching working together; we know we can pull the load we must pull to fulfill our responsibilities to society.

REFERENCES

- Drucker, Peter, Management: Tasks, Responsibilities, Practices, Harper and Row, New York, NY, 1973.
- Ikerd, John E., "The Changing Professional Role of the Extension Economist: Discussion," American Journal of Agricultural Economics, 64:5, December 1982, pp 886-888.
- Johnson, Marc A., "Research-Extension Interaction," Unpublished Paper Presented at Western Agricultural Economics Council Meeting, Monterey, CA, January 22, 1987.
- Knutson, Ronald, D., "Restructuring Agricultural Economics Extension to Meet Changing Needs," American Journal of Agricultural Economics, 68:5, December 1986, pp 1297-1306.
- Schuh, G. Edward, "Revitalizing Land Grant Universities," Choices, American Agricultural Economics Association, Dunning Communications, Washington D.C., Second Quarter 1986, pp. 6-10.
- Sprot, Michael J., "Restructuring Agricultural Economics Extension to Meet Changing Needs: Discussion," American Journal of Agricultural Economics, 68:5, December 1986, pp 1316-1318.
- Wood, William W. Jr., "Future Directions in Extension Economics Programs: Discussion," American Journal of Agricultural Economics, 64:5, December 1982, pp 884-885.
- Woeste, John T., "Future Directions in Extension Economics Programs," American Journal of Agricultural Economics, 64:5, December 1982, pp 874-878.

DISCUSSION: ACHIEVING SUCCESSFUL EXTENSION-RESEARCH
INTERFACE IMPACTS OF ORGANIZATIONAL STRUCTURE

William W. Wood, Jr.*

The environment in which agricultural science, extension and research function has changed significantly in terms of land grant focus, population, rewards, problems and specialization. Operational goals and objectives for various structural units with clear reward signals to staff are more important than altering ongoing organization and structure.

As I analyzed an early draft of John Ikerd's paper, I concluded that there were three distinct focal points: a philosophical explication of the difference between discipline and profession, an effort to objectively analyze the impacts of organization and structure based upon subjective assessments, and a statement of creed. Upon reflection, this approach makes a significant contribution to the continuing debate over the appropriate focus for agricultural economics and the organization of people and programs within land grant universities. It demonstrates that some very strong beliefs and perceptions are involved, that pressures for change are many and often in opposite directions, and the topic is most often discussed with some very important assumptions left implicit and definitions not clarified.

Whether one accepts Ikerd's definitions of discipline and profession the distinction helps focus on one issue: there is a difference between a body of knowledge derived from analytical principles and the manner in which a person uses that knowledge to solve societal problems. I would add one additional factor which makes a difference: the entity by whom the individual is employed and that entity's goals and objectives.

The analysis of survey responses is interesting but hardly enlightening. Without any specifications as to what constitutes effective joint productivity or useful working relationships, personal views are not particularly susceptible to comparison. Furthermore, the title of this session creates problems since "successful" is not objectively defined (more on this later).

Ikerd's section on mission oriented strategies can be best characterized as a statement of beliefs. In this context

*Program Director-AECD, Cooperative Extension, University of California, Riverside

there are several sets of 'beliefs' which are relevant: those held by funding bodies, those held by the institution, those held by faculty and staff, those held by past, present and potential clientele, and those held by others in academia. Mission is a marvelous word-it permits us to debate, without requiring us to become specific, and run the danger of creating opposition. I heartily concur that we need an explicit mission, just as we need statements of goals, objectives and priorities. It is less clear who the 'we' is in the complex environment in which each of us currently functions. To argue that the basis of "restoring professional credibility" is a return to a larger proportion of applied research ignores that same complex environment. It also presumes that the most relevant objective is to utilize research results to solve problems for agricultural and rural people. Implicit in this interpretation is that research results mean those produced by the agricultural sciences component of the land grant university.

Significant changes in our environment include:

1. Focus and role of the land grant university
Agricultural sciences is a relatively small component of most land grant universities. Neither original mission nor the magnitude of agriculture formula funding (Hatch, Smith-Lever, etc.) tend to be the pivot points upon which state university policy is determined.
2. Population and demographics
Population distribution between rural and urban, access to higher education, and the realities of employment and income no longer hold the same political and philosophical import.
3. Academic reward systems
The merit and promotion system is driven by the presumed more rigorous research and publication standards of faculty groups in the basic sciences. The inclination is to give little more than lip service to teaching (undergraduate) and public service.
4. Nature of societal problems
Current problems, even those in agriculture and rural communities, are of a more complex nature requiring input from a variety of disciplines. The two goals of pursuing research results at the edge of current knowledge and participating with scientists from other disciplines in solving the type of problems presently extant, frequently with no common jargon, are increasingly incompatible. The stronger the tie to the discipline focused department on campus, the more difficult it is for the individual to participate in cross discipline problem solving.

5. Increasing specialization in research

As the frontier of knowledge is pushed further into the unknown, the focus of research (and the researcher) becomes more narrowly focused. Gaining this increased specialization (depth of understanding) is obtained at the price of effectiveness in dealing with more general issues (breadth).

To the extent that this representation of the changing environment reflects where we are today, it suggests challenges for those of us in extension who are expected to provide effective linkages between academia and some portion of society. Organization and structure are important contributors or deterrents in meeting those challenges; which depends in large measure on the goals and objectives that pertain. Without an organized and effective support group among clientele or students in the political arena it becomes even more critical for those of us who are agricultural economists.

In order to more directly address John Ikerd's paper and yet inject my own views and questions, three specific areas of concern will be examined:

- discipline/profession/employment
- mission/goals/objectives
- organization/structure

Discipline, profession and employment

Distinctions among these concepts could probably be debated extensively but also probably to no significant purpose. I simply suggest that Ikerd's definitions are acceptable and operational. However, he focuses on the wrong distinction; the important one is employment. The issue is are there different sets of goals and objectives, explicit or implied, between cooperative extension and the resident faculty organization. Both are expected to perform teaching and research. However, there seem to be very significant implied differences between the goals of extension and those of the experiment station as well as between extension and the larger university. If these goals are different, then it should be expected that those of us employed by one or the other should practice our profession in different ways. For extension, there seem to be at least five different goals each struggling for supremacy:

1. To achieve academic advancement and recognition within the current university system.
2. To contribute to the discovery and use of new information and knowledge.
3. To translate for the lay public between empirical problems and discipline research.

4. To provide a communication and transfer conduit between research and users.
5. To permit administrative direction and control so as to more effectively allocate resources to centrally determined priority problems.

One could clearly combine these or expand the list ad infinitum. The significance is who sets what priorities and goals for the agricultural economist in extension.

Mission, goals and objectives

All of us have been exposed to mission statements ad nauseam. Educational institutions seem wont to prepare such documents from time to time. Most of these statements are necessary to the institution but have little relevance to the individual staff person. Without clear marching orders from my employer, there are only three relevant signals; personal satisfaction, ongoing budget support and professional advancement. Personal satisfaction may involve peer approval, ego, feelings of contributing, or knowing that I accomplished something and did it well. Budget support includes such items as support personnel, travel, supplies and other expenditures that either make my work easier or permit me greater productivity, however, I may define productivity. Advancement means both salary and rank. The interface with a department is going to make a difference only to the extent that I clearly understand that there will be a different impact on one of the above signals. At present, many of us in extension are receiving, or at least think we are, mixed signals with regard to these variables, particularly advancement. Further, the term, "successful" implies standards by which attainment of explicit goals and objectives are measured. With the ambivalence created in large measure by the complex environment in which the land grant university exists, no such clear goals and objectives, let alone standards, seem to apply. As a result, the paraphrase, "I do, therefore I am successful" seems to apply.

Organization and structure

In many human endeavors timing is a critical variable. If I had the opportunity to establish a new land grant agricultural university, my inclination would be to place the extension, research and resident instruction functions all within administrative units down through the subject matter department. I would also develop a campus based support staff and a field staff compatible with this organization in terms of number, location, and subject matter orientation. Trying to make organizational and structural shifts of any magnitude while in full operation is extremely perilous. Perhaps the best way to get at the

issues involved is to raise a series of questions for which each of us must provide answers. These questions are all posed in the context of change, fully integrating the extension specialist in agricultural economics into the campus department. For those currently functioning as a part of an integrated department, the answers to or consideration of the questions should be in the form of what steps can be taken to further improve effectiveness and efficiency with regard to the issue.

- To what extent can and/or should the agricultural unit in the land grant university counteract the apparent emphasis of the larger academic community regarding criteria for advancement?
- Given the present cast of characters in a given institution, to what extent will the current departmental administrator be able to enhance the interface between extension and research if it has been a problem?
- Is the present composition of field staff (agents) compatible in terms of subject matter orientation to bridge what may be an even wider gap between field problems and disciplines?
- Does this structure enhance or deter from the ability to call upon research results that may have been produced by other departments or institutions?
- If a gap existed between specialists in extension and the departmental researcher, does this structure simply shift the gap to between the discipline and the field staff?
- At what point in the continuum should the translation of problems into the relevant subject matter components occur? If it was not being done prior to integration, the question is moot.
- If the applicable measure of academic excellence continues to focus on published research results, is the extension function as traditionally interpreted properly an academic activity?

The interaction of extension with the research base necessary to address real world problems is critical. While organization and structure can probably make a contribution, it is not clear that it is even a necessary condition; certainly it will not be sufficient. What is required is a clear set of goals and operational objectives for extension, the experiment station, the agricultural sciences unit, and the university. These goals and objectives must be reinforced by understood signals as to the applicable reward system for each employee. We will always have examples of

dedicated professionals who were not rewarded, as well as those who were rewarded in spite of common sentiment that the individuals did not so warrant. However, most of our colleagues are dedicated professionals who are willing to apply their professional abilities to achieve the goals of the organization, if only we could find out what those goals are. Competent, dedicated and innovative professionals will nearly always advance no matter what the system. While we in Extension cry loudly about being viewed as less qualified, this self-flagellation seems more ritual than substance.

PROMOTION, TENURE AND THE EXTENSION/RESEARCH INTERFACE*

Marc A. Johnson**

An after dinner address on promotion and tenure is a prescription guaranteed to cause indigestion. Promotion and tenure elicit more fear and anxiety than salary procedures. Salary increments are handled privately and in relatively continuous fashion, offering hope for the future. Promotion and tenure are discrete events approached with critical appraisal of the subject's performance by faculty colleagues, with public announcement of the result, and with an outcome that signifies professional success or failure, professional employment or unemployment. Promotion and tenure affect one's ego and job security, both of which are usually more important than a few extra dollars.

Once an individual starts the tenure clock, the ticking is always audible, and the sound grows louder and louder as the day of judgment approaches. Anxiety is heightened by the fact that the men and women in black robes are different each year, in different moods, with different experiences of each unique subject, and not particularly accountable for their judgments.

Why Promotion and Tenure

What purpose do promotion and tenure serve? Why is this anxiety and potentially adversarial experience among colleagues justified? Promotion and tenure are quality control devices in the construction of academic faculties. Tenure is provided to reduce the short-term pressure for job security, to provide freedom to look to the long run, and to provide protection to address subjects repugnant to rent-seeking special interests. Promotion and tenure signify that one's colleagues respect the initiate's intellect and energy and desire to count him or her among their collegial lot, to be partners in an academic enterprise. The uncertainty in the process can result in a degree of misdirection, but the generation of creative anxiety is important to stimulate creativity and productivity.

Operating promotion and tenure procedures through academic units is an essential grant of responsibility to the professionals in each discipline to set their own standards and to police themselves. This is a privilege to be protected, because it permits specialists to preserve disciplinary and scholarly integrity. This privilege allows faculties to be built on mutual respect, rather than by garnering individual favor with administrators or politicians.

*Presented at the American Agricultural Economics Association Extension Workshop on "Maintaining the Cutting Edge," August 1, 1987, Michigan State University, East Lansing. Contribution No. 88-46-D from the Kansas Agricultural Experiment Station.

**Professor and Head, Department of Agricultural Economics, Kansas State University, Manhattan, Kansas. The author benefitted from comments of Barry Flinchbaugh, James Mintert, John Schlender, and Orlo Sorenson.

Promotion and tenure are parts of the reward structure that direct activity and output. This reward structure is blamed for inhibiting interdisciplinary work, extension work by researchers, research by extension specialists, and other creative mixes of university activity. Sometimes the excuses are justified, but the reward structure is given more blame than is warranted. Any selection process will suffer occasional type I and type II errors, but individuals with high output in a creative variety of university work will nearly always clear the hurdles, as long as scholarly potential is demonstrated.

The Extension Agricultural Economics Profession

These remarks will continue with suggested criteria for promotion and tenure for Ph.D. agricultural economics extension professionals. Before developing the criteria, two questions will be addressed: (a) What is the agricultural economics extension profession? and (b) What are the responsibilities of Ph.D. agricultural economists?

What is the agricultural economics extension profession? If there are benefits to specialization, in which dimension should specialization be directed, in extension or in agricultural economics? If the profession specializes in the extension dimension, specialists will read the Journal of Extension and train in adult education theory and delivery techniques. This approach will lead to Kohl, Shabman, and Stoevener's description of the deliverers of management information, who require master's degrees in the subject matter discipline, who are separated from the researchers, and who eventually, as a unit, move outside the university to perform their services.

If the profession specializes in the subject matter dimension, specialists will read agricultural economics journals and keep their skills honed for creating, interpreting, and applying economic principles to agricultural issues. Research-extension interaction is more likely to occur with research and extension personnel in the same department, and subject to similar criteria for professional justification than with physical and professional distinction. Specializing in the subject matter dimension also provides the best chance of addressing Eidman's extension dilemma of "staffing to present quality educational programs on increasingly complex subject matter areas to an increasingly sophisticated clientele" (p. 1311). Clearly, extension specialists are not going to be unidimensional, building economic knowledge and neglecting the search for creative delivery techniques. But the discipline of their analytical thought processes is the economic way of thinking, which needs continuous practice.

Farrell et al. have finally brought into open discussion what most agricultural economists have perceived for some time, by describing the relationship between extension and research as "cultural separatism." "Cultural separatism" means being isolated from one another because of the customs and beliefs that diverge as distinct groups pursue distinct missions. Professors can share offices and be culturally separate. Kohl et al. are very straightforward when describing the "tensions between the service needs of extension and the requirements for individual professional advancement in research and in the classroom" (p. 12). If not recognized and handled

appropriately, these conditions breed contempt for one another and drive a wedge into collegiality. Are these comments familiar? "The journals are worthless; they are filled with mathematical erotica, which has no application." "Researchers don't produce anything I can take to the field," implying uselessness. "Extension economists just blow in, blow off, and blow out." "I don't see why it takes a Ph.D. to do extension work."

Cultural separatism is, in part, a result of the failure of universities to create the incentives for all faculty to maintain their disciplinary human capital at equivalent levels, thereby creating academic barriers to research-extension interaction. Not until all faculty are promoted on similar criteria of demonstrated ability to contribute to their discipline in the creation, interpretation, and application of disciplinary knowledge, will the culture of separatism be eliminated. Each individual will have a unique mix of professional products. The criteria relate to "similar ability" rather than "similar products." Promotion based on "job responsibilities" separates faculty along dimensions other than disciplinary expertise, resulting in different criteria for extension specialists and research-teachers. This results in professional isolation and spawns mutual contempt.

Promotion and tenure criteria should promote cohesion in an environment of cultural diversity. A well-balanced agricultural economics program produces a range of outputs, including journal research, bulletin research, publications for laymen, classroom teaching, and off-campus teaching and service. Individual faculty tend to specialize in a subset of these media for the distribution of economic knowledge. Mutual respect among individuals serving the various missions of the university is desirable. However, mutual respect in a university department is much more realistic when all faculty members are hired, promoted, and maintained with similar professional standards. Expectation of similar academic prowess in all program areas, that is, the ability to use economic knowledge, will break the "cultural" boundaries and foster mutual respect and joint work among research and extension specialists.

The second question is: What should be the responsibilities of Ph.D. agricultural economists? Ph.D.'s generate, interpret, and apply economic knowledge and teach economic concepts. Ph.D. extension specialists are suited to interpreting others' research; disseminating research-based information in publications, workshops, and classes; and developing applied research in both disciplinary and multidisciplinary, issue-oriented settings. All university faculty are promoted and given other rewards for maintaining their disciplinary potential by keeping up with the current literature, practicing disciplinary inquiry, and publishing results. If extension is to continue to educate ever more sophisticated audiences, specialists must be called upon to maintain their human capital (Libby, Knutson). If extension specialists are to be recognized as peers by research faculty, they must maintain their human capital (Eidman, Beattie, and Watts). Of course, research and teaching faculty must maintain their human capital to earn the respect of extension specialists, as well.

Promotion and Tenure Criteria

Promotion and tenure are not rewards for past performance. These are privileges granted in recognition of the future potential of an individual as a

productive colleague. Past performance provides evidence about the intellect, creativity, and energy of individuals, which characterize momentum in their professional careers. Constructing a merit badge card, listing requirements for promotion and tenure, should be resisted. Bestowing an award for requirements fulfilled represents completion and termination of effort. The award is backward-looking in recognition of past accomplishment. Promotion and tenure are forward-looking career decisions, recognizing future potential. In practice, the difference is subtle, but significant.

Extension specialists with Ph.D.s should be judged on their future likelihood of performance in four categories: (a) client development, (b) program performance, (c) unit service, and (d) professional advancement. Client development relates to an effectively planned and implemented effort to become familiar with the client base to be taught, to assess the educational demands of clients (demand is a price and quantity relationship for information of a given quality), and to achieve credibility among clients. Within a five year tenure cycle, a specialist should know his client group characteristics, be familiar with individuals in the group, identify areas of educational deficiency, understand which communication methods are effective, and be well thought of as an expert in his or her field by members of the client group. In 10 to 12 years, a specialist should be recognized nationally among extension specialists for expertise in a subject matter area, to qualify for the rank of full professor.

The client development phase in extension is similar to the problem definition phase in research. Research of a quality leading to promotion and tenure requires that topics of inquiry are studied to determine the highest value subjects to address, appropriate hypotheses to test, and efficient and effective methods with which to test. Interaction with extension personnel and citizens provides valuable input into the research problem definition phase.

The second criterion for future potential as an effective extension specialist is evidence of successful program performance relying on sound economic content, efficient delivery, leadership, and popularity. Program content should include application of economic principles with sufficient depth to complement information available through other media. It also should be original and provide dynamic responses to changing conditions.

A specialist should indicate a continual search for ways to magnify the impact of a program through video taping, fact sheet publication, news article composition, and agent training, where appropriate, to reach additional audiences with each program. This zeal to add output until cost becomes excessive represents economic efficiency in program delivery.

Extension programs should evidence leadership of client groups. This implies offering new concepts and challenging conventional wisdom, that is generating a bit of creative anxiety for the client in safe dosages.

Program experience also should show popularity. Popularity means that the preceding elements of client assessment and program performance have been done effectively. Popularity signifies that the specialist has the ability to assess the educational demands of clients, and to select appropriate means of

communication and that a degree of credibility has been established. Most specialists have had busts. But a continuous sequence of busts means a specialist is on a wrong track. Inability to find a right track is an accountable flaw.

The third criterion for career specialists is a positive, teamplayer attitude. Extension requires flexibility and a willingness to respond. This flexibility is demonstrated in many ways from turning in paperwork, to serving on committees, reviewing papers and programs, guest lecturing in classes, cooperating on grant projects, hosting visitors, etc. An agricultural economics unit cannot function without accomplishing these tasks, and willingness to contribute builds the spirit of cooperation and enhances faculty interaction in professional work.

Finally, the specialist should have shown that investment in human capital is a natural and habitual act. This includes evidence of keeping up on journal and bulletin literature in the chosen subfield and interaction with extension, research, and teaching colleagues in seminars, discussions, joint projects, and professional meetings. Human capital building also entails adoption of an explicit component of economic inquiry in the annual work plan. Probably the most debilitating flaw of effective extension specialists is the inability to manage time to include human capital building activities. Farmers who pay no attention to repair and augmentation of equipment and facilities soon find themselves with major replacement expenses or obsolescence. If the university is not to become obsolete, new faculty who fail to adopt capital building habits must be expelled.

All university professors should have a scholarly component to their work, to maintain and develop their ability to use economic tools and interpret their results. It is difficult to imagine an extension specialist being deeply involved in the field for five years without running into issues that need in-depth investigation. Teaming with researchers of agricultural economics or other disciplines is a way to get such projects started.

Departmental and college managers have a responsibility to see that new specialists are guided in a direction toward developing work habits that will meet these criteria. Administrators also have a responsibility to protect the time of specialists to permit development of well-balanced careers with long-term integrity.

Summary

Promotion and tenure procedures represent healthy mechanisms for maintaining the vitality of a profession. When managed appropriately, promotion and tenure procedures establish guidelines within which young professionals develop good work habits and generate creative anxiety to stimulate high performance. Promotion and tenure procedures will enhance research and extension interaction only if criteria include interest and potential for intellectual growth in the subject matter discipline and the propensity to deliver original, research-based information to clients. These criteria apply to researchers and teachers as well. The unity of promotion and tenure criteria for all university agricultural economists builds mutual respect among colleagues, which enhances the probability of interaction.

References

- Beattie, Bruce R. and Myles J. Watts. "The Proper Preeminent Role of Parent Disciplines and Learned Societies in Setting the Agenda at Land Grant Universities." Paper presented at the 1987 Western Agricultural Economics Association meeting, Kansas State University, July 13, 1987.
- Eidman, Vernon R. "Restructuring Agricultural Economics Extension to Meet Changing Needs: Discussion." American Journal of Agricultural Economics, Vol. 68, No. 5, December, 1986, pp. 1310-1312.
- Farrell, Kenneth R., et al. "Toward Enhancement of Applied Agricultural Economics Research and Extension Programs at the University of California." Report to the Executive Committee of the Giannini Foundation of Agricultural Economics, September, 1986.
- Knutson, Ronald D. "Restructuring Agricultural Economics Extension to Meet Changing Needs." American Journal of Agricultural Economics, Vol. 68, No. 5, December, 1986, pp. 1297-1306.
- Kohl, David M., Leonard A. Shabman, and Herbert H. Stoevener. "Agricultural Transition: Its Implications for Agricultural Economics Extension in the Southeast." Paper presented at the 1987 Southern Agricultural Economics Association meeting, Nashville, Tennessee, February 2, 1987.
- Libby, Lawrence W. "Restructuring Agricultural Economics Extension to Meet Changing Needs: Discussion." American Journal of Agricultural Economics, Vol. 68, No. 5, December, 1986, pp. 1313-1315.

Extension-Research Interface

The Cutting Edge

Henry A. Wadsworth

August 1, 1987

The experiences of population growth and associated community changes produce discontent and frustration in many rural/urban fringe areas of this country. Attitudes of people living in these transition zones reflect two points of view, those who think things are basically fine and change should occur by its own accord and those who prefer to see change occur within the framework of an overall comprehensive plan. These conflicting attitudes are not easily reconciled and often result in benign neglect that permits some undesirable land use change to occur. The reality that such adverse affects of inaction could continue usually compels people in the two groups to resolve their differences and join in a united effort to develop an acceptable land use plan and workable rules for its implementation. A phrase often heard during such times characterizes the process as "Action without planning is fatal, planning without action is futile."

There are many similarities between change and the rural/urban scene and change and the extension-research missions of our Land-Grant universities. To me, the most obvious is a paraphrase of the planning description, "Extension without research is fatal, research without extension is futile." The need for the extension-research interface is clear and in fact the effectiveness of the system depends upon research based extension and extended research results. It is my judgment that our Colleges or Schools of Agriculture, by whatever name, dare not lose that uniqueness or risk losing the public confidence and support that have made them highly respected institutions.

Henry A. Wadsworth is Director, Purdue University Cooperative Extension Service, and Associate Dean, School of Agriculture, Purdue University. Appreciation is expressed to David C. Petritz, Jerome B. Siebert and J. Michael Sprott for their critique of an earlier draft.

In preparing for this paper, I did some long delayed reading of some of the dialogue within this association about the appropriateness of our extension-research undertakings. Bonnen, in his 1986 Fellows Lecture at the annual meeting of the association, discussed the continuum of knowledge, its three components, i.e., disciplinary knowledge, subject matter knowledge and problem-solving knowledge and the demands this continuum places on agricultural science (Bonnen). He observed that many Colleges of Agriculture appear to be abandoning their responsibility for the full continuum and need to recapture a catholic view of science.

He further observes, "Other colleges of agriculture, many Land-Grant universities and some agricultural professional associations have absorbed as their ideal the academic science establishment's focus on disciplinary research. Their "search for academic excellence" is denaturing the Land-Grant tradition of problem-solving and service to all people, irrespective of wealth or position. A near exclusive focus on basic discipline depreciates applied, multidisciplinary research, denies admission of problem solvers and prescriptive analysis to the academic pantheon, and turns good Land-Grant universities into second-rate, private academies. Such an environment destroys the basis for effective extension education and problem-solving, and lowers the potential productivity of any agricultural science investment."

Focusing more specifically upon agricultural economics, Bonnen comments, "Agricultural college departments are applied, subject-matter fields with responsibility not only to science but to clientele for specific areas of problem-solving. Disciplinary capability is vital but we are not, as an institution, free to focus exclusively on disciplinary research: individuals - yes; departments and colleges - no. When entire departments devote themselves solely to pleasing disciplinary peers, they eventually lose much of their understanding of and relevance to the society and its problems. This undermines the social value of agricultural economics and the capabilities that brought the profession to where it is. It leaves agricultural economics without a culture capable of sustaining extension or many types of applied research."

Schuh expressed thoughts in a similar vein (Schuh). He notes, "In addition to the notion of providing mass education for society, the essence of the Land-Grant University was traditionally a strong institutional mission orientation. The idea was that the University had a responsibility to address the problems of society, and to apply the tools of science and technology to the solution of those problems." Further he concludes that promotion and merit pay have caused "almost a perverse turning away from institutional responsibility. Professionals are self- and professional-peer oriented. They are concerned with advancing the state of knowledge and hence publishing for their professional peers, not generating and applying knowledge in the solution of society's problems."

I am heartened by the dialogue and the discussion. These are two of the most eminent scholars in our profession. They recognize a problem but others remain to be convinced. It is not a problem Agricultural Economics can address apart from the rest of the disciplines within Schools or Colleges of Agriculture. However there is no reason that Agricultural Economics cannot be the initiator of change in the system. In particular are extension economists prepared to propose constructive changes and assume new responsibilities in order that the discipline might recapture its problem-solving mission?

Extension-Research Interface

How good is the extension-research interface? I doubt if many Extension Directors or Experiment Station Directors are satisfied with the present situation. However, I suspect that it is the Extension Directors who express the greatest concern. They do so because it is extension staff, particularly county extension agents, who are confronted daily by persons with problems, some seeking quick solutions in areas where there may be no good answers. These staff know only too well the inadequacies of the existing interface. As a result, it is the Extension Directors who are most aware of the changes occurring on the knowledge development and application continuum.

Extension specialists focus heavily on new or emerging problems, anticipating change and developing research based analyses to evaluate its

consequences. But where is the research? While once they might have found departmental colleagues with interests, research programs and graduate students in that problem area, such is usually not the case today. Specialists tell me that they have to do more and more research in order to adequately support their educational programs. They indicate there is little opportunity for substantive departmental discussions on identifying important problems and even less on the commitment of extension-research resources to the resolution of those problems. Under such circumstances, I do not see how we achieve a continuum as described by Bonnen.

Bonnen and Schuh's observations about research are further corroborated in my discussion with specialists, both those within agricultural economics and those in other agricultural departments. Research thrusts have shifted from applied work on problems of broad interest to pursuit of disciplinary interests and concentration on basic research. Much of this results from increasing reliance on outside grants and contracts for the funding required to maintain state of the art research equipment and peer recognized research programs by the Agricultural Experiment Stations. Applied research is relatively less important in the total program as it is less likely to generate significant outside dollars. We can also observe that significant amounts of applied research work are being done by proprietary companies whose intent is to capture the economic benefits of their work. The consequence of this is that extension staff have relatively less applied research results available from their research colleagues and the data from proprietary companies is unavailable to them.

I believe I understand what is happening. First, as Bonnen notes, our research colleagues were stung by the criticism that agricultural research couldn't compete in the world of peer reviewed proposals. I can't help wondering if the criticism wasn't as much motivated by a desire to break down the formula funding arrangement as it was a legitimate concern for science. Secondly, public funding growth by Congress and state legislatures was not keeping up with the cost of doing business by the mid to late 1970's. Given the very heavy commitment (85-90 percent) of "hard" funds to faculty salaries.

the administration at most of our Land-Grant agricultural schools and colleges determined that the preferred course of action was to support faculty salaries with "hard" funds and encourage faculty to obtain outside support for expenses to carry on a research program, including graduate student stipends, post-docs, lab equipment, etc. Research faculty have responded but the price is becoming quite clear. Outside dollars drive the system directing the use of much of the "hard" funds. Research faculty do not consult with extension colleagues or interact with leaders of their state when determining their research program. The bottom line is that applied research does not generate research dollars commensurate with the task, so the work doesn't get done.

Thus, there is good reason for concern about the extension-research interface, particularly the willingness and the desire to undertake the subject matter and problem-solving research so necessary for interfacing with the problems of society as encountered by the extension educator. It is an issue we must keep visible. During last year's invited paper's section on Restructuring Agricultural Economics to Meet Changing Needs, Knutson described two essentials for extension as it relates to research (Knutson). The first, "Extension must fully restore the tradition of extending research results and working with experiment station scientists. This is a responsibility of both the research and extension staff." The second, "Extension must place dramatically increased emphasis on adopting and testing the products of the bio- and information technology era for efficacy and performance under local conditions."

The first suggestion is both desirable and attainable if opportunities are created that involve both talents in approaching a problem. I believe extension professionals value the "research base" and will develop such a base if one is not available to them. Fortunately, we can do this and we are not completely dependent upon research colleagues for results upon which to base educational programs. Joint appointments are encouraged by both Extension and Experiment Station Directors at most of our Land-Grant universities. The primary purpose for such appointments is that the faculty member should have the resources to direct some of the research activities needed to undergird

creative and innovative educational programs focused on the solution of real world problems. Furthermore, most Extension Directors do not spend a great deal of time determining whether extension specialists are doing applied research vis-a-vis extension educational work. Most support what it takes to do a quality educational job on an important problem, if that means applied research on extension funds, so be it. This reality was finally recognized in the Smith-Lever Act by a change accomplished during the passage of the 1985 Farm Bill (Smith-Lever). "Cooperative Agricultural extension work shall consist of the development of practical applications of research knowledge and giving of instruction and practical demonstrations of existing or improved practices or technologies in agriculture etc." Wording of the legislation recognizes what has come to be common practice.

If extension accepts greater applied research responsibilities then it will also have to develop the funding sources to match. Current dedication of extension funds to such research is modest and there is no significant amount of dollars available for reallocation unless the mission is substantially changed. I believe public funds (state and federal) are and will be available for this purpose but definitive proposals to support such requests must be made. My own sense is that joint proposals by Cooperative Extension Services (CES) and Agricultural Experiment Stations (AES) are most likely to be well received by appropriating bodies. Secondly, there are a number of commodity groups, trade organizations, and agribusiness groups who do recognize that they must accept substantially more of the responsibility for funding of research and development in their industry. Through membership fees, check offs or assessments they are or can generate substantial sums to underwrite applied research work on problems of particular interest. Thirdly, we can obtain dollars from companies and private corporations to support particular efforts, but we must be mindful of our public responsibility in doing so. Knutson's comments re biotechnology developments are pertinent. I have no problem with CES or AES involvement in testing and analyzing products. I think it is necessary before we can effectively incorporate these possibilities into a thorough analysis of alternatives. But what are the rules? Will we only have data from the company? Will we be limited in the

use we can make of the data? What limitations will exclusive licensing arrangements impose? A final caveat, our past association with companies suggest that we have been willing to do such work at a small fraction of its cost. We need to be more realistic about the resources required to complete these efforts.

The above are by no means a panacea for the problem. Extension staff can and do do a quality job of research. Extension staff can never do all of the "applied" research needed to undergird extension programs, and to maintain the "applied" part of the continuum. Our work should not substitute for the legitimate demands that agricultural research support subject matter and problem-solving inquiries. I believe it is incumbent upon Extension Directors to articulate research needs to supply scientific information of value in solving problems and to raise the awareness level and appreciation for professional staff who dedicate their careers to this purpose. Secondly it is also necessary for you to do likewise within the profession and in the departments in which you work. Extension and research staff must talk together, determine problems needing work together and accept their individual responsibilities of such a team effort if the desired interface is to be achieved.

Cutting Edge

The obvious objective of an extension-research interface is to produce results that will make a significant difference in the resolution of a problem. This "cutting through to the heart of the matter" is in fact an enabling of our clients to make an enlightened choice when confronted with an important decision. I deliberated about discussing methodology or various means to polish the interface so as to sharpen the cutting edge. That however is of lesser importance than the design and selection of materials which in larger part determine the value of the cutting edge. One can easily observe the value of professional cutting tools is in large part related to the value of the substance to be cut. Materials are carefully selected and combined so as to produce a substance whose characteristics are such that it will take and hold the edge required to cut the substance in the desired manner. The more

complex and difficult the task and the higher the value of the outcome, the greater the value of the cutting device. An obvious parallel is that the value of the extension-research interface is determined by the importance of the problem to which the extension-research effort is applied. If extension and research efforts are directed towards problems of little consequence, not much is accomplished. Feeble efforts on significant issues have little or no impact and are usually discarded as irrelevant to the problem-solving process. The key is to select issues and sharpen the cutting edge from quality materials produced in full recognition of the complexity and significance of those issues.

What are the issues to which the cutting edge will be applied? Most faculty consider the choice of problem or issue to be a professorial prerogative even though most were hired to fill a position that had at one time a fairly specific job description. In less dynamic times and when there were more extension and research staff, there seemed to be reasonable satisfaction that research was producing the kind of information needed to undergird extension educational programs on the important issues of the day. But the changes of the 1970's as described by Schuh have produced such a dynamic environment and extensive array of problems that it is virtually impossible to address all of them appropriately. Priority setting thus becomes necessary in order to direct efforts to significant problems. Identifying significant problems is a difficult task that must be accomplished taking into account the missions of the School or College and the problems of those we purport to serve. The choices cannot be left to individual faculty. It is imperative that Deans, Directors and Department Heads insist upon some deliberative process requiring discussions with colleagues and clientele in the selection of priorities and then allocate or reallocate resources to departments and faculty based upon their response to such priorities.

Setting priorities in our Land Grant colleges means that we create and maintain a feedback loop in relation to those who are "users" of the information and analysis we provide. Since our "users" are represented by federal, state and local governments, we must establish our priorities taking

into account federal, state and local concerns. At the federal level guidance is provided by the work of the Joint Council on Food and Agricultural Sciences as established by the Farm Bill of 1977. Initially charged to encourage and coordinate research, extension and higher education activities in the food and agricultural sciences, successive Farm Bills have directed the Joint Council to improve planning and coordination and relate it to the federal budget process. As a result the Joint Council prepares a five year plan of goals and objectives (updated every two years) and an annual priorities report reflecting the Joint Council's judgments for the next fiscal year. In developing these reports, the Joint Council requests recommendations from many groups, particularly the National Extension Committee (NEC) and the National Agricultural Research Committee (NARC).

The 1989 priorities of the Joint Council describe three overriding societal concerns (Table 1). These are: Enhancing Profitability and Competitiveness in Agriculture; Family Economic Strength; and Revitalizing Rural America. Each of the national priorities is important in its own right but in the judgment of the Joint Council its importance is primarily based on contributions each can make to one of the three societal concerns.

Table 1
Priorities for Fiscal Year 1989
by the
Joint Council on Food and Agricultural Sciences

Overriding Societal Concerns:

1. Enhance Profitability and Competitiveness in Agriculture
2. Family Economic Strength
3. Revitalizing Rural America

National Priorities:

1. Maintain and Preserve Water Quality
2. Expand Biotechnology and its Application
3. Develop and Maintain Scientific Knowledge and Expertise

4. Improve Understanding of Food, Human Nutrition and Diet and Health Relationships
5. Sustain Soil Productivity
6. Assess New and Expanded Uses for Agricultural Products
7. Preserve Germplasm and Genetically Improve Plants
8. Improve Food Processing, Food Quality and Food Safety

Source: Proceedings of the Meeting of the Joint Council on Food and Agricultural Sciences, April 15-17, 1987, Arlington, Virginia.

These national priority statements are important in the continuing efforts to convince Congress and the Executive Branch that public funds are directed to important problems, that the system is responsive to national needs and can initiate needed action and achieve the desired results. It has been said that extension's response to the "Profitability" issue did more to enhance extension's image within USDA and the Congress than any other extension program initiated during this administration. Since many of you were involved in this undertaking, I commend you for your efforts. They were recognized and should serve as an example for future efforts.

A formal opportunity to establish state priorities is available to Extension every four years when state "Four Year Plans of Work" are developed. This effort is now being completed in every state. At Purdue, we decided that we wanted to make our efforts count. In times past, our state plan of work has reflected a collection of individual plans of work. In 1984, our Four Year Plan indicated about 80 different program thrusts. In 1988, our Plan of Work covering 60 percent of our effort will be directed toward 25 program priorities. While we will continue many educational programs not included in the plan, we will shift resources and effort towards these priorities at every opportunity.

Establishing priorities in this manner has one major shortcoming, it is done without any involvement of research. I believe that the ultimate

viability of the Land-Grant Colleges of Agriculture depends on how well both extension and research keep "close to the customer". Peters and Waterman in their analysis of successful companies concluded "despite all the lip service given to the market orientation these days, the customer is either ignored or considered a bloody nuisance" (Peters and Waterman). Does that characterize our attitudes? While we are a not for profit entity, we still must compete in the knowledge and information business. If we are to keep and expand our clientele base, we must deliver more accurate, more timely and more useful information and analysis to our users. This can only be done by staying close to our clientele. We talk about ourselves as "grassroots". The implication of this is that we will organize and listen to user advisory committees, whose membership represents the broad array of user interests. As Peters and Waterman note, "If you can't understand the customers, you won't understand the business."

Approaching priorities on a state by state basis is not likely to produce cutting edge efforts on the number of issues that we believe to be priorities. I believe it is time that we looked at this problem on a multiple state basis. The need for specialized talent is rather pervasive among all kinds of organizations and institutions. Most have adapted to this need by increasing the scope of the organization thus making it possible to obtain and utilize such specialized talents. At most of our institutions we are currently hard pressed to maintain existing levels of staff. So how do we cope? Are we willing to look at staffing on a multi-state basis? This could let us assemble the kind of talent we need. I recognize that this is outside the usual collegiality considerations, but it seems to me that we have to use current communication technologies to help us get beyond our individual institutional limitations. I am not suggesting joint appointments between states other than on an adjunct basis to facilitate relationships. What I am talking about is a series of contractual arrangements between states for exchange of a particular set of talents. I prefer this arrangement because it appears to keep the compensation, fringe benefits, promotion and tenure considerations within the purview of one university while providing the needed expertise to the affiliated states.

Conclusion:

My reason for the foregoing discussion is to emphasize two points: 1. Full discharge of our public responsibilities requires an appropriate extension-research interface. More attention must be directed to applied research in order to achieve the desired interface. 2. Priorities must reflect the problem-solving needs of users. Addressing such issues requires extension and research to collectively develop content that will appropriately address the issue.

I am obviously convinced of the importance of the extension and research missions of our Land-Grant universities. We need to use every means at our disposal to encourage interactions that create cutting edge educational efforts on priority issues. Within our Land-Grant system, processes that focus major effort on priority issues and enhance the extension-research interface are most likely to produce educational programs of significance and maximize returns to our clientele and the public dollars provided for this purpose.

REFERENCES

- Bonnen, James T., "A Century of Science in Agriculture: Lessons for Science Policy", American Journal of Agricultural Economics, Volume 68, No. 5, December 1986, pp. 1065-1080.
- Schuh, G. Edward, Revitalizing the Land-Grant Universities Colloquium, Strategic Management Research Center, University of Minnesota, September 28, 1984.
- Peters, Thomas J., and Waterman, Robert H., Jr., In Search of Excellence, New York: Harper and Row, 1982.
- Knutson, Ronald D., "Restructuring Agricultural Economics Extension to Meet Changing Needs", American Journal of Agricultural Economics, Volume 68, No. 5, December 1986, pp. 1297-1306.
- Smith-Lever Public Law 99-198, National Agricultural Research, Extension and Teaching Policy Act, Amendments of 1985, Section 1435.

DEBT RESOLUTION THROUGH MEDIATION: EXTENSION-RESEARCH LINKAGES

Glenn D. Pederson*

The concept of farm credit mediation is reviewed and analyzed in the context of the mediation process implemented in Minnesota. Impacts of mediation activity on farmers, lenders and Minnesota Extension Service are discussed. Problem areas in farm mediation are identified and discussed. Extension-research linkages are identified in the areas of farm financial management and financial policy. Extension programming in the mediation/debt resolution area needs to consider both the management and policy dimensions of the problem.

The policy issue of how to resolve the farm financial stress/farm debt problem has received widespread attention from agricultural economists (AAEA Task Force on Financial Stress 1987; Brake 1986; Hughes et al. 1986; Knutson 1985; Duncan 1985; Jolly et al. 1985) and other farm policy analysts. The initial challenge for economists was to characterize the problem and develop indicators of its extent and severity. The subsequent challenge has been to evaluate 1) the impacts of financial stress and 2) alternative private and public policy actions for mitigating the negative effects. In the process, an extensive and productive literature has been developed.

There is, however, a void in that literature concerning the analyses of state-level programs and policies such as: interest rate buydown programs, farm loan participation programs, state statutes on farm foreclosures, farm credit mediation and various other state laws. Some recent exceptions can be cited (Crowley 1987; Saxowsky et al. 1987; Pederson and Eidman 1986). One explanation for the lack of analyses is that research on these state-level initiatives is hampered by lack of adequate data bases. Most state-gathered, farm financial data sets are based on only one or two years of survey activity, where the scope of the questions is quite limited and the results are of questionable validity. Along that same line, farm credit mediation is relatively recent in its origin (the first programs were established in 1986) and no data has been assembled for economic analysis. In addition, the extension-research linkages for addressing current and future farm debt problems have not been widely explored or promoted.

* Associate Professor, Department of Agricultural and Applied Economics, University of Minnesota. The author acknowledges helpful comments made by Michael Boehlje, Richard Hawkins, and Claudia Parliament on an earlier draft.

The tasks of this discussion paper are to: 1) review briefly the concept of farm credit mediation and what it is designed to accomplish, 2) analyze the Minnesota mediation process and the role of the Minnesota Extension Service (MES), and 3) identify extension-research linkages at both the micro and policy levels in the areas of farm debt mediation, resolution, and management. The underlying objective is to promote ideas on how extension and research agendas and activities can be productively integrated to respond to farm financial and resource adjustment problems.

Farm Credit Mediation

Although state mediation programs vary, the central feature of mediation legislation is that it provides for a statutory delay in the process by which a lender can exercise the right to collect on a nonperforming loan through foreclosure on a mortgage and/or repossession of property. Additionally, the farmer is provided assistance in documenting and analyzing his(her) financial position at the start of mediation. The delay, and the corresponding farmer-lender mediation sessions, provide an opportunity for parties to assess their individual financial, tax, and legal positions and search for a settlement which is agreeable to both sides - the potential "win-win" solution. In cases where no mediation settlement is reached, the benefit is that the debtor and creditor(s) have re-established communications for a time. The delay aspect is important, since it appears to have had the impact of reducing the rate of foreclosures and bankruptcy filings in Minnesota during 1986-87. The implication is that mediation has slowed the rate of resource/debt adjustment and has led to a further cumulation of losses for farm lenders.

Mediation may be voluntary or mandatory. When it is mandatory, mediation activity is required (if requested by either party) under state law before a creditor can proceed to collect on a farm debt. Mandatory mediation can be initiated by either the debtor or the creditor. Under creditor-initiated mandatory mediation, the creditor is required to file a request for mediation with the designated mediation service. Return notification of the date of the initial mediation meeting (in Minnesota) starts the mediation "clock." The debtor has the option to accept mediation, or do nothing and waive the right to mediation. When the notification period tolls, the creditor may pursue collection through foreclosure or other legal remedies.

Figure 1 portrays the farm mediation process in Minnesota. The entire mediation period is 90 days after creditor notification has been served and the debtor has responded.¹ Any of 3 potential outcomes occurs at the conclusion of the mediation sessions: settlement, impasse, or lack of good faith. If the farmer and creditor agree to a settlement, the mediator prepares a Memorandum of Agreement which is reviewed by all parties and their attorneys. Once the agreement is signed, it serves as a legally enforceable contract and no further mediation of that debt is required under state law. If no settlement results, the mediator prepares a report that mediation has concluded with no agreement. At that point the negotiating parties are able once again to pursue alternative legal remedies.

MESs Role in Mediation

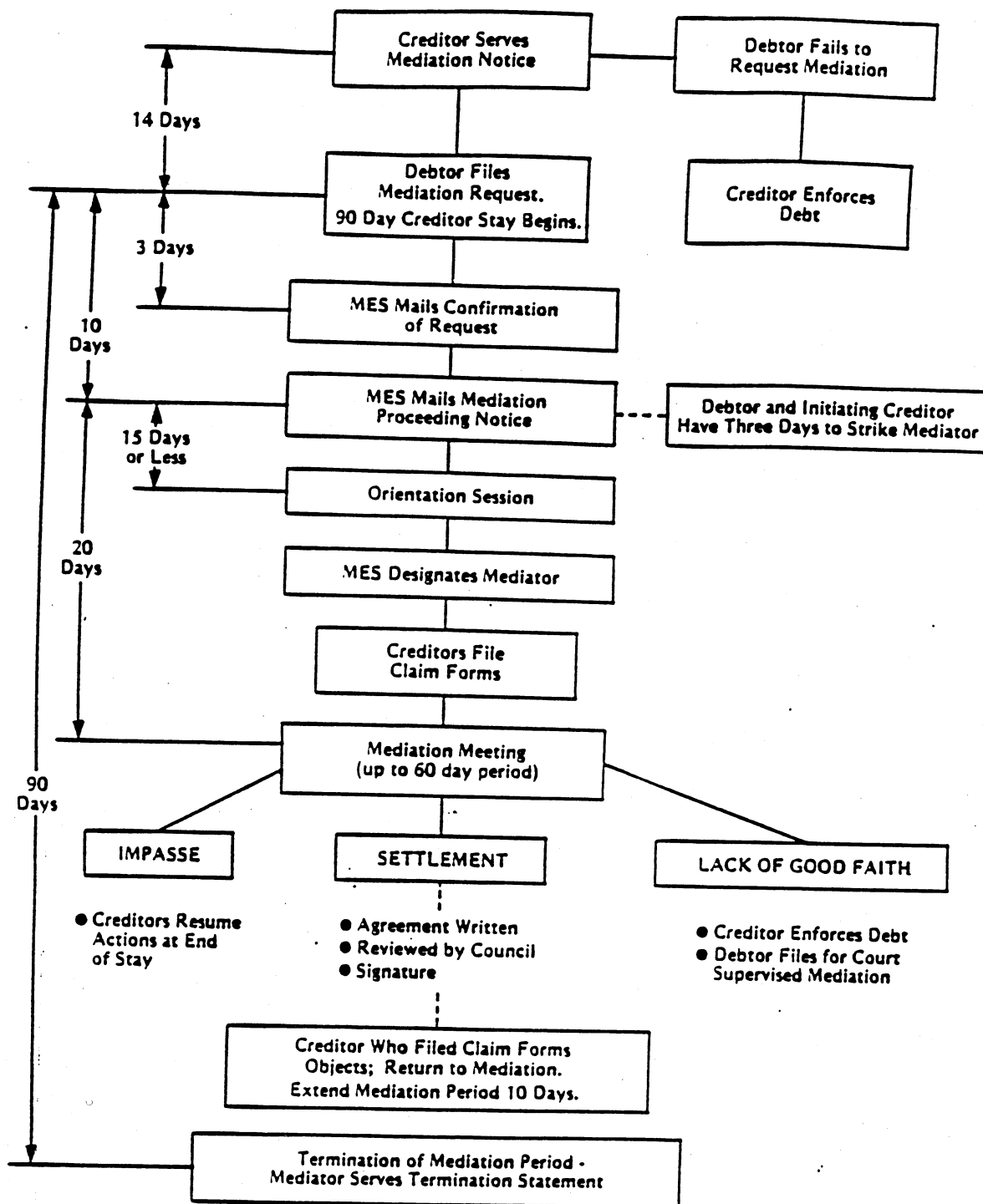
Minnesota's 1986 mediation law applied to all agricultural property with a secured debt exceeding \$5,000. The initial low debt threshold and the relatively high incidence of delinquency on farm debt in 1986 produced a large caseload, especially in southern Minnesota (see Figure 2).

The MES was named in the state legislation to provide personnel and resources to administer the program, beginning March 1986. Funds totaling \$875,000 were appropriated by the Minnesota Legislature for the 1986-87 program, and \$535,000 for the 1987-88 program. The corresponding expenses of the MES were \$944,000 in 1986-87, and are projected to reach \$680,000 during 1987-88. The potential drain on the MES is \$214,000 over 2 years. MES support activities have included: processing of mediation notices; screening, training and assignment of mediators; extension agent assistance to the farmer in preparing financial information and projections for the initial mediation session; maintenance of completed case files; and reporting to central MES personnel and the state legislature. The scope and level of involvement of the MES in farm mediation exceeded those of extension services in other states.

Based on 4,393 farmer requests for mediation in Minnesota between March 1986 and June 1987, the following cumulative distribution of cases has emerged: 487 cases were settled prior to the first mediation session, 1,175 cases were settled with an agreement (892 agreements involved a continuation of farming operations and 197 of the agreements terminated the farm business), 1,334 cases ended with no agreement, 129 cases were suspended due to lack of good faith, and

¹ If lack of good faith is found on the part of the creditor, an affidavit is filed by the mediator and the creditor's remedies are suspended for an additional 180 days. Lack of good faith may be found when parties; fail to attend, fail to provide full information, fail to provide a written statement of alternatives, or fail to release funds. Lack of good faith has been reported in a minority of cases in Minnesota.

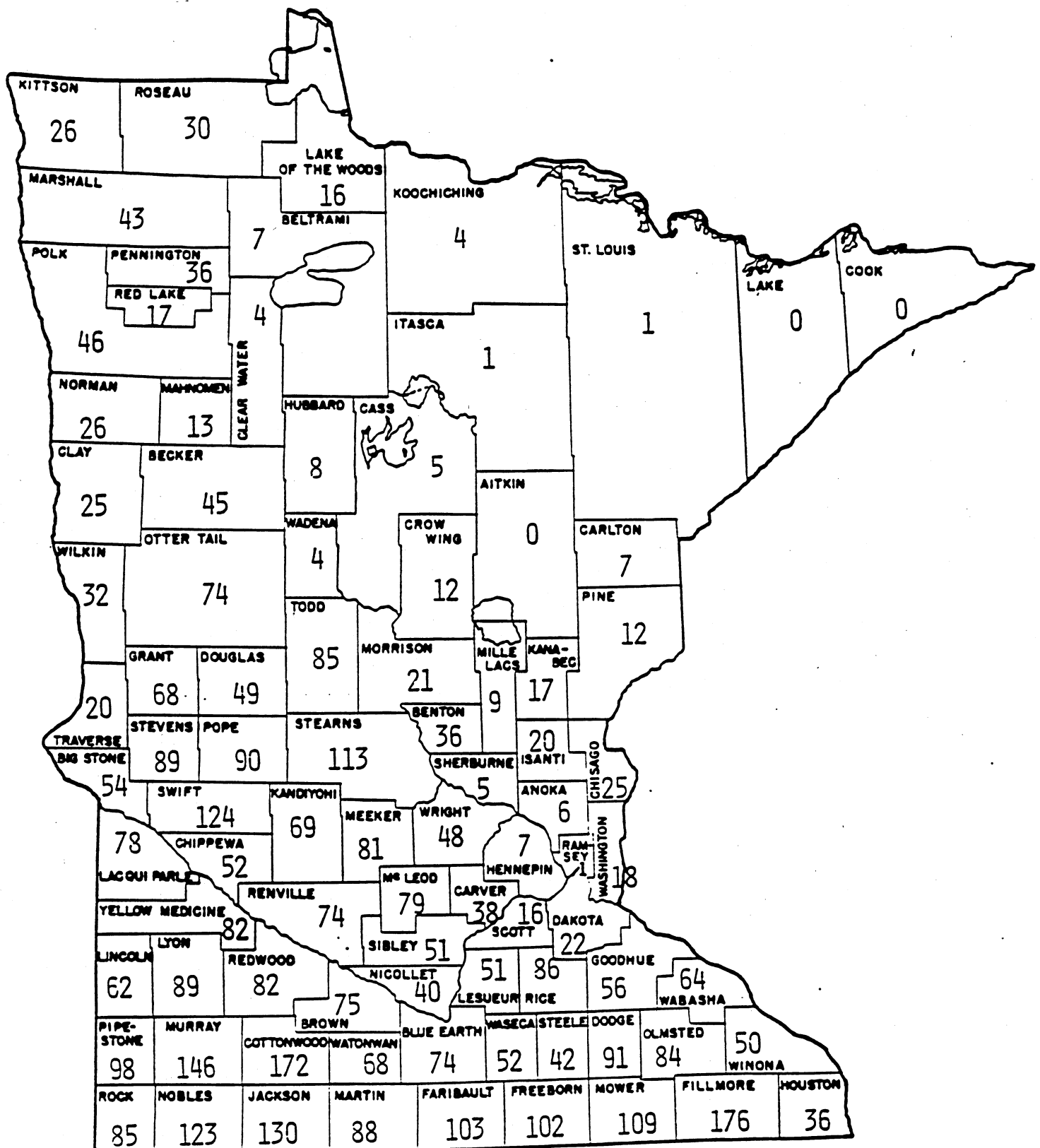
FIGURE 1. STEPS IN MINNESOTA'S MANDATORY FARM MEDIATION



Revised 5-30-87

Note: Creditors' stay may be shortened or extended due to provisions in the Act for agreement between debtor and creditor allowing creditor to proceed, for conciliation court decisions of release of collateral, and for District Court review of mediator's findings of good faith.

FIGURE 2. FARMER REQUESTS FOR MEDIATION (MARCH 1986 - JUNE 1987)



1,078 cases are still in progress. This indicates that just under 1 in 3 mediation cases (from those which have gone completely through mediation) resulted in an agreement which allowed the farmer to continue to operate. It is not known what percentage of those farms could be considered viable subsequent to restructuring.²

A major reason for the central role of the MES in farm mediation has been the availability of the FINPACK computer programs and past training of extension agents in the use of that software. It was recognized that mediation settlements involving debt restructuring would need to demonstrate debt repayment ability and sustained economic viability of the farm-household unit to be acceptable to creditors. To meet that need the FINLRB program component of FINPACK generated whole-farm business summaries of profitability, liquidity, and solvency positions based on production plans, market prices, and financing arrangements which are assumed to be relevant for a 3-5 year planning horizon. Analysis of plans for financial adjustments in the farm business over time was also possible using FINTRAN (transitional whole-farm budgeting).

At a minimum, a baseline farm plan (current situation) was to be run on each farm prior to mediation negotiations. Alternative farm plans were to be run, if requested, for various debt resolution strategies such as; asset liquidations, deedbacks, debt adjustments, interest rate reductions, reamortizations, equity infusions, etc. The total number of FINPACK runs (primarily FINLRB - whole farm budgeting) was 7,547 through June 1987.³ The county extension agent's support role was to obtain the necessary information from the farmer, execute the FINPACK program(s), provide an interpretation of the results of the baseline analysis at a mediation session, and perform additional analyses, if requested.

The MES conducted an evaluation of the program by analyzing a mail survey of 915 farmers, mediators, creditors and extension agents (Krueger et al. 1986). Based on an 80 percent response to the questionnaire, it was generally concluded that mediation had assisted farmers toward 1) improving economic viability of the farm unit or 2) leaving farming. A majority of the farmers who had completed mediation indicated that they would reduce the size of their operation (56 percent) and obtain additional off-farm income (59 percent). Significant percentages also indicated they would reduce family living

² An MES survey of mediation participants produced a range of estimates of the percent of farmers (who had settled their mediation cases) that would continue to farm between 27 percent (creditor estimate) and 40-50 percent (mediator and extension agent estimates).

³ The total number of FINPACK runs translates into approximately two financial analyses per mediation case. The implication is that (on average) only one resolution strategy was analyzed in addition to the baseline projection.

expenses (37 percent) and change the mix of farm enterprises (23 percent). It was generally indicated that the program had improved communications between farmers and their lenders and lessened community tensions.

Problem areas also surfaced in the survey responses. Case preparation, session attendance, and paperwork required an average of nearly 40 hours per case of combined mediator, extension agent, and creditor time. Extension agents indicated that the increased time demands of the mediation program have been met by scaling-down or postponing agricultural extension programs or shifting certain responsibilities to nonagricultural agents or volunteers. Negotiations in the early (1986) cases were inhibited by reluctance of the Farm Credit Service to make concessions and lack of FmHA participation. Some farmers used the program to stall resolution of the debt problem, and there was widespread lack of adequate preparation for mediation. Mediators indicated that farmers were not nearly as well prepared for mediation as were banks, Farm Credit Services, FmHA, or insurance companies.

Lenders were most critical of the program and called for its termination citing the following reasons: 1) farmers did not perform after the settlement has been reached and most farmers in mediation were not running viable operations anyway, 2) many debtors not in mediation were questioning their obligations to lenders, which had negative implications for credit standards, and 3) the program would seriously reduce the future availability of credit to other farmers. In spite of the problems and costs of the program most survey respondents (including many lenders) were generally supportive. This indicated that there had been a change in attitude from the time the program was initiated and a recognition of the benefits obtained through renewed communication between farmers and lenders.

Various research efforts are subsequently being conducted on Minnesota's farm mediation program such as; the role of mediation in family adjustment to crisis, the effect of timing in negotiation, and the broader public policy issues involved in initiating mediation. Although still in its initial stages, a research effort has begun focusing on the determinants of "successful" farmer-lender mediation. The study takes an econometric approach to determining the factors affecting the probability that mediation will result in a settlement agreement. Debtor, creditor and mediator characteristics, as well as location and timing determinants are being included in the independent variables set. A probability model will be used to test the hypotheses that 1) farmer personal and financial characteristics and preparation for mediation, 2) type and number of creditors involved and financial obligation to those creditors, and 3) mediator variables, significantly affect the probability of a settlement. Several implications may follow for future conduct of mediation programs, extension education programs, and development of farmer and creditor mediation strategies. These research efforts indicate the potential for a broader extension-research involvement at the levels of farm management and policy analysis.

Extension - Research Linkages

Although farm mediation and debt resolution have primarily involved extension support activities, the linkages between extension and applied research in farm financial management and policy are useful to explore. As an example of this linkage in the mediation area, past research and development of the FINPACK software and its extension at the county agent level has provided both the product and the support services to facilitate farm mediation. In Minnesota, the institutional capacity to respond existed prior to the advent of farm mediation. However, the FINPACK software was not designed to strategize across debt resolution strategies. The program requires the user (extension agent) be able to apply financial principles and concepts when identifying strategies for analysis, trained in its use, and knowledgeable of how to interpret the results.

Traditionally, the applied research appropriate to extension was problem-solving in nature with emphasis on analysis of management problems.⁴ Increasingly, subject matter research on policy issues has become an important component of extension programming. In either setting it is instructive to consider two mathematical expressions:

$$f: x \rightarrow y$$

defines the function f as a "mapping or transformation" from the set x into the set y . Further, the function may not be "single-valued" (i.e., more than one y -value may result from a given x -value). Consider "extension" as the set of activities denoted by x and "research" as the set of activities denoted by y . The function f is the process which "maps" economic problems faced by extension into a researchable problem, or set of problems. There is, by analogy, another function g ,

$$g: y \rightarrow x$$

which denotes the transfer of research results (new information, decision aids, etc.) back to extension for communication to rural and agricultural clientele. These two-way interactions are what constitute linkages.

Two points are worth emphasizing. First, these extension-research linkages should be broadly interpreted to include both: extension and research activities which an individual might be performing in an area of specialization, and the activities which separate extension and research individuals perform and communicate to one another. Second, where separate individuals are involved these linkages provide an opportunity for extension and research economists to challenge one another concerning the underlying problem/issue, the

⁴ Johnson (1986) provides an excellent discussion of problem-solving, subject matter and disciplinary types of economic research.

selection of an appropriate research approach, and the most effective way(s) in which to disseminate the research results.

These linkages occur at two levels of inquiry -- the micro/individual level and the policy/aggregate level. Micro linkages promote problem-solving -- identification, analysis, and development of aids to improve the quality of decisions at the firm/household level. Policy-level linkages are characteristically different due to their subject matter focus, and the condition that they are not (to date) as well defined or extensively developed. The partial list of research issues in finance suggested by Lee (1987) contains six areas related to the farm financial crisis, which are relevant to the question of extension - research, policy-level linkages.⁵

The area of financial management, including farm mediation and debt resolution strategies, represents a potentially productive area for improving on past efforts and developing new, innovative linkages. A clear message that the farm mediation program has communicated through extension is that the abilities of that group of farmers are extremely deficient in the area of financial management. That deficiency includes both an inability to summarize past and current financial position and performance, and an inability to strategize about financial adjustments and their likely consequences. While a majority of the early mediation cases involved farmers who were not previous MES customers, inadequate farmer preparation for mediation was a widespread problem.

Past research on analysis of integrated risk management strategies, which has resulted in decision aids, needs to continue with a strong focus on how research products might be most effectively extended to users with limited background and formal training in farm finance and risk concepts. The "balance sheet approach" suggested by Barry and Boehlje (Hughes et al. 1986) provides a general framework for analyzing the effects of alternative adjustments (or shocks) in the production, marketing and financing activities of the firm. It also indicates the relative effectiveness of actions when undertaken in combination for the purpose of restoring the "equilibrium" levels of business and financial risk. The approach has particular relevance for consideration of the role of financial leverage and farm-level adjustments in response to financial stress.

⁵ Previous studies by Leathers and Chavas (1986) and Shepard and Collins (1982) provide some additional bases for extension-research consideration of the economic rationale for policy intervention under conditions of farm financial stress, and the significance of farm policy variables and other factors in the rate of farm bankruptcies.

A possible innovation is to develop and apply an expert system to farm financial management problems.⁶ An expert system is currently a research-oriented tool. However, with development and refinement a financial analysis expert system could be a means for raising the awareness of farmers and their lenders concerning the need for financial planning when borrowing and investing. An expert system could provide rapid feedback to the decisionmaker as to the financial feasibility and/or relative attractiveness of alternative management strategies and the need for adjustments. A significant amount of "learning" could potentially occur if a farmer and/or a creditor could interact with an expert system.

An expert system could be developed for an accounting/control model such as FINPACK. A financial analysis expert system of this type would require a knowledge base. The sources of data for that knowledge base include; financial statements (historical and proforma balance sheets, income statements, and source and use of funds), farm production records, loan transactions and requests, and selected capital budgeting projections. Of course, this is a significant data requirement which initially limits its practical use and makes a human financial expert more appropriate. However, development of the financial analysis expert system and upgrading of the quality of farm management information would allow for rapid determination of 1) financial condition, 2) level of borrowing which will be required and serviceable, 3) need for debt adjustment/restructuring, and 4) feasibility of farm investments. Additionally, these questions could be addressed in the context of alternative levels of production, price, and policy risk. A limitation of this particular expert system is that it is applied to an accounting/control model which does not deal with the economic problem of optimal resource allocation.

Conclusions and Implications

The tasks of this discussion paper have been to 1) review farm mediation and the role of the MES, and 2) examine the extension-research linkages. Two conclusions can be drawn at this point. First, given that farm mediation is a policy response to a crisis situation (which implies a massive caseload) it is not recommended that an extension service both provide technical support and administer the program -- as was the case in Minnesota. The MES is more effective in the former role with its capacity to provide educational and training programs for mediation participants. A related observation is that farm mediation (or any state-sponsored mediation activity) should be a fee-based service to cover mediator services and other direct expenses, as is the case in other states with mediation programs.

⁶ An expert system is a computer program that utilizes stored data and decision rules to mimic a human expert. Expert systems typically deal with situations characterized by a great deal of uncertainty (Senn 1987).

A second conclusion is that extension-research linkages in the areas of management and policy are characteristically different. Existing extension-research linkages are operable, but in different ways. We need to consider ways to improve past linkages in the management area, and develop innovations in the products and services which are extended. There is also a need to foster the development of policy linkages in a number of emerging agricultural problem/issue areas. Farm mediation is an issue which cuts across management-policy lines. The implication is that linkages between extension and research activities relating to mediation are more complex, and require that we consider more effective ways to integrate our extension and research programs.

References

- AAEA Task Force on Financial Stress. "Financial Stress in Agriculture: Issues and Implications." Agr. Fin. Rev. 47(1987).
- Crowley, B. Farm Finance: Minnesota and North Dakota Assistance Programs Available to Farmers. GAO/RCED-87-143FS, U.S. General Accounting Office, GAO Fact Sheet for the Chairman, Subcommittee on Conservation, Credit and Rural Development, Committee on Agriculture, U.S. House of Representatives, Washington, D.C., June 1987.
- Duncan, M. Challenges for Agricultural Finance: Managing Current Stress and Molding Future Change. W. I. Myers Memorial Lecture. Department of Agricultural Economics. Cornell University Agricultural Experiment Station, 1985.
- Hughes, D. W., S. C. Gabriel, P. J. Barry and M. D. Boehlje. Financing the Agricultural Sector: Future Challenges and Policy Alternatives. Boulder, Colorado: Westview Press, 1986.
- Johnson, G. L. Research Methodology for Economists: Philosophy and Practice. New York: MacMillan Publishing Co., 1986.
- Jolly, R., A. Paulsen, J. D. Johnson, K. H. Baum, and R. Prescott. "Incidence, Intensity, and Duration of Financial Stress Among Farm Firms." Amer. J. Agr. Econ. 67(1985):1108-1115.
- Knutson, R. D. (ed.) The Farm Credit Crisis: Policy Options and Consequences. B-1532 Texas Agricultural Extension Service, 1985.
- Krueger, R., M. Mueller, and M. A. Casey. Farm Credit Mediation Evaluation Report. Minnesota Extension Service, University of Minnesota, December 1986.
- Leathers, H. and J. P. Chavas. "Farm Debt, Default, and Foreclosure: An Economic Rationale for Policy Action." Amer. J. Agr. Econ. 68(1986):828-837.
- Lee, W. F. "Conclusions and Research Implications." Agr. Fin. Rev. 47(1987):156-159.
- Mangum, K. Farm Credit Mediation: Policy Manual and Operational Guidelines for Extension Agents and Mediators. Second Edition, Minnesota Extension Service, University of Minnesota, December 1986.
- McDowell, G. R. "Political Economy of Extension Program Design: Institutional Maintenance Issues in the Organization and Delivery of Extension Programs." Amer. J. Agr. Econ. 67(1985):717-725.
- Minnesota Family Farm Law Project. Mediation From the Farmer's Perspective. Minnesota Extension Service, University of Minnesota, June 1986.

Pederson, G. and V. Eidman. "Financial Assistance to Minnesota Farmers: Public Programs and Policy Issues." Minnesota Agricultural Economist. No. 652. Minnesota Extension Service, University of Minnesota, September 1986.

Saxowsky, D., C. Gustafson, M. Ali, J. Braaten and J. Roterling. Economic Impact of North Dakota Laws That Permit Delay or Partial Repayment of Agricultural Debt - July 1, 1986. Agric. Econ. Report No. 216, Agricultural Experiment Station, North Dakota State University, Fargo, January 1987.

Senn, J. A. Information Systems in Management. Third Edition. Belmont, California: Wadworth Publishing Co., 1987.

Shepard, L. E. and R. A. Collins. "Why Do Farmers Fail? Farm Bankruptcies 1910-78." Amer. J. Agr. Econ. 64(1982):609-615.

RESPONSE TO
DEBT RESOLUTION THROUGH MEDIATION:
EXTENSION-RESEARCH LINKAGES

My charge this afternoon is to react to the paper by Glenn Pederson and to stimulate questions and discussion. I have no problems responding to the paper. And, I feel the topic is crucial enough that questions and discussion will naturally occur.

In general, I feel Glenn has done an excellent job looking at two critical issues. I will discuss mediation first and then the linkages for extension-research.

Farm credit mediation affects several states and will affect more in the months to come. Current experiences should be examined to avoid mistakes.

Glenn points out the mediation legislation "provides for a statutory delay". While this is true, to be successful the mediation program must be viewed as a basis for two sides to meet with a neutral third party to hopefully find "the potential win-win solution." In Iowa our mediation process can only take 42 days and the service administering the program is The Iowa Farmer/Creditor Mediation Service. The point is that we have tried to take a more balanced approach between farmers and creditors and I think this has helped. If mediation is viewed as a delaying tactic then it will be rejected.

I think one of Glenn's main conclusions addresses a key question for us. He states, "it is not recommended that an Extension Service both provide technical support and administer the program." I strongly concur with this conclusion for at least three reasons. First, Extension does not have the resources for this type of program. Even in Minnesota where extra funds were appropriated, expenditures were higher. Second, the increased workload does mean other programs are delayed or eliminated. Extension runs the risk of working with only one segment of the agricultural community, if it is forced to administer mediation as well. And, third, Extension runs the risk of losing its neutrality by administering mediation. Someone is bound to be unhappy.

Another crucial area with mediation that Glenn mentioned was preparation. Preparation is the key to mediation. Preparation is at two levels and Extension can help at either or both levels. The first level of preparation is mental. Many farmers and farm families have not come to grips with the severity of the problem they face. Also in some cases relations between farmers and creditors have deteriorated to the point that there cannot be meaningful dialogue without a realization that this is a problem for both parties. Mental preparation includes

Michael Duffy, Associate Professor, Extension Economist, Iowa State University, Ames, Iowa and Ronald Plain, Associate Professor, University of Missouri, Columbia, Missouri.

many facets for both creditors and farmers. One step in mental preparation is knowing what services; legal, mental, etc. are available.

The second level of preparation is proposal development and presentation. Farmers should have more than one proposal in mind before mediation. If the first proposal is rejected and differences cannot be reconciled then there is something to fall back on. It is also critical how the proposal is presented. Both levels of preparation are crucial for successful negotiation. And, we must remember a successful negotiation does not always mean staying on the farm.

FINPACK is an excellent tool for mediation. However, too often we consider a FINLRB run adequate preparation. If the numbers are bogus or if the plan is not the farmer's, they will never be able to convince a creditor.

The extension-research linkages from mediation abound. Glenn has correctly illustrated the two-way notion between research and extension. He has also mentioned several of the major research areas that have been identified through mediation.

One of the important points Glenn noted was that as a rule farmers in mediation or financial difficulties "are extremely deficient in the area of financial management." We must be aware of this if our extension programs are to be useful and our research is to have relevance.

Another major research area is farm level adjustments to financial stress. Questions such as what can be done, what are farmers doing and how can they survive need answers. One thing I think that has been underestimated was farmer's resiliency. Many farms that should have been out of business continue to plug along with creative financing.

Mediation can be a very effective program. It can also be a boondoggle. Extension is favorably or unfavorably affected by the role it plays in mediation. States contemplating mediation would be well served to look at Minnesota and Iowa models.

The extension-research linkages become very apparent when talking about mediation. Two way communication is essential if we are to truly help those who need it today and be sure others will not need the same help tomorrow.

The policy level linkages Glenn eluded to are also very important. I feel the mediation issue raises two levels of policy questions. First, we must keep the extension linkages so that we can effectively influence policy. By knowing the nature and extent of a problem, policies can be better drafted to address the problem. The second policy level question focuses on Extension's role. Is the mediation type service-oriented program one that should be pursued? If not, how can Extension get in a more active rather than reactive mode?

The issues raised in this paper illustrate the complexity of the problem faced. We must become more aware of what mediation is intended

to do and how both parties can adequately prepare for mediation. We must also be aware and encourage the feedback and linkages between extension and research.

The area of mediation and extension research linkages raises several important questions and areas for further research. What sort of information is being collected on these mediation cases? It could be useful to know such things as educational background of these farmers. Have they been heavy users of Extension in the past? What caused these farms to become financially unviable while their neighbors survived -- untimely purchases, high personal expenses (illness, fire, divorce, etc.), starting farming at the wrong time, etc.? It would be highly desirable if factors could be identified which could be used to help prevent future generations of farmers from suffering these same problems.

I am equally interested in the effect on Extension of these mediation programs as in their success at resolving debtor-creditor disputes. Research should be done on the impact this legislated Extension program has had on employee morale, the image of Extension with the public (are we perceived as another social program for the needy?), and the reaction of our traditional clientele. Also, the reaction of state government to Extension's handling of this program could be useful to Extension administrators in states considering adopting mediation programs. Will long-term Extension funding be enhanced as a result of our involvement?

DEVELOPING TOOLS TO IMPROVE FARM FINANCIAL DECISIONS: RESEARCH AND EXTENSION INTERACTIONS

Harry P. Mapp and Ross O. Love*

Experience gained in developing and implementing a microcomputer spreadsheet package, Integrated Farm Financial Statements (IFFS), provides the basis for discussing research and extension interactions in developing financial decision tools. Including extension faculty on graduate student advisory committees, securing the resources needed for a successful transition from research model to extension decision tool, reaching the proper balance between flexibility and complexity of the decision tool, planning for feedback from users, developing high quality documentation, and planning for continued development and product evolution are some of the essential ingredients for developing successful extension decision tools from research models.

Developing tools to improve farm financial decisions is a unique process. Our expertise in this area is admittedly somewhat limited. Our observations are based primarily on the experience gained in developing a set of integrated microcomputer spreadsheets known as Integrated Farm Financial Statements (IFFS). IFFS consists of a net worth statement, a cash flow statement, an income statement and a debt worksheet, plus several associated files, developed as spreadsheets in Lotus 1-2-3. Initial funding for the development of the integrated farm financial statements as a research tool was provided by the Oklahoma Agricultural Experiment Station. Our goals for the research were modest--to develop a financial decision aid which would solve the financial problems of Oklahoma farmers and ranchers. Our resources were virtually unlimited--all those resources that accompany a beginning graduate student without research or extension experience working half-time, often less. In the early stages, little thought was given to the possibility of using the farm financial statements developed as part of the research model in an active extension program with producers in financial trouble. Clientele needs and the depth of the farm financial crisis were largely unassessed.

Despite these and other substantial obstacles, a fairly successful financial decision tool was developed and is being used throughout Oklahoma, in 20 other states and several other countries. What factors contributed to successful interaction among research and extension faculty, extension personnel in field locations, and clientele groups and individuals? Were there lessons learned in developing the research tool and making the transition to extension which can

* Harry P. Mapp and Ross O. Love are professor and associate professor, respectively, in the Department of Agricultural Economics at Oklahoma State University. Professional Paper No. P-2498 of the Oklahoma Agricultural Experiment Station. Comments and suggestions by Daniel J. Bernardo and Damona G. Doye are gratefully acknowledged.

be transferred to other locations and situations? The purpose of this paper is to discuss those factors which contributed to the successful development of IFFS. We attempt to identify some of the potential stumbling blocks for others working on or planning to work on similar projects. We also present a new version of IFFS designed to facilitate development of multi-year farm financial plans.

Development of IFFS

The purpose of the research which led to the development of the Integrated Farm Financial Statements was to analyze the causes and consequences of mounting cash flow problems for farms and ranches in Oklahoma during the early phases of the farm financial crisis. A decision was made early to develop the model for use on the microcomputer rather than the mainframe. This decision was made, at least in part, because the Department had just purchased a set of new microcomputers and we were anxious to test their power and usefulness. In addition, we thought that the model could be used in developing class examples and homework exercises for our undergraduate agricultural finance class. The potential usefulness of the model for extension programming became apparent a little later in the process.

One of the keys in the development of the farm financial statements was the decision to include our extension agricultural finance specialist as a member of the graduate student's research advisory committee. Our extension faculty are fully integrated into the department and often serve as committee members and, in some cases, advisors for graduate students. Several of our faculty have extension and research appointments. Service by extension faculty on research committees benefits both research and extension. In this case, a high level of interaction and communication was established among the advisor, student and committee members. Early involvement in the theoretical and developmental discussions by the extension finance specialist increased his interest in the project. Because his early input was well received, a proprietary involvement became evident. Thus, the theory and mechanics of the financial decision tool were well understood by the extension specialist, and he had a stake in the success of the tool.

As discussions of the model continued and the farm financial crisis deepened in Oklahoma, the extension specialist began to visualize the potential usefulness of the model for one-on-one work with farm and ranch families. The financial management concepts upon which the model is based were already being taught in the classroom and in extension programs and workshops. The model was to be designed to make a large number of routine calculations very quickly. The use of microcomputers and spreadsheet technology offered flexibility and user friendliness for research, teaching and

extension purposes. Researcher, extension specialist and student committed totally to the project. Each brought a somewhat different view of the final product to be developed, but those views were complementary rather than competitive. Open and frequent communication among the participants was crucial during the modeling phase of the research project.

A high level of interaction between researcher and extension specialist greatly improves the likelihood of future acceptability of a decision tool by extension field staff. Information regarding the decision tool can be passed along to field staff at in-service training sessions. The field staff should be kept aware of the timing of the development so that they can plan for use of the tool when plans of work are developed. Valuable feedback from field staff can influence the development of the decision tool, but only if effective communication is established among the participants.

Two other related events contributed to the development of the IFFS package. First, our extension and research faculty spent considerable time revising the printed material on financial statements used in class and extension programming. During those meetings and discussions, we agreed on accounting procedures and adopted a common set of terms, formats and definitions. The structure, formats and definitions were carried into the IFFS developed for use on the microcomputer. The formats of the statements have been well accepted by commercial bankers, FmHA, Farm Credit System, bank examiners, lawyers, farm consultants, farmers and ranchers, and the courts.

Second, one of our area farm management specialists had been attempting to develop a procedure for constructing the cash flow statement by transferring data into a cash flow format directly from enterprise budgets. He used our printed material on financial statements and VisiCalc to develop the cash flow statement. Enterprise budgets were also developed in VisiCalc. Then, data from the individual budgets were saved in data interchange format files and transferred by command into the cash flow statement. Although somewhat cumbersome, the approach convinced us that spreadsheets have several advantages over the use of Basic or some other programming language for the development of the package. A primary advantage of spreadsheets is that modifications can be made in any of the financial statements directly on the screen without cycling back through a set of accompanying data tables. A second advantage is that many of the prospective users of the tool are well acquainted with spreadsheets which reduces the user's start-up time on IFFS significantly. A third advantage for us was that we could adopt the area agent's budget approach as one method to create the cash flow statement.

Our research version of IFFS was developed in VisiCalc because that was the only spreadsheet available to use on the hardware we had when we began the project. However, the final VisiCalc version, which had performed well in a research mode, was too slow and cumbersome for use in the field as an

extension tool. The power and flexibility of Lotus 1-2-3 offered obvious advantages as program development continued.

The Transition from Research to Extension

There are a number of important steps in the transition of a decision tool from research to extension application. Four steps, discussed in detail below, include continuing financial support during the transition for the graduate research assistant involved in model development, solidifying support and funding from extension, developing feedback mechanisms to improve the decision tool, and developing training materials and sessions for potential and actual users.

Continued Graduate Student Support

A critical point in the practical application of many research-generated decision aids occurs when the graduate student completes the thesis or dissertation. Most graduate students leave as soon as the thesis is complete, if not shortly before. Most institutions are faced with research assistantship commitments to a new class of incoming graduate students and are unable or unwilling to continue funding beyond the completion of the thesis. Most graduate assistants have made a definite commitment to report for work at a specific time in a new location, and completion of the thesis takes longer than expected. These circumstances often lead to the development of research models which "never see the light of day" as extension tools and may not be used again as research devices. The student understands the model completely and could work efficiently with research and extension faculty to prepare the model for extension application or use. Careful thought needs to be given to the resources required for a successful transition from research model to extension tool.

In our case, concerted efforts by the major professor to have extended funding for the graduate student and unexpected research funding for an undergraduate student were crucial to continuity in the development of IFFS. Yet, neither of these occurrences were planned far in advance. Nor is it standard practice for our institution to extend graduate student funding or provide research funding for undergraduate students. However, this additional funding greatly enhanced our ability to get a useable product to the field in a timely manner. We, therefore, suggest that plans be made early for the critical transition from research model to extension tool. Many other disciplines have full-time positions for technicians who perform similar tasks. Departmental and college administrators should be encouraged to recognize this as a critically important function and provide funding and perhaps permanent technical personnel to facilitate the transition.

Extension Support, Including Funding

Even after a well-conceived, research-generated decision aid has been adopted by extension, the continued support of the extension specialist is essential. Whether the users are to be extension staff, professional farm managers, industry intermediaries, or farmers, one should plan for training, technical support and updates if the application is to be successful. Obviously, the timeliness and need for the decision tool are important factors in the extension specialist's willingness to support the tool. In the case of IFFS, it was clear that the timing and need were present. We were faced with the decision to support the use of IFFS by our extension staff or broaden the support to include all potential users. Once the decision was made to make IFFS available to all potential users, a commitment to support and improve the system required considerably more time. First, revision was necessary to improve the likelihood that non-extension users could successfully master IFFS. Improved documentation, a formalized distribution process, and the ability to answer questions quickly also became essential. To improve the likelihood of acceptance by clientele, extension specialists must be willing and able to revise, adjust and develop decision-making tools. At this point, our extension specialist took the lead in the development of revisions.

Thus, as development continued and user acceptance broadened, both researcher and extension specialist had expended considerable effort and time to generate a pragmatic decision tool.

The ability to continue revision and refinement of the decision aid is important to the quality and scope of use both today and in the future. While input from the research and extension faculty is essential, much of the developmental evolution of these tools can be completed by others. Often, this process is left to the field staff or other users. However, a means to fund a central effort for improvement and refinement might be desirable in many cases.

With IFFS, when the demand by lenders and other non-extension users became obvious, we decided to charge these non-extension users for the software. We had a history of a successful user-fee system started by Dr. Ted Nelson. Because of this history and policy developed by the department and administration, we were able to set a fee and submit IFFS to review for the college-wide microcomputer software series. The decision to charge a user fee for the package forced us to develop a processing and distribution system, purchase forms and software users' agreements, and to worry about accounting procedures, billing, use of funds and producer liability.

The decision to charge a user fee had two very practical results. First, those purchasing IFFS were more committed to using the program and often provided feedback on potential changes. Second, the proceeds of software sales permitted us to hire an undergraduate student to process orders, help

handle technical questions, and serve as a programmer to improve the software. Looking back, the small amounts of money spent for student assistance paid large dividends.

Developing Feedback Mechanisms

In order to get the feedback necessary for a research tool to be an effective extension tool, the developers must be willing to seek out this information. Discussions with potential users, surveys and steering committees can prove useful. An environment conducive to feedback must be responsive to the feedback. This may mean adjustments in the research topic, time needed to complete the research, and the models or decision aids themselves. However, one positive aspect of the well-developed feedback environment may be better quality research with a greater useful life.

Extension application of research-generated decision aids will be facilitated in an environment where user needs and desires are considered early. For example, because the budget-to-cash flow concept was conceptualized by an area specialist, the idea had garnered acceptance by several of the field staff. Questions as to format, information needs and calculation methods were asked of groups of lenders prior to programming decisions. In developing the Lotus version, numerous revisions were the direct result of user feedback.

Although the research may include considerable testing of a decision tool, additional testing will be necessary prior to use in extension. Fortunately, we were able to supply early versions of IFFS to the area specialists. Later, as the Lotus version was being developed, area specialists and part-time financial specialists, hired through Intensive Financial Management and Planning Support (IFMAPS) grant funds, provided input to eliminate software problems and enhance its useability. The area specialists and part-time specialists hired through IFMAPS quickly applied IFFS in a wide variety of situations. Individuals such as these specialists, who are in close contact with the developers, understand most of the economic theory, and are willing to give you a "piece of their mind," serve a useful function.

Use by early adopters and their feedback provides additional useful information. Several bankers were allowed to use IFFS prior to its general release. The loan officers applied IFFS with the understanding that the package was still being tested and were asked to notify us of any problems or suggestions. From mailing many revised versions to the area specialists and several bankers, the product was much improved when the time came for public release.

User Training

IFFS is used by a wide variety of individuals and institutions interested in agriculture. Oklahoma extension specialists and those working in the IFMAPS project are important users. We have incorporated IFFS into our agricultural finance course and over 100 students obtained hands-on experience with it this year in a laboratory setting. Colleagues teaching courses in farm and ranch management and farm records have also introduced students to IFFS. Approximately 70 bankers have purchased and are using IFFS in working with their customers. Numerous private farm consultants and law firms in Kansas, Arkansas, Illinois, Colorado, Kentucky, Texas, Louisiana and Oklahoma have made extensive use of IFFS. Extension specialists and resident faculty in over 20 states have purchased IFFS. Extension personnel in several states have adopted IFFS for use in their programs. In other states, resident faculty use IFFS in teaching and research. Farmers, ranchers, production specialists, vocational-technical instructors in several states, and agricultural economists in other countries also use IFFS.

As one would expect, the variety of users brought with it some special problems. While the area specialists learned IFFS as it was developed and refined, many other users, including new area specialists, part-time financial specialists, farm consultants, business management fieldmen, and bankers, needed training initially. Two training sessions were conducted specifically with bankers in cooperation with the Oklahoma Bankers Association. In addition, several group sessions were conducted for area farm management specialists and a number of one-on-one training sessions were conducted as financial diagnosticians were hired under the IFMAPS program. The training conducted for financial specialists and bankers was especially valuable for further development. The 50-plus bankers trained in spreadsheets and IFFS proved to be an important core of users that provided suggestions and constructive criticism and through word of mouth introduced other users to IFFS. Most users have had considerable success with purchasing the software and learning the system on their own with the assistance of the user's manual. In these cases, the users have decided how best to use IFFS, often without additional training or discussions with us. However, formal training sessions certainly increased the efficiency of a number of users.

We have mentioned some critical requirements in the process of developing and transferring research-generated decision tools to extension. Based on our experience, the earlier these factors are considered in the development process, the greater the likelihood of success.

Comments on IFFS as a Product

A few comments seem appropriate on the nature of financial decision tools as a product. While these remarks are based on the experience with IFFS, they appear appropriate for other types of decision aids developed in our profession.

Documentation

High quality documentation developed with the user in mind should be high priority. Documentation of decision aids is an area in which we as agricultural economists often fall short. Even though documenting the decision aid may be quite time consuming, in the long run good documentation will save much time for the researcher and specialist through fewer user questions. Good documentation also reduces learning time for the user and may avoid costly delays. Quality documentation increases the likelihood that the decision aid will be used effectively and correctly, and will result in a broader set of people capable of using the decision aid.

Educational Support

As educators, we should be particularly interested in educational support for the decision tool. A microcomputer-assisted decision tool often offers excellent opportunities to teach the basics of economics and decision making. We need to be prepared with written educational materials and, where appropriate, educational meetings that complement and supplement the decision aid. Some of the educational support can be included with the documentation. However designed, the educational support should be well integrated with the decision aid and appropriate for learners at various stages.

Flexibility-Complexity Tradeoff

Attempt to reach a balance between flexibility and complexity--the decision tool should be flexible yet not too complicated for a range of users. Unfortunately, increased flexibility and reduced complexity are often difficult to achieve in the same product. Do not attempt to develop a tool which will solve all problems for all people--focus the decision tool on the most important relationships. An outstanding decision tool for one or several important related decisions will be more valuable than a mediocre tool which can be applied to a wide variety of decisions. Having a target audience for the decision tool will help in deciding on the appropriate levels of complexity and flexibility. In developing IFFS, the decision to use a widely accepted and easily understood spreadsheet did much to increase flexibility in working with a reasonably complex system of relationships.

Continuing Development

Finally, if the decision aid becomes accepted by research and/or extension users, continued development and product evolution are likely to occur. We have learned a couple of lessons concerning continued development. First, the researcher and extension specialist should jointly agree upon and understand new developments. These agreements insure that the revised decision aid is viable for both research and extension. Any changes should also go through the same review process as the original versions. For example, developmental feedback, pretesting, and updated documentation will be important. Care should also be taken in revising decision aids to maintain as much of the present user's knowledge as is reasonable. In other words, new developments should build on what the user already knows about the decision aid. Building on the user's knowledge becomes increasingly important as software, hardware and our programming abilities improve. However, consideration of the present learner's accumulated knowledge will increase the acceptability of the revision and make more efficient use of time.

Surely, there are other factors important to the make-up of the decision aid itself. Those presented are simply a few we encountered which we had not anticipated.

The Multi-Year Version of IFFS

The version of Integrated Farm Financial Statements which we are going to discuss today differs radically from the first research version. In fact, it differs substantially from the version described in Mapp, Love and Hesser which some of you in the audience are currently using. The version which we present here is designed to facilitate multi-year farm financial analysis. It will be made available to users sometime this fall after further testing is completed and the user's manual is updated.

This new Lotus 1-2-3 version of Integrated Farm Financial Statements consists of seven basic components: a cash flow statement, a net worth statement, an income statement, a debt worksheet, and a set of financial indicators make up the MULTSTAT file. The sixth component consists of the CLBUD file and 60 crop and livestock budget files. The seventh component is the AI file through which non-enterprise and enterprise-indivisible information may be entered into the cash flow statement. The relationships among the components and statements are presented in Figure 1. A series of menus and macros ties the components together, facilitates the movement of data between components, allows the user to save any or all of the components and to print each individual statement or the entire set of statements.

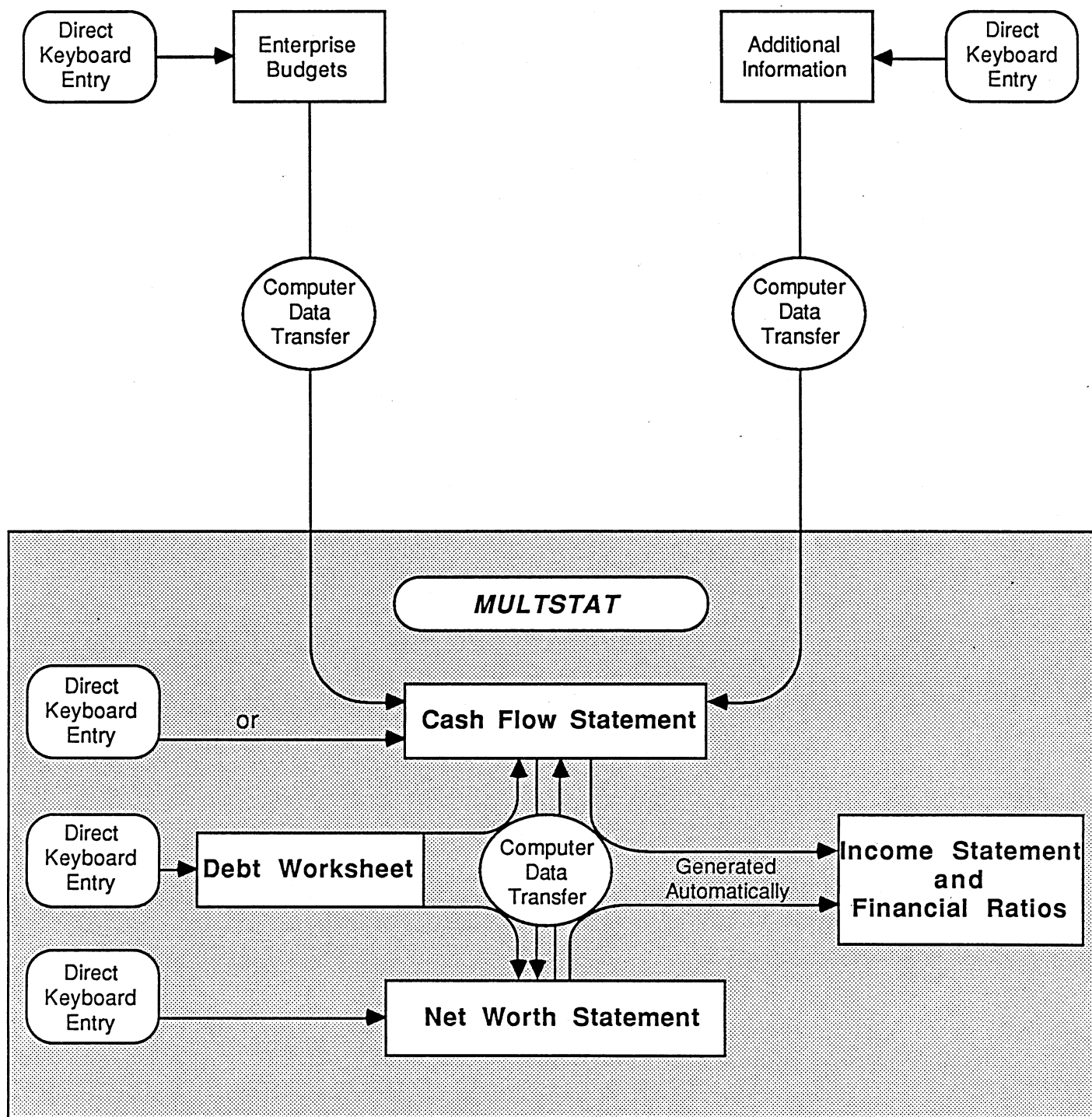


Figure 1

The main menu for the MULTSTAT file appears in Figure 2. Any option in the menu may be selected by pressing the ALT key and the desired option. Alternatives A, B, C, D and I move the cursor to the top of the net worth statement, cash flow statement, income statement, debt worksheet, and financial indicators, respectively. Alternative E allows the user to enter data from previously created enterprise budgets and budget data files or from the additional information budget data file into the cash flow statement. Once this alternative is selected and the budget data file name is entered, macros move the data into the appropriate rows and months of the cash flow statement. Alternative G allows the user to specify the disk drive A, B, C or D for reading or storing data. Alternative H permits the user to save the entire MULTSTAT file under the existing or a new file name. Alternative J permits transfer of control from MULTSTAT to the CLBUD or AI files. Alternative K allows the user to select the starting month for the cash flow and/or enter the name and date to be placed on all statements. Alternative P allows the user to print any individual statement, print all of the statements, and, if appropriate, change the print set-up string. Alternative M allows the user to return to the MULTSTAT menu from anywhere on the spreadsheet. Alternative N allows the user to subtract enterprise or AI budget data from the cash flow statement. This is a valuable alternative as farmers and ranchers consider basic changes in the production plan.

While annual planning is very important, often planning beyond one year is important to decision making. New multi-year IFFS will allow the user to easily plan for several years into the future. All pertinent data from one year for the next can be saved and transferred ahead with two simple macro commands. This allows IFFS to be a very specific multi-year planning tool. Alternative S allows the user to save data in the current year's financial statements which are needed to construct the following year's financial statements. Alternative R permits the user to retrieve these data as input for the following year's financial statements.

Two options exist for creating the cash flow statement. The first option is for the user to enter most data items directly into the cash flow format which appears on the screen. The second option is for the user to create a set of crop and livestock budgets and the additional information budget, and transfer data from each of these into the cash flow statement. To create the cash flow from budgets, the user makes extensive use of the CLBUD file. Users may modify an existing crop or livestock budget, or create an entirely new budget to fit their situation, and then save both the budget and the budget data for transfer into the cash flow statement. The budgets also supply an easily visible record of various assumptions. Such a system is very output-information-rich and avoids the so called "black box" problems often associated with computer programs.

The debt worksheet is an important component of the Lotus 1-2-3 version of Integrated Farm Financial Statements. It was developed to facilitate analysis

INTEGRATED FARM FINANCIAL STATEMENTS

MULTSTAT Main Menu

To execute option

PRINTER SETUP: \027\081

Press <ALT> and the letter indicated.

<ALT> M will always return you to this menu.

<ALT>	A	Net Worth	<ALT>	J	*Retrieve another file*
	B	Cash Flow		K	Select starting month / name and date
	C	Income Statement		M	Return to this menu
	D	Debt Worksheet		N	Subtract budget data from Cash Flow
	E	Load budget data into Cash Flow		P	Print the statements
	G	Change data drive		R	*Retrieve beginning totals from preceding MULTSTAT*
	H	Save the worksheet		S	Save ending totals for next MULTSTAT
	I	Financial Ratios			

*You may wish to save this worksheet first.

⇒Press PgDn to look at the files loaded or subtracted.⇐

Figure 2

of the impact of new debt as well as debt restructuring and refinancing alternatives for farmers and ranchers in financial stress. For each intermediate and long-term loan in the debt worksheet, the user specifies the interest rate, amount of the payment, outstanding principal balance, and month in which the payment is to be made. Formulas in the debt worksheet calculate the amount of principal and interest to be paid and beginning and ending liabilities. Macros transfer these numbers to the cash flow and net worth statements. The amount of the beginning operating loan balance and accrued interest are also entered by the user in the debt worksheet. Changes in the amount or terms of individual loans are made in the debt worksheet and as the recalculation occurs, are communicated automatically to the cash flow and net worth statements.

The net worth statement used in IFFS is double-column balance sheet reflecting beginning and ending values and net change during the year. Beginning and ending asset values must be entered by the user. All subtotals, totals and net changes are calculated in the spreadsheet. Most of the data on the liabilities side of the net worth statement are automatically generated from information in the debt worksheet.

The income statement is calculated automatically from data transferred from the cash flow statement and the net worth statement. Entries into the income statement for operating receipts and cash farm expenses are transferred from the cash flow statement. The adjustments for changes in accrued items, inventories and the value of capital items are transferred from the net worth statement. The financial ratios are calculated automatically based on data taken from appropriate locations in the net worth and cash flow statements.

Because IFFS is built using the widely used spreadsheet Lotus 1-2-3, it can be easily understood by novice users and permits a very flexible system for the more experienced spreadsheet user. Ease of data manipulation is an important aspect of IFFS. Even though it is in a spreadsheet concept, great effort has been expended through the use of intricate macros and menu systems to give IFFS the user-friendliness of language based programs.

The present IFFS version has evolved over three years of testing and revision. IFFS has been used by a broad spectrum of users in many states. This extensive testing both within extension and by private business has made IFFS a versatile and trusted planning tool. One of the true strengths of IFFS has been a well accepted user's manual. Quality documentation has resulted in time savings on the part of the users and the developers. The documentation has also allowed more users to use IFFS in a timely manner.

Concluding Comments

Research and extension interactions in developing financial decision aids, as in other areas of cooperation, do not just happen accidentally. Conscious decisions must be made to pursue cooperation between research and extension. Include extension faculty on graduate student research advisory committees. Meet as a group to discuss research objectives and discuss the model to be used in the analysis. Discuss the potential uses of the model as a decision aid which could be useful in extension programming. Not all research models will be useful as extension tools, but remain open to the possibility. If the model appears to have potential for use as a decision aid in the field, informally extend the lines of communication to extension field staff and potential clientele. Seeking input at this point could alter the model design, yet make it easier to modify and perhaps more useful later in the development process.

Plan and attempt to secure the resources needed for a successful transition from research model to extension decision aid. Offer the graduate research assistant six additional months of support beyond completion of the thesis research, but be specific about what is expected during that period of time. Extract a promise, in blood if necessary, for the following products: first and second drafts of a journal article and a research bulletin; a workable decision aid suitable for additional testing and adoption by extension personnel; and, first and second drafts of the documentation for the decision aid. A combination of research and extension funding is needed and is appropriate. The marginal benefit associated with this incremental funding would be very high.

During the transition of the decision aid from research to extension, plan for feedback from potential users of the device. Make early copies available to key potential users and be responsive to their feedback. Use extension field staff to test the decision aid and to communicate with the early and potential users. Do not be too discouraged by the reactions of early users and field staff, but attempt to respond to their criticisms. If appropriate, consider conducting a training session to acquaint potential users with the decision aid. They will provide useful feedback and, if their reaction is positive, will increase the acceptability of the decision aid.

High quality documentation is crucial to widespread adoption and use of most decision aids. Prior to sending the decision aid to potential outside users, develop a draft of the documentation and have the users provide feedback on both components of the package. Any decision aid should offer an opportunity for teaching economic and decision making concepts. The educational component should be integrated with the decision aid and made appropriate for learners at various stages.

Attempt to reach a balance between flexibility and complexity. Rather than attempting to do all things for all people, focus the decision tool on the most important relationships. An outstanding tool for one important decision is likely to be more valuable than a mediocre tool which can be applied to a variety of decisions.

Plan for continued development and product evolution if the product is widely accepted. As updates and improvements are made, follow the same review process with developmental feedback, pretesting, and improved documentation used on the original decision aid. Interaction between extension and research is still crucial as a decision aid approaches maturity.

References

Mapp, H. P., R. O. Love and R. Hesser. Integrated Farm Financial Statements: Lotus 1-2-3 Version. Okla. Agr. Exp. Sta. Computer Software Series CSS-9, October 1985.

REACTIONS TO DEVELOPING TOOLS
TO IMPROVE FARM FINANCIAL DECISIONS:
RESEARCH AND EXTENSION INTERACTIONS¹

The financial model developed is suitable for cash flow analyses, but not for analyzing profitability at either the enterprise or the whole farm level. The computer model is built as a worksheet template, thus the internal formulas and calculations are transparent to the user. Research/Extension Interactions, to be successful, must be a two way street with extension personnel involved in research and research personnel involved in extension.

My charge is to comment on this paper and to stimulate discussion. Comments are divided into three areas:

1. Disciplinary Review
2. computerization and Extension Usage of Decision Aids
3. Research/Extension Interactions

Disciplinary Review

The model developed relies heavily on cash flow projections mostly developed from enterprise budgets. Oklahoma State University has, and continues to have, a strong tradition and reputation for developing enterprise budgets. This financial model continues to build upon that tradition. However, nowhere in this paper, nor in the manual which I previously received, was any information about enterprise analysis and selection. Optimal enterprise combinations would seem to me to be an important part of financial analysis.

To take this one step further, this model seems to be developed primarily for analyzing the cash flow capability of a particular operation. Whether analyzing a particular enterprise or a whole farm, there are at least two important steps in financial analysis. The first step would be to analyze the profitability of the enterprise or farm. The second step would be to determine the cash flow of the enterprise or farm. This particular model seems well suited for the second step but appears to be nearly void in the first step.

This in my opinion, over emphasis on cash flowability and concurrent under emphasis on profitability has been fostered by the recent "Agricultural Credit Crisis" which is not necessarily a "profit crisis."

¹by Alan E. Baquet, Associate Professor, Department of Agricultural Economics and Economics, Montana State University, Staff Paper #87-4

In the income statement preparation, a conscious decision was made to use an accrual income statement rather than a cash income statement. This appears to be at least an attempt to get at the profitability issue. Other financial analysis models seem to confuse these concepts; such models co-mingle cash and accrual concepts inappropriately. In this model the objective of the income statement is well specified. However, an explanation of how the existing debt structure is incorporated in the income statement is needed. Are existing interest payments counted as a cash expense in the income statement or is capital treated as a residual claimant or is capital assessed an opportunity cost? Either of the latter two would be appropriate for profitability analysis.

I am familiar with two financial analysis packages being used in the Extension Services across the U.S. One is this model, the IFFS program. The other is the financial analysis package FINPAK which was developed and is being supported by the Center for Farm Financial Management, Department of Agricultural and Applied Economics, University of Minnesota.

There are some similarities and some major differences between FINPAK and IFFS. Both programs rely, to some degree, on enterprise budgets as a basic source for input. Both programs generate financial statements. The income statement generated by IFFS is admittedly an accrual statement, which may or may not be appropriate for profitability analysis. The income statement generated by FINPAK is not expressly either cash or accrual. The FINPAK income statement inappropriately combines accrual and cash concepts. An income statement generated by FINPAK would sell on an annual basis all of the hay that is not fed. A cash flow analysis from hay sales is a distortion of what happens on most ranches.

Computerization and Extension Usage of Decision Aids

The two financial analysis programs mentioned above represent two extremes in computerization. FINPAK appears to have used the more traditional approach of writing source code, compiling the code, and distributing the complied program. In this situation there is very limited ability for users to modify the program. Similarly, users have very limited knowledge about the internal workings of the program.

The IFFS program takes the opposite extreme. It uses an existing spreadsheet program. Worksheet templates were written to be used with the spreadsheet program. The templates are then distributed. It is relatively easy for users to modify the templates in this situation. Also, the internal formulas and computations are very transparent.

In terms of providing support to users, the traditional "Black box" approach is easier because of the user's inability to

modify the program. The converse is true for the spreadsheet templates.

In either event computerization should not occur until after the appropriate incorporation of economic and financial concepts into the model.

Extension usage of financial models and decision aids seems to have taken two approaches. The one we seem to hear the most about involves direct one-on-one clientele assistance or public consulting. The other area which is apparently less glamorous in the eyes of extension administrators, involves the usage of decision aids in educational programs. This paper discusses using the IFFS program for direct clientele assistance-consulting, and classroom education, but no mention is made of using the program in Extension education activities. There are a whole host of educational activities that could be addressed with financial decision aids. These include education on financial statement preparation, including issues of asset valuation and contingent liabilities, preparation of enterprise budgets for either cash flow analysis or profitability analysis, and calculations of expected debt carrying capacity. Computerized financial models and/or decision aids enhance such educational activities.

RESEARCH/EXTENSION INTERACTION

My comments here relate to three steps in what I view as a continuum of research-extension activities.

Research Phase - I do believe it is important to have extension economists involved in those research activities which have some known relevance to their areas. However, I would hope that Extension economists are involved in research because of the expertise they can bring to the project not to educate them on the theory and mechanics of the research effort as is suggested in this paper. Most Extension economists are trained as researchers and many are more current on economic and financial theory than their research counterparts.

Transition Phase - It is not clear who should have responsibility for transforming research models into a usable format. I would suggest that researchers and extension specialists have an equal responsibility. Most of us work within a land grant institution. Our primary clientele are the agricultural constituents within our respective states. This applies to both researchers and extension specialists. Thus it is incumbent on both parties to insure the transition from a research model to an educational tool and/or decision aid. In certain instances the researcher may be able to shift his/her responsibility to a graduate student. However, the responsibility remains with the researcher/major professor.

Extension Phase - Just as it is important to have an Extension economist involved in the research phase, it is important to have the research economist involved in the extension phase, whether this phase involves educational activities or direct one-on-one clientele assistance. This symmetry between research and Extension is often overlooked and in some cases deliberately disavowed. Research/extension interaction, if it is to be on-going and effective, must be a two way street.

CONCLUSION

The paper presented by Drs. Mapp and Love and reflects the usual preoccupation with computer issues rather than the underlying economic and financial concepts. Research and extension economists have overlapping responsibilities in a land grant university. Care should be taken to extract the greatest product possible from limited resources devoted to computer-assisted decision aids for farm management.

It would be nice to find a project that has been designed from its inception with the full research-extension continuum in mind, rather than the usual accidental extension applications being added after the fact.

YOUR FINANCIAL CONDITION: A PROGRAM ON FINANCIAL
STATEMENTS, ANALYSIS, AND LEGAL ASPECTS OF BORROWING¹

Your Financial Condition is a program designed for non-extensional professionals to teach farmers and ranchers in small workshops the preparation and analysis of financial statements and the legal aspects of farm borrowing. Five teaching modules designed to require 20 hours of contact time were developed by state extension specialists. Emphasis is on educational design and a complete set of teaching materials, with additional quality control generated through workshop training for instructors.

The program impacts positively in two distinct ways: First, by developing skills on financial statements/legal aspects of borrowing, and secondly, through introduction of new methodology to deliver extension programs.

Problem Defined

As a group, farmers were woefully ill-prepared for the financial and business management revolution of the 1970s and 1980s. Many farmers drastically increased their use of debt capital without understanding the financial impacts or the legal aspects of their borrowing. They were offered little assistance: universities continued to emphasize production and marketing technologies; too often lenders were cheerleaders for high credit use rather than forcing an indepth financial analysis; accountants were unfamiliar with agriculture at the farm level; and farm suppliers financed larger shares of farm purchases without understanding the farmer's financial framework.

The farmer's goals were framed in terms of production and yield--not in terms of financial efficiency. Many farmers could not organize and analyze their farm financial data, nor appreciate the legal aspects of borrowing transactions. Lenders often prepared farmers' financial statements based on an interview. As long as lenders were satisfied with this informal system for creating financial statements, and there were no other external users of the statements, farmers had little motivation and/or opportunity to learn and understand the financial aspect of their operations.

It is no longer enough to master the tools of farm production. To continue their operations, farmers must master the tools of financial management as they have mastered the tools of production. Farmers must manage their balance sheets and income statements as aggressively as they manage fertilizer applications and livestock marketing.

¹Dr. Thomas L. Frey, Professor and Extension Specialist in Agricultural Finance, Department of Agricultural Economics, University of Illinois. Presented at the American Agricultural Economics Association Extension Workshop, Lansing, Michigan, July 31, 1987.

Program Overview

Farmers desperately need to organize and analyze their financial data. The goal of this program is to help farmers learn those skills. In addition, they'll gain an appreciation for the legal aspects of borrowing money.

YOUR FINANCIAL CONDITION (YFC) must reach thousands of farmers in the next few years. To teach farmers in small workshop settings, many instructors must be involved. Thus, the program emphasizes excellence in educational design and a process to train instructors to deliver a uniform and effective program with a minimum of preparation time. Extension advisers (agents) are teaching team leaders in each county. Advisers are encouraged to include lenders, accountants, attorneys, financial consultants and community college instructors, along with CES staff, as instructors. The instructional materials were developed by researchers and state extension specialists. The program includes five teaching modules that cover goals, financial statements and legal aspects of borrowing. The YFC program requires 20 hours of small group instruction over a two-year period.

Preparing an education program delivered by state or district extension specialists differs significantly from an educational program developed by state specialists for delivery by county advisers, lenders or other local professionals. When other professionals must do the teaching, three new issues emerge; 1) how to develop a uniform subject matter expertise among instructors to meet minimum standards of competence; 2) how to develop a set of educational materials that will maintain integrity regardless of who teaches the course; and 3) how to help instructors become better teachers and how to motivate them for the task.

Objectives

To appreciate what the YFC program is designed to accomplish, it is useful to review the following six major goals established for Levels 1 and 2 (see Appendix B).

After completing YOUR FINANCIAL CONDITION, participants will be able to:

1. Use the goal planning process to establish individual financial goals and plan how to reach those goals.
2. Explain the need for complete and accurate financial data and analysis for their own farm operations.
3. Use accounting concepts that support financial statements.
4. Gather, organize and record financial data into various financial statements--balance sheet, income statement and cash flow.
5. Understand the legal issues, documents and procedures related to financing the farm business.
6. Prepare financial statements and apply basic financial analysis techniques to their own farm businesses, as a way to identify important financial and legal issues.

Specific objectives for each module are shown in Appendix C.

Research-Extension Linkages

Appendixes A and B illustrate the program structure. Central to any sound educational program is the research and resource development. Basic concepts and principles underlying financial statements for agriculture were developed several years ago and are explained in the booklet, Coordinated Financial Statements for Agriculture. The four basic financial statements were formatted in accordance with accounting principles to generate a fully integrated set of financial statements. Supporting work schedules to help farmers prepare financial statements and a series of "how to" booklets covering the balance sheet, income statement and cash flow are available. Narrated slide sets are available to offer an audio visual training supplement, with a VHS video version of these to be released in September 1987.

Recent research in the Department of Agricultural Economics has been incorporated into YOUR FINANCIAL CONDITION. Relevant areas include: 1) A new financial statement to replace the 'statement of change in financial position (SCFP)', as reported in the forthcoming Agricultural Finance Review. The challenge was to research the historical development of the SCFP as a basis for understanding the 1986 exposure draft by the Financial Accounting Standards Board that proposes to replace the traditional SCFP with a cash oriented historical analysis statement. The forthcoming proposal by Brubaker and Frey adapts the accounting proposals and existing Accounting Principles Board (APB) No. 19 into a statement that offers potential for significant analysis of farms and ranches; 2) Legal research by the agricultural law staff formed the basis for part of this program. Included in their work is documentation and analysis of the legal provisions related to the borrowing process, plus considerable analysis of the bankruptcy code and legal remedies available to lenders and borrowers; 3) Further development of concepts underlying the handling of difficult issues related to financial statement preparation is in process (including leasing, CCC loans, PIK Certificates, and deficiency payments); and 4) Financial analysis ratio studies are underway, based on reliable data organized in a uniform manner from farm to farm.

Organization of Program

From Appendix A, note that a two-day workshop, "Farm Financial Information Management and Analysis," has been the content workshop available for instructors. Much of the material is identical to that in the YFC program. Participants learn the concepts and principles underlying the financial statements, and how to analyze and interpret this data to develop a clear picture of the farm's finances. The four-hour workshop, "How to be a More Effective Instructor," gives specific suggestions for teaching the YFC program. Also included are the following topics: 1) learning styles; 2) inventory of personal characteristics that affect teaching; 3) physical considerations that affect teaching -- learning; and 4) general educational principles.

In Appendix B, note a series of modules arranged in three levels. The five modules in Levels 1 and 2 are taught by local professionals. Approximately 20 total hours of instruction time is required. The balance sheet and cash flow require 4-1/2 -- 5 hours, but the introductory module requires only about three hours. All participants

begin with "Taking Charge," a session that explains how and why farmers benefit from understanding their business through financial statements. It introduces a goal planning process to guide personal, family and business decisions, and describes the YFC program as a potential solution for mastering the basic financial skills of preparing and analyzing financial statements, and the basic legal documents and procedures associated with the borrowing transaction.

As Appendix B illustrates, the Taking Charge module provides the only prerequisite for the next modules -- balance sheet, cash flow, and legal aspects. The balance sheet module is a prerequisite for the income statement module, and farmers are encouraged to study the income statement one year after the balance sheet session. By that time, they are ready to prepare their own second balance sheet, which provides data necessary to complete their income statement. Each financial statement module describes the structure and major concepts underlying that statement, and illustrates how the financial statement data relates to decision making for family and business. Participants use information from a case study to prepare statements, which are the basis for instruction on financial analysis. A major goal of each module is to motivate and prepare each participant to complete his or her own financial statement following the workshop.

The legal module emphasizes key provisions in the promissory note, including terms of the debt and a loan agreement. Participants explore borrower and lender responsibilities associated with unsecured and secured credit, including judgments in case of borrower default. The session includes security agreements and various means of a lender perfecting that security interest, and special attention is directed to legal concerns and responsibilities from a borrower's perspective. The key issues and legal documents related to financing real estate with a mortgage are addressed and the module concludes with the objectives of and distinctions among the several chapters on the federal bankruptcy laws governing farm liquidations and reorganizations.

Level 3 is currently available only through state staff. Advanced financial analysis is taught via four, two-hour TeleNet sessions. A program to generate cash flow projections and pro forma balance sheets and income statements using a computer has been pilot tested. This program should be available soon through the University of Illinois Cooperative Extension IlliNet Service.

Educational Design of the Modules

To understand how this program is intended to work, it is important to review some of its design concepts. Each module has three separate parts: instructor's materials, copy from which overlays can be made, and participant materials.

The instructor package is a complete self-contained teaching unit. No additional materials are required. Each package includes: how to use the materials, a checklist to guide preparation for workshops, workshop agenda, a detailed table of contents, learning objectives, and a complete script (often both in narrative and outline) to guide delivery of the entire program. (See Appendixes C-G.) Appendix H, from

the cash flow module, depicts both the script and outline format. It also reflects that much of the program delivery focuses on an overlay that the instructor teaches from (see Appendixes J and K for companion overlays for the Appendix H presentation). Appendix I illustrates notes for the instructor -- material not shared with participants. The first message refers to an optional pre-test that can be given and the second message describes the optional use of a narrated slide-tape set.

The participant materials (not in the appendix) provide an introduction and welcome to participants. Reduced copies of selected overlays allow participants to make notes and understand important points. Exercises and case study materials are a major part of each participant packet.

Since the introductory module, Taking Charge, is motivational, it differs from the other modules. (Note Appendix D.) A video with six segments totaling 72 minutes is the major teaching vehicle. The video includes farmers filmed on their farms, sharing their methods of developing and using financial information. The video tape also includes a commercial banker and an FmHA county supervisor. Nearly all their borrowers prepare their own financial statements. The section on goals opens with a video segment, followed by exercises for participants.

As you review Appendix D, note the variety of teaching techniques employed -- lecture, video, slide-tape set, hands-on exercises, comments from local lenders/farmers, and finally an instructor describing local plans for the YFC program. This is a key module to launch participants into the program.

Program Delivery

In Illinois, four two-day workshops were organized to train the county extension advisers (both agricultural and home economics). Numerous two-day workshops have helped lenders and other professionals master the content of the YFC program. This is an on-going process. In addition, in the fall of 1986 the four-hour workshop, "How to Be a More Effective Instructor," was delivered in four locations, using a 4-9 p.m. format to accommodate work schedules of professionals attending. To date, one set of program materials has been delivered to each county and the extension adviser is responsible for organizing the county program. Materials are reproduced as needed at the local level. Advisers are encouraged to invite lenders and other professionals to develop plans for their county. Individuals willing to instruct are identified, along with those willing to assist during workshops.

A maximum of 30-35 individuals is recommended in all but the introductory module, which more people can attend. Counties are encouraged to offer modules of the program over several years, and allow participants to progress at their own pace. A first year group might complete Taking Charge and the Preparing and Interpreting Your Balance Sheet, while a second year group might be studying the Preparing and Interpreting Your Income Statement and Cash Flow Planning modules. A third year group might complete Legal Aspects of Farm Borrowing, Advanced Financial Analysis, and computerization of the statements and

pro forma statements. Eventually, all modules would be taught each year to accommodate participants of various stages, however, two or three modules might be a reasonable limit for the first year.

Involving several instructors is critical for most modules. During the financial statement sessions, approximately half the workshop time is devoted to case study exercises. There should be at least one instructor for every 10 participants during the case study work time--this becomes the key to a successful workshop. While participants work on the case study, the instructors must continually circulate, offering assistance and encouragement.

The legal aspects module is designed for lenders to teach. Attorneys may be called upon for special topics and to clarify technical legal issues. Some attorneys have served well as lead instructors, but instructors must be careful that the delivery does not go beyond issues of interest to farmers.

Promoting and advertising this program is critical. In Illinois, an advertisement (for newspaper or newsletters), news releases, feature articles and sample letters that could be sent to farmers and local professionals have been developed by the state staff. Advisers welcome this support. Public service announcements have not yet been used for TV and radio, but are being strongly recommended. Since some counties may not offer the program, state-wide promotion is somewhat limited.

More and more lenders are using the YFC program materials for in-house workshops. Lenders have a vested interest in helping farmers learn how to prepare their own financial statements, so the program may be more widely used and supported if it is delivered directly to lenders. Clearly, this is the best strategy for counties in which the adviser is not interested in making YFC a prominent part of the county program and/or where the individual lender wants to implement the program with a large number of his or her borrowers.

To be a successful program, farmers must perceive YFC as a program for good operators wanting to develop their financial skills, in contrast to the perception that the program is for farmers having financial difficulty. In certain areas of Illinois, it appears some farmers avoided association with the program because of the negative connotation perceived.

Results

The program was initiated in November 1985 with the balance sheet and income statement modules. At least 136 sessions were held for 3090 participants with 151 instructors.

All five modules were available by late 1986. TAKING CHARGE and LEGAL ASPECTS OF FARM BORROWING were not available until nearly year-end, which inhibited their widespread use. About 3,700 participants attended in fall and winter 1986-87 in over 180 sessions, with 172 instructors involved. Over half of all Illinois counties have offered this program.

Forty-seven percent of participants surveyed the first year indicated that this was the first time they had attended an extension program. Participants strongly supported the program. Based on a scale of (1) = strongly agree, (2) = agree (3) = disagree, and (4) = strongly disagree, there was a 1.6 rating on "I would recommend this course to friends," and a 1.8 rating on "this course was of great benefit to me." Ninety-five percent or more of the respondents indicated "agree" or "strongly agree" to questions on usefulness or helpfulness of overlays used, case studies and reference materials, as well as the booklets used to prepare their own statements. When asked, "Did you complete your own balance sheet as a result of this course?" 73 percent said yes. Ninety percent responded yes to the question, "Will you complete your own balance sheet, income statement or financial analysis during the next three weeks?"

For the 1986-87 teaching year, we asked county advisers to assess the strengths and weaknesses of the program. The item that advisers ranked as most important to a successful YFC program was "lender encouraging borrowers to participate." Next in importance was conviction by lenders that farmers need help in learning how to prepare/analyze financial statements and in understanding legal aspects of farm borrowing. Advisers regarded financial support from lenders to pay for materials or food as not important.

Advisers indicated that the usefulness of the modules as teaching tools, and the fact that lenders and farmers believe this information is important were the program's major strengths. Other program strengths, as rated by advisers, include the fact that program is taught by local professionals; the reference book, Coordinated Financial Statements for Agriculture and the "how to" booklets on completing the three financial statements; and the workshop, "How to be a More Effective Instructor."

No weaknesses were identified. Some advisers expressed concern over having to reproduce all the materials and order resource booklets. Advertising and promotion was judged inadequate by some. It was particularly encouraging to note that advisers do not believe the program is too involved and time-consuming for county extension staff.

Summary and Conclusion

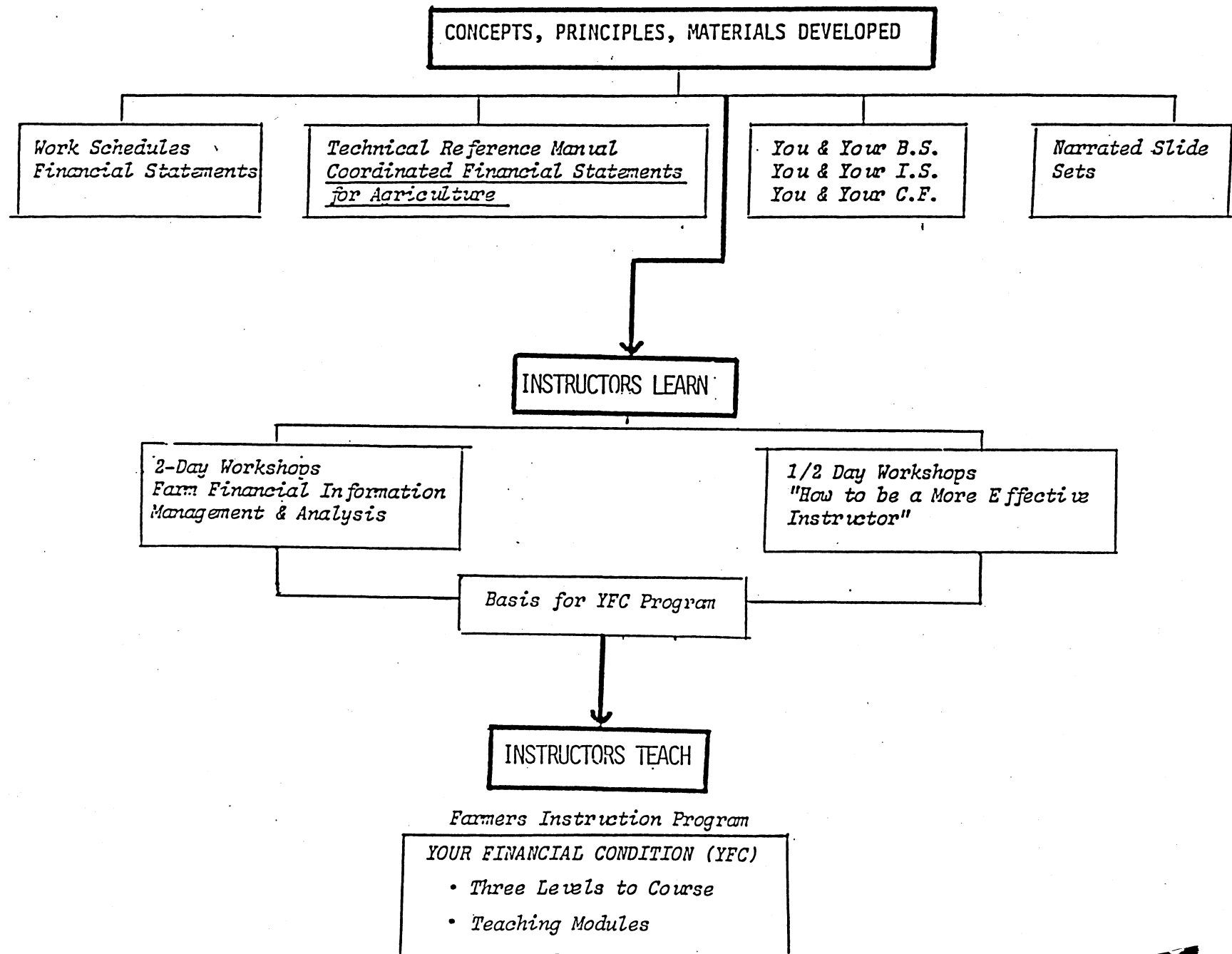
The program, YOUR FINANCIAL CONDITION, has a positive impact in two distinct ways. Most obvious is developing the skills of thousands of farmers, teaching them how to prepare and interpret financial statements and understand the legal aspects of borrowing. Thus far, the program has been used primarily in Illinois. Now that materials have been used one year in addition to the pilot testing, the program is being made available nationwide. Already, materials are under review and/or in a pilot testing stage in 10 states.

The second major impact of this program is to introduce new methodology to deliver extension programs. The program calls upon non-extension professionals -- local volunteers -- which multiplies the impact of county extension staff.

The focus on educational design allows those not trained in extension or education to be effective instructors. The program maintains its integrity because the materials are complete and ready for use. The instructor's materials include a complete script, along with outlines for the more experienced instructor who may prefer to use his/her own words, plus overlays and all case study and reference materials needed by the participants. The two-day workshop on content and a four-hour workshop on "How to be a More Effective Instructor" provide quality control and a more uniform educational experience across many instructors with varying experience and teaching ability. Nothing about Illinois makes success of the YOUR FINANCIAL CONDITION program geographically unique. It would be useful to farmers everywhere who need help in preparing and interpreting their financial statements.

In addition, applying the methodology developed for YFC to other extension programs seems useful. Already, a national Soil Conservation Service educational plan is being modeled after this program. Other interest has been expressed.

EDUCATIONAL PROGRAM
FINANCIAL STATEMENTS FOR FARMERS



Your Financial Condition Program Overview

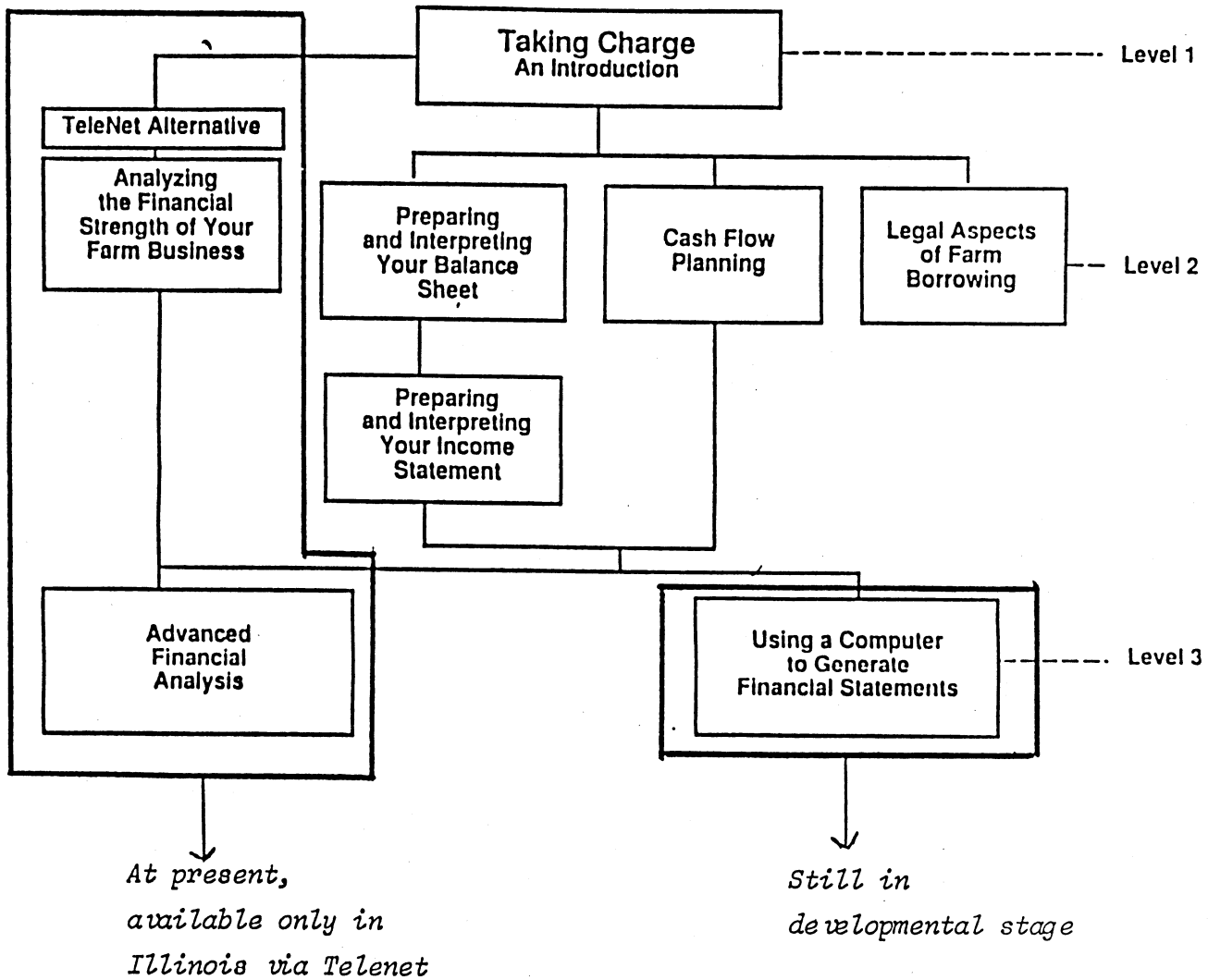


FIGURE 2

APPENDIX C

SPECIFIC WORKSHOP OBJECTIVES FOR YFC MODULES

TAKING CHARGE

Workshop Objectives

After this workshop, participants should be able to:

1. Describe changes taking place in farming industry.
2. Explain why farmers are using financial statements and how they got started.
3. Describe how farmers can use financial information available from financial statements.
4. Suggest how they might work with a lender to learn to prepare financial statements.
5. Set goals to guide and make personal, family and business decisions.
6. Develop a strategy for preparing and analyzing financial statements in his/her farm operation.

PREPARING AND INTERPRETING YOUR BALANCE SHEET

Workshop Objectives

After attending this workshop, each participant should be able to:

1. Explain why learning to complete a balance sheet is important to their farm operation.
2. Describe the structure of a balance sheet.
3. Describe how a completed balance sheet can be used to make financial, production and marketing decisions.
4. Describe how a balance sheet is related to an income statement and cash flow statement.
5. Gather several examples of accrual versus cash accounting procedures, and outline the consequences of using each.
6. Complete Fred H. America's 1986 Balance Sheet.
7. Collect his/her information and complete his/her own balance sheet at home.

APPENDIX C (continued)

PREPARING AND INTREPRETING YOUR INCOME STATEMENT

Workshop Objectives

After this workshop, participants should be able to:

1. Describe the structure of an income statement
2. Summarize the function of an income statement.
3. Explain how an income statement links one balance sheet to the next.
4. Complete the Fred H. America Income Statement.
5. Define: liquidity, solvency, profitability and financial efficiency.
6. Analyze their own financial position based upon liquidity, solvency, profitability and financial efficiency.

CASH FLOW PLANNING

Workshop Objectives

After completing this workshop on cash flow planning, you will be able to:

1. Explain the purpose of a cash flow statement and how it can be used to improve farm financial management.
2. Describe how the cash flow statement coordinates with the balance sheet and income statement.
3. Identify and describe the major accounting concepts that support the cash flow statement.
4. Identify major components of a cash flow statement.
5. Gather, organize and record business information into a proper cash flow format.
6. Analyze cash flow information to make credit and cash management decisions.
7. Explain the need for further analysis via pro forma statements.
8. Prepare a projected cash flow for your farm business and use it to identify areas of financial strength and weakness.

APPENDIX C (continued)

LEGAL ASPECTS OF FARM BORROWING

Workshop Objectives

After attending this workshop, you should be able to:

1. Interpret and understand key provisions covered in a promissory note, including terms of the debt.
2. Understand and explain the key elements of a loan agreement.
3. Understand the borrower's and lender's responsibilities with unsecured credit, including use of judgments in case of borrower default.
4. Understand and explain the borrower's and lender's positions and associated responsibilities under secured credit transactions, including sureties, a security agreement and means of lender perfecting that security interest, especially through use of a financing statement.
5. Recognize legal concerns from a borrower's perspective.
6. Explain the key issues and legal documents related to getting mortgage financing of real estate.
7. Describe the objectives and distinction among the several chapters of the Federal bankruptcy laws governing farm liquidations and reorganizations.

APPENDIX D

(TAKING CHARGE MODULE)

TABLE OF CONTENTS

	<u>Page</u>
How to Use These Materials	iii
Checklist (preparing for the workshop)	iv
Workshop Objectives	v
Workshop Agenda	vi
Instructor's Outline and Script	
I. Taking Charge of Your Financial Condition	1
II. New Era in Agriculture	3
A. Trends of U.S. farms	
B. Video: Meeting the Management Challenge	
III. Preparing and Using Financial Statements	9
A. Slide/Tape Set: "Using Coordinated Financial Statements to Manage Your Farm Business Dollars"	
B. Video: YOUR FINANCIAL CONDITION: Program Overview	
IV. Taking Charge by Setting Goals	10
A. Video: Focusing on Goals	
B. Completing the Goal Planning Exercises	
C. Conclusion: Using Goals to TAKE CHARGE	
V. Experiences From Those Who Are TAKING CHARGE	14
A. Video: The Lender's Role	
B. Comments from local lenders/farmers	
C. Video: Farmers Are Using Financial Statements	
D. Local plans for YOUR FINANCIAL CONDITION	
E. Video: Tools for Taking Charge	
VI. Summary and Closing Remarks	17
Instructor's Resources	
Slide/Tape Set Script: "Using Coordinated Financial Statements to Manage Your Farm Business Dollars"	19

APPENDIX E
(TAKING CHARGE MODULE)
CHECKLIST

- ___ 1. Review the Supplementary Materials and Participant Materials.
- ___ 2. Study the Instructor's Materials, taking note of:
 - a) How to use these materials, page iii.
 - b) Workshop objectives, page v.
 - c) Workshop agenda, page vi.
- ___ 3. Study the teaching outline and script, beginning on page 1. Decide how you will present the information. Cross out portions of the script or outline that you do not plan to use; add your own notes where they would be helpful.
- ___ 4. Review each segment of the video tape. Practice using your equipment. (Be sure your assistants are familiar with it also.)
- ___ 5. Prepare acetate overlays from the original overlays.
- ___ 6. For each instructor and assistant, prepare:
 - a) One copy of the Instructor's Materials.
 - b) One copy of the Participant Materials.
- ___ 7. For each participant, prepare one copy of the Participant Materials.
- ___ 8. If you plan to use the slide set, "Using Coordinated Financial Statements to Manage Your Farm Business Dollars," reserve it by calling your regional CES office. You'll also need a (Wollensak brand) slide/tape player and screen.
- ___ 9. Develop a schedule of all other workshops that participants may attend.
- ___ 10. Photocopy the Workshop Report Form found just before the Preface in this packet. Complete the upper portion, then allow participants to sign in as they arrive. RETURN THE FORM TO TOM FREY. Return a Workshop Report Form for every workshop you hold.

APPENDIX F
(TAKING CHARGE MODULE)
WORKSHOP AGENDA

Suggested Time Allotment	Activity
	Welcome and Orientation
5 minutes	I. Taking Charge of Your Financial Condition
35 minutes	II. New Era in Agriculture
40 minutes	III. Preparing and Using Financial Statements
45 minutes	IV. Taking Charge by Setting Goals
50 minutes	V. Experiences From Those Who Are "TAKING CHARGE"
5 minutes	VI. Summary and Closing Remarks

APPENDIX G
(CASH FLOW MODULE)

HOW TO USE THESE MATERIALS

These Instructor's Materials include the workshop objectives, workshop agenda, instructor's outline and script, and an answer key to the pre-test and post-test. Supplementary materials include overlays to be used with the teaching script, a problem set (Fred H. America case study) and its answer sheets. Participant Materials contain key overlays, tests and problem sets.

To begin, review all materials, including the participant materials and the overlays. Then, study the Instructor's Materials using the Table of Contents as a guide. You'll note some special features of the Instructor's Outline and alternative script.

For example, "Welcome to Cash Flow Planning," pages 1-3, is written in full script. You may learn this script and present it verbatim, or paraphrase it. "Introduction to the Cash Flow," page 4, begins with script also. The first idea within each major section of the outline is scripted to give you a smooth transition from one section to the next.

After this initial script (see page 4) the teaching text is in outline form, beginning with "A. Purpose of the cash flow statement." This outline lists major points and allows room to add your own notes, ideas and examples. You may decide to follow the outline word for word or concentrate on key words and provide your own narration. Avoid the temptation to simply read the material, which is not conducive to good teaching. Use your own words and examples to custom fit the materials to your teaching style and your participants' interests.

Complex sections include a script alternative to the outline. On page 4, notice ALTERNATIVE SCRIPT TO A. ABOVE. You may use this script in place of developing your own narrative from the outline. These alternative scripts can be found in several other places in the outline, also. In no instance should you present the section outline and the alternative script; this would repeat the material.

Each overlay is coded, and that code matches the code appearing to the left of the instructor's outline under the heading "Overlays." Instructions to turn the overhead projector off (to avoid unnecessary distraction) appear occasionally. Many overlays correspond to key points of the outline, linking what participants hear to what they see on the screen.

APPENDIX G (continued)

Study each NOTE TO THE INSTRUCTOR well in advance of teaching. Observe these instructions and ideas and decide how you will incorporate them into your presentation.

Be aware of the list of questions often asked, page 33, and the glossary in the Participant Materials. To use these materials effectively, become familiar with the format. Then, decide how you will present the information. Finally, review the Checklist on page v and complete each item before the session. Thoroughly knowing the material and presenting it with sincerity, in your own style, will be most effective. Remember, materials don't make a good workshop--you do. Best wishes in your teaching.

APPENDIX H

I. INTRODUCTION TO THE CASH FLOW

Overlays

CF 1 Financial Statements

Outline and Alternative Script

This new era of agriculture places heavy emphasis on financial and business management. Farmers must be as well acquainted with their businesses in financial terms -- assets, liabilities, net income, financial feasibility -- as they are in physical terms -- acres, yields, chemicals, etc. Just as farmers have mastered the tools of production, they must master the tools of financial management. There are four basic financial tools, the Balance Sheet, the Income Statement, the Statement of Change in Financial Position and the Cash Flow Statement. All four tools are necessary to gain a full understanding of a farm's financial structure. For today, however, we'll focus on the cash flow statement. Cash flow statements can reflect actual cash flows of the past or projected cash flows for the future. Today we'll concentrate on preparing a projected cash flow statement.

CF 2 Purpose of Cash Flow

A. Purpose of the cash flow statement.

1. Focus on plans (direction) for the future, sort of a "map" outlining future financial plans.
2. Project the timing and magnitude of total cash inflows and outflows for the coming year.
3. Indicate financial feasibility (repayment capacity).
4. Prevent liquidity problems.
 - Pay bills and loans on time.
 - Market products in an orderly way.

ALTERNATIVE SCRIPT TO A. ABOVE:

The purpose of the cash flow statement is to focus on the future by projecting all anticipated cash inflows and cash outflows for the coming year. Such a projection can indicate financial feasibility and prevent liquidity problems. While

a manager cannot change the past, he or she can gain some control over future performance. Management must focus on planning for the future. Few people would make detailed plans for a long trip without looking at a map for directions. Likewise, a projected cash flow can provide some direction for making financial decisions.

The cash flow statement guides decision-making by listing all anticipated cash inflows (receipts) and all anticipated cash outflows (expenditures) for the coming year. The timing of these flows is important; thus, they are usually pro-rated on a monthly or quarterly basis. This shows whether or not the operation will be financially feasible in the coming year; that is, whether or not enough cash is available to pay bills and make loan payments on time. This is often referred to as repayment capacity. Knowing this, a manager, in consultation with his lender, can plan his borrowing to avoid embarrassing and damaging liquidity problems. Preventing liquidity problems by managing cash properly will enable the manager to pay bills and loans on time. With this plan, the manager can make other decisions, such as marketing and purchase decisions, which affect the efficiency of the business.

Turn the
overhead off

- B. How the cash flow statement relates to the balance sheet and income statement.
- Balance sheet: shows the financial position at a moment in time.
 - Income statement: shows the profitability of the past year.
 - Cash flow: indicates future plans and summarizes the anticipated cash position.

APPENDIX I

CASH FLOW (continued)

NOTE TO THE INSTRUCTOR:

The pre-test, item C, is optional. It is a short pre-test (a beginning inventory) on key concepts of cash flow planning. It is designed to indicate to participants what to look for in the lesson and stimulate their thinking. The same test can be given at the end of the session to reinforce the concepts and show the increase in learning. If you use the test now and as a post-test, do not provide the answers now; review the answers after the post-test.

C. Pre-test is on pages 5 and 6 of your materials.

1. The pre-test will:

- Give you an idea of what you will learn in this workshop.
- Stimulate your thinking about cash flow concepts.

2. Read the instructions before answering questions.

3. Answers will be given at the end of this workshop.

4. Take about 5 minutes to answer the questions now.

NOTE TO THE INSTRUCTOR:

An option to Sections II. and III. that follow is to use the slide-tape set PROJECTING YOUR FINANCIAL STATUS WITH A CASH FLOW STATEMENT slides 1 through 32. Do not use the entire slide set now; the rest of the slide set fits better in a later section of the workshop. If you use the slide-tape set, you may need to follow up with selected comments. These comments could be drawn from key points in the following outline. Another option is to use the slide set and present Sections II. and III.

Financial Statements For Farm Financial Analysis

1. Balance Sheet
2. Income Statement
3. Cash Flow Statement
4. Statement of Change
In Financial Position (SCFP)

Purpose of Cash Flow

- Indicate Financial Feasibility (repayment capacity)
- Focus on Plans for the Future
- Project Timing and Magnitude of Cash Inflows and Outflows
- Prevent Liquidity Problems

APPENDIX L

YOUR FINANCIAL CONDITION

Order Form

Each initial order must include the introductory module, TAKING CHARGE, and the video tape. After you have purchased one set of materials for each module, additional copies of instructor materials for that module are available for \$20 apiece. One set includes instructor materials, originals for overhead transparencies, reference materials, and participant materials. Educational institutions may take a 50% discount on printed materials (no discount is available for the video tape or for shipping).

MODULE TITLE	QUANTITY	PRICE EACH	TOTAL
TAKING CHARGE	1	\$60.00	60.00
Additional copies of instructor materials		20.00	
Video tape (not available at discount)	1	45.00	45.00
PREPARING AND INTERPRETING YOUR BALANCE SHEET		55.00	
Additional copies of instructor materials		20.00	
PREPARING AND INTERPRETING YOUR INCOME STATEMENT		55.00	
Additional copies of instructor materials		20.00	
CASH FLOW PLANNING		55.00	
Additional copies of instructor materials		20.00	
LEGAL ASPECTS OF FARM BORROWING		55.00	
Additional copies of instructor materials		20.00	
TOTAL OF ORDER			
SHIPPING			5.00
TOTAL OF ORDER plus SHIPPING			

All orders must be accompanied by payment. Make your check payable to THE UNIVERSITY OF ILLINOIS. Send your check and this order form to:

Anne H. Silvis
Department of Agricultural Economics
1301 W. Gregory - 305 Mumford Hall
Urbana, IL 61801 Phone: 217-333-2547

SHIP TO: Name _____
Institution _____
Street Address _____
City _____ State _____ Zip _____
Telephone () _____

THE LINKAGE OF APPLIED FINANCIAL ANALYSES AND CREDIT SCORING TO EXTENSION AND TEACHING PROGRAMS

David M. Kohl
and
Gerald W. Warmann

The changing agricultural environment will make educational programs pertaining to the management of credit imperative for both the farmer and lender.

Research has been conducted at Virginia Tech predicting the repayment ability and financial condition of borrowers from commercial banks, farm credit system, and Farmers Home Administration.

Factors that were found to be significantly related to repayment of a loan account were: percent equity or debt to asset ratio, current debt ratio, cash expense - cash receipt ratio excluding interest and depreciation and cash flow coverage ratio.

Results were extended in 25 seminars and schools with lenders and producers state and nationally. Written articles have been developed for industry journals and popular publications.

Domestic and global factors in agriculture and the general economy are impacting the profitability and structure of agriculture. Farm numbers, in all likelihood, will continue to decline with a strong probability to a bimodal agricultural sector composed of a segment of larger commercial farms in prime agricultural areas and smaller part-time farms in locations that provide employment opportunities.

The changing agricultural environment will make careful management of credit imperative for both the farmers and lenders; the challenge is to develop approaches to serve a diversified agricultural structure with a sophisticated set of needs.

Historically, land grant universities have played a significant role in agricultural credit pertaining to research, extension, and teaching programs. However, one of the difficulties has been that efforts have lacked continuity in disseminating and implementing new techniques and discoveries from agricultural credit research to Extension and teaching programs. Research has frequently been criticized as being too abstract or not timely enough to meet critical problems. The communication process was also hindered in some cases when the research fails to go beyond a thesis or research journal, thus never reaching the application process in Extension programs and the classroom.

In the future land grant university professionals need to be cognizant of the rapidly changing agricultural environment and play a

significant role in linking research in agricultural credit to Extension and university teaching programs. It will be imperative that agricultural lenders, farmers and agri-professional and undergraduate students be abreast of the latest research and techniques for implementation of research so that proper credit decisions can be made.

Objectives of Paper

Research and Extension work that has been conducted in the areas of agricultural financial statements has largely pertained to farm record systems development and a refinement of accounting procedures for the basic financial statement preparation. The complexity of the recent farm crisis and transition has demonstrated a greater need not only for elaborate financial records, but also methods for their analysis.

Successful systems or models which predict financial strength have not been developed previously for assorted reasons. Poor recordkeeping and financial information makes extensive analysis of most loan accounts difficult. Lenders have also used varied lending analysis techniques as well as accounting systems. Diversity in crop and livestock enterprises and factors such as weather and markets and other externalities have plagued agrilenders and farmers in credit analysis techniques.

Two research projects at Virginia Tech, one which is completed and one that is in the process, have been conducted using data from commercial banks, Farm Credit System, and Farmers Home Administration in predicting repayment ability and financial strength of their borrowers. The ultimate goal was to assure that the research was utilized in state and national Extension and university teaching programs. The specific objectives of this paper will be to:

1. Discuss the study and how it was conducted.
2. Introduce basic results and analysis.
3. Reveal how study results have been utilized in Extension and teaching programs.
4. Discuss modifications that have been made to program subject matter and the linkage of future research and Extension projects.

The Study Objectives, Data, and Procedures

The primary objective of the study was to determine what factors will significantly predict financial strength and weaknesses of individual loan accounts. Each study analyzed the weaknesses and discrepancies of previous research and develop a model that would effectively aid lenders in making initial credit decisions and in monitoring portfolios.

Data used in the study that was completed are from agricultural loan accounts that were originated from 1980 to 1985. Data were obtained using surveys sent to various commercial banks, Farm Credit Associations, and FmHA offices. Loan officers randomly selected both

delinquent and non-delinquent accounts and provided balance sheet information for each account. Borrower and farm characteristics and repayment status were also included in the data requested and obtained.

The sample survey included 382 loan accounts with 16 percent from commercial banks, 62 percent from Farm Credit Associations, and 22 percent from FmHA. Approximately 20% or 73 of the loan accounts had become delinquent, while the remaining 309 had remained on current status.

Thirty percent of the loans analyzed were from primarily crop operations, i.e. grains, tobacco, etc., while 18 percent represented primarily dairy farms. Thirty percent were classified as mixed livestock farms, beef cow calf, feeder cattle, hogs, while the remainder were very diversified encompassing farm operations ranging from fruits and vegetables to forest products. Non-farm income was verified on 70 percent of the loans with Farm Credit and commercial bank customers reporting the largest amounts. Twenty-five percent of the account generated more than \$250,000 gross farm income while 25 percent reported between \$100,000 and \$250,000. At the other end of the spectrum, 20 percent had under \$10,000 gross farm earnings; 30 percent were between \$10,000 and \$100,000 annually.

Through the review of literature, participation in Extension meetings and seminars and informal conversation with agrilenders, the most widely used ratios and variables for determining repayment ability were listed and analyzed for each loan. Since the dependent variable (delinquency) was dichotomous in nature, a qualitative choice model was used. The probit model was used by choice, as a study by Capps and Kramer concluded that the probit and logit models yield similar results.

Results

A number of factors were found to significantly produce repayment of a loan account. Significant ratios were: percent equity or debt to asset ratio, current debt ratio, cash expense cash receipt ratio excluding interest and depreciation, and the cash flow coverage ratio. Table 1 illustrates the means of delinquent and non-delinquent accounts for these factors. In terms of magnitude of significance, the percent equity or debt to asset ratio was ascertained to be the most significant and affected the probability of delinquency the greatest.

Table 1. An Economic and Financial Profile of Non-Delinquent and Delinquent Loan Accounts, 382 Loan Accounts From Virginia Agrilenders, 1980-85.

<u>Factor or Ratio</u>	<u>Account Status</u>	
	309 Non-Delinquent	73 Delinquent
	Percent	
Debt to Asset Ratio	61	39
Current Debt Ratio	18	23
Cash Expense - Cash Receipt Ratio	71	82
(Excluding Interest and Depreciation)		
Cash Flow Coverage Ratio	42	.006

Other variables, found significant, that described certain characteristics of a farming operation included: number of credit lines or sources of credit; an operation that reported a diversified set of enterprises; loans made by Farm Credit or FmHA; and an operation with a gross farm income of less than \$10,000. The model indicated that as a number of creditors increased for an applicant, the chance of delinquency decreased. An explanation for this was that the loan applicant was using money from one creditor to repay another. According to the models, the probability of delinquency decreases if the operation has more diverse enterprises. There was also less chance of delinquency if the loan was made by Farm Credit with loans being made by FmHA having the greatest probability of delinquency. The remaining significant variable indicated that an operation with a gross farm income less than \$10,000 had less chance of becoming delinquent because of the prominence of stable non-farm income respective to the size of the farm operation.

According to the model, a profile of a borrower with high risk of repayment problems would operate a large commercial farm operation with little diversity, small amounts or no reported non-farm income, high debt to asset ratios, low cash flow coverage ratios along with high current debt and cash expense - cash receipt ratios excluding interest paid.

The results of the study proved that certain ratios and descriptive characteristics of an operation are significant in determining the probability of a loan becoming delinquent. However, it was not concluded that the ratios found not to be significant in this study should not be used in determining whether an applicant receives a loan. The analysis and study was completed in an effort to objectively aid lenders in making loan decisions during volatile and transitional times in agriculture, not make the decision for them.

The linkage of this research project to state and national Extension and teaching programs has been vital, particularly to the recent farm financial crisis. As previously mentioned through the review of literature, Extension meetings, and seminars, ratios and

variables were identified for determining the repayment ability of a loan. The research that was completed tested these ratios and assisted in refining the importance of each in the analytical aspects of farm financial statements. The financial analysis information has been very useful in Extension programs with agrilenders, farmers, Extension clientele, regulatory agencies and the undergraduate classroom. The information has been disseminated in a series of articles in agrilending journals, popular farm press, and textbooks for agrilenders and undergraduates.

Instruction Programs

The financial analysis data has been extremely important in agrilending schools and seminars. In the past 18 months, 25 Extension seminars and schools have been conducted state and nationally concerning the use of farm financial statement analysis.

Examples of schools and seminars have been the Virginia and Southeastern Agrilenders Schools, State Banking Schools in Arkansas, Illinois, Kansas, Kentucky, Maryland, Nebraska, New Mexico, New York, North Dakota, Pennsylvania, and South Dakota. Research information has been used at the Advanced National Agricultural Bank Management School, as well as Farm Credit and FmHA training programs.

Participants are introduced to the basic ratios and variables through six to twelve hours of lecture based around a real life case study. For each ratio and factor risk assessment is presented. For example, for the debt to asset ratio a ratio of less than 30 percent would be considered little risk, 30 to 60 percent moderate risk, and over 60 percent high risk. This is illustrated through the stop light concept, i.e. green light -- low risk, yellow light -- moderate risk, red light -- high risk, Appendix A. This tool has been very useful in motivating seminars and school participants in retaining information. Agrilenders are encouraged to use ratios and variables together and not isolate just one factor. Financial analysis for specific enterprises and agrilenders is left up to the responsibility of participants as research data has not been refined for enterprise or lender specific in most cases. Once the lecture is completed, participants are required to analyze another case study or visit a farm situated problem if available. This reinforces the concepts and principles of financial analysis and further assures that the students have a grasp of how the variables can be applied. If time permits, it has been found quite useful to ask students to take an exam pertaining to financial analysis to assess the instructor's abilities in presenting the materials.

The agrilender participants have been encouraged to use the application of financial analysis data for the screening of the initial applicant, portfolio analysis, control and management, differential pricing of loans, and problem loan identification and workout. The agrilender group was targeted first in the farm financial crisis and transition because of the multiplier aspect in the dissemination of information. For example, one agrilender may work with 50 to 100 loan

applicants, so information is dispensed and actually used in a much broader context than would be otherwise.

Farm and Extension seminars have been presented in a different context. Generally speaking, because of program format, a much shorter time requirement places constraints on the ability to encourage application in the seminars. In these instances, the ratio and variables are used in a motivational sense and farmers are encouraged to apply it themselves. In some instances follow-up seminars of one or two days have evolved out of the shorter talks, which have been structured simliar to the agrilender seminars.

A series of articles and papers have also been prepared for state and national publications. An article entitled, "The Credit Analysis Scorecard," was featured in the Journal of Agricultural Lending published by the American Bankers Association Agricultural Division. This mode of communication made the results available to agrilenders nationwide, and was 2,000 words in length and illustrated by a case situation. Articles of similar length and format were published in Agrifinance, a popular press publication for agrilenders and agribusinesses. Articles in Successful Farming and Hoard's Dairyman, the national dairy magazines have been or are in the process of being published. This allows for access to farm and Extension groups. A video in cooperation with the Farm Credit System and USDA Cooperative Extension will focus on the use of these ratios and variables in properly using credit. The research project information has been particularly useful in problem loan consultation by our farm management specialists and agents who were trained at our agrilenders schools and called upon to work with farmers and agrilenders in financial crises situations.

Scoring System

A refinement of the financial analysis research data and its application to Extension programs have been the development of a credit scoring system for different agrilenders, Appendix II. The credit scorecard, illustrated in Appendix II, is a refinement of credit analysis with the application of scores to various factors. The scorecard has five sections with points corresponding to the factors of analysis. Larger values were placed on certain sections such as financial condition and repayment ability. That's because research and feedback through application have indicated these areas and factors have a greater impact on loan success. The scoring system acts as a guide to systematically evaluate a loan not to replace the agrilender's judgement. Using the scoring technique, the loan receives a maximum of nine points for repayment ability, 12 points financial condition, six points credit management, six points production management and profitability and three points on the farm and individual. A maximum of 36 points can be obtained and various risk codes are summarized by agrilender type. For example a low risk green loan would require 30 points with Fram Credit and commercial banks but only 25 points with FmHA that frequently deal with the marginal financial situation.

Agrilenders have used this system in initial loan screening, portfolio management, supervision and pricing of loans to farmers. Some lending institutions have reported that they have computerized this scoring technique and modified it to their financial analysis system.

The current research project in process is further refining this scorecard to ascertain whether any new variables be changed or individual sources be modified.

Future Needs and Challenges

We are in a new era in agriculture -- one in which the agrilender and particularly the farmer must redirect the perception of agriculture from primarily a production standpoint to include financial terms. Completion and interpretation of financial statements will be essential and teaching efforts will be critical.

The future challenge from an Extension effort will be the progress towards uniform financial statements. Consistent methods of financial statement preparation will allow for more reliable measures and guidelines. The advent of accrual accounting should prove effective in this matter, particularly on commercial farms.

Enterprise and lenders' specific financial analysis is a future thrust of applied Extension work and should be encouraged. Perhaps standards established by Robert Morris Associates and Dunn's and Broad Street Business and financial profile should be a number one priority in linking land grant research in agricultural finance to Extension and teaching programs. This, in turn, would assist agriculturalists in managing their credit more effectively in the current agricultural transition.

APPENDIX I

A Summary of Farm Financial Statement Analysis "Cash Flow Factors"

1. Debt service (interest and principal and interest on operating money) should not exceed 25 percent of gross farm and non-farm earnings.
 - * under 15 percent, green light
 - * 15 to 25 percent, yellow light
 - * over 25 percent, red light
2. Cash flow coverage ratio (earnings residual/debt service) should exceed a minimum of 10 percent for projection purposes.
 - * greater than 30 percent, green light
 - * 10 to 30 percent, yellow light
 - * less than 10 percent, red light
3. Farm operating expenses/farm earnings ratio (excluding interest and depreciation) should be under 75 percent if large debt loads exist.
 - * less than 65 percent, green light
 - * 65 to 80 percent, yellow light
 - * greater than 80 percent, red light
4. The farm and family business should demonstrate reasonable sensitivity to volatility of outside influences. (Can it meet the following tests?)
 - * five percent drop in farm earnings (by production and price declines)
 - * five percent increase in farm expenses
 - * three percent variance in loans on variable interest rates
 - * farm and family business can handle adverse directions in all three areas, green light
 - * farm and family business can handle adverse directions in one to three areas, yellow light
 - * farm and family business can NOT handle any adverse directions in these areas, red light

Balance Sheet and Equity "Liquidity and Solvency Factors:

1. Current ratio (current assets/current liabilities) should exceed 1.25 to 1 as for a minimum.
 - * greater than 1.5 to 1, green light
 - * 1.0 - 1.5 to 1, yellow light
 - * less than 1.0 to 1.0, red light

2. Accounts payable ratio (total average extended accounts payable divided by total farm and non-farm earnings).
 - * less than 5 percent, green light
 - * 5 to 15 percent, yellow light
 - * 15 percent or greater, red light
3. Percent equity (total net worth/total assets).
 - * over 70 percent, green light
 - * 40 to 70 percent, yellow light
 - * less than 40 percent, red light
4. Borrowing capacity and reserve in the financial statement, to withstand changes in market values.
 - * reserve in all areas, green light
 - * reserve in one to three areas, yellow light
 - * no reserve, red light

Profitability Analysis

1. Capital turnover greater than farm size and enterprises for the area. $(\text{farm assets}/\text{farm earnings}) = (\text{turnover in years})$
 - * exceeds that of comparable farm, green light
 - * about average, yellow light
 - * below average, red light
2. Farm profitability analysis indicating a positive return. (net farm income + interest paid - living expenses/total average value of farm assets)
 - * returns greater than interest rate, green light
 - * positive return but less than interest rate, yellow light
 - * negative return

Code of Risk Potential

Green light "strong prospect": Six to ten green lights

Yellow light "questionable prospect": Four to six green lights

Red light "problems": Under four green lights

APPENDIX II

Credit Risk Scorecard Risk Scoring for Evaluating Agricultural Credits

I. Repayment Ability and Cash Flow (9 points)	<u>Points</u>
A. Cash Flow Coverage Ratio	
Greater than 30 percent	3
10 - 30 percent	2
1 - 10 percent	1
Zero or negative	0
B. Debt Service Ratio	
Less than 15 percent	3
15 - 20 percent	2
20 - 25 percent	1
Greater than 25 percent	0
C. Earnings Expense/Earnings Receipt Ratio Excluding Interest (Historical)	
Less than 65 percent	3
65 - 75 percent	2
75 - 80 percent	1
Greater than 80 percent	0
Total Points	—
II. Financial Condition (12 points)	
A. Current Ratio	
Greater than 1.5	3
1.0 - 1.5	2
.5 - 1	1
Less than .5	0
B. Percent Equity	
Greater than 75 percent	6
50 - 75 percent	4
33 - 49 percent	2
Less than 33 percent	0
C. Borrowing Capacity and Reserve	
Reasonable amounts of reserve in all areas	3
Reasonable amounts of reserve in two areas	2
Reasonable amounts of reserve in one area	1
No reserve	0
Total Points	—

III. Credit Management (6 points)

A. Credit Lines

Consolidated credit	3
Some split lines of credit	2
Many split lines of credit	1
History many split lines of credit & unsatisfactory payment	0

B. Supplier and Creditor Accounts

No unpaid bills	3
Unpaid bills less than 5 percent of revenue	2
Unpaid bills between 6-10 percent of revenue	1
Unpaid bills over 10 percent of revenue	0

Total Points _____

IV. Production Management and Profitability (6 points)

A. High production and efficiency in top 20% of managers	3
Above average manager but not outstanding	2
Average to slightly below average manager	1
Below average manager	0

B. Returns greater than long run comparable investments	3
Returns positive but less than long run comparable investments	2
Returns positive in the one or two percent range	1
Returns negative	0

Total Points _____

V. Individual and Farm (3 points)

- Goals, records, financial planning, strong farm family background	3
- Some goals and records and financial planning, sound farm and family background	2
- Very few goals and records, doesn't understand financial planning and some farm or personal adversity	1
- Poor attitude, farm and/or personal adversity, doesn't keep or understand records	0

Total Points _____

Point Summary

	<u>Maximum</u>	<u>Farm</u>
Section I	_____	_____
Section II	_____	_____
Section III	_____	_____
Section IV	_____	_____
Section V	_____	_____
Total Points	_____	_____

Commercial Bank & Farm Credit

<u>Overall Evaluation</u>	<u>Code*</u>
30 - 36 points	Green
24 - 29 points	Yellow
18 - 23 points	Orange
Less than 18 points	Red

Farmers Home Administration

<u>Overall Evaluation</u>	<u>Code*</u>
25 - 36 points	Green
18 - 24 points	Yellow
12 - 17 points	Orange
Less than 12 points	Red

Code Explanation*

- Green: This loan is very serviceable and would most likely require minimal supervision
- Yellow: This loan is serviceable and would require supervision at least once a quarter
- Orange: This loan is questionable and, if made, would require very close supervision
- Red: Reject: If you have one, it may require work-out

THE LINKAGE OF APPLIED FINANCIAL ANALYSES AND CREDIT SCORING TO EXTENSION AND TEACHING PROGRAMS: DISCUSSION

Danny A. Klinefelter

Kohl and Warmann begin by noting the challenge that exists for Extension to develop new approaches to serve its clientele in light of the trend toward a bimodal farm sector. I am in agreement, but am concerned that traditional delivery systems, the farm financial crisis and political pressures will continue to focus Extension's programs and resources on the mid-sized farming operations which are decreasing in both number and economic importance. Such pressures generally have a tendency to create a reactive rather than a proactive approach to adjusting to change. While many of the current programs can be adapted relatively easily to meet the needs of part-time farmers, educational efforts to meet the needs of the emerging commercial sector are going to require a significant upgrading in program breadth and depth. This is particularly true in the areas of business management.

The second point in their introduction refers to the lack of continuity in disseminating new techniques and discoveries from research to Extension and teaching programs. I firmly believe that performance evaluation and reward systems for both Extension and research staff need to place more emphasis on getting the results of applied research published in Extension publications, farm trade publications and/or the popular farm press. The public deserves and should demand more end user oriented dissemination of the results of the research it funds. While not every research project will result in a refereed journal article, it should produce answers or shed light on one or more questions relevant to some segment of the industry. I am not suggesting less emphasis on journal articles, but the requirement for broader dissemination of research results. Kohl and Warmann have done an outstanding job in this regard. In many cases these applied publications would require joint authorship by Extension and research staff which would help to keep open lines of communication as well as providing for the continuing education of the professional staff involved.

In stating the objectives of the paper, the authors point out that the farm credit crisis has demonstrated a greater need not only for better financial information but also for better methods for analysis. While this is true, I want to re-emphasize that most farmers still have a long way to go in terms of recordkeeping, particularly at the enterprise level. Most farmers, lenders, Extension specialists and researchers are still operating in the "garbage-in: garbage-out" stage in terms of analysis because of the lack of adequate, consistently prepared financial information.

Danny A. Klinefelter is an Extension Economist in the
Department of Agricultural Economics. Texas A&M University.

They also note the problems in loan analysis created by enterprise diversity and factors external to the firm. As we have learned from the work on integrated systems approaches to management, strategic planning and expert systems development, effective loan analysis cannot afford to become so myopic in terms of analyzing financial data that it ignores or places too little emphasis on those factors influencing financial performance but not directly reflected in the financial statements themselves. This includes the analysis of both past and projected performance.

The more capital intensive and the more specialized the operation, the more important these "other" factors become. Some of the guidelines that have been developed for producers considering the production of alternative enterprises include many of the factors that need to be considered as we refine our educational efforts in financial analysis and credit scoring. While I cannot list all of the additional factors that need to be explicitly incorporated into credit scoring models, I would like to mention a few:

1. Historical trends in financial indicators in addition to current period values
2. Physical production data - production efficiency and production variability
3. Commodity price - consideration of market cycles and price variability
4. Management quality, succession and depth
5. Changes in capital asset values
6. Changes in government policy - agricultural, fiscal, monetary and trade.

Other market factors should be included in analyzing specific new enterprises and investments; but, the above list is applicable to any farm operation. While Kohl and Warmann's Credit Risk Scorecard reflect some of these variables, others were not addressed.

One additional suggestion is the need to show program participants how the various financial ratios are interrelated and what cause and effect relationships exist. Some "what if" analysis using the DuPont Model would be a good example.

I was particularly glad to see them address the priority that needs to be placed on enterprise specific analysis and the establishment of a set of standard comparisons for agriculture comparable to Robert Morris Associates Annual Statement Studies. A tremendous need exists among producers, lenders and Extension personnel for standards and performance ranges for similar firms against which to compare an individual firm's performance.

They note that their educational efforts were first targeted to agrilenders because of the multiplier effect in the dissemination of the information presented. While I do not question the wider impact of the use of the information by lenders who work with a number of farmers, my own experience leads me to question how often lenders explain or dispense the information to their borrowers. I am not disagreeing with the priority placed on lender education, but rather emphasizing that we should not assume borrowers will learn something just because their

lender knows and uses it.

They also mentioned that research was continuing to ascertain whether variables in the scoring system need to be changed or modified. This needs to be an ongoing effort. However, of equal concern and much less well defined is the need for extensive research and education regarding the weighting schemes and decision rules employed in both credit scoring models and expert systems. Too much is still based on general observation, subjective judgment and the results of limited statistical analyses.

In concluding, I would like to express two cautions which need to be observed by anyone teaching financial analysis to farmers and agricultural lenders. First, we need to be very careful about stating generic rules of thumb when explaining individual ratios. Trends, timing, and specific characteristics of the firm and the industry can change the rules. Second, we need to recognize that frequently even the most commonly used ratios are not well defined or prepared on a consistent basis. The numerator and the denominator of a ratio, as well as the data going into each should always be evaluated for comparability.

LESSONS FROM THE FINANCIAL CRISIS IN AGRICULTURE

Michael Boehlje*

Although the financial crisis has not yet been completely resolved for some farm and agribusiness firms, it is not too early to think about the lessons learned and issues to be debated and resolved beyond the agricultural financial crisis of the 1980s. That is the purpose of this discussion -- to identify and speculate concerning some of these issues. The issues selected include diversified financing, new dimensions of agricultural debt, challenges of the equity market, and leasing of agricultural assets.

Diversified Financing

The 1980s has reinforced again (as did the 1930s) the risk associated with the relatively narrow financial base in agriculture. For much of the last two decades, only two basic sources of funds have been perceived to be legitimate on the part of the agricultural community: internally-generated equity and debt. Leasing assets, whether land or machinery and equipment, was perceived to be a way to start farming, but was not acceptable on the part of most farmers as a permanent component of the financial structure of the farm business. And off-farm investors or externally-generated equity was even more suspect even as a way to get started in farming. Consequently, farmers who were unable to generate an equity base from internal savings and/or inheritances as rapidly as was desired for expansion purposes were encouraged to borrow the necessary expansion capital rather than obtain it through the leasing or outside equity markets.

The result has been a relatively narrow capital base for agriculture with the industry participants receiving most of the financial reward but bearing almost all of the financial risk. If the farmer loses money, the lender still expects to be paid his interest whereas an outside investor shares the loss. The significant losses of equity capital of the past 5-7 years on the part of many farmers should encourage them to reconsider and reevaluate the costs and benefits of equity sharing agreements and outside investment in agriculture.

Debt

Three issues are of paramount importance in the debt markets for agriculture: new instruments, changes in debtor/creditor rights, and new institutions. New financing instruments and arrangements include the potential for using shared appreciation mortgages or guaranteed buy-

*Professor and Head of Department, Department of Agricultural and Applied Economics, University of Minnesota, St. Paul.

of acquired properties on the part of some lending institutions. Other lenders are providing packaged credit with an appropriate proportion of short-, intermediate- and long-term financing to their farm borrowers. Long-term financing with fixed interest rates for a specific time period shorter than the term of the loan are being used in the real estate market, and mortgage-backed credit that can be sold in a secondary market is being discussed by individual lenders as well as in the policy arena. A new instrument that includes fixed annual payments but variable term or length of loan to reflect variable interest rates merits investigation as a mechanism to allow the lender to "pass through" to the borrower changes in interest cost without increasing the repayment risk on the loan obligation.

Recent legislative changes in debtor/creditor rights, including Chapter 12 bankruptcy rules, mandatory mediation in selected states, increasing difficulty in obtaining deficiency judgments, increased exemptions under state bankruptcy rules, etc., have changed the balance of property rights on the part of borrowers and lenders. In essence, lenders perceive that they have fewer rights and options under current law when a borrower defaults than in the past. The implications of this change in the legal/institutional structure of the credit markets for interest rates, availability of credit to marginal customers, and documentation requirements that increase the transaction costs of credit activity, are not yet well understood.

The agricultural debt markets are also changing in terms of institutional participation. Traditional lenders such as the Farm Credit System and commercial banks appear to be reducing their activity or refocusing on selected farm borrowers. Simultaneously, some potential new entrants are evaluating the agricultural credit market. Possible new entrants include the savings and loan industry with packages of structured short-, intermediate- and long-term debt combined with equity financing through limited partnerships and other legal instruments; international financial institutions including Rabobank and Credit Agricole; credit unions looking for portfolio diversification; and input supply firms that will not only package credit with product sales, but may even add a finance subsidiary as a profit center within the corporate structure. Again, the implications of the changes in the institutional structure of the agricultural credit markets is not yet well understood.

Equity

As indicated earlier, a significant proportion of the equity base in agriculture and in many agribusiness firms has disappeared with the losses and declining asset values of the past five years. Rebuilding that equity base is a priority for many firms. Three dimensions of this issue deserve mention. First, rebuilding the equity base through internally-generated earnings will be difficult for many farm and agribusiness firms (including many of the regional and local input supply and product processing cooperatives). Now may be a very logical time to broaden the equity capital base in agriculture by merchandizing

time to broaden the equity capital base in agriculture by merchandizing investment packages of profitable enterprises and activities within the sector to the broader investment community. Second, this may be an appropriate time to assess the role of private and public sector venture capital arrangements that would stimulate and encourage the movement of equity funds into selected components of the farm and agribusiness sector. Third, as we think to the future about issues of new entrants into agriculture, it may be appropriate to follow the New Zealand example of savings subsidy programs (for example, a state or federal government match of the amount that a prospective farmer saves to acquire agricultural assets) to encourage equity accumulation and reduce the financial risk of new entrants, rather than use the traditional approach in the U.S. of subsidised interest rates and lenient credit terms which encourage excessive leverage and results in high financial risk. Note that we are not arguing here for additional investment capital for agriculture to increase the size of the productive plant. What we are arguing is that the equity base for agriculture must be rebuilt and that debt utilization should continue to shrink to reduce the financial risk faced by the sector.

Leasing

A final area meriting further analysis is that of the role of leasing in the agricultural sector. Leasing has always been a more common approach to "financing" the control of agricultural assets in the real estate market, but even there it has been perceived by most to only be a temporary component of the financial structure until funds are available to buy the assets. The role that leased assets, whether land or machinery and equipment, might play as a permanent part of the capital base of the farm business should be evaluated. Within the non-agricultural sector, a significant component of the equipment and machinery used in the production/manufacturing process is leased by the firm. Why similar arrangements should not be utilized in agriculture is a fundamental question.

As to the issue of leasing farmland, a basic question may be that of relative property rights of tenants versus landlords. Currently, institutional structure and law gives farm tenants very few property rights -- typically only one-year leases, no compensation for improvements, etc. Thus tenants have little control over a large part of their resource base; it follows that they have a strong economic incentive to become an owner-operator. Changing the balance of property rights of tenants versus landlords, including the potential for longer term leases and compensation to the tenant for improvements made, may have a significant impact on the economic and social attractiveness of renting farmland. The institutional structure surrounding rental of farm land is a significant function of property laws and public policy in general. If reasonable terms of trade are maintained between owners and users, the perceived negative social consequences of renting may be partially offset, and increased tenancy may in fact improve the financial resiliency of the agricultural sector.

CRYSTAL BALLS, OUIJA BOARDS, AND PALM READING VIEWS ON THE FUTURE OF AGRICULTURAL FINANCE

MARVIN R. DUNCAN*

The crisis in agricultural finance is over, but its aftermath remains with many farmers, financial institutions, and rural communities. American agriculture has undergone an immense secular structural adjustment. An estimated 150,000 farmers are in the vulnerable category, with perhaps 50,000 who will not recover. Those who can get healthy are doing so. Those who cannot will ultimately have to change their occupations. Public policy attention should now shift from farm financial crisis management to the more difficult, but more productive, task of developing greater off-farm economic growth in non-metropolitan America. Because of Chapter 12 bankruptcy laws, state statutory impediments to foreclosure, and restructuring of debt by lenders, many financially troubled farmers are obtaining debt relief by write-downs of principal and interest. Some farmers blame their lenders for their own financial problems, but the farm lenders themselves have suffered substantial losses. Events in recent years and changes being contemplated by the Congress could well change the face of agricultural lending in the United States for years to come.

Text

The big news is that the farm crisis is over in the United States. Land values are stabilizing, farm income is record high, the expected flight of farmers from the land has not materialized to nearly the extent feared, and farmer optimism is returning. But the crisis leaves behind it a legacy of change for many farmers, financial institutions, and rural communities. The secular structural adjustment that American agriculture experienced was immense. Its effects will be felt for years to come. And it is unlikely that the sector can, or would want to, return to the conditions that caused the adjustment.

The U.S. Department of Agriculture says that 150,000 farmers are in what it calls the "vulnerable" category. Of that group, some 50,000 have irretrievably failed. Those who can get healthy are doing so. Those who cannot will ultimately have to find new occupations. Public policy attention should now shift from farm financial crisis management to the more difficult, but more productive, task of developing greater off-farm economic growth in non-metropolitan America to aid rural communities and assist those who can no longer earn a living from farming.

Agricultural lenders too have absorbed heavy losses. The losses suffered by the Farm Credit System are legend and the numbers of commercial agricultural banks that have failed are the largest since the Great Depression. These problems have carried over into rural communities where many small businesses have closed their doors and where the very financial fiber of the communities themselves has worn thin.

*Member, Farm Credit Administration Board, McLean, Virginia

The advent of the Chapter 12 bankruptcy code last November set off a new wave of farm failures. According to recent figures from Dun and Bradstreet, it appears that most of the 93-percent increase in farm bankruptcies recorded in the first half of 1987 can be attributed to Chapter 12 as farmers seem to be taking advantage of the code's more lenient debt reorganization provisions. It also appears that lenders are more willing to restructure troubled debt in efforts to avoid Chapter 12 proceedings.

Debt restructuring that is based on sound business practices makes good sense and is both a necessary and constructive part of the solution to farm financial problems. But if it merely delays the inevitable, it may be an injustice to both the borrower and the lender. Many farmers have rationalized that their lenders were partners when they borrowed money and should share in the losses when the money cannot be repaid without disrupting the farmer's business or life style. History will indicate that lenders did share in those losses, sometimes to the point that the lender was driven from business.

Some recent state and federal laws have substantially strengthened the position of borrowers in dealing with creditors. Regardless of whether that new legal tilt is needed to deal with current conditions, the laws will have longer run implications for credit availability and price. These implications typically will be adverse to farmers. The longer run results will likely include fewer lenders actively pursuing farm loan business, more difficulty for marginally credit worthy borrowers in obtaining funds, greater difficulty in obtaining home and farmstead improvement loans, and somewhat higher interest rates reflecting the higher risk in agricultural lending.

Lenders will be far more cautious in their approach to lending. Not only will they pay more attention to markets, cash flow, and repayment capacity, they will be more conservative and demand greater equity positions and more collateral from their borrowers. It is also likely that some traditional agricultural lenders will look elsewhere for more diversified business. So if farmers gain some short term benefit through extra liberal restructuring, they may face bigger problems in the long run. It is now time for lenders and borrowers to discuss their mutual future needs. An equitable legal framework will benefit both in the longer run.

Of course, the decline in agricultural loan volume in the past couple of years indicates this cuts both ways. Many farmers are "making do" with older equipment, using less fertilizer and pesticide, and are not looking to expand or add to their real estate holdings. Farmers realize they must use less leverage in their businesses. But with farm real estate values stabilizing and farm incomes relatively high, expansion opportunities for farmers likely will require more debt financing in a year or two as the volume of agricultural debt stabilizes and returns to a slow growth rate.

I said at the outset that the crisis in agricultural finance is over. That statement recognizes that farm lenders must still work through billions of dollars in non-performing loans and dispose of large inventories of acquired properties. In that process some troubled farmers will be saved and some with little or no debt will pick up farm land at bargain prices. One innovation worth mentioning in this regard is the guaranteed buy back program being offered in the St. Paul Farm Credit District. Life in rural America may well be changed, but it will go on.

Before we look too far into the future, let's look very quickly at where we are. There is no question that conditions are beginning to improve. More than 82 percent of all farms with annual sales greater than \$100,000 generated positive net cash farm income in 1986. Land prices have stabilized. Inflation remains under control. The dollar has weakened while currencies of some of our trading partners, particularly Japan, have strengthened. Interest rates have moderated. The 10-year Conservation Reserve Program, now at 23 million acres, may reach its goal of 40 to 45 million acres by 1990. The paydown of farm debt continues and may go as low as \$150 billion. And government farm program outlays remain substantial, despite some cuts being proposed by the Office of Management and Budget.

Given this brighter scenario, let us now turn to the future of agricultural finance beginning with the Farm Credit System.

We begin with the assumption that the Congress and the Administration have decided that public policy continues to require a special credit system focused on the agricultural sector. The next considerations are what that will cost and what form such a system will take.

Legislation has been introduced in both the House and the Senate designed to return the system to viability. What the legislation lacks is a price tag. An analysis of the problem undertaken by the Farm Credit Administration indicates that a total assistance package of as much as \$5.2 billion would return most system institutions to viability by the end of 1994, \$4.1 billion of which would be required during the first two years. That estimate could sharply increase if the provision of federal funds is linked to a reduction in interest rates charged borrowers or to legislated loan restructuring. While such proposals would be popular among farmers, federal budget realities seem likely to require that loan restructuring be business based and interest rates set high enough to cover operating costs. A line has to be drawn between a workable businesslike solution to the system's financial and operating problems and a social program solution to the problems of its troubled borrowers. If it isn't, the Farm Credit System will become a second Farmers Home Administration in the sense that it will be restructuring loans that would be commercially unacceptable.

If that happens, the system will require regular infusions of federal assistance because it is unlikely that credit worthy borrowers will be satisfied to pay the higher costs associated with social program responsibility.

The other unresolved questions are how to accommodate the need for financial assistance within the constraints of the federal budget and the perceived need for statutory change in the structure and operation of the system itself. The perception is that changing the structure of the system would somehow automatically result in substantial cost savings, primarily through a reduction in personnel and in bricks and mortar. The fact of the matter is that large numbers of competent people will be required to work through the system's nearly 100,000 troubled loans, although some savings could be attained once that process is completed. The biggest culprit affecting the system's cost of doing business at the present time is the high cost of the system's outstanding securities. Currently, the cost of outstanding debt for system institutions is edging upward as market rates rise. Moreover, several Federal Land Banks either have negative net interest margins or negative returns on equity and assets as a result of reducing borrower interest rates in an effort to hold volume in a shrinking credit market. In the longer run, both restructuring the delivery system to attain operating efficiencies and pricing to cover long run costs of doing business will be necessary if the system is to survive as a private sector borrower owned lender.

A controversial element of the proposed legislation involves the creation of a secondary market for farm loans. The proposed legislation would establish a Farm Mortgage Corporation allowing Farm Credit System institutions and commercial lenders to package their agricultural real estate loans for resale to investors as tradable interest bearing securities. The corporation would provide "credit enhancement" through the Federal Farm Credit Banks Funding Corporation and, ultimately, through the government to guarantee investors that they will receive timely payments of principal and interest. The fundamental attributes of this "securitization" by the Farm Mortgage Corporation are two-fold. One is to shift the bearing of interest rate risk to investors and away from either the borrower or the lender at a market-determined price. Because risk is reduced, so may be the capitalization needs of Farm Credit System institutions and other farm lenders. Being able to sell assets in a well defined market means lenders can be more innovative in the kinds of loan products they offer.

Another important consequence of securitization is market enforced credit standards. To sell as part of a pool or package, loans must meet credit and appraisal standards. Those standards are constantly tested and refined by investor response to loan backed securities and by the judgement of independent rating companies who evaluate the quality of their offerings. The result is that pricing of loan products is market driven, a fundamentally healthy circumstance for everyone involved.

If the secondary market is limited to real estate loans, it will pave the way for 5,000 to 6,000 commercial banks, thousands of savings and loan associations, and dozens of insurance companies to enter agricultural real estate lending or expand their lending activities. But if non-real estate farm loans are also included, it gives a green light as well to countless merchants, dealers, manufacturers, exporters, processors, distributors, and cooperatives who may wish to sell financial services to their customers. Whatever happens will affect the Farm Credit System as well as other farm lenders and will undoubtedly have significant ramifications for the future of agricultural finance. A secondary market would create more competition among a wider range of lenders. Some would gain and some would lose. That competition would result in more innovative loan products and services.

While the farm crisis may have passed, its aftermath must still be worked through. More importantly, it is now time to look broadly at public policy options and business practices that can be of longer term benefit to U.S. farmers and their lenders, as well as to rural America. In fact, a new and even more challenging agenda awaits.

###

ISSUES IN AGRICULTURAL FINANCE

--by Neil E. Harl*

In the 1980's, the rules for sharing losses attributable to indebtedness not paid in agriculture have been modified. Losses are shared in accordance with legal rules among the borrower, the lender, other borrowers not in financial difficulty (as interest rates for agricultural lending have remained elevated) and the federal government. Mandatory mediation and Chapter 12 bankruptcy are among the most visible institutional changes affecting the sharing of losses. Major concerns include the impact of these modifications and others on credit availability and interest rates, the reforming of the Farm Credit System as federal assistance is provided, how best to meet the financing needs of a sector in overproduction and facing daunting international competition and the implications of excess capacity in agricultural lending.

In the past five years, agricultural finance in the United States has been dominated by efforts to minimize the sharing of losses. The amount and concentration of debt, although the amount of debt has been in a clear downward trend since 1983, suggest that the loss-sharing process will likely continue for another two to five years before substantial equilibrium is reached. [Harl, 1986d p.71]

The phenomenon of loss sharing has created problems and perspectives on agricultural finance that have not been experienced in a half century. The effects have been particularly significant for the legal or institutional side of agricultural lending. Participants in credit extension share cheerfully in gains without much attention to legal niceties. But no one shares in losses unless legally obligated to do so.

The loss sharing process

As collateral values have fallen and cash flows have proved to be inadequate, lenders have been thrust into the unaccustomed role of "brokering losses." Losses are being shared among several parties in the adjustment process -- (1) the borrower who is in default and unable to make payments, (2) the lender, (3) other borrowers and (4) the federal government.

*Charles F. Curtiss Distinguished Professor in Agriculture and Professor of Economics, Iowa State University; Member of the Iowa Bar. The helpful comments of colleagues Michael Duffy and Arnold Paulsen are gratefully acknowledged.

- The sharing of losses by the borrower and the lender are traditionally straightforward and to be expected. After default on loan obligations, the borrower often loses all assets other than exempt property. With respect to any residue of loss remaining, the lender loses to the extent collateral values are less than the amount owed.

In the current era, however, the sharing of losses is no longer completely traditional as the rules have been modified legislatively.

- Borrowers not in financial jeopardy are contributing to the adjustment process as interest rates have remained elevated to cover loan losses and to reflect diminished lending competition in rural areas.

- The federal government has also participated in loss sharing directly through loan guarantees and indirectly as farm subsidy payments have risen to record levels and have added income buoyancy to the loss sharing process.

This "socialization" of losses is, to a degree, inconsistent with the traditional view that borrowers unable to repay principal plus interest suffer the consequences. In recent years, the process has necessarily and inescapably involved more participants because of the nature and magnitude of the problem.

Rules governing loss sharing

From the beginning of the recorded history of lending, the institutional system has furnished the rules governing remedies upon default and the realization of creditors' rights. The traditional creditors' remedies have included foreclosure and forfeiture with Uniform Commercial Code default procedures added in more recent time. Debtors have never been totally without rights, however, and in the modern era have been eligible for bankruptcy (Chapter 7 liquidation, Chapter 11 reorganization and Chapter 13 rehabilitation). In the 1930's, 28 states enacted statutes providing for moratoria on farm real estate mortgage foreclosure.

In the 1980's, the moratorium has received relatively little attention, perhaps because of the adverse impact on lenders and on lending and the realization that other intervention approaches could be fashioned to better achieve relief for debtors.

- One of the more successful interventions has been mandatory mediation, enacted in Iowa and Minnesota and considered in several other states. Early in the process, we observed that lenders, in pursuing their traditional remedies, were provoking greater losses to themselves than would be needed in the form of principal forgiveness or interest rate reduction to make the borrower economically and financially stable.

Mediation is a rational procedure to force the parties to examine both sides of the issue and, hopefully, to reach agreement on a rational outcome.

• Chapter 12, effective November 26, 1986, enables eligible farm debtors to write down debt to collateral value if necessary to make the debtor stable. [Harl 1987b] The amount of debt above collateral value is treated as unsecured debt which is substantially discharged. Under a typical Chapter 12 plan, less than 10 percent of the unsecured debt is paid. [Faiferlick and Harl]

Arguably, Chapter 12 does not increase the hit taken by lenders but it does -- (1) require that the hit be taken sooner than the lender or the lender's examiners would have required, (2) preclude the lender from recovering more if the borrower's economic position improves (either because of better fortunes for agriculture or because Aunt Lillian dies) and (3) the lender loses some of the control traditionally held over the default-liquidation processes.

Ongoing research at Iowa State University confirms that the influence of Chapter 12 goes well beyond the number of filings, which is substantial as shown in Table 1.

Table 1. Number of Chapter 12 Filings in the North Central Region Since November 26, 1986.

<u>State</u>	<u>January 31</u>	<u>March 31</u>	<u>May 31</u>	<u>July 31</u>
Illinois	46	121	179	233
Indiana	30	74	153	199
Iowa	73	188	264	290
Kansas	59	102	139	210
Michigan	18	48	87	137
Minnesota	46	69	91	120
Missouri	18	109	172	206
Nebraska	96	220	409	491
North Dakota	25	51	74	87
Ohio	23	87	142	163
South Dakota	106	208	315	438
Wisconsin	<u>38</u>	<u>89</u>	<u>129</u>	<u>254</u>
Total	578	1,366	2,154	2,828

The widespread and pervasive influence of Chapter 12 helps to build the case for intervention benefits favoring lenders. Borrowers may become stable either -- (1) by receiving interest payment assistance (generally assumed to come from government) or (2) by being the beneficiary of principal forgiveness or interest write down by lenders.

Research over the past three years at Iowa State University indicates that the intervention cost would be approximately the same whether the intervention is to benefit lenders or to benefit borrowers. A strong case can be made for intervention benefits to borrowers [Harl 1986f pp. 29-30] on a targeted basis but the influence of Chapter 12 suggests that lenders may end up bearing a greater proportion of the losses than was anticipated before the enactment of Chapter 12.

A look ahead

Given the amount and distribution of farm debt at present, near term concerns in the institutional arena will likely be dominated by efforts to modify and refine the rules for sharing losses.

- A major concern is in the possible modification of Chapter 12. Lien avoidance rules, trustees' fees, treatment of partnerships and corporations, eligibility of those filing under another bankruptcy chapter before November 26, 1986, to convert to Chapter 12, and tax consequences of Chapter 12 all pose important legislative questions. The tax aspects are particularly serious and pose a significant barrier to using Chapter 12.

- The handling of discharge of indebtedness, especially for solvent taxpayers, is confusing and uncertain. [Harl 1987e] The proposed Technical Corrections Act to the Tax Reform Act of 1986 will resolve some of the more serious problems of the 1986 amendment in this area.

- The income tax consequences of abandonments of property in bankruptcy continue to pose serious problems for farmers contemplating bankruptcy filing under Chapter 7 and 11. [Harl 1987a] It is not completely clear whether the debtor or the bankruptcy estate bears the tax consequences of transfer of property to creditors.

* * *

Over the longer run, questions can be raised now about a range of potentially important issues --

- What will be the long-term effects of institutional modifications on credit availability to agriculture and what, if any, interest premium can be reasonably anticipated? Will the "price surface" for money remain permanently elevated? If not, for how long?

- Will the experiences of the 1980's have an effect upon the movement of farm operations into "superfirm" status with capital, management and labor provided by individuals of more than one generation? What financing options will emerge to enable farm and ranch firms to expand and reach the minimum point on the cost curve?

- Will the more conservative attitudes relative to borrowing continue for a time and what are the likely effects on firm expansion? Will the structure of agriculture be shaped by the changes in the borrowing-lending climate in the 1980's?

- To what extent will the problems relating to global overproduction in basic agricultural commodities and the prospects of output-increasing technology, perhaps on an accelerated basis, keep resource earnings depressed and affect the extension of credit?

- What type of configuration can we expect from the legislation providing a bail-out for the Farm Credit System? What are the implications of excess capacity in agricultural lending for that

assistance? What is the irreducible minimum in terms of survival of the Farm Credit System? With respect to that minimum role for the Farm Credit System, agriculture clearly needs a dependable source of funds, long-term, for financing land acquisition and land improvements. A central land bank or a functioning secondary market with adequate credit enhancement could meet that need. Agriculture has been well-served by the efficient money-gathering features of the Farm Credit System. The Farm Credit System could supply funds on a wholesaling basis to other lenders who, with some adjustment, could handle the retail lending function.

Arguments can certainly be made for other functions to be performed by the Farm Credit System, including a full line retail lending operation. A major policy question is the extent to which public funds should be used to assure survival of a full line lending operation and a structure resembling the present structure.

- The circumstances of the 1980's have demonstrated once again the consequences of non-diversity in loan portfolios on the part of agricultural lenders. Research attention should be devoted to examining the economic effects of alternative ways of dealing with non-diversity as institutions are reformed. In particular, attention should be given to achieving diversity over time as funds are accumulated in favorable economic periods to carry lenders through protracted periods of loan losses in agriculture. Should the United States Treasury continue to be the "insurance fund" for agricultural lenders "too big to fail"?

- Any financing efforts premised on tax-inducement to channel capital into agriculture should be approached with great caution. The Tax Reform Act of 1986 mounted the greatest attack on tax shelters since the federal income tax became effective in 1913. It is my belief that the attack on tax shelters in agriculture in the 1986 legislation was appropriate. For a sector in chronic overproduction as to basic commodities, what is needed for that sector is fewer resources, not more.

Conclusion

Agriculture has perhaps passed the midpoint in adjusting through the problems of too much debt concentrated in too few hands. The level of farm income will have a great deal to do with the amount and duration of economic pain experienced during the remainder of the process.

Clearly, our policy focus should increasingly be on the period beyond the period of intense debt adjustment. We should not, however, lose sight of the need to reform institutions, such as the Farm Credit System, in terms of features to help the sector cope with the next period of crisis 50 or 60 years from now. Crises are scarce resources to be utilized with great care; institutional reform is most likely to occur in times of perceived crisis.

References

- Faiferlick, Chris, and Neil E. Harl. "The Chapter 12 Bankruptcy Experience in Iowa." J. Agr. Tax'n & Law 9(1987):_____.
- Harl, Neil E. Agricultural Law 4(1987): Secs. 39.02, 39.03.
- _____ Agricultural Law 13(1987): Special Supp., Feb. 1987.
- _____ "The Architecture of Public Policy: The Crisis in Agriculture." Kan. Law Rev. 34(1986): 425-456.
- _____ "The People and The Institutions: An Economic Assessment," in Increasing Understanding of Public Problems and Policies - 1986. Farm Foundation, Oak Park, Illinois.
- _____ "Planning Under Bankruptcy and Debtor Distress." J. Agr. Tax'n & Law 9(1987): 157-169.
- _____ "A Proposal for Interim Land Ownership and Financing Through an Agricultural Financing Corporation." J. Agr. Tax'n & Law 8(1986): 19-33.

WHAT CAN THE ECONOMIST DO AND NOT DO IN THE PUBLIC POLICY PROCESS?

Neill Schaller

The roles of land grant university economists in the public policy process are shaped by the purpose, principles and practice of policy extension education, the interface of policy extension and research, and the economist's tool kit. Land grant extension and research can meet the growing need for knowledge and understanding of public problems and policy solutions if they strive to maintain objectivity, continue to serve a broad public, ensure a strong extension-research partnership, and make wise use of the economist's expanding tool kit.

The Public Policy Process

My assignment first calls for answering two other questions: What is public policy and how is it made? As a start, it helps to distinguish between private and public policies. Private policies are made by individuals, groups, or even governments, to achieve a particular benefit for specific persons or groups. Public policies, in contrast, are made by society, or an important segment of it, and arise in either of two ways:

First, society sees a problem or issue as a public affair requiring public or governmental action. For instance, people have long viewed farm problems as public problems and government intervention as an appropriate response. Second, public policy often develops in reaction to spillover effects of private policies (House). In this case, people who are "spilled upon," or fear that they will be, seek to block the private action or alter its consequences through public policy.

Examples of spillover effects are commonplace in an interdependent society such as ours. A farmer's neighbor complains when the farmer hires a crop duster to spray insecticides on his fields. Landowners object because a government lending agency depresses land prices by selling land it had acquired through foreclosures.

Neill Schaller is Assistant Director, Resources and Technology Division, Economic Research Service, U.S. Department of Agriculture. The views expressed in this paper are his personal views, not those of the Economic Research Service or the U.S. Department of Agriculture.

Public policies, as a rule, are developed and carried out through governments, and therefore in ways determined by the type of government in effect. In a country with representative, democratic government such as ours, public policies are made in a participatory way. That is, they represent the interests of citizens involved or affected, and the majority rules (Spitze, August 1986, p. 2).

The dynamic properties of the public policy process are well described in what Charles Gratto has called the "policy issue cycle" (p. 40). Figure 1 shows a simplified version of that cycle, with the following stages:

Concerns expressed--People begin to feel or fear a problem or "hurt" due to some public problem or to adverse effects of private action. The failure of past policies to solve an earlier problem, or effects of policies to resolve an entirely different problem, may cause those concerns.

Issue identified and debated--Concerns evolve into an identifiable issue which is discussed and debated, often with information of mixed reliability and rising emotions.

Alternative solutions considered--This stage is marked by the identification and discussion of alternative policy solutions, the increasing availability of facts and information (and misinformation) about the alternatives and their likely consequences for people affected by the issue.

Action taken--Here the policy debate moves to action, such as the passing of a law or steps taken by the executive or judicial branches of government.

Action evaluated--Effects of the action taken are monitored, analyzed, and reported. If the action is successful, the policy issue is considered resolved. If the policy does not solve the problem or it creates a new problem while solving the one originally addressed, another or new cycle begins.

The process of reconciling diverse and conflicting interests and agreeing on a policy decision is often difficult and time-consuming. Indeed it can take many years for a policy issue to emerge and move through a complete cycle. Compromises of the kind required to reach a policy agreement usually increase the chances that the policy will be found wanting by some interested or affected parties.

Take farm legislation. It is typically given a life of only a few years, and the debating of farm bill modifications rarely ends with passage of an act. For instance, the signing of the 1985 Food Security Act launched a new debate on alternative approaches, such as mandatory supply controls. Thus the policy process pauses but seldom really ends. New interests and concerns often emerge to join the debate with each new cycle. As an example, local community concerns may be stirred when, as

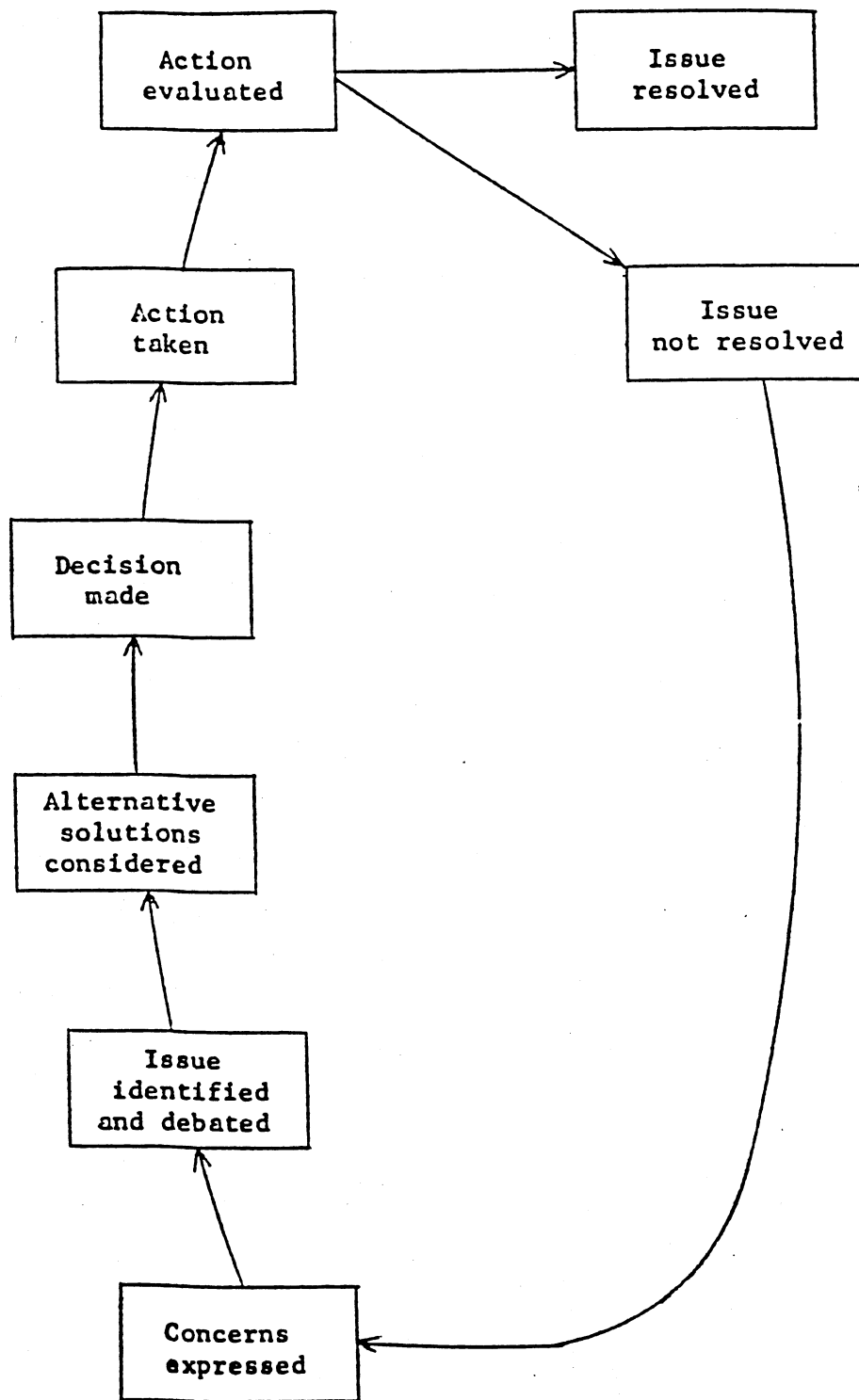


Figure 1. The policy issue cycle

in the last farm bill, conservation reserve and other land idling policies are enacted.¹

Despite the conflicts and delays that invariably accompany the making of public policy, there are means of expediting the journey through the policy cycle. Political scientist Daniel Ogden writes, "In the United States, public policy is made within a system of semi-autonomous power clusters. Each cluster deals with one broad, interrelated subject area, like Agriculture.... Each cluster operates quite independently of all other clusters to identify policy issues, shape policy alternatives, propose new legislation, and implement policy" (p. 34). Each power cluster includes administrative agencies (government departments, bureaus, services, and commissions), legislative committees, interest groups, professionals (including policy research and extension economists), volunteers, an attentive public, and a latent public.

Ogden defines the attentive public as citizens who "...pay special attention to one area of public policy. Usually it is the area in which they make a living and hope to advance both economically and socially. Thus, farmers pay attention to agricultural policy and hikers, hunters, and fishermen pay attention to public land management policies..." (p. 38).

Ogden describes the latent public as people "...who have interests which are affected by the power cluster but who do not normally pay much attention to the cluster for they do not perceive that its policies will change to affect them adversely. They normally identify with another power cluster and focus their attention on its affairs. So long as the policy upon which they depend continues consistently, they are content not to interfere in the affairs of the other cluster and do not expect to be consulted about changes. However, a major switch in policy which effects this latent public may stimulate them to interfere in the cluster's internal decision-making to protect their own interests." Consumers often fit this description, protesting only when farm policies threaten to boost food prices dramatically or to ignore food safety and quality. And the general public is typically a latent public when it comes to issues like world hunger.

Membership in the Agriculture power cluster has expanded dramatically in recent decades--which can either slow or speed up the process of resolving conflicts. Don Paarlberg drew our attention to this development during the 70's when he wrote and spoke of the changing "farm policy agenda committee" and the issues added to the agenda by new members

¹The food and agricultural policy issue cycle which began in 1981 and led to passage of the Food Security Act of 1985 is especially well documented. See Spitze (August 1986 and a 1987 article for Agricultural Economics) and papers by Penn, Browne, Barrows, Flinchbaugh, and Behm in the 1986 issue of the proceedings of the National Public Policy Education Conference, titled Increasing Understanding of Public Problems and Policies.

(pp. 95-96). He cited, in particular, food price issues placed on the agenda by consumers; USDA food programs, an issue placed on the agenda by what had become known as the hunger lobby; and ecological questions, added to the agenda by environmentalists; as well as land use issues, civil rights, and collective bargaining for hired farm labor.

While the complexion of many of these issues has changed since the 70's, certainly the membership in the Agriculture power cluster has continued to broaden. Consider the 1985 Food Security Act. Resource conservation provisions of the Act--the conservation reserve, sodbuster, swampbuster, and conservation cross compliance provisions--were the product of a remarkable coalition of old and new power cluster members representing food, farm, rural community, resource conservation, and environmental interests.

What Do Economists Do?

Economists play different roles in the public policy process. Many serve as policy analysts and advisers. They work for private firms and organizations, as well as for government bureaus and agencies. Some are self-employed consultants. However, the economists for whom this workshop is mainly intended are those doing public supported policy education and research, primarily in land grant universities.

Whatever their titles and affiliations, economists involved in the public policy process have much in common. All practice economics and all are professionals who presumably meet the same basic standards of professionalism. While their roles may differ with respect to purpose, mode, and clientele, they all seem to share the task of helping participants in the policy process make better decisions (Quade, p. 13). The main difference between the roles of land grant university economists and other economists in the policy process is that the former serve a broader public.

As this workshop is concerned with the roles of land grant economists in the policy process, let's now consider how those roles are shaped 1) by the purpose, principles, and practice of policy extension education, 2) by the interface of policy extension and research, and 3) by the economist's tool kit.

Policy Extension Education--Purpose, Principles, and Practice

The rationale for policy extension stems from three fundamental beliefs: The land grant system, along with the U.S. Department of Agriculture (which Abraham Lincoln labelled "the People's Department"), has a unique responsibility to serve the general public; an effective democracy depends on an informed electorate; and so the role of public policy extension education is to provide the general public with the knowledge, facts, and information they need to be informed participants in the policy process. Or, as California extension economist Bill Wood puts it, "The outcome of public policy education must be effective democracy at work" (p. 184).

Public policy education is a relative newcomer to extension's program menu (Bottum, p. 185). Conceived during the Depression of the 30's, it reflected a growing awareness that farmers, individually and collectively, could not fully shape their own destinies. The need for government intervention and enlightened public policies was deemed inescapable. Agricultural economists were especially instrumental in raising awareness of the need and support for policy education to help ensure wise decisions. In fact, from its inception, policy extension has been the particular domain of agricultural economists. Even though the policy issues addressed have gone well beyond the farm income problems of the 30's, and for that matter beyond economics, only within the last two decades have we seen a significant broadening of the community of public policy extension workers from economic specialists to other social science disciplines (Flinchbaugh, 1977).

Land grant and policy extension leaders have developed an impressive set of principles to guide their educational programs.² These principles grew out of a commitment to the purpose of public policy education and a professional comraderie fostered by dedicated individuals and institutions. The Farm Foundation, for example, has sponsored a National Public Policy Education Conference in each of the last 36 years, bringing together policy extension leaders and specialists from every region to swap educational experiences and to sharpen their teaching skills.

Major questions addressed by the principles for policy extension are, What is the most effective educational approach? Who are the students? What policy issues should extension address? When should policy educators teach?

What is the best educational approach? The guiding principle is clear: The purpose of helping the public be informed participants in the policy process will not be well-served if the educator becomes an advocate for one group or policy position. Public policy educators must strive to be as objective and unbiased as possible. The teaching "model" which extension educators generally believe fits this principle the best is the so-called alternatives-consequences model in which a manageable number of policy alternatives is singled out for discussion, including an assessment of their consequences for different individuals and groups. The alternatives are those identified by participants in the public policy process, including extension educators themselves.

Commodity program alternatives identified in past policy extension programs have typically included some version of price and income supports, production controls, and a market-oriented policy, with different bells and whistles for specific commodities. Consequences of the alternatives

²See especially a new report edited by Roy Carriker with papers by Barrows, Spitze, Marshall, and Ogden, as well as articles on policy education methodology and experiences in the annual reports, Increasing Understanding of Public Problems and Policies, published by the Farm Foundation, Oak Brook, Illinois.

considered in the policy process include the effectiveness of the policy in achieving its goals and its expected impacts on different people and interests--farmers, input suppliers, consumers, taxpayers, and so on.

Policy extension educators know that the alternatives-consequences model helps to ensure but never guarantees objectivity. Extension can depart from objectivity in innocent and trivial ways--through the choice of policy issues addressed, the kinds and order of policy alternatives identified, and the possible consequences discussed in the educational program. The uneven availability of research-based knowledge and facts may contribute to the perception that extension educators are biased. For example, agricultural economists have probably produced more information and facts about the impacts of food and agricultural policies on farmers than on consumers and other affected persons, on the grounds that the impacts on these other groups are widely dispersed. Nevertheless, the unevenness can carry through to the policy extension program unless the policy educator fills the void, making sure that all affected parties and consequences are considered.

Harold Breimyer, for one, has written of more serious threats to objectivity (p. 4): "The most obvious challenge to the integrity of the University and its scholars is private funding of research, either institutionally or as private consulting. These are alike in that both compromise the basic role of the Land Grant University. That role is to spread knowledge, to make it a public good." But the more general threat to integrity, Breimyer goes on, "...is not that which is bought but that which is subtly induced. Some research and extension economists attach themselves to an interest group so tightly as almost to be indentured."

He has a point. The extension worker in daily contact with farmers, homemakers, or local leaders, not only identifies with their problems but, anxious to continue serving them, may adopt their positions without realizing it. As USDA's Extension Administrator in 1977-79, I found myself often in the middle of claims and counter claims regarding extension objectivity. Department officials and nonfarm interest groups complained that extension agents were "indentured" to farmers as well as to agribusiness firms which helped to finance agent training. Newspaper clippings routed to me told of extension staff, concerned about possible adverse effects of USDA actions on farmers, publicly misrepresenting facts and speaking out in opposition to Departmental support of measures to protect food safety and to ban 2,4,5-T or other pesticides believed to cause cancer.

So, like it or not, extension--especially policy extension--is an actor in the political arena. It is never politically neutral (Barrows, p. 16). Merely addressing an important issue in a policy extension program increases public awareness of the issue, the policy alternatives, and their consequences, and thereby potentially alters the balance of power.

Complete objectivity is impossible. As Breimyer puts it, "Personal capacity for detached objectivity is an uncommon endowment, while inducements to compromise are many" (p. 6). But of course those

inducements to compromise must be resisted if the mission of the land grant system is to be fulfilled.

Who are the students? The ideal of an informed electorate and the goal of providing useful knowledge and information to that electorate implies a large, diverse student body. As a minimum, we think of it as including the individuals and organizations most directly interested in or affected by the policy issues addressed--Ogden's attentive public. And we certainly do not exclude the "latent" public.

One challenge is to resist pressure to limit the audience. It is easier, and results come faster, if programs are designed for and targeted to the more highly motivated, knowledgeable audiences. Pressure to do so builds as the performance of extension educators is judged more and more by evidence of immediate, observable results.

Moreover, policy specialists have made important contributions through educational programs for Congressional staff and other direct participants in the policy process. Often under the label of leadership development, extension has given agricultural and rural leaders who influence policy--and who teach others--far greater knowledge and understanding of policy issues, alternatives, and consequences than would have been possible through a program for a broader audience.

Policy extension education and leadership development are not either-or's. But at some point, the commitment of the land grant system to the ideal of an informed electorate could be impaired unknowingly if the balance shifts too far toward serving special audiences. Not only would that give undue advantage to some participants in the process, it would raise the troublesome question, who in fact decides whom extension should serve?

What policy issues should be addressed? The public decides, not extension educators or others in the university. Often, of course, different people will perceive an issue differently. It is up to the extension educator to help them understand when and if the issue in their eyes is part of a larger or another problem. Even when it is, the smaller issue may be the one to address if it is the source of major public concern or is simply more manageable.

When to teach? The guiding concept is the "teachable moment." Simply stated, you can address a policy issue too early (adequate interest and concerns have not surfaced) or too late (emotions are too high or positions have already been taken). The teachable moment also applies to each stage of the policy issue cycle (Figure 1). That is, you can be too early or too late preparing material and conducting programs to fit each stage of the cycle.

The Interface Between Policy Extension and Research

The two-way relationship between research and extension under the same land grant college roof is unique among public supported institutions worldwide. In theory it works this way: Research produces knowledge

and facts which extension adapts, interprets, and conveys to the public through educational programs. Extension identifies knowledge gaps or information needed for effective educational programs, which researchers seek to close.

As Bob Spitze explains, "The organization at each educational institution can effect the productivity of this relationship. When the same person is both the researcher and the policy educator, the integration is easy. However, when they involve separate professionals or when the programs are administered separately, there is often difficulty in achieving this integration" (August 1987, p. 24).

Natural differences between research and extension preclude perfect integration of the two functions. Different policy researchers typically contribute very different kinds of data and analyses at different stages of the policy issue cycle, and much of it may never be thought of or labelled as policy research. I include the monitoring of trends and analysis of relationships which may, perhaps only by chance, describe, clarify, or quantify public problems, thereby supporting or dispelling reasons for public concern. For example, in past years, agricultural economics research carried out quite separately from policy education programs clarified, if not dispelled, concerns that independent owner/operator farms were vanishing with the spread of corporate agriculture and foreign ownership of farmland. Results of independent research may also identify potential policy problems.

Analyses of policy alternatives and consequences and evaluations of current policies and programs, probably come closest to what most of us think of as policy research. Here too, the research is not necessarily done as an integral part of a policy research and education program.

Still, a solid partnership between extension and research is essential. In my view, extension should have a strong voice in guiding policy research. Researchers probably listen too little to extension when deciding what to research, and extension educators are probably too timid when it comes to telling researchers what they need. An unfortunate pecking order persists. Research is still seen by many researchers, and administrators who came up through research, as somehow higher on the ladder of professionalism than extension. The irony, of course, is that if achievement in the agricultural sciences is held in higher esteem than public service, the uniqueness of the land grant system and its claim to public support will probably erode.

The Economist's Tool Kit

So far, what I have said about policy extension and the interface between policy extension and research could apply to any discipline or to any land grant professional involved in the policy process, not just economists. To answer the question, what can the economist do and not do in the policy process, I must acknowledge the role and use of the economist's tool kit. A review of the history of economic thought would be needed to describe adequately the pertinent economic concepts,

knowledge, theories, and techniques. Here I can only point to some highlights and trends.

Classical and neoclassical economics have provided the economist with powerful concepts of human behavior, but they also suffer from important limitations for policy work. Despite the relevance of focusing on issues of choice and decisionmaking, classical and neoclassical economics have had application mainly to individual decisions rather than public decisions and actions. The central importance of markets and the accompanying emphasis on monetary values and economic efficiency in production and distribution are further limitations. So too is the historical emphasis of economics on value-free, positive knowledge and the perception that human values could not be identified and analyzed objectively by economists, and therefore were beyond the domain of economics.

Through time, the economist's tool kit has been amended and refined. Improvements in the relevance of economics have often come at a faster pace in periods of criticism, such as the 1960's when economics, science in general, and our academic institutions were taken to task for failing to solve major problems of society. Agricultural economists, with their applied orientation, have been instrumental in forging more practical economic concepts and tools.

Major additions and refinements relevant to policy research and education have come with developments such as welfare economics, institutional economics, and more recently public choice theory (Spitze, August 1986, pp. 5-8). Welfare economics, though still suffering from restrictive assumptions and other practical limitations, at least has helped to increase the economist's awareness of the importance and the feasibility of objective normative knowledge (knowledge about values) as a companion to positive knowledge of existing facts and relationships. Glenn Johnson, Michigan State University, speaks of positive and normative knowledge as the essential ingredients of prescriptive knowledge, which of course has direct value to problem-solving, both private and public.

The stretching of economic thought over the years has also brought a recognition that economics can and should deal with both monetary and nonmonetary values, that its concepts and tools need not be limited to that which can be measured in dollars and cents. Equally important for public policy application has been the economist's understanding and handling of issues of resource ownership and income distribution, as causes of public problems and as effects of different policy alternatives. Indeed, the analysis and compromising involved in making policy decisions typically must deal with the question, who benefits and who pays?

Developments in institutional economics and, more recently, public choice theory have also responded directly and indirectly to the limited applicability of classical and neoclassical economics to public problems and decisionmaking. Clearly, the policy arena involves a variety of institutions and institutional processes in addition to markets. The public choice school of thought typifies the modern extension and reshaping of that thought. As described by Spitze, "It recognizes the

limitations of the classical heritage emphasizing the individual participant, the economic maximizing motivation, and the private market determination of economic value as it focuses instead on a society of groupism, multi-goal seeking human beings, and expanding governmental spheres. In its efforts to conceptually link economic and political motivations and decisions, it deals with 'power maximizing' along with 'individual decision making'... Public choice theorists study political processes as just as logical an expression of the economic striving of rational individuals for achieving maximum utility as a study of the processes of the marketplace" (August 1986, p. 7).

A few closing points are implied by this brief discussion of the tool kit:

- o Effective policy extension and research call for a problem-solving orientation as well as a disciplinary base. They require prescriptive, normative, and positive knowledge. The problem-solving orientation is always potentially restrained by limitations of the economist's tool kit. But many of those limitations have been reduced through time, giving economists increasingly useful concepts, knowledge, and techniques for policy work.
- o Extension economists are comfortable with the problem-solving orientation. Some research economists are not. Sometimes, research and extension economists simply march to different drummers. For instance, the principle of objectivity, to extension economists, usually means providing objective, unbiased knowledge and educational assistance to the public. Researchers view objectivity with equal reverence. But they also desire to be identified with science and recognized as scientists, in which case objectivity tends to mean value-free, rigorous inquiry. Although the standards of excellence in agricultural science and public service should be complementary, in truth they may appear to be at odds. In the extreme, this could weaken the partnership between policy extension and research.
- o I should qualify the last point. If research economists, seeking recognition from their discipline, err by becoming enamored with scientific sophistication and mathematics, extension economists may also err by neglecting, if not abandoning economics as they seek acceptance from their audiences. The pressures to do so are routine. Policy extension economists are called upon to be more than economists. Their audiences need and want educational, problem-solving assistance, not assistance from specific disciplines.
- o As the economist's tool kit expands and becomes more useful for policy application, economists could forget the importance of a basic understanding of economics on the part of participants in the policy process. At times, the most critical (or only) need of participants is for a better understanding of things like demand and supply, economic efficiency, benefits and costs, and marginality, or a simple clarification of economic myths. By

incorrectly assuming a high level of economic literacy among participants, economists could fail to give those people the foundation they must have to become informed participants.

Closing Thoughts

My crystal ball shows a steady rise in the need and opportunities for public policy education and research. Growing interdependencies between people and nations and closer links between food, agricultural, resource, environmental, and rural community issues, all point to more public issues and spillover effects of the kind that spawn public policies. It is simply harder now for people everywhere to be masters of their own destinies without affecting others directly or indirectly. But as policy issues grow in number and complexity, it is also harder for people to maintain their interest and ability to be informed participants in the policy process (Elgin and Bushnell).

My crystal ball shows land grant policy research and extension economists making an impressive contribution to the need for public knowledge and understanding, provided they strive to maintain objectivity, continue to teach a broad public, ensure a strong extension-research partnership, and make wise use of the economist's expanding tool kit.

REFERENCES

- Barrows, Richard. "Basic Principles of Public Policy Education." Roy R. Carriker (Ed.), Policymaking and Policy Education: Papers from a Washington Workshop for Extension Educators. University of Florida. August 1987:2-18.
- _____. "The 1985 Farm Bill and Future Natural Resources Policy Education." Increasing Understanding of Public Problems and Policies--1986. Farm Foundation, Oak Brook, IL, 1986:164-166.
- Behm, Karen S. "The 1985 Farm Bill and Future Family Policy Education." Increasing Understanding of Public Problems and Policies--1986. Farm Foundation, Oak Brook, IL, 1986:167-169.
- Bottum, J. Carroll. "Outcome of Public Policy Education." Increasing Understanding of Public Problems and Policies--1980. Farm Foundation, Oak Brook, IL, 1980:185-187.
- Breimyer, Harold F. "Public Sector Research and Education and the Agri-Business Complex: Unholy Alliance or Socially Beneficial Partnership?" University of Missouri-Columbia, Department of Agricultural Economics Paper 1973-27, 1973.
- Browne, William P. "Lobbyists, Private Interests and the 1985 Farm Bill." Increasing Understanding of Public Problems and Policies--1986. Farm Foundation, Oak Brook, IL, 1986:148-159.
- Elgin, Duane S., and Robert A. Bushnell. "The Limits to Complexity: Are Bureaucracies Becoming Unmanageable?" The Futurist. December 1977:337-349.
- Flinchbaugh, Barry. "Opportunities for Effective Extension Policy Education." Increasing Understanding of Public Problems and Policies--1977. Farm Foundation, Oak Brook, IL, 1977:14-16.
- _____. "The 1985 Farm Bill and Future Commodity Policy Education." Increasing Understanding of Public Problems and Policies--1986. Farm Foundation, Oak Brook, IL, 1986:164-166.
- Gratto, Charles. "Public Policy Education--A Model with Emphasis on How." Increasing Understanding of Public Problems and Policies--1973. Farm Foundation, Oak Brook, IL, 1973:40-49.
- House, Verne W. "An Introduction to Policy Education." Talk for Policy Education Project Workshop, Otter Rock, OR, September 20, 1976.
- Johnson, Glenn L. "Roles for Social Scientists in Agricultural Policy." Paper presented at Conference on Religious Ethics and Technological Change, Iowa State University, Ames, IA, February 20-21, 1986.

- Leman, Christopher K., and Robert H. Nelson. "Ten Commandments for Policy Economists." Journal of Policy Analysis and Management. 1(1981):97-117.
- Marshall, J. Paxton. "Extension Education on Public Policy Subjects." Roy R. Carriker (Ed.), Policymaking and Policy Education: Papers from a Washington Workshop for Extension Educators. University of Florida. August 1987:27-32.
- Ogden, Daniel M. Jr. "How National Policy Is Made." Roy R. Carriker (Ed.), Policymaking and Policy Education: Papers from a Washington Workshop for Extension Educators. University of Florida. August 1987:34-49.
- Penn, J.B. "Public Policy Education and the 1985 Farm Bill." Increasing Understanding of Public Problems and Policies--1986. Farm Foundation, Oak Brook, IL, 1986:139-147.
- Quade, E.S. Analysis for Public Decisions. New York: Elsevier Science Publishers, 1975.
- Spitze, R.G.F. Determinants of Agricultural and Food Policy Decisions in the U.S. University of Illinois, Department of Agricultural Economics Staff Paper 86 E-362, August 1986.
- _____. "The Evolution and Implications of the U.S. Food Security Act of 1985." Agricultural Economics. 1(1987):1-16.
- _____. Food Security Act of 1985--Implications for Agricultural and Food Policy Research. University of Illinois, Department of Agricultural Economics Staff Paper 86 E-359(Rev.), February 1987.
- _____. "Organizing the Substance of Policy Education--Issues, Alternatives, and Consequences." Roy R. Carriker (Ed.), Policymaking and Policy Education: Papers from a Washington Workshop for Extension Educators. University of Florida. August 1987:20-25.
- Wood, William W. Jr. "Outcome of Public Policy Education." Increasing Understanding of Public Problems and Policies--1980. Farm Foundation, Oak Brook, IL, 1980:183-184.

DISCUSSION: WHAT CAN THE ECONOMIST DO AND NOT DO IN THE PUBLIC POLICY PROCESS?

Roy Carriker

Introduction

Jacob Viner once defined economics as what economists do (McKenzie, p. 627). Neill Schaller devotes a section of his paper to a discussion of "What Do Economists Do?" He tells us that economists play several roles: they serve as policy analysts and advisers, they work in the private sector as well as for government, and they do education and research in land grant universities. Dr. Schaller observes, citing Quade, that they all "seem to share the task of helping participants in the policy process make better decisions." But what do economists do, as economists, when they advise, work, analyze, and help? And how do these economists define "better" decisions in the policy process?

In his section on "The Economist's Tool Kit" Schaller states that a "review of the history of economic thought would be needed to describe adequately the pertinent economic concepts, knowledge, theories, and techniques." He therefore limits his discussion to some "highlights and trends." He alludes to the classical and neoclassical traditions in economics and credits them with providing the economist with powerful concepts of human behavior. He notes that these traditions have some inherent limitations and asserts that welfare economics, institutional economics, and public choice theory constitute major additions and refinements relevant to policy research and education.

Schaller declines to be specific in his treatment of the economist's tool kit and the appropriate role of the economist in the public policy process. Yet he is willing to assert that "...extension economists may ... err by neglecting, if not abandoning economics as they seek acceptance from their audiences." Implicit in this statement is the presumption that there is some agreed-upon definition of the appropriate analytical and prescriptive response by economists to particular categories of public policy issues and of the role of economics as a thought system in the policy arena. But the scholarly journals of economics indicate that there is persistent disagreement among competent and articulate economists on just this very point. Disagreements among economists go deeper than mere disputes about priorities and tactics for doing economic analysis in the context of public policy decisions, where all participants share a common vision of what economics is and should be. Rather, these disagreements include alternative conceptions of economics and extend to fundamentally different methodological orientations among economists (McKenzie; Randall; Shabman).

Roy Carriker is Professor and Extension Economist, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL.

Methodological Boundaries of Economics

The differences in methodological orientation have received slightly different treatment by different authors, but the central theme is the same. Shabman (p. 1030) recasts several schools of thought into two groups: the "mainstream" and the "institutional". Mainstream economics demonstrates the role of markets in solving resource allocation problems through creation of exchange prices. Mainstream economists tend to focus their work on the potential for voluntary market exchange for allocating resources. Often, the mainstream economist implicitly accepts the Wicksellian compensation principle of justice (even if he or she has never heard of it), and insists that social organization based on market exchange can be treated objectively as a superior organizational form. Economic efficiency is the product of the exchange process, and its virtues are used to justify economic efficiency as the main determinant of social welfare. The mainstream economist bases policy prescriptions on the view that the legitimate role of government is to facilitate market exchange by the definition and enforcement of transferable property rights. If for some reason markets cannot be established, government should regulate resource allocation decisions so as to mimic the allocative results of an idealized market.

Institutionalists acknowledge the allocative potential of markets or market-like institutions (Shabman, pp. 1030-1031). However, institutionalists do not attach any prescriptive significance to the outcomes of market allocations. They point out that economically efficient outcomes, in the mainstream conception, are non-unique: each reflects a distribution of income determined by existing property rights and the existing knowledge base that determines preferences and production technology. Institutionalists view economic efficiency as one of many goals which the political process might legitimately choose, not as a preeminent goal to be presumed by the analyst. The institutionalist views market price as a reflection of human values, but inquires further into the determinants of human values and the factors that cause human values to change. To this extent the institutionalist carefully avoids confusing the behavioral postulate of utility maximization (and its corollaries) with models based on behavioral research. Exchange is viewed as but one mechanism that has evolved over the millennia for organizing the relationships among people as they relate to resources and other substances of importance to individuals. The institutional focus of study extends to the multiple cultural political and social institutions that affect property rights, human values, and resource allocation. Collective action through government is not justified solely to make markets work or to mimic market results. Government exists to provide a socially legitimate means for promoting values and for redistributing property rights in ways that would not result from idealized market exchange.

Since the equimarginal rule for consumer utility maximization was first precisely formulated, mainstream economists have enthusiastically adapted and applied it to almost everything people value. The behavioral postulate characterizing our conduct as consumers has been adapted to the economics of crime, fertility, family relations, discrimination, anarchy, political decision making, charity, human capital, ethics, law, bureaucratic management, and constitutional development (McKenzie, pp. 627-629; for example, Yandle). The mainstream school of thought treats economics as follows: the individual is assumed to have wants, which can be anything, and, regardless of what he wants, he will follow the equimarginal rule. By identifying the good or goods in the individual's utility function, the equilibrium conditions can be specified; external institutional changes,

similar to changes in relative prices, or incomes, can be postulated; and predictions can be made as to how the utility maximizing individual will respond.

This construction is plausible to the extent that the behavioral postulate is plausible. However, the approach may not, by itself, yield predictions of human behavior for at least two reasons:

- (1) it fails to account for the process by which values are acquired and preferences are developed in individuals. Propositions concerning the results of maximizing behavior are not refutable unless the relevant portions of individual preference functions are known and amenable to measurement. Such knowledge can come only from systematic research into the process by which people acquire and revise their personal value systems.
- (2) this approach also fails to account for the role of institutions in determining "whose values count" in any given decision making process. Thus any effort to predict or explain the outcome of human decisions must explicitly consider, not by assumption but by empirical investigation, the differential effect of institutions on which value systems will come to bear in the decision process.

To limit our definition of the legitimate domain of economics to the analysis of decision outcomes given a single behavioral postulate that governs conduct is to unnecessarily prevent economists from asking most of the truly interesting questions about why people make the kinds of choices they do. The consequences for credibility are real. The deputy staff director of the U. S. Senate Committee on the Budget made this comment to an audience of agricultural economists:

I would be less than candid if I did not indicate what many of you already recognize, a widespread disenchantment among decision makers with our profession in helping to guide economic and agricultural policy. I argue that, in part, this is because of our failure to grasp the institutional and organizational changes that have evolved ... and how those changes have impinged on policy and economic theory (Hoagland, p. 1017).

We know, from research in psychology and sociology, that human values differ from culture to culture, that an individual's values are learned, that education can cause an individual to realign his values, that age, experience, and maturity are often attended by a change in personal values. The explanatory power and the predictive power of these research results need to be systematically organized and directed, by economists, to the questions of human choice under conditions of relative scarcity.

Implications For Economists in the Policy Process

In all likelihood, most of the economists involved in the policy process in one capacity or another are not familiar with the arguments and distinctions pertaining to methodological orientations of economists. However, it would be interesting to study the de facto methodological orientation of each. While many economists would identify themselves as "mainstream" by Shabman's definition, it is likely that most of them have in fact adopted certain aspects of the institutionalist

approach in order to better define the larger context within which certain kinds of mainstream analysis is useful. Sir Alec Cairncross, in his Richard T. Ely lecture to the American Economics Association, suggested that economics is undergoing a rapid division of labor, with a lengthening chain of intermediaries between the priestly who live in clouds of theory and the lay brethren in Washington, Whitehall and elsewhere, who do battles in the corridors of power (Cairncross, p. 1) The latter have learned that economic rationality may at times stand in contradiction to political rationality because mainstream economic analysis is not attuned to the political linkages that may be forged between seemingly unrelated decisions (Shabman p. 1033). They have come to recognize that the debate over social values cannot be avoided by maintaining a facade of scientific objectivity and insisting that economic efficiency is value-neutral. Economists who are comfortable in the policy arena have probably learned to be sensitive to the way others can find statements of value in economic arguments, and have used those insights to achieve a more careful crafting of economic advice.

Return to the question, "What can the economist do and not do in the public policy process?" The quick answers are suspect. So is Schaller's assertion that "...extension economists may ... err by neglecting, if not abandoning economics as they seek acceptance from their audiences." The question cannot be approached without explicitly dealing with assumptions about the legitimate domain of economics and with differences in methodological orientation among those who call themselves economists.

REFERENCES

- Cairncross, Sir Alec. "Economics in Theory and Practice." American Economic Review. 75:2 (May 1985): 1-14.
- Hoagland, G. William. "The Need to Rethink Agricultural Policy in General and to Perform Some Radical Surgery on Commodity Programs in Particular: Discussion." American Journal of Agricultural Economics. 67:5 (December 1985): 1017-1019.
- McKenzie, Richard B. "On the Methodological Boundaries of Economic Analysis." Journal of Economic Issues. 12:3 (September 1978): 627-645.
- Randall, Alan. "Methodology, Ideology, and the Economics of Policy: Why Resource Economists Disagree." American Journal of Agricultural Economics. 67:5 (December 1985): 1022-1029.
- Shabman, Leonard. "Natural Resource Economics: Methodological Orientations and Policy Effectiveness." American Journal of Agricultural Economics. 67:5 (December 1985): 1030-1034.
- Yandle, Bruce. "Models of Political Economy of Regulation: an Insider's Perspective." Gary D. Lynne and J. Walter Milon (Eds.), The Political Economy of Natural Resource and Environmental Use. SRDC Series No. 79. Mississippi State, MS: Southern Rural Development Center in cooperation with the Farm Foundation. June 1985: 90-107.

WHAT CAN THE ECONOMIST DO AND NOT DO
IN THE PUBLIC POLICY PROCESS?: COMMENT

Craig L. Infanger

What is our model for policymaking? What is the role for economists in the policymaking process? Policy educators need to improve the use policymaking models by examining the literature of applied political science. While Ogden's power cluster model explains structure, it does not adequately address system behavior. One alternative is the Lindbloom model of policymaking as "incrementalism". Within the policymaking system, economists can serve several different functional roles but it is imperative to recognize the differences in objectives and behavior for each role.

W. Neill Schaller has addressed many of the fundamental issues regarding economists, policymaking, and policy education. I will focus on two questions: (1) What is our model for policymaking?; and (2) What is the role for economists, or for that matter social scientists, in the policymaking process?

While Schaller focused on Dan Ogden's power cluster policy model, I will argue this is a model of structure (the who, what, and where of policymaking) but not a model of behavior (the why and how). I agree with Schaller that economists play different roles in the public policy process. I want to suggest some functional roles and argue that we, as public educators, ought not to attach differing degrees of respect or goodness to these roles but carefully recognize the distinctions.

WHAT IS OUR MODEL OF PUBLIC POLICYMAKING?

What do we as agricultural economists use to understand, explain, and predict policymaking? Ogden's power cluster model is certainly an improvement on the Iron Triangle concept and is becoming more familiar to policy educators and our students. The power cluster idea is a practical, even earthy, articulation of the issue network concept popularized by Hugh Heclo.

In recent months it has been forcefully brought to my mind that Ogden's power clusters are a description of the policymaking structure but not the policymaking process. That is to say, a power cluster helps a student or analyst

Craig L. Infanger is Extension Professor and Extension Specialist, Department of Agricultural Economics, University of Kentucky

understand the who, what, and where questions about policymaking at national, state, and local levels. It even describes behavioral aspects of participants. It does not, however, describe the operation of the policymaking process, the behavior of the system. These are the crucial "Why?" and "How?" questions so necessary if understanding, much less explanation or prediction, is possible for policy analysts and educators.

Where do policy educators turn for a model of the policymaking process, the behavior of the system? There is a substantial body of literature available, primarily in applied political science. Literature overviews are available in one book by Dye and another by Anderson. It is clear that political scientists have, in the words of Anderson, "more facility and verve for theorizing about public policy than for actually studying policy" (p. 8). Models competing for application include such concepts as the rational comprehensive model, the functional process model, systems theory, institutionalism, and mixed scanning.

From this literature I have found one particular model by Lindblom useful in my policy education--both in the classroom and with my off-campus students. Lindblom's model describes the policymaking process as one of incrementalism. It is a model of pragmatic behavior in the face of competing group demands. Lindblom argues policymakers are essentially pragmatic compromisers, not searching for Pareto optimality but for "something that will work". In fact, Lindblom's article is titled, "The Science of Muddling Through".

Lindblom's incrementalism, his "muddling through", is certainly applicable to agricultural policy. For example, I think incrementalism is useful in explaining to farm groups in my state why it is highly unlikely that the Food Security Act of 1985 will be re-opened by this Congress to substitute Harkin-Gephardt mandatory production controls legislation.

Lindblom is perhaps not "the best"; it is certainly not "the only" model of the policy process. Nonetheless, we as policy researchers and educators out to become more familiar with the available literature. For example, Jack Hansen's 1985 article on "Congressmen and Interest Groups: The Development of an Agricultural Policy Network in the 1920s" examines the question of why an "agricultural price policy network" replaced the Farm Bloc and political parties as the dominant determinant of farm policy. He argues, and persuasively I think, that issue networks arose (1) because groups acting in concert can take care of friends farm better than political parties or local political machinery; and (2) the catalyst for an issue network is the expectation of both group and issue recurrence. Hansen concludes,

"...the agricultural lobbies proved their superiority to bands of local loyalists and to parties in transmitting

political communications and intelligence and in advancing their interests...the farm groups had shown that they could do what parties and local backers at the time could not: help congressmen get a farm program, help them claim credit for it and help them return to office.

Secondly, representatives established close and regular ties with interest groups because they had determined that price support was an issue that was going to come up again and again." (p.41)

Thus, to return to my first question: "What is our operational model for policymaking?" I think policy educators have probably treated too lightly the basic need for models of policymaking. Many have relied on intuitive and unsystematic shorthand for explaining the policy process. Adopting Odgen's power cluster concept is a step in the right direction but it is time we went further into the available literature.

The consequences of inattention to policymaking models are serious. Oftentimes we cannot communicate with decisionmakers. Either our information is irrelevant or it is poorly timed. In many cases we don't know what is important and what is trivial. And finally, we are unable to predict and explain, which is after all the function of a model in the first place. Bill Hoagland paraphrased Sir Alec Cairncross to describe the consequences this way:

"...economists fail to grasp some of the most important factors that shape public policy. Government is not a simple optimizing activity that can be reduced to a second differential; it is more likely to be a collection of bald-headed and somewhat bewildered men sitting around a table, harassed and short of time, full of doubts and dogmatism, with all the strengths and failings of successful politicians" (p.1018)

WHAT IS THE ROLE OF ECONOMISTS IN POLICYMAKING?

To turn to the second question: What is the role for economists in the policymaking process? Or as our session organizers have stated it, "What can the economist do and not do in the public policy process?"

As Schaller has argued in his paper, there are different roles for economists in policymaking. I would re-state these roles in functional terms:

--The Impartial Provider of Analysis and Information. This is the most common and stereotypical role for an economist. These are the economists who desperately want to believe they are scientists, value-free and un beholden. These economists are sometimes surprised when their analysis is

ignored and occasionally shocked when they see how policymakers use the products of their analyses.

--The Policy Legitim�izer or Apologist. These economists have assumed the objective function and values of their employer or patron. Pareto optimality and economic efficiency are, of necessity, a secondary concern. These economists might reply to a policy inquiry, "Oh, you want to know what I think about the issue; oh well, that is a different matter."

--The Policy Advocate. These are the Paul Craig Roberts's and Lester Thurow's of policymaking. They are pushing a economic agenda, not necessarily representing an organization but oftentimes an ideology.

--Policymaker. This is the most rare of all functional roles. There are few examples: Garry Carruthers, Governor of New Mexico; Phil Gramm, U.S. Senator from Texas. We have much to learn from these economists if we can persuade them to return to the educational system when their present role ends.

--Policy Educator. These are the economists with students and an obligation for responsible enlightenment. They should have good models and reliable data but sometimes lack both. They should have experience within the policymaking system but often don't. Their education should provide analysis with perspective, not merely "the numbers".

I believe economists can perform in any of these roles in the policymaking system. Each of these roles is viable, legitimate, and functional. There are, however, differing objectives and behavior patterns within each role. It is imperative that these differences be recognized and appreciated.

We, as educators, should not let our academic arrogance attach differing levels of respect to these roles. However, the absolute necessity is that we not mix up the roles and assume an economist is performing in one role when in fact he/she is not.

References

Anderson, James E. Public Policy-Making, 2nd ed. New York: Holt, Rinehart and Winston, 1979.

Dye, T. Understanding Public Policy, Englewood Cliffs, N.J.:Prentice-Hall, Inc., 1981.

Hansen, John Mark "Congressmen and Interest Groups: The Development of an Agricultural Policy Network in the 1920s." American Political Science Association annual meetings, New Orleans, 1985.

Lindblom, Charles E. "The Science of Muddling Through.", Public Administration Review 19(1959):78-88.

Heclo, Hugh "Issue Networks and the Executive Establishment.",The New American Political System, ed. Anthony King. Washington, D.C.: American Enterprise Institute, 1980.

Hoagland, G. William "The Need to Rethink Agricultural Policy in General and to Perform Some Radical Surgery on Commodity Programs in Particular: Discussion.", Amer. J. Agr. Econ. 67(1985):1017-1019.

Ogden, Daniel M., Jr. "How National Policy Is Made". Policymaking and Policy Education: Papers From a Washington Workshop for Extension Educators, ed. Roy R. Carriker, Dept. of Food and Res. Econ., University of Florida, January 1987.

UTILIZING ECONOMETRIC PRICE ANALYSIS MODELS IN EXTENSION OUTLOOK AND MARKETING PROGRAMS

David Miller¹

The history of extension work is one filled with applications of technology to the problems of the agricultural producer. With the shift away from diversification of many farm businesses a need has developed for more precision in financial management and marketing. In response to these needs, the extension farm management specialists in Missouri have been incorporating the findings of the Food and Agricultural Policy Research Institute (FAPRI) into various aspects of the farm management and outlook programs.

Incorporation into Outlook Programs

The Missouri extension farm management program includes as one of its segments farm price outlook projections. Various methods of delivery are utilized in getting this information to the producers. One method that is used is a series of amplified-telephone conference calls wherein 7 to 15 locations across the state are linked together. State specialists are assembled to make basic outlook statements and present current market fundamental information. These specialists are then available for a question/answer session from the participants at the remote locations.

A major part of these conferences is the presentation of the quantity and price projections that are developed by FAPRI. The major focus within the state of Missouri is centered on corn, wheat and soybeans along with cattle, both feeders and fat cattle, and hogs. The yearly average price projections are presented as a guide to producers in developing benchmarks for analyzing price offerings throughout the marketing year. These yearly average prices can also be used as base guidelines for financial projections such as cash flow projections, profit and loss estimates and long range plans. Price and quantity expectations are presented for a 10 year planning horizon.

A strength of using an econometric model for outlook work is the ability to answer the "what if" questions of producers by applying the impact multipliers that are generated by the model. Both quantity and price impacts can be handled in this matter. For example, a producer may ask what is the expected impact on soybean prices if production is cut by 100 million bushels. Through use of the impact multipliers this question is readily answered. Likewise, the impact of a reduction (or increase) in corn production can be estimated for soybean prices. Estimates of this type are useful to producers in judging how changes in

¹David Millser is an Extension Associate/Researcher, University of Missouri, Columbia, Missouri.

crop size can impact price expectations. These changes in expectations can then be incorporated into existing plans and projections.

In addition to the outlook conferences, several other types of delivery methods are used in presenting outlook information. One of these is the newsletter or printed outlook statement. In Missouri, outlook newsletters are printed quarterly for hogs and cattle, semi-annually for feeder cattle and annually for land values and interest rates. In the newsletters, the projections of the econometric models are used in conjunction with other sources of information to develop composite estimates. Various segments of the newsletters, such as the interest rate projections may come directly from the models.

Incorporation into Policy Programming

A second use of econometric models is in policy programming. Analysis done by FAPRI is used as a base estimate of potential impact of the various farm programs being proposed. The policy programs then become springboards for discussion by the participants about the merits or problems associated with the various proposals. Used in this context, the results of the econometric models are not presented as absolute predictions, but rather as most likely scenarios given the assumptions about weather, government action, and other variables within the model.

The strength of using the econometric models in policy programming has been the ability to look at the comparative advantages of the various proposals. This has allowed the producers to be better informed regarding the potential impacts of farm programs over a longer horizon. Utilizing the insights gained through the econometric models, producers are better able to make informed decisions regarding long term investments, marketing plans, and the comparative advantages of participation in government programs.

Aiding Farmer Decision Making

While the information gleaned from the econometric models has been very useful to extension personnel in presenting programs, the question that begs asking is whether or not the information of the models has been useful to the farmer in decision making. The answer to this question is yes, and in many different ways.

One of the primary uses of the information has been as a marketing guide; not as a price predictor per se, but rather as a gauge to judge the relative attractiveness of current market price offerings. As an example, the model estimates that this year's yearly average price for soybeans will be \$4.62 per bushel. Combining this information with the 1975-85 standard deviation for monthly soybean prices, which is \$1.00, one can build a cumulative probability schedule for analyzing soybean prices relative to the expected yearly average price. Using this naive approach, a schedule would be generated that suggests that the probability of monthly prices being above \$5.62 is 0.16 and that the probability of prices being above \$6.12 is approximately 0.1. This type of analysis allows a basis for comparing the current market price

offerings relative to expected average prices. Making the assumption that prices more than one standard deviation above the average are likely to be short-lived, a producer would have been in position to evaluate the recent rally in soybean prices.

A second use of the information by farmers has been in evaluating long term investment decisions. The predicted prices of the model can be used in long term profitability estimates and cash flows. Likewise, the long term estimates can be used to evaluate such problems as the relative impact of placing land in the conservation reserve versus growing crops on it over the next 10 years. Information from the model can be used to generate the relevant financial analysis for each year of the planning horizon. While it is obvious that other variables need also be considered, the estimates of futures prices can be quite valuable in making decisions concerning investment and disinvestment.

A Note of Caution

While the econometric models can be useful in aiding decision making by producers, there are some points of caution which should be exercised when using the output of such models. The first point to note is that the information generated by such models is no better than the accuracy of the data which is inputted. Secondly, the models are typically unable to react to system shocks until after the shocks are known, although the impact multipliers do give relatively good estimates of the effects of minor shocks. A third point is that most of the models currently operating generate yearly average estimates which may be quite misleading for shorter planning periods. These and other concerns should not deter the use of econometric models, but the user should be aware of the limitations of the models and their relevancy to the particular situation.

References

- "Comparative Analysis of Selected Policy Options for U.S. Agriculture."
Food and Agricultural Policy Research Institute, Columbia,
Missouri, Ames, Iowa, February 1987.
- Implications of the Food Security Act of 1985 for Missouri Agriculture:
1987 through 1990 Projection." Food and Agricultural Policy
Research Institute, Columbia, Missouri, May 1987.

HOW CAN THE POLICY MODELS SERVE THE FARMER DECISION MAKERS?

John Ferris ¹

Extension economists should make more use of policy models in their programs with farmers and other audiences. Clientele not only want more detailed analysis of policy options, but also have a growing understanding of the modeling process. At least this is my impression from early efforts to explain a microcomputer version of a model of U.S. and world agriculture. This particular model generates long-range annual projections of about 180 endogenous variables to the year 2000. The solution requires only about three minutes, making possible "live" demonstrations and testing of alternative policies.

Few issues generate more lively discussion and debate than do questions related to farm policy. This has sparked repartee at dinner tables in farm homes, at rural meetings, and in the halls of Congress. And this has been going on for many years. This innate interest in farm policy has provided the Cooperative Extension Service with excellent opportunities for educational programs. Such programs can serve not only to inform farmers, agribusinesses, others in the food system, and the general public about the choices, but also to teach economic principles.

There are some excellent examples of well developed extension programs in farm policy. Last fall when I was interviewed for a videotape on mandatory production controls, the background materials which helped me most were a set of pamphlets prepared by a national extension committee in the early 1960s.

Effective as many of our policy extension efforts have been, we have not been able to be as definitive as we might wish to be in explaining the consequences of alternative policies. Considering the sophistication of our extension audiences today, it is not sufficient to say that mandatory production controls would raise consumer prices and lower Treasury costs. They want to know how much and the timing of the changes. This type of information policy models can provide.

As evidence of the interest in the level of detail, the FAPRI (Food and Agriculture Policy Research Institute of Iowa State University and the University of Missouri) analysis of the Harkin/Gephardt Bill has been given substantial visibility in the popular press. The July 1987 issue of Michigan Agriculture, published by the Michigan Democratic Agriculture Committee, carried extensive references to the study. A recent issue of Farm Bureau News (published weekly by the American Farm Bureau Federation) featured an article on the effects of

¹ John Ferris is a Professor in the Department of Agricultural Economics at Michigan State University.

freezing the level of federal outlays as analyzed by the Washington University Macro Model (WUMM) of Lawrence H. Meyer and Associates.

With improved microcomputer technology and growing availability, new opportunities will rapidly emerge for use of policy models in our extension programs. In recent months, I have developed a fairly comprehensive model of the grain-soybean-livestock sector for the domestic economy and an aggregate international sector to generate export demands. While patterned after the MSU Agriculture Model, this model, known as AGMOD, was basically built from scratch and estimated from annual data beginning in 1960. AGMOD was made possible by a new version of the software package Micro TSP, which just became available in 1986 (Lilien and Hall).

AGMOD presently includes 186 equations, 180 endogenous variables, and 44 exogenous variables. The model could be expanded to a total of 300 variables which is the current maximum for Micro TSP. Micro TSP is not only an excellent program for regression analysis, but it provides a convenient way to formulate models with those equations. The Gauss-Seidel procedure is used to solve the models.

With an upper limit of 300 variables, I have had to be very selective in terms of which items to include and how much detail was really needed. While some sectors of the agricultural economy are omitted, the model is capable of generating answers to the salient policy questions. The relative simplicity of the model facilitates updating, re-estimation, and necessary trouble-shooting that modelers must regularly do. The scale of the model is also an asset in explaining and demonstrating its operation to others, particularly lay audiences.

AGMOD generates annual projections to the year 2000. On my Zenith 248-82 with 512 K, the solution generally is completed in two to three minutes. This facilitates the examination of numerous alternative assumptions about farm policies and other exogenous variables. With a little imagination, microcomputer models such as this could be easily incorporated in extension policy education programs. The process could be demonstrated live with small groups and, with the improvement in computer screen projection technology, could be used with large groups as well. My limited experience in showing this model to lay audiences has been encouraging.

We do need to guard against the possible misuse of these models and their results. We must be liberal with the usual caveats concerning the validity of the assumptions and the inherent errors in the model and the data. Since the policy issues are very sensitive, extreme care must be taken in the presentation of the results. Political figures are tempted to extract the information that supports their case and ignore the negative.

One of the deficiencies of our policy models is that we have not adequately incorporated risk factors. Alternative scenarios are usually depicted by single-valued projections with no direct accounting for the differences in risk. One way to begin to incorporate risk (and model error as well) in policy models is to apply random number generators to the equations. Repeated solutions would trace out the implied probability distributions on the results.

I want to take this opportunity to congratulate Abner Womack and his colleagues who have developed and maintained FAPRI. This is a respected

research group that has demonstrated the value of econometrics in policy analysis. Our Michigan State Agriculture Model group has operated somewhat in a parallel fashion, but with differences in emphasis. We have benefited from the FAPRI experience and I hope the information we have shared with FAPRI has benefited them.

References

Herr, Ronald J. and Donald B. Billings. "A Spending Freeze Could Work." Farm Bureau News, Am. Farm Bureau Fed., July 6, 1987.

Lilien, David M. and Robert E. Hall. Micro TSP User's Manual, Version 5.0. Quantitative Micro Software, Irvine, CA; McGraw-Hill Book Co., New York, NY.

Michigan Democratic Agriculture Committee. "Family Farm Act of 1987." Mich. Agr., July 1987.

National Committee on Agricultural Policy. The Farm Problem ... What are the Choices?. Farm Found. and Ctr. for Agr. and Econ. Adjustment.

INTEGRATING DAIRY POLICY EXTENSION AND RESEARCH PROGRAMS

Andrew M. Novakovic¹

This paper reviews efforts at Cornell to integrate dairy policy extension and research efforts into a coordinated program. Programming with respect to the Milk Diversion Program and the Dairy Termination Program is described. Linkages between extension and research are drawn from these examples. Lessons for future work are suggested. Particular attention is paid to the importance of timeliness, attention to the key interests of policymakers, identifying and working with the appropriate groups, continually building a foundation of information and knowledge from ongoing research and extension, and maintaining programming and administrative flexibility.

INTEGRATING DAIRY POLICY EXTENSION AND RESEARCH PROGRAMS

This paper contributes to the part of this workshop on commodity programs. Its specific purpose is to review efforts at Cornell to integrate dairy policy extension and research efforts into a coordinated program. The approach I will take for this discussion is to focus on two projects with which I have been involved, namely our extension projects relative to the Milk Diversion Program (MDP) and the Dairy Termination Program (DTP) or buyout as it is more popularly known.

At the outset I must add two asides. First, the MDP project involved several people at Cornell and the DTP project involved 16 people at seven different universities. Second, while we think these two efforts were notable, they represent only a part of our total dairy marketing program over the last 5 to 10 years. Part of the story about these two programs involves appreciating the fact that the extension effort was collaborative and that it built on prior research and extension efforts.

¹ Associate Professor in the department of agricultural economics at Cornell University. The author, who has sole responsibility for the content of this paper, wishes to acknowledge the large contributions made to Cornell's dairy marketing and policy programs by James Pratt and Craig Alexander, as well as those who have been associated with our Milk Diversion and Dairy Termination extension programs.

Review of Projects

The MDP and the DTP represent radical departures from a 30 year old program of supporting farm prices for milk. They were adopted to address a surplus problem the magnitude and persistence of which has been unprecedented. Prior to the MDP in 1984, the primary if not exclusive instrument of the Dairy Price Support Program (DPSP) was price, more specifically the purchase prices for cheddar cheese, butter, and nonfat dry milk offered by the USDA as a means to support farm prices for milk. Beginning in 1980, it became clear that a price oriented approach to the growing problem of dairy product surpluses meant lowering the support price, or at least halting the then current policy of frequent and large support price increases.

For obvious reasons, price driven solutions are distasteful to both those who have to authorize and implement them and the farmers who have to live with them. Hence the path to the MDP and DTP involved several steps and a good deal of debate and contention along the way. First came the realization that large and frequent price increases could not be justified. Shortly thereafter it became apparent that even small, annual increases could not be justified. Eventually policymakers came to realize that just freezing the support price wasn't going to solve the problem either. Beyond freezing the support price, Congress, the Administration, and dairy industry leaders could not agree on a solution to the dairy problem.

Through 1981, the forces that typically shape dairy policy today, i.e. Congressional agriculture committees, USDA leadership, and dairy cooperative leaders, failed to resolve their stalemate. In their absence, a remedy for the growing cost of the DPSP was implemented through the Congressional budget reconciliation process. Thus was born the Dairy Collection Plan for directly assessing dairy farmers. The assessment plan proved to be immensely unpopular, although it was very effective in reducing Treasury costs. Dairy leaders had no stake in this program and worked hard to get rid of it. This however forced them to come up with a "better" program. Through 1982 and 1983 the concept of the MDP emerged.

The MDP was conceived and developed by the National Milk Producers Federation (NMPF), which represents most of the dairy marketing cooperatives in the U.S. The NMPF found a sympathetic ear for its plan among the House agriculture committee. The House eventually adopted the NMPF plan with a few modifications to the MDP. An assessment was used to help offset the cost of diversion payments, which was now acceptable to dairy farmer leaders because of the quid pro quo. A nationwide promotion program was added in hopes that a small promotion deduction would help forestall or eliminate the need for larger price cuts. In conference, the House members agreed to future price cuts urged by members of the Senate agriculture committee in the event that the MDP did not achieve a lasting solution.

The evolution of what came to be known as the Dairy Production Stabilization Act of 1983 (DPSA) started when NMPF began planning a

diversion program in late 1982. By spring 1983, discussions of the NMPF plan were quite open and public. By fall 1983 it was becoming clear that some kind of a diversion program was becoming likely. Around this time, I had some opportunities to interact with members of the House agriculture committee staff. This gave me some additional insights into what the final shape of new legislation might be. The DPSA was eventually passed in late November. An initial price cut was taken on December 1 and a new assessment began on that date. The MDP signup began in January 1984 and the program itself was initiated on February 1, 1984.

Because we were anticipating these changes and had contacts with people who were able to quickly share copies of the new legislation and, later, the USDA regulations, we were ready to prepare informational and decision aid materials to dairy farmers on a timely basis. A paper describing the legislation and basic outline of the MDP was distributed shortly after the DPSA was signed. Budgeting worksheets were completed and made available through the Cornell Extension system. Meetings were held throughout New York to deliver materials and provide counseling to farmers.

The story of the Dairy Termination Program is similar; however lessons learned by the MDP exercise left us much better prepared to react to the DTP. The MDP expired on March 31, 1985. By May or June it was obvious that milk production was rapidly rebounding following the reduction induced by the MDP. It was equally obvious that the new omnibus farm bill scheduled for October 1985 would contain something new for dairy.

From an extension perspective, I had two objectives with respect to new dairy legislation. As with the MDP, I wanted to be sure that we were prepared to offer dairy farmers information and whatever decision aids or other materials might be needed to help them understand and cope with a new policy. Bolstered by the success of our extension program for the MDP, I also felt that it should be possible to broaden the reach of any similar program, should one be needed. A second objective preceded this.

When the MDP was being debated in fall 1983, I had the opportunity to offer input to Congressional policymakers concerning the prospects for its success. In retrospect I felt that my analyses and input were almost completely irrelevant to the policy-making process. I concluded that, if given the opportunity to become involved, one should make a larger effort, sufficient to have some effect, or simply stay out of it. I decided to try the former. During 1985, I worked closely with a key member of the House agriculture committee staff and interacted with several other staff members and analysts in influential positions in Congress and elsewhere. This provided me with valuable insights into the political evolution of the dairy component of the 1985 farm bill; it also made it possible for me to offer meaningful input as ideas were discussed and decisions were made on a day-to-day basis.

During the summer and fall of 1985, the House agriculture committee was openly working with the NMPF on a new plan for setting the support

price and using a "milk diversion program" as a supplemental instrument to reduce production when needed. A "buyout" program first emerged as a viable option in September 1985, when it was introduced as the Milk Production Termination Program by Congressman Jeffords. A supplemental "buyout" program was also offered as an option when the House agriculture committee finally reported a bill; however this option received only passing mention and virtually no explanation in the committee's bill.

By late October, dairy marketing economists at several land-grant schools began to talk about developing a strategy and preparing materials in anticipation of a "buyout" program. In November, a group of agricultural economists representing six universities met and decided to coordinate the development of extension materials for a new program, assuming a new dairy policy did indeed come to pass. It was also decided that an effort would be made to contact other universities and offer the materials that would be generated to anyone interested in using them. This meeting and the activities of the group were purely ad hoc.

The Food Security Act of 1985 (FSA), including the provisions for a buyout program, was signed by the President in late December. During January, the ad hoc National Dairy Herd Buyout Extension Program Committee refined its plans, worked on materials, and contacted counterparts at other universities. The first output, a paper describing the dairy provisions of the FSA, was released on January 3, 1986, two weeks after the bill was signed. Other committee materials became available as they were completed. USDA regulations for a Dairy Termination Program were completed and distributed to county ASCS offices in late January. A one-month program signup period began on February 7. Nine committee publications, a computerized worksheet, and a videotape surveying the basic publications were distributed by mid-February. Written materials were distributed to at least one contact person in each state; in addition 73 diskettes and 27 videotapes were distributed. (This does not include copies used in New York or made by other states from an "original" version.)

Lessons for Dairy Policy Extension and Research

In actual design and execution, the activities described above were basically extension activities, but research connects to the extension programs in several ways. One way is in the evolution and development of the policy itself. A second occurs in understanding how the policy works and how the dairy industry is affected by changes in economic policy. The feedback loop is completed when insights and information gained by extension work is plugged into new research, the third type of connection.

During the policy development process a linkage between extension and research can occur when past and current research results are combined with an extension objective of educating or informing those in a position to shape or make policy. For our dairy policy activities, this

occurred to some extent prior to the enactment of the DPSA -- in our work with local dairy cooperative leaders and when we provided comments and analyses during the final House debate. As discussed above, it occurred in a much more meaningful way during the development of the FSA and its dairy buyout component. Prior research, in particular national dairy market modeling work, facilitated rapid analysis of the many alternatives that were being bandied about. Likewise, contacts with and exposure to industry groups through prior extension activities provided insights that made it easier to focus the analytical work on the most critical areas of concern and to adapt analytical models to proposed policies.

In this context, one of the fundamental lessons for me was learning how essential it is that policy research be meaningful and timely. The former requires that research specifically address or respond to the policy instruments and performance variables in which policymakers are interested. With respect to timeliness, I can only remark that this word takes on new meaning when one works with Congressional policymakers, who generally have no respect for the time it takes to come up with good answers to their many questions. If policy research meets these twin criteria, it will be used in the policy-making process.

Part of being meaningful comes from knowing what is going on. Part of being timely is getting the message to those who would benefit from hearing it. Both relate to what I see as the second fundamental lesson associated with policy development. It is essential to identify and communicate with people who are in the policy-making loop. The assessment program reminded us that even when we think we know the right people, we can be surprised. In fact, it is often heard among extension workers today that policy agendas and actors are shifting too rapidly for extension to keep up with it all. We know that we need to know the right people, but who these people are changes too quickly for us to keep up. The dairy assessment is an example of this, but we should not be overly disheartened by such events. Although we could not anticipate the assessment, we could keep up with the reaction to it. Eventually control of the policy agenda would return to the traditional power groups.

In the case of dairy policy, the key policy-making groups have been NMPF and other dairy cooperative leaders and the Congressional agriculture committees, particularly on the House side. A smaller role has been allotted to representatives of the dairy processing sector, such as the Milk Industry Foundation. Note who this does not include. In the development of the MDP and the DTP, USDA played almost no role whatsoever. Most USDA staff, including our peers in the Economic Research Service, didn't know about these programs any quicker than the academic community did. USDA obviously becomes involved in the execution of these programs, and from that point on they become the key contact group. But, if we think that our contacts with USDA staff are our contact with policymakers, we are generally mistaken. Another group that might logically be thought of as a contact group is "your congressman". If the Congressmen or Senators in your area do not include a member of the agriculture committee or in a general leadership position,

chances are they have next to no ability to influence dairy policy. More often than not you might not even get good information from them. If they are not in the loop, they may not really know what's going on. The right people in this case are the people in a position to actually influence change.

Earlier, I stated that a second opportunity to integrate research and extension occurs in the implementation stage of new policy, in understanding how a new program will work and estimating what its impacts will be. If analytical work is done during the development phase, it is obviously easier to conduct post implementation impact analyses. One difference that may exist is that after a policy has been implemented, we probably have some new and better information to improve our analysis. During the development phase of new policies, the parameters of a specific proposal are often sketchy at best and the initial response to a farm program is one of the things that an analyst has to estimate. During the development of the buyout program we were asked to analyze what would happen if we paid farmers to quit producing milk and sell their herds, how much would the government have to pay to achieve a certain reduction, how many farmers would sign up, what would be the long-run effects of the program, etc. After USDA wrote the rules for a new Dairy Termination Program and completed the farmer signup, we knew what the parameters of the program were, how many farmers signed up, what the bids were, and how much milk was involved.

As with the policy development phase, knowing the right people can be important to the success of extension and research activities conducted in conjunction with policy implementation. At this stage, however, we must begin working with a new group of people. People who play a key role in the development phase may have no role in implementation and vice versa. With the DPSA and FSA, USDA was the implementing agency. However, different groups within USDA may have responsibility over one part of the legislation or another. For example, the Agricultural Stabilization and Conservation Service (ASCS) was responsible for writing regulations and administering the MDP, DTP, and price support aspects of these bills. The Agricultural Marketing Service has been responsible for collecting assessments and monitoring the new national dairy promotion and research program.

With both the MDP and DTP, Congress allowed USDA very little time to write regulations that would implement these new policies. Particularly in the case of the DTP, the legislation gave USDA few specific guidelines to follow, making their job an even greater challenge. This also didn't allow much time to prepare extension material to help dairy farmers and related industries. So, knowing what was going on and having access to the details that were then generated following the legislation was absolutely critical. This is when having the right USDA contacts becomes very important.

Putting together effective extension programs for the MDP and DTP meant having contacts at the national level and at the local level. The former determines the basic regulations; the latter is the group that will deal directly with the farmers or other groups that are also our

extension targets. Of utmost importance is knowing what the details of the program are so that accurate and credible materials can be provided.

Making contacts with regulatory agencies is important, but it may not come easily. Occasionally there is some mistrust between the regulatory agency toward the extension worker or researcher. One very understandable reason is that it must be awfully frustrating for someone in a national regulatory agency to get calls from many different people in various locations who all want to be insiders to every detail and want to get the scoop as soon as it comes off of the memo pad. Perhaps this suggests that as a profession or as a group of people with common interests we need to figure out some better way of collecting this information than the current every-man-for-himself approach. Perhaps this is something that the Federal Extension Service should be doing. Centralization of that information-gathering activity would make information gathering easier on the supplying agency and may make it more likely that accurate information would be obtained and more evenly distributed to extension workers and researchers. We approached something like this with our National Dairy Herd Buyout Extension Program Committee; however this ad hoc effort could only be described as a step in that direction.

Once we obtain accurate information about a new program, we can begin extension programs to help others understand it and make decisions relative to it, and we can initiate new research to improve our understanding of what the new program may do. In our case, this presumes that we have basic knowledge about how the dairy economy works, including the things dairy farmers need to know and do to successfully manage their farms. Thus we need a foundation built on production and market research and knowledge gained by extension activities.

The third linkage between extension and research mentioned earlier concerned the feedback that extension activities can provide to research. This can occur at any stage of the policy process, and it is especially important in the assessment stage, when the question is asked: did this policy work? As discussed above, our extension activities can help us obtain information that helps us formulate and conduct our research. Knowing how a program actually functions because time was spent trying to help farmers understand it can make the difference between doing research that sounds right versus that which actually is specified correctly. Extension activities can also help provide the researcher in a less tangible way by providing the researcher with a better feel for how a market works or how an agent being studied has responded to economic stimuli before.

Based on our work and experiences at Cornell, I would identify two final prerequisites to conducting successful and integrated extension and research programs on dairy marketing and policy. The first is sticking with research and extension programs even when dairy policy issues are not on the front burner. It is during these times that we can add to our store of knowledge and make the contacts that will serve as our foundation when important issues do heat up again.

Secondly, we and our administrators must be flexible and willing to go out on a programmatic or financial limb from time to time. Top-down planning with lots of advance preparation may be a more comfortable mode of operation for us; however we seldom have the luxury of ample time. Moreover, my most favorable experiences have been ad hoc, bottom up efforts. Many of us are well able and interested in doing creative and effective policy extension and research, but for one or more reasons we are not always able to do so. The challenge to ourselves and our administrators is to let these activities occur, to break down some of the barriers that discourage us from doing this work, and to provide some catalysts to encourage extension workers and researchers to get together.

CASE HISTORY OF THE SALINITY/DRAINAGE TASK FORCE,

UNIVERSITY OF CALIFORNIA

A RESPONSE TO A CRITICAL ISSUE

George Goldman

The University of California has had great success in setting up a Salinity/Drainage Task Force to work on salinity problems in general, and selenium toxicity in particular. Selenium toxicity, caused by irrigation, recently became a "hot" issue and caused the creation of the Task Force. This paper details the process which led to the success of this Task Force and extracts the necessary elements that made this a success.

What I would like to talk about today is the formation and work of the Salinity/Drainage Task Force in the Agriculture and Natural Resources Division of the University of California and its work over the last three years.

First of all, I would like to say that this was a success story insofar as all of the parties involved felt that the Salinity Task Force has been a success. I purposely chose a success story even though nonsuccess stories are far more common and usual. Perhaps by examining a success story we can try to distill out the elements of what made this successful, and maybe we can learn for future issues and problems that come along.

First let me try to define the mood as it existed in 1985 when this Task Force really started. The legislature felt that the University of California, although a fine research institution, was not necessarily the best place to go to find solutions for pressing natural resource problems. There was a feeling in the legislature that the University was not responsive and although desirous of money, was not as willing as several nonprofit and consulting firms around the state in responding to critical situations. There have been examples in California, in the

George Goldman is an economist with Cooperative Extension, University of California, Berkeley.

This paper was presented to the American Agricultural Economics Association Extension Workshop Program "Maintaining the Cutting Edge" at Michigan State University in East Lansing, Michigan held July 31 - August 1, 1987.

last fifteen years, when issues such as energy efficiency and transportation have come up, of the legislature giving money to nonprofit institutions, such as Rand and SRI, rather than giving money to the University. The academic world, on the other hand, felt that the legislature expected them to just pull solutions out of the hat. It has not been unusual for academics to go in with requests to the legislature saying that it may take ten to twenty years of studying the problem before any useful solutions could be reached.

What happened to make the Salinity Task Force different? Salinity has been a long standing problem in the state of California. There has been concern about the building up of salinity in the soil in the Central Valley in California, and the problem of what to do with the disposal of salinity in the drainage water after irrigation. The salinity issue is also linked to a host of other issues and problems: large commercial agriculture, the financial and political operations of the Bureau of Reclamation, the suppression of vital information by the Bureau over the years, the use of chemicals in agriculture, the use of "subsidized" water on "surplus" crops, and others.

In late 1984, there was a crisis at Kesterson Reservoir. Kesterson reservoir was a collector of agricultural drainage water that was set up to be a wildlife refuge in California's San Joaquin Valley. About 1984, it began to be known that the wildlife, most noticeably ducks, were getting poisoned by an element leached from the soil, selenium. Irrigation of crop land was washing selenium out of the soil and into the drainage water, and this was concentrated as it moved up the biofood chain. The drainage water was collecting in Kesterson reservoir and this was responsible for ill-effects on wildlife, and a possible threat to humans. In December 1984, the legislature held a hearing on the problem and no one from the University of California was invited. There was a feeling in administrative circles at the University that there was something wrong with this state of affairs and that there should be some kind of effort to focus the University's research capability on the problem. Incidentally, the University had put in a supplemental request to the state for money to work on salinity problems which had recently got turned down. Accordingly, Lowell Lewis, head of the Experiment Station, called a meeting in January 1985 of thirty people: Extension people, research people, and county based advisors. These people inventoried the current research that was going on that was applicable to the situation as well as the public service that had been occurring. In March of 1985, Lewis, the head of the Experiment Station, and Jerry Siebert, the head of Extension, created the Salinity/Drainage Task Force and

authorized the chairs to call a meeting of seventy-five people: research, extension, and county based farm advisors to decide what could be done about the problem. This effort was headed by two faculty administrators and the head of the Extension water unit. These were people who were or had been department chairmen, but who also had respectable research credentials. This meeting was to decide what to do if additional money was available. This meeting broke down into six working groups in different areas (e.g. public health, soils, plants, animals, etc.).

After some budgetary negotiations (an original request for about \$1.5 million was put forward), \$651,000 was appropriated from the state through the budgetary process to the University to do something about this problem. This was a small share of a larger sum allocated to state agencies and the University. It was made very clear that this was a base line increase and it would not be subtracted from some other program in the University's budget. Parenthetically, the University administration is frequently against initiatives of this sort because they think any special appropriations will come out of some other program within the University. They fear that it's really a zero-sum game.

This increased base line budget was not just for one or two years. This would be part of the University's budget indefinitely.

In addition to this \$651,000 the head of the Experiment Station added \$400,000 from a private foundation source, the Kearney Foundation. This foundation's money was usually allocated for research topics in five year chunks, and since the previous five year research topic had been salinity, it was felt that putting the \$400,000 with the money of this Task Force was entirely appropriate. This meant that there was a little over \$1 million to spend the first year on research and extension work. Research proposals were solicited very quickly by the executive committee of three. Forty proposals were received and the committee funded thirty-three of these in the six subject areas created in the March meeting. These were one to three year projects. It was made as clear as possible that on these projects immediate output was expected. The projects were organized in subject groups and care was taken so that there would be peer pressure developed to quickly get out research results. It was important that everyone feel connected to the work of the whole Task Force.

In terms of the roles of the various participants, at first it was thought that the research people would do the research and the extension people would do the dissemination of the research. However, Extension in

California has a long tradition of being involved in applied research, and almost immediately, the state extension specialists and the experiment station people were performing the same role. They both submitted research proposals for applied research projects which were funded by the Task Force. The farm advisors did not really get that much involved because they perceived this as a disciplinary problem, not a commodity based issue. The county based farm advisor staff are usually drawn to problem and issues on a commodity basis. As a result, most of the people submitting research proposals were campus based experiment station staff and campus based extension specialists.

Dissemination mechanisms such as publications and research conferences were set up from the very beginning. Because of the leadership of the three people involved, the peer pressure that was built up, and the immediacy of the problem, research results were disseminated fairly quickly.

To repeat, this probably had a lot to do with the fact that the three leaders of the project were respected academics as well as administrators and that they were willing to devote a considerable amount of time to public service. It was also important that at the same time the process began, the University hired a very skilled, Ph.D. level assistant to the head of the Experiment Station, and a very skilled Sacramento based lobbyist for the Agriculture and Natural Resources Division. Both of these made sure that the legislature and the media were well aware of what the University was doing to help solve the problem, and to keep the process going.

The upshot has been that all the people involved, the researchers, the administrators, and the legislature has perceived this Task Force to be immediately beneficial to the people of California. There is a very unusual state of affairs with respect to how the legislature perceives what the University is doing and its applicability to current society problems.

As an aside, this situation can have its drawbacks. People in the state capital have remarked to our lobbyist, "Why can't the University do as well with this (problem), as it did in the Salinity case?"

What are the elements that made the Salinity/Drainage Task Force so successful?

1. A "hot" issue where the University had a competitive advantage in the application of science to help solve a society problem.
2. An administrative leader who was willing to take the

lead in securing additional funds for a "hot" issue, and take the chance that the University could deliver.

3. State political leadership that was willing to give the University permanent new money.

4. A team of three scientifically respected administrators willing to devote the time to organization, leadership and contact with state government. Willing to keep the researchers relevant and on schedule.

5. University staff, research and extension, treated equally with respect to research and extension roles, who had the background and expertise and willingness to shift priorities to work on this problem. In addition, the soil and water experts had a history of working together successfully.

6. Two key liaison people, an assistant to the Experiment Station director and the Agricultural and Natural Resource Division's lobbyist who did the real staff work and kept the lines of communication open to the legislature.

All of these elements were necessary, none would have been sufficient by itself to ensure success. Perhaps that is why these successes are relatively rare.

DECISION SUPPORT SYSTEMS--DEFINITION AND OVERVIEW

Stephen B. Harsh

This paper has two main sections. First, it addresses the evolution of information systems from the electronic data processing efforts in the 1960's to the current use of decision support systems (DSS). DSS systems are unique from earlier developed systems as they support managers in addressing semi-structured decisions. Also, they are computer based and generally have four main components: a) database system, b) modelbase system, c) user interface and d) the decision maker. Second, it reviews the Michigan State University efforts to build a DSS system for a dairy/cash crop farm. This is a multi-disciplinary project. The system is being prototyped on a new research/educational farm.

The need for more and better information on which to base decisions is not a new problem. In recent years this problem has become even more paramount for agricultural managers particularly in industrialized countries. Today's farm managers are confronted with numerous government regulations, changing tax laws, new emerging technologies, and changing institutions. All these factors make managing a farm a more demanding task. Furthermore, with the agricultural markets becoming more competitive from an international viewpoint, the managers must identify areas where they have a comparative advantage. A wrong decision may have a major long-term impact on the farming operation. Therefore, new and more effective farm level information systems are needed.

This paper has two main sections. First, a review of decision support systems concepts and second, a discussion of our efforts at Michigan State University to build a decision support system for U.S. commercial farming operations.

Decision Support System Concepts

The process leading to the development of decision support systems has been more evolutionary than revolutionary. During this evolutionary process, some concepts have emerged as being more important than others. A concept that has withstood the test of time is one proposed by Davis and others in which they make a distinction between data and information. This distinction is important because it emphasizes the problem associated with developing and utilizing modern information systems to support decision making. Davis defined data as "a group of non-random symbols which represents quantities, actions, things and so forth. Information is data that has been processed in a form that is meaningful to the recipient or is of real or perceived value in current or prospective decisions." Therefore, for data to be useful for decision making purposes, it must be processed into useful information. Hence, information is data that has been evaluated in the context of a specific problem. (See Figure 1)

* Dr. Stephen Harsh is a professor of Agricultural Economics at Michigan State University. The author wishes to acknowledge the useful comments and suggestions of Gerald Schwab and Sherrill Nott.

This is Michigan Agricultural Experiment Station Journal Article Number 12405.

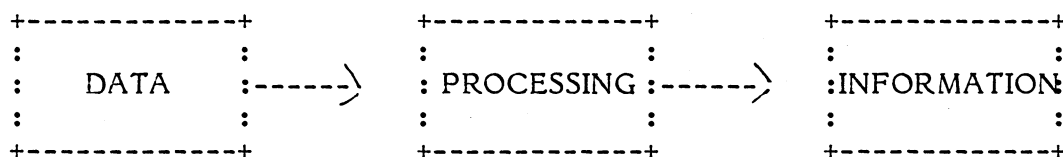


Figure 1. Transformation of Data Into Information

Researchers, farm managers and others operate under the mistaken impression that more data results in better decisions. This is only true if it can be processed into information. For example, commodity prices are only useful to the farm manager if he or she is able to convert that data into information on which he or she can base marketing decisions. Likewise, micro-climate data is only useful if it can influence decisions such as helping the farm manager determine the optimal time to spray for pests or to harvest a crop.

In agriculture, as well as in other areas, a significant amount of effort has been directed at increasing the amount of data available, improving upon the processing procedures used to transform data into information, and working with decision-makers to improve their analytical skills to better utilize information for decision making.

This whole process of building better information systems has been greatly accelerated with the advent of computer technology. As computer technology has become more sophisticated, easier to access and more cost effective, information systems have also become more effective and easier to use. In the early 1960s, there was great enthusiasm related to the use of electronic data processing (EDP) in agriculture. A number of conferences were held to discuss possible application areas. From some of these conferences, proceedings were published (IBM, 1965). The proceedings indicate a high level of optimism regarding the potential of EDP to improve management decisions of agriculture operations. The main areas identified as appropriate for EDP were financial and production record systems and the use of optimization techniques, particularly linear programming. As computer technology was applied in these areas, it soon became apparent that there were limitations as to the ability of computerized record systems to improve the decision-making process. Likewise, the use of optimization techniques was constrained by the large amount of time needed to collect the necessary data, transform it into the form required by the standard algorithm available on mainframe computers, generate the results and explain them to the decision-maker. Thus, some of the optimism associated with the advances in computer technology was certainly tempered and new directions were sought.

Improvement in computer technology continued at a rapid pace in the 1960's. Among the improvements emerging in the late 1960's were time-share computer systems, communication networks and more powerful and cost-effective mainframe computers. These advances, coupled with a better understanding of the shortcomings experienced with EDP systems, resulted in the development of management information systems (MIS). These systems contained more problem-solving capabilities and generated standard reports that were more useful to decision-makers. Several MIS projects originated in agriculture. Most were narrowly focused and relied heavily on computerized decision aids as the main building blocks of the system. As a rule, these models were rather fixed in structure and there was little opportunity to share or transfer data from one model or sub-system to another (Harsh, 1979 and Blackie and Dent, 1979). For example, it

was not possible to directly use data from the accounting sub-system to drive a cashflow projection model and subsequently pass the cashflow projections back to the accounting sub-system to be used as control parameters.

Although the MIS concepts are more progressive than the EDP approach, there are acknowledged deficiencies. These deficiencies, coupled with further advances in computer technology such as the availability of low-cost microcomputers, development of non-procedural languages, improvements in user interfaces, refinements in database management systems and development of expert system shells, resulted in a strong interest in developing decision support systems for agriculture. These systems are argued to be more flexible and powerful than the earlier developed information systems and thus are in a better position to support managers in their decision-making process. For some, the distinction between the various systems may not be that obvious. Anderson and colleagues, drawing upon the concepts presented by Moore, Chang and others, categorize the systems as follows:

1. Transaction Processing System (TPS)--data processing programs for gathering, updating and posting information according to pre-defined procedures. Examples include a basic payroll system or an order processing system.
2. Management Information System (MIS)--a system with pre-defined aggregation and reporting capabilities often built upon a TPS. Examples include a payroll system with managerial reports such as a labor distribution summary.
3. Decision Support System (DSS)--an extensive system with capabilities to support ad hoc data analysis and reduction as well as decision modeling activities. Examples include a general ledger-based planning system with both pre-formatted and user defined reports loosely interpreted as models.

There are other authors that choose to view DSS in a somewhat different vein. For example, Mills and colleagues, considered the above three classes of systems as part of computer (based) information systems (CIS). The procedures and principles used in developing any of the systems is the same. The main difference relates to the level of management the system is designed to support.

What are Decision Support Systems?

Currently, it seems to be in vogue to indicate you are developing or using a decision support system. Exactly what does it mean when one uses the term "decision support system?" Ginzberg and Stohr (Ginzberg, 1981), in their review of the development of decision support systems observed that in the early 1970's, that a decision support system would generally be defined as "systems to support managerial decision-makers in an unstructured or semi-structured decision situations." The key concepts in this definition are support and unstructured.

These systems do not attempt to replace managers by making decisions for them, but rather supply the manager with the analytical tools and data for them to use in arriving at a decision. They also address primarily unstructured decisions rather than structured ones. Structural decisions are those in which the procedures for arriving at an appropriate decision are well established and accepted. For

example, the feeds to include in an animal ration can be determined with a linear programming model that has been developed for ration balancing. Arriving at structured decisions generally does not require significant management resources because the procedures are well defined.

Alternatively, with unstructured (semi-structured) decisions, the procedures to arrive at a decision are less defined and usually more complex. For example, a major expansion of the business would involve evaluating the effectiveness of sub-components of the business (e.g., machinery systems, cropping systems, livestock housing facilities), the financial impact of the change, and so forth. With these decisions, greater management input and analyses is needed.

Definitions as suggested by Ginzberg and Stohr, captured the main concepts of decision support systems through the 1970's. However, by the end of the decade, new definitions began to emerge. Alter, defined decision support systems by contrasting them with a more simplistic EDP system (See Table 1).

Table 1. Difference Between Information Systems

Dimension	Decision Support Systems	Electronic Data Processing
Use	Active	Passive
User	Line staff, Management	Clerk
Goal	Overall Effectiveness	Mechanical efficiency
Time Horizon	Present and Future	Past
Objective	Flexibility	Consistency

Source: S.L. Alter, Decision Support Systems: Current Practices and Continuing Challenges, 1980.

The framework suggested by Keen and Morton, can also be useful in contrasting decision support systems with the other systems for operational control, management control and strategic planning. (See Table 2) Operational control is concerned with performing predefined activities, whereas management control involves management acquiring resources and insuring they are effective and efficient to achieve the firms objectives. Strategic planning involves setting or changing the firm's objective. It is interesting to note that many of the decisions for which we have developed agricultural computer models would likely be classified as structured. They also stress that a goal of DSS is to improve the effectiveness of decision making rather than its efficiency. They define effectiveness as being able to make timely and correct decisions, whereas, efficiency relates to the amount of managerial resources needed to reach a decision.

Sprague and Carlson, presented a somewhat similar and expanded definition of decision support systems. They define decision support systems as "computer based systems that help decision-makers confront ill-structured problems through direct interaction with data and analysis models." Some of the key words in this definition are computer-based, help decision maker, ill structure, direct interaction data and analysis models.

Table 2. A Framework for Information Systems

Type of Decision	Management Activity			
	Operational Control	Management Control	Strategic Planning	Support Needed
Structured	Inventory control rations	Least cost mix models	Choosing enterprise Man. sci.	Clerical or
Semi-structured	Restructuring the farms debt	Set production goals for the business	Expanding the support business	Decision systems
Unstructured	Hiring farm employees	Delegation of business responsibilities	Major re-structuring of the business	Human intuition

SOURCE: Adapted from Keen and Morton (1978) to reflect agricultural examples.

Current Conceptualization of Decision Support Systems

Today, many authors are arguing that Decision Support Systems are composed of models, databases, a user interface and a decision-maker. The above definition by Sprague and Carlson certainly contained these basic components. The conceptual design of decision support systems as proposed by Watson and Sprague (House, 1983), also reflected the basic components of a modern decision support system (See Figure 2). The model base, database and user interface are linked by an integrated database and model base management system. Although a DSS must contain all the basic components, each one will be examined independently.

Database and Database System

A database system is used to store classes of data which have been collected for various purposes such as financial data, production data, marketing data, and so

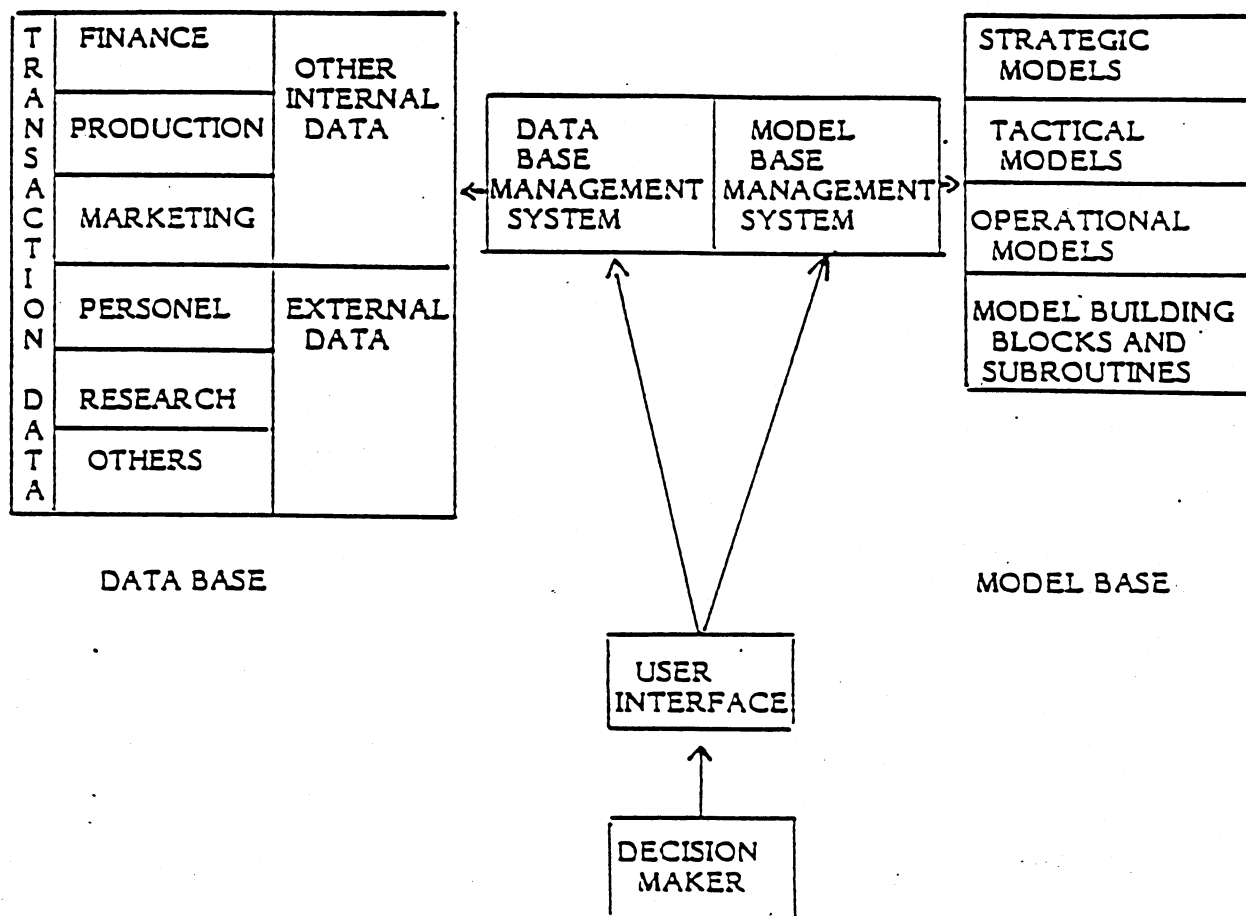


Figure 2. COMPONENTS OF A MODERN DECISION SUPPORT SYSTEM

forth. This data can be generated by the firm itself or it can come from external sources. The various databases need to be consistent within the overall structure and need to be shared across functional needs. This means that the accounting data is not stored using a different system than the production or marketing data. Likewise, when the data is entered into the system for one purpose, such as sales data in the financial records sub-system, if it has important data elements which are needed by other record sub-systems (e.g. production records), the data elements need to be appropriately cross linked. Data dictionaries are often employed to help manage the various sub-databases and data elements. Also, the database management system has the ability to automatically extract data needed by the model based component of the system and likewise take results generated by the model base component and store it in the appropriate sub-system of the database. Obviously, this is a very advanced and integrated database system.

Model Base and Model Base System

Related to the database is the model base. There are several types of models contained in the model base. Some are used for doing strategic planning, and others are used for tactical and operational decisions. The model base is constructed in a modular fashion. This allows for the linking of models together to solve larger or more complex problems.

The model base management system performs the same basic role as the database management system. It is charged with retrieving the appropriate model (or models) needed for the analysis and then requesting the necessary data for the database system and/or the user. If necessary, it can link models together to address large problems and pass results from the models to the database for storage and later use.

Alter (House, 1983) developed a classification system to describe various modeling approaches, that can be used in developing DSS. In his classification system (see Figure 3), he stressed that systems are either data-oriented or model-oriented. There are three data-oriented systems: a) file drawer systems concept, b) data analysis systems and c) analysis information systems. The file drawer system basically reflects a computerization of information that was previously kept in files or notebooks. The computerization simply increases the speed and flexibility of access to the information.

Data analysis systems allow for the manipulation of data by means of a set of general purpose commands. A good illustration is the use of a general purpose database system to tabulate information on which further analysis might be desirable.

The analysis information systems provide access to a series of databases and a small set of models from which analyses can be made. These systems are more powerful than the proceeding systems but the analytical models are still somewhat simplistic in design. The transactional processing or EDP systems (e.g., accounting and payroll systems) are examples of data systems.

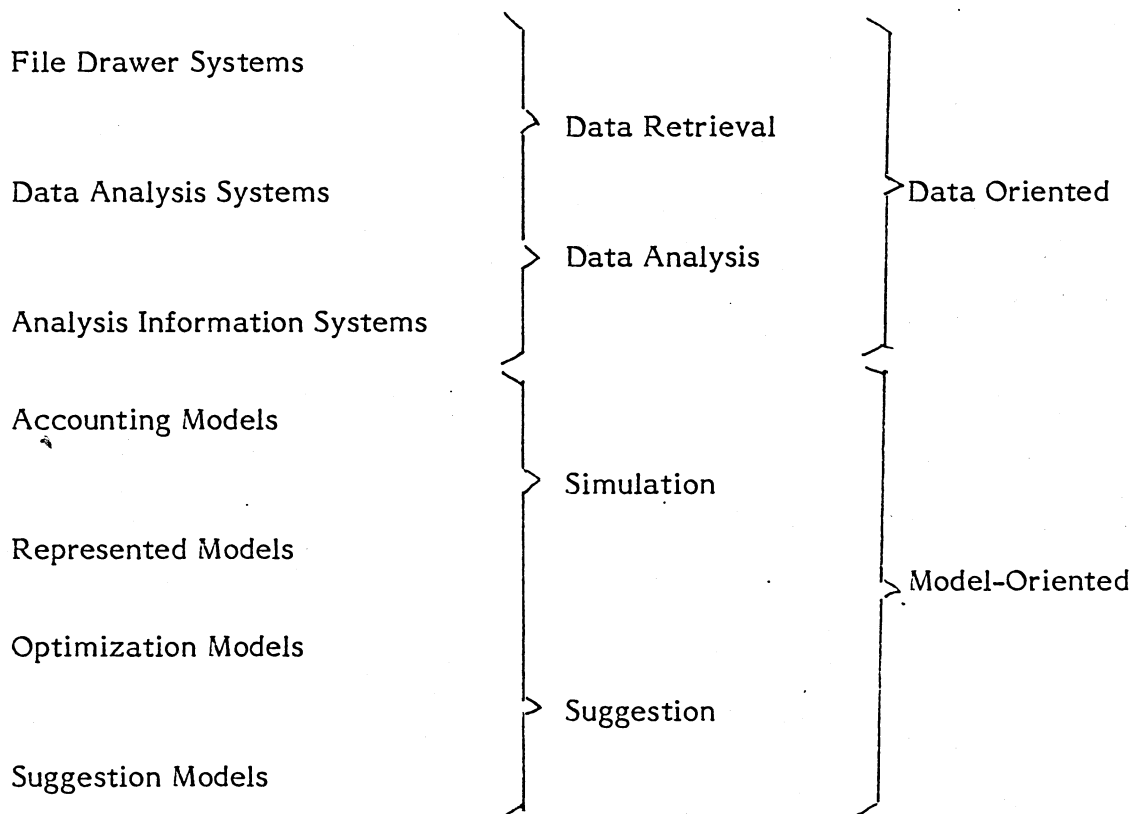


Figure 3. Data-Oriented vs. Model-Oriented Decision Support System Types

As a general rule, the systems that are data oriented tend to be most useful for supplying descriptive and to a lesser extent, diagnostic information to the decision-maker. However, they have limited capabilities of providing predictive or prescriptive information. This is not to belittle the importance of these systems, it simply points out the need for model-oriented systems.

There are four types of model-oriented systems: a) accounting models, b) representational models, c) optimization models and d) suggestion models. Accounting models calculate the consequences of planned actions using an accounting structure. Programs for forward financial planning are examples of such systems. The input/output coefficient of these models are, for the most part, fixed in nature. Even considering some of the shortcomings of accounting models, they remain rather popular techniques for planning purposes.

Representational models attempt to predict the consequences of the actions based on predefined relationships of the system. These models have become fairly sophisticated in their modeling approach and their main objective is often to identify the various interactions of the overall system.

Accounting and Representational models are basically simulation models. They do not give normative answers. Indeed, the decision-maker is charged with using heuristics skills with these models to improve upon previous solutions.

Optimization and Suggestion models constitute the suggestion group. Optimization models are normative in nature because they suggest to the manager

exactly what should be done. They supply prescriptive information, and are based on an algorithm that finds an optimal solution within the constraints placed on the problem. Some examples of optimization model uses are linear programming techniques, and to a lesser extent, adaptive control theory.

The last grouping, Suggestion models, perform mechanical work leading to specific suggestions for a fairly structured question. These models have a specific task, performing a set of calculations to achieve a specific recommendation. There are two new activities in the suggestion models area that are particularly interesting and exciting. One activity is the application of expert systems. There are numerous expert systems that have been developed or are being developed for micro-level decisions. Expert systems can be designed to perform several different functions, such as document knowledge or to verify one's own knowledge. However, the primary uses of these systems is to serve as an expert when an expert is unavailable. In this context, they are being used for diagnostic purposes and as a prescriptive tool. The second activity relates to the use of probabilistic models that address decision making under a risk and uncertainty environment.

User Interface

The user interface is one of the more important components. It is interactive in nature and helps the user translate his/her desire for information into a series of commands to give the DSS in order to obtain the desired information. To accomplish this objective, the user interface must be easy to use and provide the user with suggestions on how to proceed. It must also present the information in an understandable form (e.g., use of graphics).

For some problems, this process is fairly straight forward; in other cases it can be quite complex. Benezek and colleagues, argued that the user interface can be the most critical and most difficult component of a DSS. Therefore, its design should not be taken lightly. Bennett and others, state that expert systems can play a role in directing the user on how to proceed with the analysis of the problem situation. Indeed, one of my colleagues, T.J. Manetsch at Michigan State University, in the Systems Science Department, is using an expert system to help instruct the user how to use the appropriate model (e.g., simulation vs optimization) for the problem situation confronted and for the specific goals of the decision-maker.

The Decision-Maker

If information systems are to be successfully utilized, the decision-maker's analytical and conceptual skills need to be improved. Several universities, agribusinesses and other organizations have already conducted workshops that train end users on the fundamentals of computers. These training workshops explain the various hardware components and expose them to the standard set of general purpose software packages such as electronic spreadsheets, database management systems, general financial packages and some office support software (e.g., word processing packages). However, to effectively use either the general purpose software or special purpose agricultural software contained within a DSS, the users must have adequate conceptual skills to apply the appropriate software to their unique problems. For example, for an economics problem, the user needs to know whether capital budgeting, cash flow planning, linear programming, or some other analysis technique is appropriate for the problem at hand. A major educational effort will be

required before a large proportion of the agricultural managers have these skills. To help in this educational effort, some of the newer software being developed has the capacity to educate the end user, many of the expert systems will explain the logic rules used to arrive at a conclusion, and some of the newer decision aids have educational features built into them.

Integrated Decision Support System Project at Michigan State University

Background

A common means to describe the design and functioning of a decision support system is to illustrate with examples. The following is a description of our efforts at Michigan State University to build a DSS for a dairy/cash crop farm.

Michigan State University has a long history of applying computer technology to microlevel decision making. The TELFARM system, a computerized accounting system, was started in the mid 1960's. This system continues in operation with approximately 1400 farms half of which are dairy farms. More recently, a microcomputer version of this system has been developed for field use. Michigan was one of the leaders in getting the DHIA system established and in using computers to process the information. The TELPLAN system, a system of nearly 60 decision aids which runs on time sharing computers, was made available to extension agents, farmers and others since 1969. The PMEX system, an integrated pest management system, broke new ground in biological monitoring and pest modeling. There are many models in this system that address microlevel decision making as it relates to pest management.

More recently, Michigan State University established the COMNET system, a computerized communications network that has the capability of delivering timely information to farmers and others. This system has been used to download pest alerts, market information, weather forecast, and give current production recommendations and other information to extension agents, farmers, and agribusinesses. The FAHRMX system, a computerized system for monitoring and tracking the animal health situation for individual dairy farms, was also built and implemented at Michigan State University. Currently, an ongoing project is in the area of computer aided design of agricultural facilities.

Even though a large amount of computer software has been developed for these various systems, the software as a general rule, was lacking in integration ability. The results of one system could not easily be fed into another. As a result, it was decided that it would be desirable to integrate these numerous system into a more comprehensive package, an integrated decision support system for Michigan farms. Reaching this decision was encouraged by the availability of a new research and educational dairy center and farm at the Kellogg Biological Station.

The dairy center and farm at the Kellogg Biological Station (KBS) has activities in the areas of teaching, research and extension. The farm is used for internships to teach students the principles involved in managing and operating a dairy. Research activities are concentrated in the study of dairy and crop production practices. The extension program disseminates to various clientele the latest economically viable research findings and productive practices. The dairy center and farm at KBS are a cooperative effort in agricultural education and research between Michigan State

University and W.K. Kellogg, and more recently the W.K. Kellogg Foundation. The idea of the current KBS dairy center and farm came into being in 1978, and was established through the time and effort of a great many individuals affiliated with MSU. The W.K. Kellogg Foundation provided the grant dollars necessary to make the KBS dairy center and farm a reality.

The farm has 855 tillable acres. A major proportion of this is currently planted to corn and alfalfa. Of this 855 acres, approximately 300 acres are irrigated with two automated systems. The farm has a capacity for 150 milking cows. The dairy herd is currently made up of registered Holstein cows. The milking parlor is a double-six herringbone. It has been designed to permit milking research, so it contains detachers, in-line meters, back flushing and flush tanks for cleaning. It has also been designed to allow for easy electronic data collection of information in the parlor. The dairy barn is a free-stall dairy barn with natural ventilation and it uses a flush system for cleaning. Cows can be easily grouped for research and production testing, and the feeding system is in line feeders.

The manure system is a liquid-solid system. Manure solids can be separated and used for bedding. The liquids can be re-circulated for flushing or irrigation purposes. Heifers can be grouped by age in free-stalls. The young stock are managed in hutches. Both bunker and upright silos are used for feed storage. There is a hay barn for dry hay feeding. The farm also has a modern machine storage/shop building. The on-farm microcomputers are IBM-AT and IBM-XT compatible.

In addition to the dairy center and farm at the Kellogg Biological Station, there is a VAX11/780 minicomputer that can be used for research. Also located at the conference center at KBS is a microcomputer laboratory that can be used for educational workshops. It is anticipated that this laboratory will also be used to train farmers on how to apply the concepts of an integrated decision support system to their own operation.

Because of the wide diversity of software that has already been developed and is available at Michigan State University, a computerized communications network, and the unique opportunities made possible by the Kellogg Biological Station dairy center/farm, it was felt by many that unique opportunity existed for the development of an Integrated Decision Support System (IDSS).

Project Objective

The objective of the project is to improve the efficiency, profitability and long term viability of Michigan farms by improving the decision making process through the development of an on-farm integrated decision support system. The IDSS is intended to provide Michigan farm managers with a set of tools that will aid them in making more timely and correct decisions through both electronic collection of necessary data and processing that data into management information using decision aids and simulation models.

Project Team and Administration

The IDSS project is multi-disciplinary with a project team composed of scientists from four lead departments: Crop and Soil Sciences, Animal Science, Agricultural Engineering and Agricultural Economics. Other departments are

involved as well. The team makes major decisions regarding the project as a unit rather than each department working independently under the overall structure.

The IDSS is jointly funded by the Agricultural Experiment Station and Cooperative Extension Service. It is also administrated at the level of the Director's office rather than at the departmental level. This level of administration helps resolve many problems and conflicts.

Development Strategy

The development strategy is illustrated in Figure 4. The IDSS will be built on a commercially available relational database system. We are currently working with a package that uses the Standard Query Language (SQL) structure. The database will allow data from several sources to be cross referenced for daily, weekly, monthly or annual reports, as well as supplying input data for farm planning. It also more easily allows for ad hoc data analysis which is an important function of a decision support system. The use of commercial software wherever possible is important in order to reduce the resources needed for software maintenance and development.

The modeling strategy used is an "open architecture" approach. This approach allows for the models to be used either within the structure of the IDSS or as "stand-alone" models. When a model operates as part of the IDSS system, data needed by the model is automatically extracted from the IDSS database by the database system and selected results from the model are subsequently stored in the database. Whereas, if the model is run in a "stand-alone" mode, the user is prompted for all the needed data. This "open architecture" approach is important if the software is also to be used in Extension.

Transactional Processing

One of the key aspects of the IDSS project will be building an information network as illustrated in Figure 5. The information network will implement electronic data gathering in order to reduce the burden placed upon the manager for entering data (automation of some of the TPS aspects of the system). It is our hypothesis that systems that make excessive data entry demands upon the manager will generally have a low level of success.

The TPS components that will likely be included in the IDSS project include:

- | | |
|---|------------------------------|
| 1. Animal (weight, milk production,
and feed consumptions) | 7. Financial
Transactions |
| 2. Feed Parameters (quantity, quality) | 8. Personnel Records |
| 3. Field Parameters (treatments, production) | 9. Evaporation Data |
| 4. Weather (temperature, humidity, precipitation) | 10. Soil Moisture |
| 5. Plant Growth (lysimeter, observation) | 11. Pest Scouting |
| 6. Machinery (fuel consumption,
maintenance records) | 12. Market Prices |

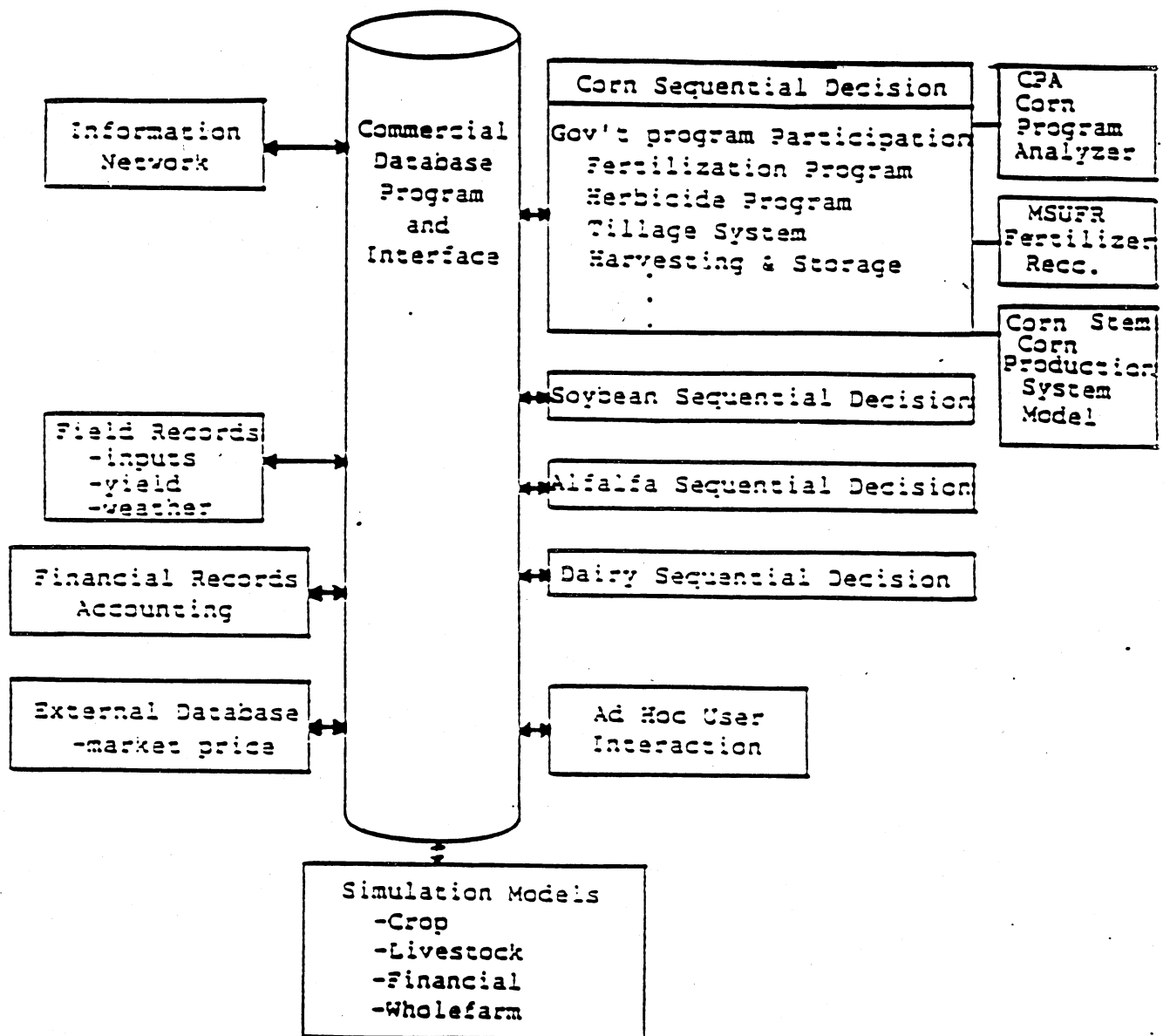


FIGURE 4. IDSS System Design

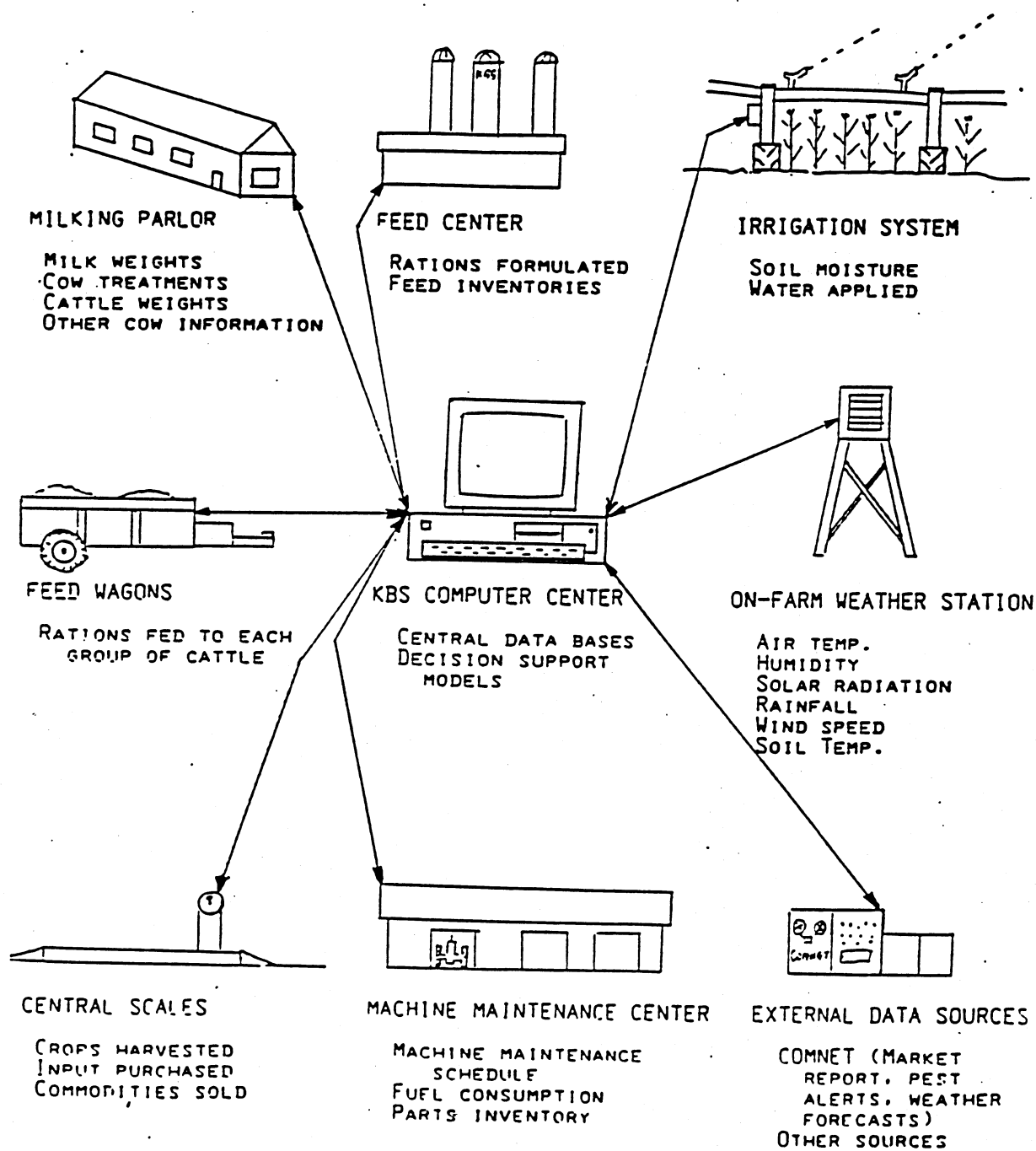


FIGURE 5. KBS Information Network

Management Information

Management information needs include both near term and long range decisions. These decisions may also be classed as tactical and strategic decisions. Tactical decisions include those decisions that occur routinely, (e.g. daily, weekly or annually). Examples include the choice of the best ration to feed dairy cows, the optimum level of fertilizer to use on corn or alfalfa and which pest strategy to use. There are many tactical decisions that face a farmer during the course of the year. Some are more important from a management projective than others. The decisions that the IDSS project team have identified as being the most important are listed in Table 3. The priority ranking reflects the needs for the future and acknowledges that some IDSS components have already been developed.

Strategic decisions address long range planning decisions that are often less structured than tactical decisions. The strategic decisions can be addressed through interactive use of the decision modules, as well as through ad-hoc analysis of the data in the database. An important and unique component of the IDSS project is the inclusion of simulation models that can draw data from the database to provide predictive type data that is useful for both strategic and tactical decisions. These simulation models will include dairy-forage models (DAFOSYM), crop growth models (CERES:MAIZE, CERES:WHEAT,...) and animal growth and production models.

Prototype Development

A working prototype of the concepts involved will be developed and implemented at the KBS dairy facility. Its purpose is three-fold. First, it serves as a test site for the decision concepts perceived to be important for agricultural production management. Second, it is an evolving guide for the conduct of component research that is needed to help understand various parts of the production system that have not been adequately quantified in the past. Third, it will serve as a model of principles and procedures for commercial concerns in the development of new products for the farm equipment industry.

Interactive computer graphics technology (ICG) will provide a more understandable communications interface between the user and the computer. The use of ICG has increased greatly, particularly in industrial areas. The information/knowledge output (and sometimes the data input) appear in a graphical form and are more readily accepted and understood than numbers and letters. The user, whether a farmer or an engineer, can concentrate on the problem to be solved rather than on the aspects of computer operation.

A widespread use of expert systems is expected. Our initial experience in using expert systems for analysis of financial records and pest management problems are most encouraging. A particularly value feature of expert systems is their ability to explain the logic used to arrive at a conclusion. This capability needs to further be exploited, particularly in those situations that the managers analytical skills may be somewhat limited. Also, they will likely be used to help the user determine which algorithms are appropriate to address different problem situations.

This project also places a high priority on the application of adaptive control systems. Control strategies and algorithms will be developed and implemented for multi-variable control. Most available controllers utilize a single analog sensor in a control loop. Multi-variable control would base the control of the process not on just

Table 3. Sequential Decisions and Ranking of Importance

Decision	Action*
DAIRY RELATED	
Feeding	7
Breeding	
Culling	
CROP RELATED	
Pest Control	1
1. corn herbicide	
2. alfalfa herbicide	
3. corn rootworm	
4. alfalfa insects	
5. European corn borer	
Fertilizer and Manure	2
Forage Harvest and Storage	4
Field Operation Scheduling	5
Tillage Systems	8
Grain Harvest and Storage	9
Alfalfa Establishment	
Irrigation	
Land Allocation	
Marketing	
Seeding Rate	
Variety Selection	
GENERAL Farm Decisions	
Enterprise Combinations	3
Cash Flow Management	6
1. taxes and tax planning	
2. credit planning	
3. cash flow management	
Government Programs	
Labor Management	
Machine Maintenance	
Marketing	

* The action index was developed by project team members. The lower numbered decisions are considered most important for inclusion in the IDSS project. Within the limitations of the interest and capabilities of the personnel involved, these lower numbered decisions will be incorporated first. Others will be incorporated as time and interest permit.

one process parameter, but on several related parameters. While these parameters could be monitored in several separate loops, they are likely to be highly interdependent. Varying one parameter affects the others, and may require associated changes in an upstream or downstream process. Controllers utilizing microcomputers will be able to handle these complexities, but they will still allow flexibility and ease of operation.

Such a prototype must be viewed as evolutionary in nature. Electronics and computer technical areas are rapidly changing, and we must have the flexibility to change with, and incorporate new technology as it becomes available. New developments in sensor technology will expand the number of parameters that can be monitored. Many of the new sensors will be solid-state sensors, that will help minimize mechanical problems.

Commercial (or near commercial), hardware for capturing data and software for decision aids will be incorporated as appropriate. Needed components that are not currently available in the desired form will be developed, tested and incorporated.

The models contained in the system will be developed using the interactive design approach. This approach involves combining the analysis, design, construction and implementation stages of model development into a single but highly interactive stage. Over the long run the system will be adaptive. As the environment in which the farm business functions changes, the system must also adapt to reflect these changes or it will cease to be useful to support managers in their decision making.

Summary

The need for better and more timely information on which to base decisions, has encouraged managers to embrace decision support system concepts. These concepts have taken some years to evolve. This evolution progress has been accelerated by the rapid advances in computer technology. The evolution has also been encouraged by some of the shortcomings related to earlier developed information systems.

Today's decision support systems are computer based, help managers address unstructured problems, are interactive, and utilize highly integrated databases and model base management systems to manipulate and control database and models. The capability of DSS to allow managers to do ad hoc data analysis and thus support them in addressing unstructured problems, is argued to be the main virtues of these systems over earlier developed information systems.

Although the application of decision support systems concept to non-agricultural areas is still relatively new, the use of these concepts to develop agricultural related DSS is rather limited. Because of this situation, at Michigan State University we have established a multi-disciplinary team to develop a prototype DSS for use on commercial dairy/cash crop operations. This prototype is being built at a new research and educational farm at the Kellogg Biological Station. Although this project has only been functioning for a couple of years, the results are very encouraging as it relates to developing a farm-level information system using decision support system concepts.

SELECTED REFERENCES

- Alter, S.L. Decision Support Systems: Current Practice and Continuing Challenges. Petrocelli Books Inc., New York, New York, 1980.
- Anderson, D.R., D.J. Sweeney and T.A. Williams. An Introduction to Management Science, Quantitative Approaches to Decision Making, 3rd Edition, West Publishing Company, St. Paul, MN., 1982.
- Bennett, J.L. Building Decision Support Systems, Addison-Wesley Publishing Company, Inc., Reading, Massachusetts, 1983.
- Blackie, M.J. and J.B. Dent, (eds.) Information Systems for Agriculture, Applied Science Publishers LTD. London, 1979.
- Bonczek, R.H., C.W. Holsapple and A.B. Whinston. Foundations of Decision Support Systems, Academic Press, New York, New York, 1981.
- Davis, G.D. Management Information Systems: Conceptual Foundation, Structures and Development, McGraw Hill Book Co., New York, New York, 1974.
- Ginzberg, M.J., W. Reitman and E.A. Stohr, (eds) Decision Support Systems, Proceedings of the NYU Symposium on Decision Support Systems, New York, New York, 1981.
- Harsh, Stephen B. "The Use of Operations Research Tools as an Aid to Farm Decision-Making -- The TELPLAN Experience," Operations Research in Agriculture and Water Resources, D. Yaron and C. Tapiero, eds. Proceedings of the ORAGWA International Conference, November 25-29, 1979.
- House, William C., ed. Decision Support Systems - A Data-Based Model Oriented, User-Developed Discipline, Petrocelli Books Inc., New York, New York, 1983.
- IBM Agricultural Symposium, Endicott, N.Y., May 10-13, 1965.
- Keen, P.G.W., and M.S. Scott Morton. Decision Support Systems: An Organizational Perspective, Addison-Wesley Publishing Co., Reading, Massachusetts, 1978.
- Mills, H.D., R.C. Linger and A.R. Hevner. Principles of Information Systems Analysis and Design, Academic Press, Inc., New York, New York, 1986.
- Sprague, R.H. Jr. and E.D. Carlson. Building Effective Decision Support Systems, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1982.

INTEGRATED DAIRY FARM MANAGEMENT

Robert A. Milligan*

The modern dairy farm firm is an extremely complex business. The author argues that previous efforts to model dairy farm businesses have not successfully integrated this complexity and in particular have not adequately reflected the role of management and the manager. The argument is developed using experiences from two Extension programs designed to teach management skills and a development effort to design an integrated dairy farm decision support system. Suggestions are provided concerning the integration of the premier importance of management into farm business management Extension programs and the development of decision support systems.

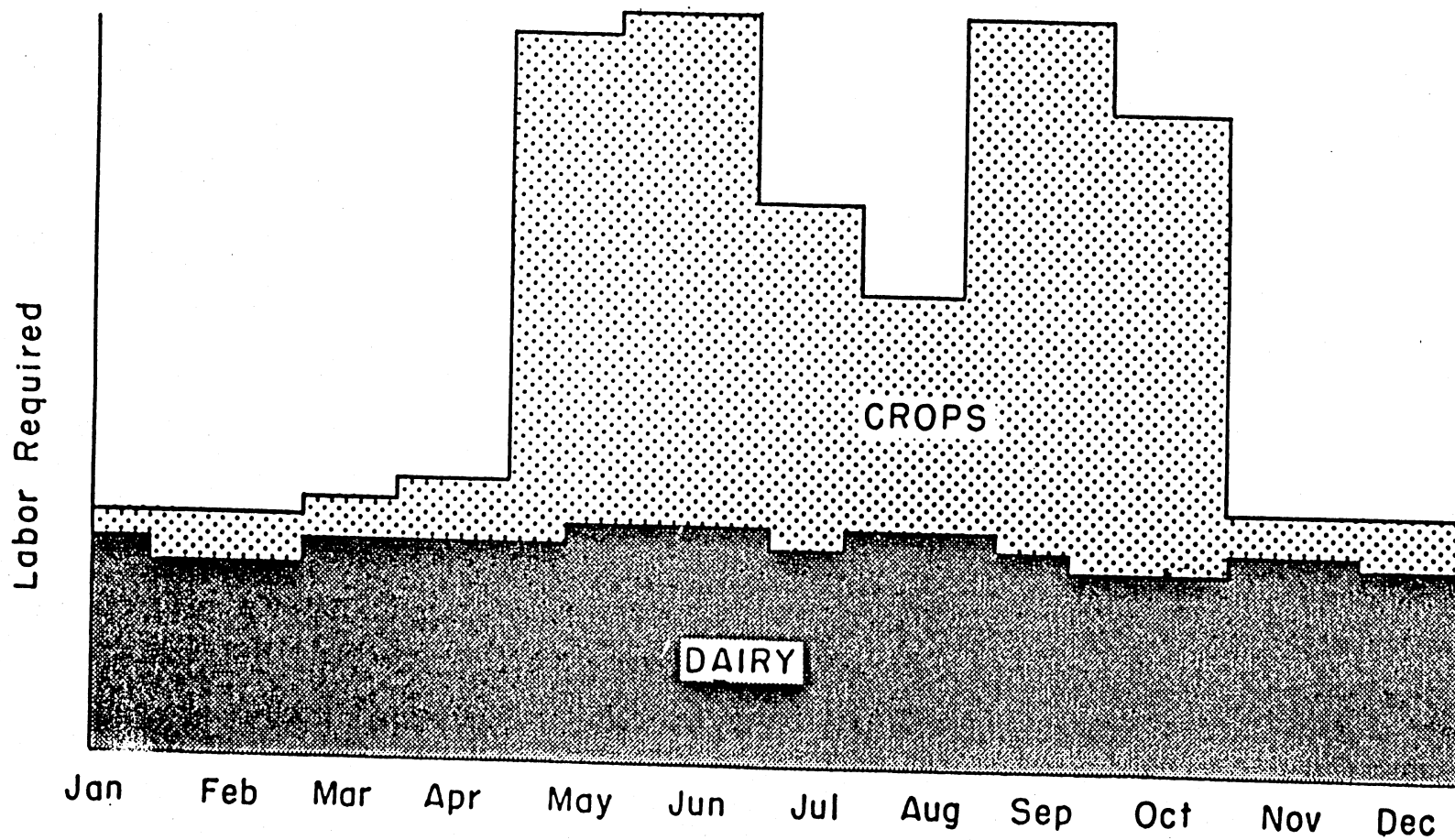
The modern dairy farm firm is a complex business that integrates crop production and livestock enterprises. The management of the typical business must have expertise in crop production, animal growth (replacements), milk production, business management, human relations, and marketing. In addition, the nature of the crop and livestock enterprises is such that the standard operating procedures for each are totally different and in both a year is often required before the direct results of productivity reducing errors are mitigated. The nature of the conflicts of the operating procedure emanates from the biological basis of production (Figure 1), the dairy enterprises have labor and other requirements that are almost constant so that a daily routine can be established while the crop enterprises' demands have no daily routine and are only partially predictable in advance. The year long impact of errors on productivity results from the annual cycle of crop production and the biological nature of the dairy cow where production recovery does not occur until the next lactation.

This is the environment faced by the management of the dairy farm business. In this paper I will argue that our approach to decision support system and dairy farm management Extension programs in general has failed to directly focus on the greatest need of most dairy farm operators which is to improve his/her management skills. I will discuss an Extension agenda (with complimentary research) for farm management programs with emphasis on the impact this agenda has on the development of decision support systems. I believe this agenda could be more helpful to these managers than our past agendas. The agenda has increased emphasis on management broadly defined and on tactical decision-making mechanisms. Many of the ideas for this agenda come from three interdisciplinary projects in which I have participated:

1. Cornell Minicomputer Dairy Management Project. A Kellogg funded project to develop an integrated data recording and analysis program for the dairy herd.¹

*Robert A. Milligan is Associate Professor of Agricultural Economics and Department Extension Leader at Cornell University.

Figure 1. CONTRASTING LABOR REQUIREMENTS FOR DAIRY AND CROP ENTERPRISES



2. Northern New York Dairy Management Project. A three year project in the six northern New York counties to test the hypothesis that selected noninnovators could significantly improve productivity by utilizing recommended management practices. Based on improvements in milk production, somatic cell counts, and calving interval, the hypothesis was accepted.²
3. The Dairy Farm Audit. This ongoing Cooperative Extension funded program resulting from the lesson learned in the Northern New York Dairy Management Program, has the objective of teaching dairy farm managers management skills.³

The Premier Importance of Management

As indicated above, major productivity gains were achieved by cooperators in the Northern New York Dairy Management Project; unfortunately, the upward trend often slowed or was reversed as project personnel presence on the farms diminished. In analyzing these setbacks, I established the hypothesis that our traditional farm management approach of emphasizing the use of approved practices was treating the symptom of the problem rather than the problem itself. The real problem was the manager's failure to integrate the practices into the management routine. Out of the acceptance of this hypothesis grew an Extension program to help dairy farm managers examine their attitude toward management and to teach management skills.⁴

In the delivery of the program we emphasize two points: the premier importance of management and the development of mechanisms to monitor and control all aspects of the business. You probably are wondering why we think there is anything new about arguing that management is important. We are not; we are, however, arguing that many or even most farm managers, many Extension agents, and even some of our colleagues really are not totally convinced that management is of pre-eminent importance. I am concerned that we in farm management are at least partially responsible. In teaching farm management, we have repeatedly argued that management is important but other than tireless expositions about keeping records, we have had little to say about why or how to manage.

In teaching the premier importance of management, we emphasize the attitude of the manager toward management, the role and functions of the manager, and then suggest that a mechanism to insure the top priority of management is to establish a time each day for management. We then suggest that this time be spent (1) making a "to do" list and assigning personnel to the high priority tasks, (2) evaluating the status of the dairy herd, and (3) completing activities and making management decisions for timely completion of activities that occur in a monthly or annual cycle. To assist in effectively using this time, we have developed a management calendar (see Maloney, et al.) for daily, monthly, and annual activities (Figure 2 is an example containing the monthly activities). In other words, we are trying to alter managers' attitudes toward management before or in addition to offering decision support systems.

Figure 2. MANAGEMENT ACTIVITIES FOR EACH MONTH

<u>Date to complete</u>	<u>Check when complete</u>	
___/___/___	___	- Evaluate performance on last month's goals and establish goals for the coming month.
___/___/___	___	- Pay bills, withdraw family living allowance, evaluate cash flow.
___/___/___	___	- Analyze accounts payable and consider borrowing to reduce interest charges; search for prepayment and cash discounts.
___/___/___	___	- Evaluate labor force relative to needs.
___/___/___	___	- Consider AIM reports from DHI to analyze weak links in herd performance.
___/___/___	___	- Search for less expensive sources of purchased feeds.
___/___/___	___	- Evaluate feeding management program - send in forage samples as changes are expected.
___/___/___	___	- Evaluate reproductive performance of heifers and milking herd, re-evaluate goals.
___/___/___	___	- Body tape sampling of heifers and cows.
___/___/___	___	- Check to be sure calfhood vaccinations/dehorning /extra teats removed - on schedule.
___/___/___	___	- Plan dry off decisions based upon expected calvings and animal numbers.
___/___/___	___	- Evaluate peak production and persistency of milking cows.
___/___/___	___	- Consider culturing high SCC and clinical mastitis cases.
___/___/___	___	- Evaluate sire selection, consider new sires.
___/___/___	___	- Inspect machinery and equipment (belts, lubrication, operating efficiency.
___/___/___	___	- Check the milking system including the following: operation and maintenance of vacuum pump, CIP system, inflations, etc.

The second emphasis is developing mechanisms to monitor and control all aspects of the business. In the context of this conference we are assisting farm managers in implementing a crude decision support system. In the program we assist the manager in assembling a complete (as possible) but not complex set of records on crops, dairy, and finances. An analysis of these records is then used to develop a control mechanism we refer to as "30 day goals":

1. Identify a small number of areas of the business that need immediate attention.
2. Select measures of performance to monitor progress in these areas.
3. Identify changes to make or tasks to accomplish to make improvements.
4. Set goals to be achieved within 30 days or identify tasks to be completed within 30 days to meet longer term goals.
5. Monitor progress, evaluate success in meeting goals in 30 days, and establish new goals.

In assisting managers develop these mechanisms, we have recognized that the human resource is so critical that a distinction is made between (1) monitoring and controlling the performance of personnel and (2) monitoring and controlling productivity, marketing, and financial performance. The second has been the traditional emphasis in decision support systems and is discussed after some thoughts on personnel.

I believe there are several implications of the premier importance of management for the development of decision support systems and more broadly for farm management programs:

1. Just as we teach how to keep records, how to manage income taxes, how to balance rations, etc.; we have to teach how to manage and before that why manage. Business schools have long taught management to nonfarm managers; we need to understand and adapt what they are teaching.
2. We need to conduct research on what skills and abilities are needed to manage a successful farm business.
3. In developing decision support systems we must consider the user of the system. Perhaps a less sophisticated system that is actually used on farms is better than a sophisticated system that never leaves the developer's office.
4. Decision support systems must be developed that assist the manager in using the information in addition to providing the information. Expert systems may have great potential in this area.

Management Organization

In working with large, progressive dairy farm managers, I have found their greatest challenge and their greatest limitation to expan-

sion is the area I call management organization. Management organization encompasses the management responsibility of each manager and the line of command of all personnel. Three activities can be helpful in specifying the management organization. The first is job descriptions for managers (as well as other personnel). The second is delineating the responsibilities of all positions into four categories: (1) general manager, (2) enterprise manager, (3) independent worker, and (4) laborer. The third is development of an organizational chart.

This area of management organization has major implications for decision support systems because it will determine who is actually utilizes these systems. In a Masters research project recently completed more than half of 15 early adopters of a remote access herd management system employed a herd manager; however, in only one of these herds was the herd manager the primary user of the system (Andrew). We believe two factors were primarily responsible for this result: (1) the herd manager was not qualified to use the sophisticated information system and (2) the computer was located with the general manager.

I believe there are several implications of management organization on the development of decision support systems and more broadly of farm management programs:

1. Management structure and increasing the role of middle management must become important Extension topics.
2. Research is needed to determine optimum organizational structures with particular emphasis on middle management. Again we may be able to learn from business schools.
3. We need to consider the role of each manager in designing decision support systems.
4. Decision support systems need to be designed recognizing the management organizations on dairy farm firms.

Decision Support System for Dairy Production and Finance

Almost seven years ago we embarked on a five year project, titled the Cornell Minicomputer Dairy Management Project (CMDMS), to develop a decision support system for the dairy herd. The objectives of the project were:

1. To develop an integrated interdisciplinary recordkeeping system that will monitor the farm financial status, impact the nutrition program, feed inventories, and the health and reproductive status of individual cows and the herd.
2. To develop microcomputer based management decision aids which use above data to assess production and profitability consequences of management decisions.
3. To develop the capacity for the on-farm minicomputer to interface with existing mainframe forward planning models.

4. To develop an interface between the on-farm minicomputer and New York Dairy Herd Improvement Cooperative (NYDHIC) and Cornell Agricultural Management Information System (CAMIS). For exchange of data and to provide the dairy farmers with increased analysis capacity.
5. To develop a system by which the user can accurately and efficiently enter information and perform needed analyses.

Figure 3 (CMDMS 1984, 1984a) is a diagram of the proposed CMDMS. The system was to integrate data collection on the dairy farm including feed acquisition and feeding, herd management, and accounting. The system was designed to be integrated in the sense that all portions of the system share a common data base.

Two computer decisions, which seemed correct when made in 1980, were to use Digital Equipment Corporation (DEC) minicomputers and to use the UCSD p-System. Neither the DEC hardware or the p-System operating system lived up to their early promise as industry leaders. In retrospect, we were laggard in that recognition and in switching to more promising alternatives. In an attempt to accommodate all components of the dairy herd, we included too much in our design. The "overdesign" of the system and the failure of our computer selection to expand with other systems resulted in an inability to complete the entire decision support system.

We were, however, more successful in the decision support system integrating feed inventories and availabilities, herd characteristics, and economical ration formulation (Figure 4; Rasmussen 1986, 1986a). The detail in the input is illustrated in Figure 5. The CMDMS Farm Accounting output can be divided into five categories: farm financial summaries, enterprise analyses, account outstanding summaries, and payroll reports. Three financial summaries reflect whole farm transaction records; these are: Farm Profitability and Cash Flow, Farm Receipts and Capital Sales, and Farm Expenses and Capital Expenditures. Each of these reports has two columns of numbers reflecting two user defined time periods. These management reports may be used for tax management purposes, as IRS capital and noncapital receipts and expenses are explicitly separated. Farm income can be adjusted to a cash basis by using 'Change in Noncapital Accounts Payable' and 'Change in Noncapital Accounts Receivable'. These two values are displayed on the receipts and expenses output reports. The CMDMS allows you to partition the farm business into 13 enterprises for analysis: Dairy Cow, Heifers, Nondairy Livestock, and 10 crop enterprises of your choosing. The enterprise analyses provide detailed cost and return information about each of the important parts of your farm.

The major functions of the nutrition part of the program are:

1. Maintaining a feedstuff inventory, which is automatically reduced as the cows consume feed over time and costing the value of the feed to the appropriate group and livestock enterprise;
2. Analyzing a ration entered and displaying where the specified ration exceeds or falls short of the cow or group's nutrient requirements; and

FIGURE 3: CMDMS
INTEGRATION FLOW CHART

You Enter Information
to Entry Forms:

Program Uses Information
to Generate Output:

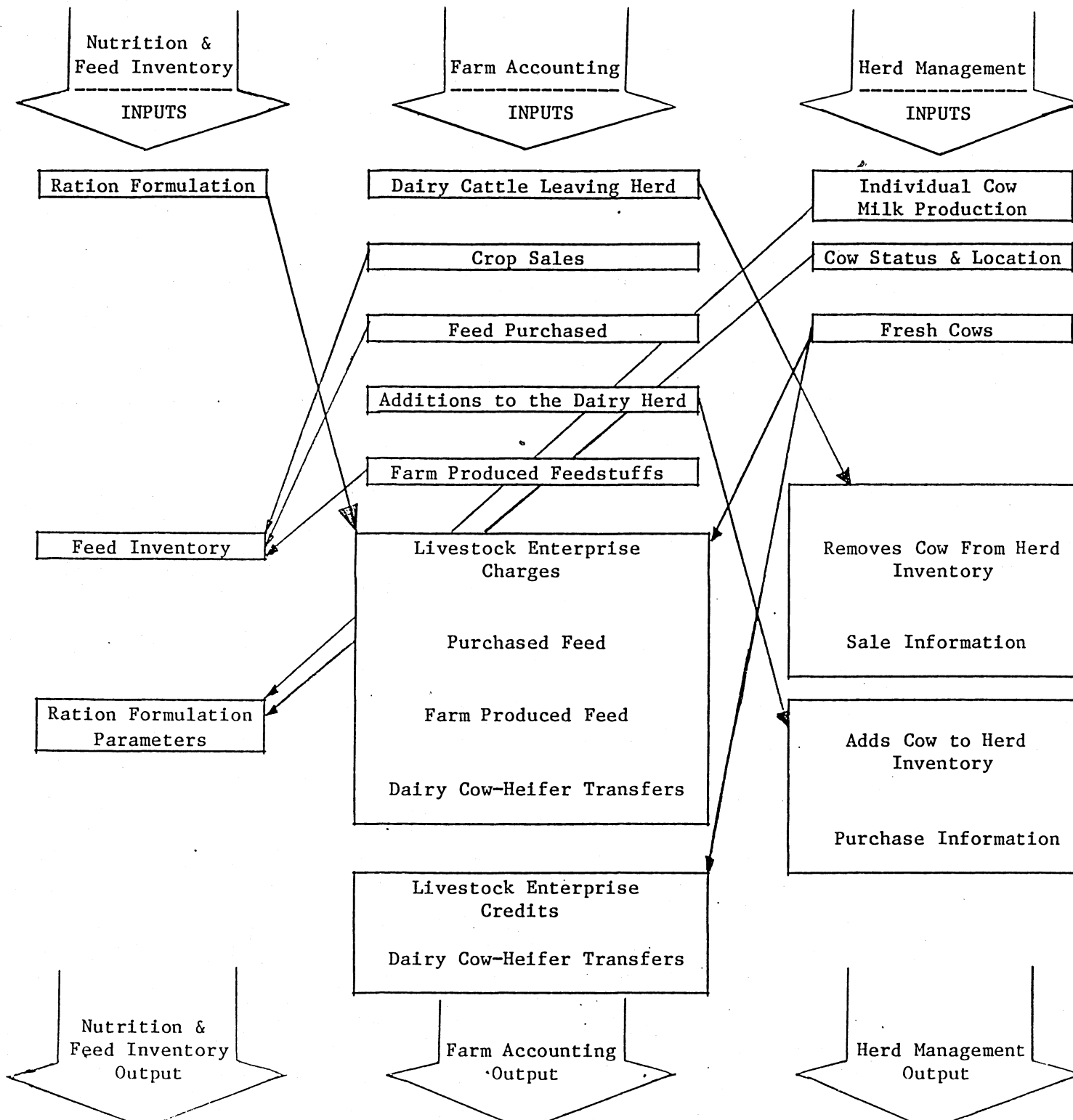


Figure 4.
HERD MANAGEMENT
DATABASE STRUCTURE

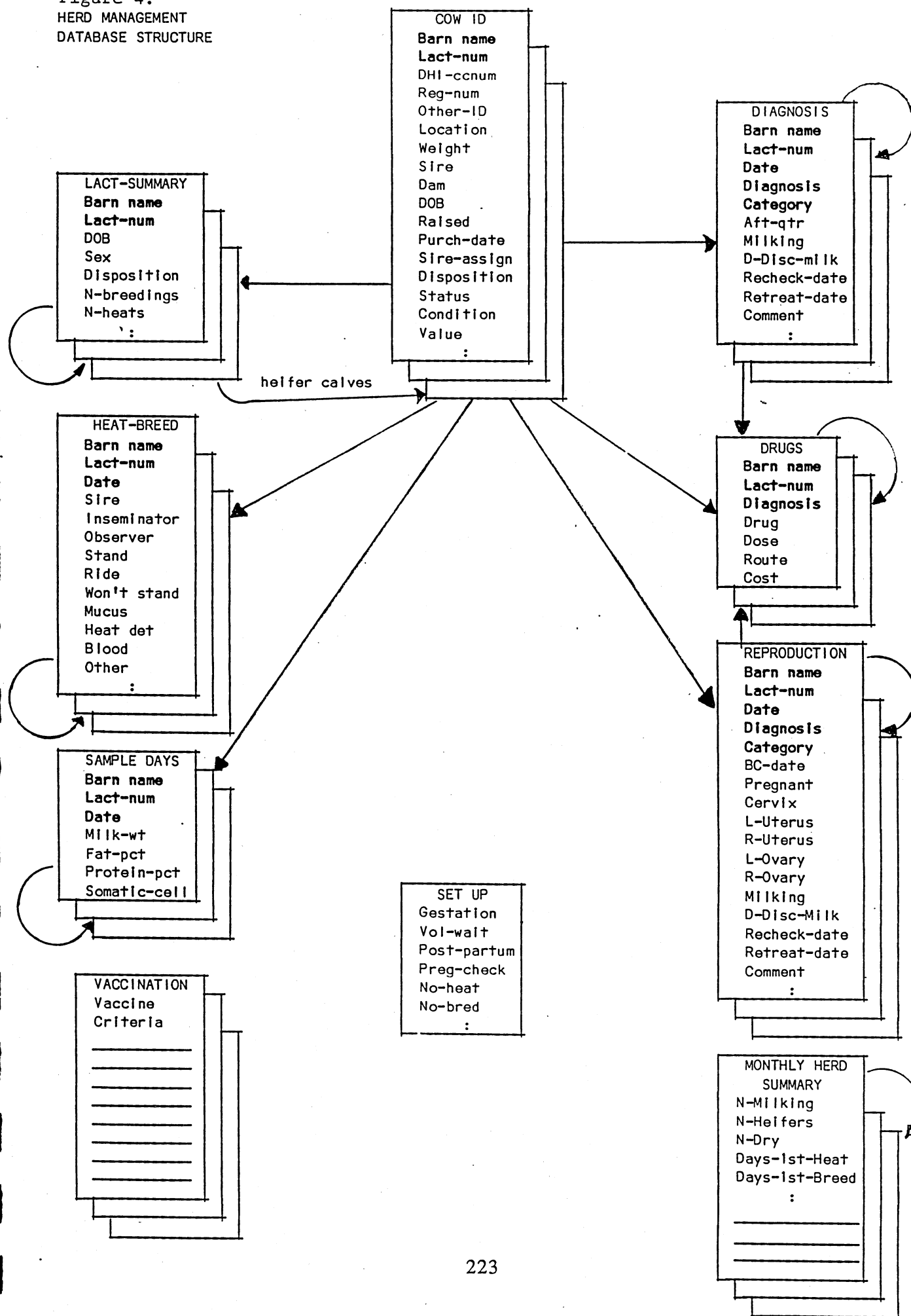


Figure 5. Screen Numbers of CMDMS Input Screens

Screen #	Section	Description
0	Farm Accounting	Farm Accounting Input Menu
1		Operating Receipts: Milk Sales
2		Dairy Cattle/Calves Sales
3		Nondairy Livestock Sales
4		Crop Sales
5		Other Operating Receipts
6		Operating Expenses: Hired Labor
7		Feed Purchases
8		Machinery & Auto
9		Dairy Livestock
10		Other Livestock
11		Additions to Dairy Herd
12		Crop
13		Real Estate
14		Utilities
15		Management Services
16		Miscellaneous
17		Capital Transactions: Machinery, Equipment & Real Estate Purchases
18		Machinery, Equipment, & Real Estate Sales
19		Accounts Outstanding: Debt Capital Accounts
20		Payments made to Expense Accounts
21		Collected Accounts Receivable
22		Other: Operator(s) Withdrawals
23		Nonfarm Income
24		Farm Accounting Output Menu
25		Farm Produced Feedstuffs
26	Herd Health & Production & Reprod.	Herd Inventory Input Menu
27		Cow & Calf Identification Update
28		Breeding and Heats
29		Fresh Cows
30		Health Exams and Treatment
31		Reproductive Exams and Treatments
32		Changes in Cow Status
33		Milk Production
34		Vaccinations & Other Routine Treatments
35		Criteria for Vaccinations & Other Routine Treatments
36		Action List Start-up
37		Individual Cow Summary: ID & Calving Information
38		Current Reproductive Status
39		Health Status
40		Production Records
41		Herd Inventory Output Menu
42	Feed Inventory & Nutrition	Feed Inventory & Nutrition Input & Output Menu
43		Feed Inventory Adjustments
44		Feed Dictionary
45		Ration Formulation

3. Determining a least-cost balanced ration.

Each of these functions may be performed jointly or independently.

This decision-support system was completed and was field tested. Unfortunately at this point the project's time and money expired so a completed program is not available for widespread use. However, the concepts developed and the experience have been integrated with many other projects and Extension programs. I have concluded that this area of feed acquisition and feeding is the largest cost center, the greatest potential for integration, and probably the greatest determinant of productivity and profitability. This area, therefore, should be high on the priority list for development of decision support and expert systems.

A Concluding Note

As dairy farm businesses move from farms with labor oriented owners to businesses using sophisticated management techniques and decision support systems, they progress along a continuum that includes:

1. Operators interested primarily in labor with a minimum of required records.
2. Manager/laborers that are grudgingly accepting that they must spend more time managing with more records but no organized decision support system.
3. Managers who are recognizing the importance of management and that are discovering the challenges and rewards of managing a business.
4. Managers of a business using sophisticated decision support systems.

In this workshop on Maintaining the Cutting Edge we need to consider how to move managers along the continuum while providing high quality, cutting edge programs for managers all along the continuum.

REFERENCES

- Andrew, George., "An Economic Analysis of Adopting a Remote Access Dairy Management System on New York Farms", unpublished Masters Thesis, Cornell University, August 1987.
- Knoblauch, Wayne A., Caroline J. Rasmussen, Robert A. Riggs, R. David Smith, Robert A. Milligan, Michael A. Brunner, and Larry E. Chase, "Cornell Minicomputer Dairy Management System", Department of Agricultural Economics, Cornell University, Ithaca, New York, September 1984.
- Maloney, Thomas R., Robert A. Milligan, W. Shaw Reid, and Terry R. Smith, "The Dairy Farm Management Calendar", A.E. Ext. 87-23, Animal Science Mimeo Series 101, and Agronomy Mimeo 87-9, Cornell University, September 1987.
- Milligan, Robert A., W. Shaw Reid, Terry R. Smith, and Thomas R. Maloney, "Cornell Dairy Farm Audit Manual", A.E. Ext. 87-22, Animal Science Mimeo Series 100, and Agronomy Mimeo 87-8, Cornell University, September 1987.
- Rasmussen, Caroline J., "Cornell Minicomputer Dairy Management System - User's Guide", Department of Agricultural Economics, Cornell University, Ithaca, New York, September 1984.
- Rasmussen, Caroline Nowak, "Cornell Minicomputer Dairy Management System", A.E. Res. 86-14, Department of Agricultural Economics, Cornell University, Ithaca, New York, May 1986.
- Rasmussen, Caroline Nowak, "Cornell Minicomputer Dairy Management System -- Reference Manual", A.E. Res. 86-15, Department of Agricultural Economics, Cornell University, Ithaca, New York, May 1986.

FOOTNOTES

¹Project leaders included Agricultural Economists Wayne A. Knoblauch (Project Director) and myself, Animal Scientists R. David Smith and Larry E. Chase, and Veterinarian Michael A. Brunner. All are Cornell faculty members.

²Project leaders included Animal Scientists R. David Smith, Charles J. Sniffen, and David M. Galton and myself (Project Director). All are Cornell faculty members.

³Project leaders include Animal Scientist Terry R. Smith, Agronomist W. Shaw Reid, and myself.

⁴The teaching outline for this program is contained in Milligan, et al.

INTEGRATING PRODUCER WORKSHOPS INTO A FARM BUSINESS MANAGEMENT DATA SUPPORT SYSTEM

by R.A. Schoney¹

The Top Management Workshops are both an intensive farm management training seminar featuring the analysis of farm business performance and forward planning and a "carrot" to induce farmers to provide both farm level information. Once the workshops are over, each farm data set is iteratively re-compiled and 10 data bases established, including expected prices, production plans, land use, and financial data. In addition, the Top Management software serves as a systems approach to simulation of the micro-impact of alternative policy programs on a profile of synthetic representative farms.

Introduction

The economic and financial challenges to agriculture today are perhaps as great as any time in the past. Yet, agriculture is little better prepared or equipped to meet these challenges in terms of farm-level information than 20 years ago. Agriculture is data rich but information poor; there are tremendous amounts of research data on the cellular functions of plants but little economic information exists at the farm level. The dearth of farm level information affects all participants in agriculture. At the policy level, the many and complex linkages and an increasingly dualistic agriculture, make it crucial that policy makers carefully evaluate agricultural policies as to which farmers are affected, how they are affected and their potential cost to the taxpayer. Farrell argues that

"improved microeconomic data and analysis are needed to assist in the formulation of public policy and in the expert evaluation of public programs. Particular areas that might benefit are production, price and income policies. The land grant universities and the Economic Research Service should consider the development of a micro-model and data consortium to make more efficient use of available resources to serve as a repository for selected farm simulation models and data, and to enhance communication among researchers" (Schertz and Baum, p101).

At the farm level, eroding land values, volatile prices and rapidly emerging new technologies make it crucial that farmers not only closely

¹ Associate Professor, Department of Agricultural Economics, University of Saskatchewan.

monitor their farm businesses, but also plan as far forward as possible; carefully evaluating the impact of changes in rotation, farm organization or farm size on farm net worth, cash flows and risk bearing ability.

Traditionally, farm accounting systems have served as the central data base for farm decisions. However, most farm record systems were designed with their primary goal as fulfilling income tax requirements; consequently, farm data were not collected in a fashion consistent with modern decision making models or data base management techniques. While past financial performance can be reviewed, it is difficult to project future financial performance because data are aggregated and there is no meaningful way to establish the linkages between key farm decisions and results. This led Jenson to comment that there was little "success in formally tying record keeping to a forward planning process" (1977, p.28). Furthermore, most farm accounting systems can not establish and maintain an adequate data base for micro-simulation models. In particular, it is difficult to construct activity level coefficients and formulate behavioral relationships. While much past research efforts were devoted towards macroeconomic models, Lee observes

"micromodeling is again proving useful for 3 specific needs: understanding likely responses of firms to specific economic conditions and policy provisions, understanding the likely distributive effects, and providing additional detail and likely behavioral responses not well specified in macromodels" (Schertz and Baum, p1).

The Top Management Program

In order to overcome some of the data problems associated with farm record keeping systems, the Top Management program was initiated in Saskatchewan in 1983 as a FARMLAB project.² In brief review, the project had the following applied research and extension objectives:

- 1) to collect farm level data,
- 2) to assist farmers in farm business analysis and forward planning,
- 3) to study farmer behavior and attitudes towards risk,
- 4) to upgrade the skills of extension personnel and agricultural professionals and
- 5) to develop a teaching laboratory interface with the real world.

There are three basic Top Management Forward Planning software packages: the Workshop Model, the Extension Counseling Model and the Stochastic

²FARMLAB was a provincially funded program over the years 1981-1983. The Top Management Workshops are currently funded by ERDA, a joint provincial-federal program.

Model (figure 1). The latter two have evolved from the Workshop Model and share many of the same Pascal procedures. The Top Management Workshop Model is a budget generator with integrated machine use, field rotations, tax and financial modules. A number of spreadsheet-style input procedures (called worksheets) which feature cursor movement and the "feel" of commercial spreadsheet packages but are programmed in Pascal. In addition, user prompts, on-line prompt windows, multiple pop-up windows and graphics support are featured.

The Extension Counseling Model is similar to the Workshop version except that it is limited to 5 year projections and actual machine use is not estimated. However, it can pull budgets from a common data base. These budgets feature a detailed budget-generator style of inputs. The third model, the Stochastic Model, is an evolution from the deterministic simulation model to a stochastic model featuring stochastic prices, yields and interest rates.³

The Top Management Workshops

The Top Management Workshops are a combination of an intensive management training seminar for farmers and a producer panel. The Workshops are a joint effort by the Extension Service, Saskatchewan Department of Agriculture and the University of Saskatchewan. The Extension Service provides the location for the workshops and identifies workshop candidates. The Department of Agriculture provides funding plus support in print materials. The University provides leadership in program development, a base for operations and responsibility for hiring and program operations. Field staff consist of farmers with either B.S. or technical School of Agriculture degrees. In general, they also have 2-3 years of post-school farming experience. These people have proved outstanding in their rapport with farmers and interest in the program.

From a farmer's perspective, the Workshops are devoted to the analysis of farm business performance using peer group performance benchmarks—the Where Am I? or monitoring phase; and the analysis of farm growth, investment and consolidation phases of business—the "Where Do I Want to Go?" or forward planning phases. Thus, the Workshops serve as a "carrot" to induce farmers to provide both ex-ante information for forward planning and ex-post information and to serve on a producer panel.

There are three phases to the Top Management Workshops. The first phase is based on the introduction meetings where new farmers are introduced to the program and given the input forms. Phase one starts in December and continues well into January. We spend approximately one afternoon explaining the forms and how to complete them. Completing the input forms takes considerable time and effort on the part of the

³Each stochastic distribution is specified for each of the five years. Cross correlations are allowed between variables within a year but not between years. The stochastic generator was "borrowed" from Robert King, University of Minnesota.

participating farmers. It takes first-year farmers at least 12 hours to complete the forms, usually with little assistance from extension personnel.

Past participants are mailed their projected income and expenses based on the previous spring. They are asked to 1) report actual farm costs and 2) update their data and expectations to the current year. In general, it does not take farmers nearly as long to update their data as it does to establish their initial data base.

The second phase is the data collection phase which continues through most of January and part of February. The fieldmen travel to each workshop area and collect the completed input forms from both new and returning farmer participants. Data are verified and any questions or problems are addressed on site. Farm data are entered at the University and the computer results are carefully inspected and reviewed for accuracy. After they have been checked, we mail each returning farmer his projected income and cost analysis for his inspection before the Workshop.

Phase three, the forward planning workshops themselves, are held throughout the province during the winter months from February to the end of March. Because of the relatively large number of workshops, we have shortened the Workshops. Explanation and discussion of output is limited to about three hours. The participants are then encouraged to review their data, re-verifying their data and checking a special "validation" table against farm records and their intuitive feel of the farm business. This step is critical in that the budget generator portion of the model can easily err. The validation check table is a modified cash income statement listing detailed cash sales for each commodity produced and cash purchases of all physical inputs.⁴ In many cases, the data are correct but the production plan described by the participant does not accurately reflect his true wishes.

After the general meeting, two-hour sessions are scheduled for each participant with one of the fieldmen and a microcomputer. Any mistakes are corrected and the modified data base reviewed. Once the participants have "fine tuned" their current farm plans, the resulting farm plan becomes the "base plan" and forms the benchmark of comparison for analysis of all other alternatives. While not all participants are interested in continuing on to the "what if" phase, most do. Usually, three or four "what if" situations are delineated. A "what if" situation may be examining the consequences of buying more land or modifying a crop rotation. The base farm data are then revised and the farm plan updated and stored as a new data file; the base farm plan is always maintained as a separate data file. Particular care is taken to ensure comparability of data between farms by allowing for standardizing assumptions.

⁴While many of the farmers have professional accountants or tax preparers, most farmers can provide at best a relatively primitive cash operating income statement and a net worth statement. These statements are used as independent validation of the first year projections.

In better economic times we stressed cost efficiency, particularly that associated with capital investments. However, because of the poor economic environment, we have de-emphasized the analysis of farm business cost efficiency and concentrated more on the analysis of the traditional financial statements: income statement, flow of funds and the balance sheet.

While the base run contains 20 tables, only those tables directly pertaining to the various financial statements such as projected five-year cash flows, taxes, and net worth are used in evaluating the various "What If" alternatives. Only the data sets actually modified in each of the "What If" trials is stored; additional trials can be based on the original base run or previously defined trials. Finally, only three key output variables are stored for comparison between trials: cash available for family living, income taxes and capital acquisitions, net cash surplus/deficit and net worth.

Other aspects of the Workshops and the Top Management Model have been described elsewhere (Schoney, 1986a,b,c and Schoney, 1984). The remainder of this paper concentrates on the database aspects of the Top Management program.

Farm Data

In order to facilitate the forward planning process, data must not only include those data associated with a net worth statement but those which are compatible with a budget generator. Individual farm data extend down to the activity level and include the trade names of chemicals and the physical amounts per acre or per bushel. Likewise, machine inventories include the description of the machine, size in feet or processing rate, horsepower, current age, hours to date, expected life span, current fair market value, replacement cost, and replacement policy. Machine system data include speed, field efficiency and machines used. Field data include tillable acres, original purchase price, current fair market value, property taxes, lease arrangement and intended rotation. Crop data include inventories, quotas and 5-year projected prices. Enterprise data include products produced, 5-year projected yields, input usage and machine systems.

Once the Workshops are over, each farm data set listed within a master list is re-compiled by a master program incorporating key Top Management input and calculation procedures but allowing selective standardization of key variables (figure 1). In addition, some data such as variable inputs need to be aggregated into general class categories such as seed, chemicals, fertilizer etc. Note that there may be several master lists according to the type of agriculture (dryland versus irrigated) or specialized farming. The following data bases are established:

1. farm income statements;
2. farm net worth statements;
3. projected income taxes paid;
4. total farm opportunity costs of production and resource use;

5. crop and livestock inventories and expected prices;
6. materials and custom services inventories and expected prices;
7. machine, equipment and building inventories and use patterns;
8. machine system performance and cost;
9. crop and livestock production plans, acreages and opportunity costs of production; and
10. land use intensity, lease arrangements and land values.

The data represent a complete re-compilation of all input and the projected first year of income and net worth data. Each data record has an attached code delineating key farm characteristics including farmer ID, soil zone and quality of data. Some data bases have only one record per farm such as those which relate to the whole farm business; other data bases such as crop recipes or machines generate large numbers of records per farm. While the data bases are relatively compact because they are maintained as Turbo Pascal records, they are still relatively large. Depending upon the data saved, 100 farmers will generate approximately 2 to 4 megabytes of information per year.

A second software package, DBStats, was designed to report data statistics such as mean, standard deviation, minimum and maximum; and to generate raw ASCII files of selected variables according to user-specified criteria as to farmer ID's or lists of ID's, record categories or variable values. Currently, a commercial integrated spreadsheet database management package is used to perform the various database and analysis operations.

End Products

In addition to the obvious counseling aspects, the Top Management program attempts to integrate data collected from extension producer workshops into a farm level data base which can be used for the following purposes:

1. to generate regional and provincial cost of production budgets,
2. to develop extension financial performance benchmarks,
3. to serve as an ongoing research data base and
4. to serve as a foundation in synthesizing representative farms for research and policy purposes.

Regional Costs of Production. The original provincial objective was to obtain detailed cost of production guidelines for direct publication as crop budgets or to use with conventional crop budget generators. The Saskatchewan Department of Agriculture had been relying on private accounting firms to provide cost data from their farm accounts. However, this did not prove satisfactory in that it was difficult to allocate costs in an ex-post fashion. Likewise, yield information was not satisfactory.

In addition, machine system costs were estimated using new machines, assumed annual use rates and field performance equations. However, our

data suggests that this approach has a number of important limitations. First, annual machine use intensities as measured by hours of direct use are considerably less than those generally assumed. Secondly, machine use patterns change with the age of the machine. Finally, the replacement policy is interrelated with the sizing decision and is also dynamic, depending upon cash flow availability and the value of the tax shield generated by new machinery investments.

Extension Financial Performance Benchmarks. While lenders often maintain that they make loans based on projected cash flows, they display remarkably little ability to generate more than a one-year cash flow projection; most lenders still seem to rely on some variation of a debt:asset or debt:equity ratio. While we could use ex-post data to evaluate financial performance, we use the cost guidelines and the representative farms to explore the impact of alternative financing terms and debt levels on firm solvency and liquidity over a five year period. Our results indicated that these financial ratios do not perform very well because of the impact of owned versus leased land; off-farm employment and government assistance programs.

Ongoing Research Data Base. The workshop data has supported research in taxes, particularly changes in the tax depreciation schedules. In addition, since our data extend to the field level, we can use the data to study land tenure and the relationship between the type of tenure arrangement and cropping intensity.

Synthetic Representative Farms. One of the most important potential uses of the data base is to serve as a foundation to develop representative farms (RF) both for use by the various farm management specialists and for policy makers. Direct extension use includes the Extension Counseling RF data base. This incorporates a number of farms with differing chemical and fertilizer intensity and the corresponding yield effect. Another extension use by farm management specialists, is its use as an applied research data base where they can evaluate new technologies from a whole farm context.

Much of our recent effort has been devoted towards developing a data base which can be used to evaluate alternative policy decisions (figure 2). Here, the Top Management data base serves as a complement to census and other surveys. Because our data base is detailed and relatively small it can be reviewed in detail and used to suggest some of the search criteria to be used with census data. Likewise, census data can be used to assign weights to the various categories or RF's.

In addition, much of the same software used in establishing the original data base can be used in a data base approach to simulation. This approach allows large numbers of farms to be delineated; since the simulation model generates records which are subsequently used by data base management techniques, the analytical effort is nearly independent of the number of farms.

⁵Of course, the effort in setting up a representative farm is still considerable.

Conclusions

Individual farmer counseling, farm level data collection and extension producer workshops are expensive. The Top Management program attempts to combine the techniques of data base management with a detailed forward planning model into an integrated data collection/use approach in order to spread the costs over multiple objectives. The producer is offered the carrot of long range forward planning and peer group performance benchmarks in return for highly detailed and highly accurate farm information. The provincial and federal governments are offered a highly visible extension program with data available for policy purposes by late spring. Finally, research economists have the opportunity to use the producer workshops as a farm laboratory where they can directly scrutinize the behavior of farmers under real and hypothetical situations. Moreover, because of farmer loyalty they can rely on high response rates to difficult surveys, such as those dealing with risk attitudes. However, the Top Management workshops are expensive and rely on the support of local extension personnel in finding good participants.

References

- R.A. Schoney, 1987. 1987 Results of the Top Management Workshops
FARMLAB Bulletin 87-02. Department of Agricultural Economics,
University of Saskatchewan.
- R.A. Schoney, 1987. Top Management Forward Planning Manual.
FARMLAB Bulletin 87-01. Department of Agricultural Economics,
University of Saskatchewan.
- R.A. Schoney, 1986. The Philosophy Underlying The Top
Management Model. Presented to Ontario Ministry of
Agriculture and Food Conference on Cost of Production
Models. February 3-4, 9pp. Toronto, Ontario.
- R.A. Schoney, 1986. An Evaluation of Cost of Production
Techniques. Presented to Ontario Ministry of Agriculture and Food
Conference on Cost of Production Models, February 3-4,
Toronto, Ontario.
- R.A. Schoney, 1986. New Developments in Farm Planning
Models: The Top Management Model, Canadian Agricultural
Economics and Farm Management Society, Summer Meetings, July 6-
10, Saskatoon, Saskatchewan.
- R.A. Schoney, 1986. 1986 Costs of Producing Crops and Forward
Planning Manual for Saskatchewan Department of Agricultural
Economics, University of Saskatchewan.
- R.A. Schoney, 1986. Input Forms to the Top Management Program.
Department of Agricultural Economics, University of
Saskatchewan.
- R.A. Schoney, 1984. Using Extension Workshops as a Means of
Collecting Farm Level Data. American Agricultural Economics
Association Meetings, August, Ithaca, New York.

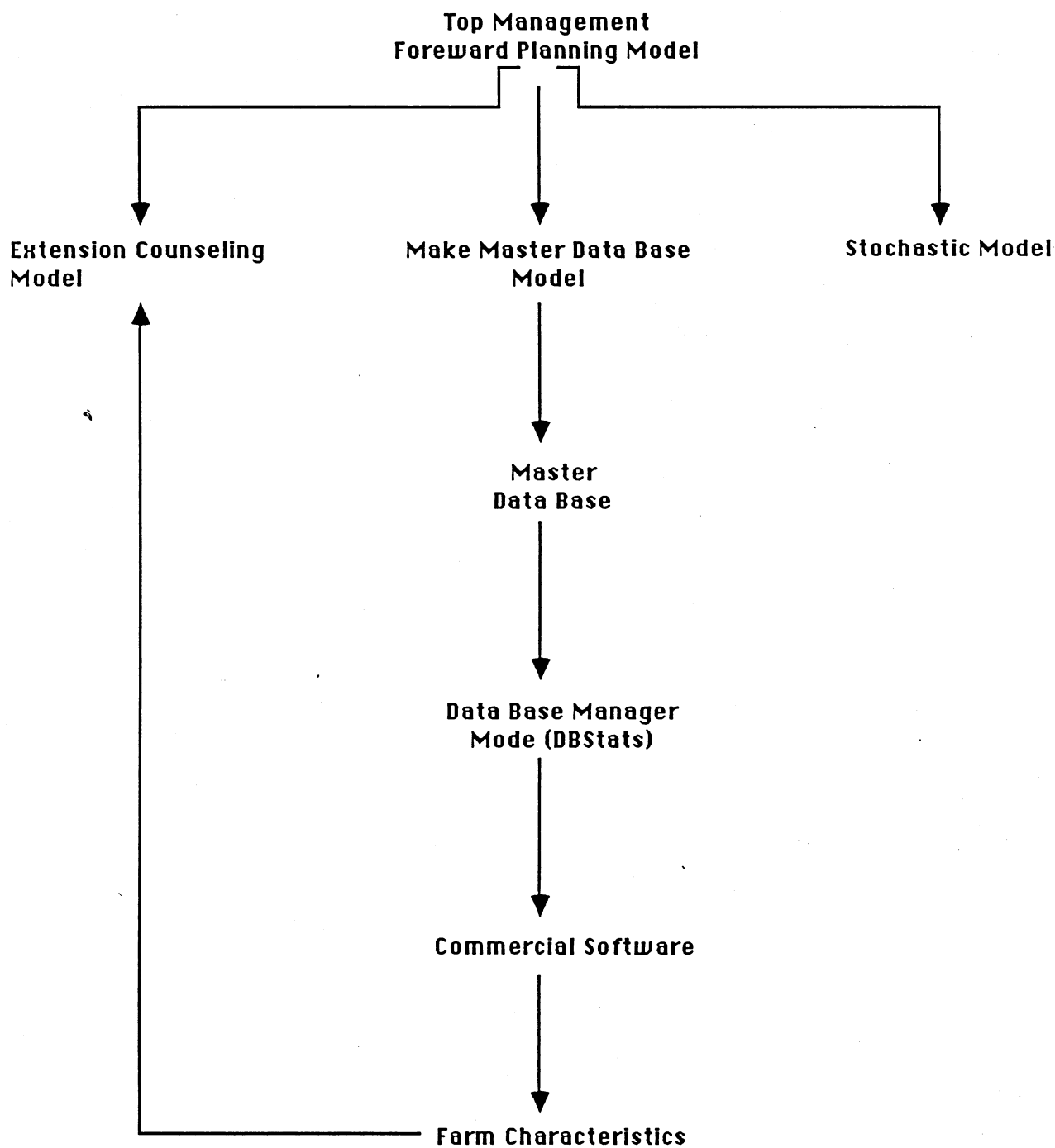


Figure 1: Top Management and Related Data Base Software

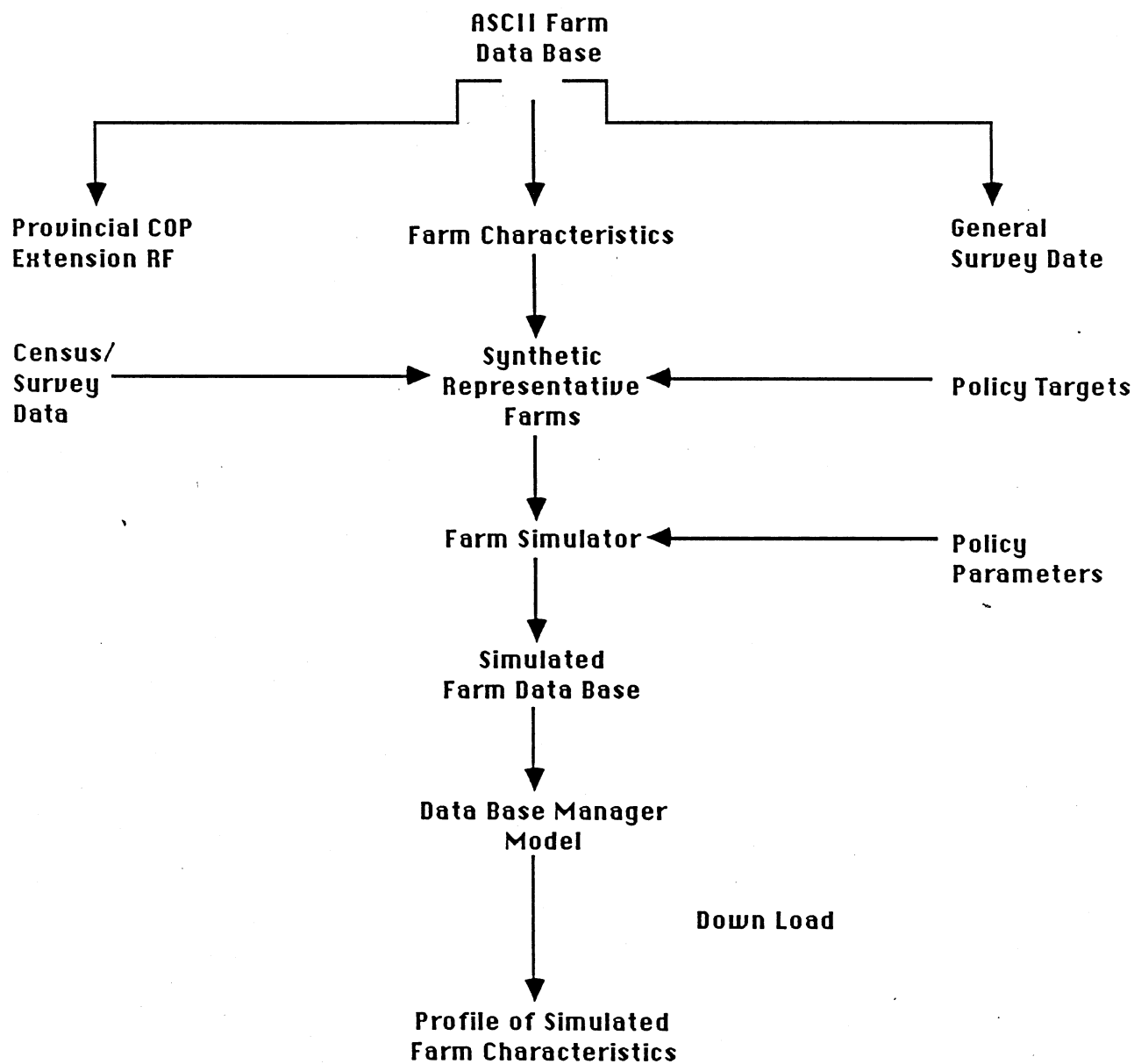


Figure 2: Farm Data Base and Simulated Representative Farms

COOP-SIM: A DECISION SUPPORT SYSTEM FOR COOPERATIVE GRAIN ELEVATORS

David W. Park and Elton Li*

This paper describes COOP-SIM, a decision support system (DSS) for cooperative grain elevators. The concept of decision support systems and their application to the decision environment of cooperative grain elevator managers is presented, the objectives of the COOP-SIM DSS project are summarized, the COOP-SIM development process is discussed, and the benefits of the integration of expert systems into COOP-SIM are examined.

Decision support systems (DSS) represent one area in which information technology is influencing the way managerial decisions are made. Designed for use by managers, the primary objective of these computer-based information processing systems is to improve the overall effectiveness of managers in planning, organizing, directing, and controlling the activities of the firm.

COOP-SIM is a DSS designed for cooperative grain elevators and is being developed jointly by the Agricultural Cooperative Service, USDA and Oklahoma State University. The system is currently in the development stage and is scheduled to be released during the spring of 1988.

The objectives of this paper are to: 1) present the concept of decision support systems and their application to the decision environment of cooperative grain elevator managers, 2) summarize the objectives of the COOP-SIM decision support system project, 3) discuss the process followed in developing COOP-SIM, and 4) examine artificial intelligence and expert systems in relation to COOP-SIM.

Primary emphasis is placed on a discussion of the COOP-SIM DSS development process which consists of analysis, design, construction, and implementation activities. The intent is not to provide a comprehensive review of DSS literature but rather introduce the COOP-SIM project and identify an appropriate approach to developing agribusiness DSS applications.

* Authors are assistant professor and visiting assistant professor, Department of Agricultural Economics, Oklahoma State University.

THE DSS CONCEPT AND COOP-SIM

A DSS is defined as an interactive computer information system coupled with decision making software models that can be readily accessed by managers to enhance problem solving and analysis. A DSS does not replace but rather supports managerial judgments and is: 1) aimed at less well-structured, underspecified problems; 2) attempts to combine the use of models or analytical techniques with traditional data access and retrieval functions; 3) focuses on user-friendly, interactive features; and 4) emphasizes flexibility and adaptability to accommodate changes in the environment and decision making approach of the user (Sprague).

The primary objective of COOP-SIM is to provide a means by which managers of cooperative grain elevators may tackle a number of alternative management decisions. The following is a brief description of performance objectives, technical abilities, and underlying technology of COOP-SIM.

Performance Objectives

The principal performance objective of COOP-SIM is to assist managers of cooperative grain elevators in decision making activities. While difficult to measure, the success of the project depends on the effectiveness of the DSS in helping managers improving firm performance. Common DSS characteristics (i.e.; the combination of models or analytical techniques with traditional data access and retrieval functions; application of user-friendly, interactive features; and model flexibility and adaptability) are incorporated into COOP-SIM.

Technical Abilities

The COOP-SIM design separates data from model specifications. Specifically, users can apply the same data to alternative models and, thereby, explore a wide range of alternatives with only minor efforts on the part of the manager. Moreover, the ability to create new models quickly and easily, catalog and maintain a wide range of models, and manage the model base is characteristic of COOP-SIM.

Underlying Technology

COOP-SIM takes full advantage of hardware and software technology. COOP-SIM is developed for an IBM PC/AT (or compatible) equipped with high resolution (EGA) color graphics. The system is programmed in the C language and the user interface consists of: 1) pull-down hierarchical menus, 2) a spreadsheet format for data viewing and input, 3) special function keys to simplify common commands,

4) modeling notes attached to cells to assist in analyzing assumptions, and 5) context-sensitive help facilities.

COOP-SIM DEVELOPMENT PROCESS

The development process consists of four stages: analysis, design, construction, and implementation (Figure 1). The stages of the process are interrelated since, for example, design is based on analysis, construction is based on design, and implementation is contingent on construction. At any point in the development process, it may be necessary to return to a previous stage(s). A discussion of each stage in the COOP-SIM development process follows.

Analysis

The analysis stage focuses on the identification of user characteristics and the decision environment.

User characteristics. Based on a recent survey of cooperative grain elevators, on average, managers had 13 and 5 years experience as general manager and assistant manager or foreman, respectively. Formal management education consisted of 2 years of trade school or college. During the past 2 years, managers attended 13 days of management seminars (such programs often focused on short-term topics rather than on long-term educational concerns). In interviews, few managers indicated any significant amount of computer experience. A number of managers expressed reluctance to obtain the requisite computer skills to perform even the most elementary analyses.

Decision environment. The decision environment is characterized by uncertainty. In fact, uncertainty is often used as a justification for the lack of adequate planning. Types of analysis conducted by managers include, but are not limited to: 1) sales and profit margin analysis; 2) cost analysis and control; 3) cash flow planning; 4) operational, tactical, and strategic planning; 5) firm reorganization; 6) sales and profit forecasting; and 7) equity redemption.

Design

Drawing upon information obtained during the analysis stage, activities in the design stage include the identification of design constraints and the formulation of design specifications.

Design constraints. The design of COOP-SIM is subject to 6 constraints: hardware constraints, software constraints, simulation model attributes, the problem environment, user experience with computerized models, and technical background and expertise (Fuerst and Martin; Meador, Guyote, and Rosenfeld).

Design specifications. Based on consideration of user characteristics, the decision environment, and design constraints, COOP-SIM has the following design specifications:

1. IBM PC/AT environment. Selection of this hardware configuration for the system should facilitate adoption by the potential users due to its low cost, high performance ratio. Standardization on IBM products further enhances implementation since firms will be able to justify purchase based on multiple uses. Moreover, a number of firms have already purchased IBM equipment capable of running COOP-SIM.
2. User-friendly interface. The interface between the user and the hardware should be simple, straightforward, interactive, and conversational. The interface should be as unobtrusive as possible to assist users in focusing on management decisions rather than on operating the program.
3. Self-documenting. As the impact of alternative scenarios or assumptions are considered, the need exists for keeping track of the factors underlying the model. In this regard, the program should provide the means of saving descriptive information pertinent to modeling activities such as reorganization and forecasting.
4. Modifiable by user. While many managers will limit the use of COOP-SIM to those templates provided with the package, it is essential to allow managers the flexibility to make some modifications to accommodate idiosyncrasies of the firm and decision environment. This capability, while not implemented within the COOP-SIM system, is available through the development of a Lotus 1-2-3 worksheet.
5. Modular. To facilitate use, a modular design which permits the user to build a number of alternative models linked to a baseline case is followed. Moreover, a consolidation feature permits users to combine the financial information of any number of disparate operations for analysis as a complete enterprise.
6. Database oriented. COOP-SIM is designed based on the concept of a database from which are extracted a number of alternative "views" such as a balance sheet, an income statement, or a sources and uses of funds statement. This approach enables the user to make changes in one view and have the requisite changes made automatically in other views.

7. Graphics oriented. High resolution color graphics are a principal design characteristic of COOP-SIM. Through the use of graphics, communication is facilitated and decision making improved (Benbasat and Dexter; Benbasat and Schroeder).

Construction

In the construction stage, a DSS development language is selected and a working prototype is produced. DSS language selection is based on: 1) end user needs assessment and problem diagnosis, 2) critical success factor identification, 3) feature analysis and capability review, 4) demonstration prototype development, 5) benchmark and simulation tests, and 6) programmer productivity and end user orientation analysis (Meador and Mezger).

One approach to DSS construction advocates the use of fast prototyping in which an initial prototype is developed quickly to elicit rapid feedback, a second prototype is developed to refine design specifications, and, finally, an operational system is developed (Kraushaar and Shirland). The benefits of this approach lie in the close user involvement throughout the development process.

In constructing COOP-SIM, the need to develop a working prototype quickly for user feedback and design refinement was deemed essential to the success of the project. Hence, an initial prototype was developed using a high level application package which provided a number of facilities which permitted rapid prototyping (i.e., Encore! by Ferox Microsystems). The major limitation of this prototype was its inability to demonstrate the user interface which was an important part of the final product. Moreover, it was not possible to develop the model structure eventually adopted due to limitations imposed by the application package environment.

The second stage of construction consisted of developing a prototype in the C programming language. While requiring greater expertise than higher level languages, C provided an environment for developing a compact, high quality software product on an IBM PC/AT. Additional benefits included software transportability and low distribution costs of the software product due to the absence of licensing costs often associated with higher level development environments.

Following field testing, an operational version is to be developed for release. Additional refinements based on user experience are to be included in subsequent versions as resources permit.

Implementation

Implementation is to be accomplished by: 1) conducting educational programs, 2) making on-site visits and presentations, 3) assisting early adopters in installing the system and assembling data files, 4) soliciting support from professional associations, and 5) developing supporting educational materials.

COOP-SIM, ARTIFICIAL INTELLIGENCE, AND EXPERT SYSTEMS

Artificial intelligence is the term applied to the application in technology aimed at simulating the interpretive processes of humans. Expert systems (ES) represent one practical application of research in artificial intelligence.

DSS differ from ES in a number of fundamental ways (Turban and Watkins). First, the objective of DSS is to assist human decision makers while the objective of ES is to replicate a human advisor and replace him/her. Second, with DSS recommendations are made by the human and/or the system. In ES, recommendations are provided by the system. Third, DSS are oriented toward decision making. In contrast, the orientation of ES is on the transfer of expertise and rendering advice. Fourth, DSS are intended to deal with problems which are complex, broad, ad-hoc, and unique. ES, on the other hand, are most applicable to problems within a narrow domain which are repetitive. Finally, and perhaps most significantly, DSS have no reasoning capability and little explanation capability while ES provide both capabilities (although somewhat limited at times).

The benefits of integrating ES components into DSS include the provision of: 1) judgmental elements to models, 2) improved sensitivity analysis, 3) a friendlier user interface, and 4) intelligent advice.

Clearly, COOP-SIM would benefit from the integration of ES components into its structure. Particularly, users would benefit the greatest from the use of artificial intelligence in improving the user interface and as a consultant in model building. Such extensions are to be included in future releases of COOP-SIM provided that adequate funding is available for development work.

SUMMARY

There are numerous potential applications of DSS technology in agribusiness firms. With support from the Agricultural Cooperative Service and Oklahoma State University, COOP-SIM is currently in the early prototyping phase of development. Many of the design issues have been addressed by the analysis of needs and constraints. The success of COOP-SIM depends not only on the development of a well-designed system, but also on careful attention to the implementation process. Experience gained through the COOP-SIM project should provide valuable insights into the development of future applications.

References

- Benbasat, I. and A. S. Dexter, "An Investigation of the Effectiveness of Color and Graphical Information Presentation Under Varying Time Constraints," MIS Quarterly, Vol. 10, No. 1 (March), 1986, pp. 59-83.
- Benbasat, I. and R. G. Schroeder, "An Experimental Investigation of Some MIS Design Variables," MIS Quarterly, Vol. 1, No. 1 (March), 1977, pp. 37-49.
- Fuerst, W. L. and M. P. Martin, "Effective Design and Use of Computer Decision Models," MIS Quarterly, Vol. 8, No. 1 (March), 1984, pp. 17-26.
- Kraushaar, J. M. and L. E. Shirland, "A Prototyping Method for Applications Development by End Users and Information Systems Specialists," MIS Quarterly, Vol. 9, No. 3 (September), 1985, pp. 189-97.
- Meador, C. L. , M. J. Guyote, and W. L. Rosenfeld, "Decision Support Planning and Analysis: The Problems of Getting Large-Scale DSS Started," MIS Quarterly, Vol. 10, No. 2 (June), 1986, pp. 159-77.
- Meador, C. L. and R. A. Mezger, "Selecting an End User Programming Language for DSS Development," MIS Quarterly, Vol. 8, No. 1 (March), 1984, pp. 267-80.
- Porter, Michael E. and Victor E. Millar, "How Information Gives You Competitive Advantage," Harvard Business Review, July-August 1985, pp. 149-60.
- Sprague, R. H., Jr., "A Framework for the Development of Decision Support Systems," MIS Quarterly, Vol. 4, No. 4 (December), 1980, pp. 1-26.
- Turban, E. and P. R. Watkins, "Integrating Expert Systems and Decision Support Systems," MIS Quarterly, Vol. 10, No. 2 (June), 1986, pp. 121-36.

EXPERT SYSTEMS FOR CHOOSING BETWEEN LIVESTOCK MARKETING ALTERNATIVES

by

Steven C. Blank and Russell L. Gum¹

This paper discusses different expert system applications that identify and evaluate alternative livestock marketing methods, and discusses differences in how these programs assist producers in their decision making. The programs place different degrees of emphasis on the goals of informing and educating users. Also, an evaluation of expert systems development and application is outlined from the view point of university research and extension staff. It appears that classroom teachers and extension faculty can use expert systems widely in their applied research and education activities.

The number of marketing choices available to livestock producers is increasing rapidly, spurred on by improved communications technology and economic necessity. The problem facing many producers is now shifting from identifying alternative marketing methods to choosing between the many alternatives available. This process is complicated by the fact that many of the new marketing methods rely on advanced communications systems, such as computer bulletin boards, which novices are unable to assess easily.

Decision aids, such as microcomputer software programs, are beginning to respond to the needs of agribusiness people. Spreadsheets, in particular, have become the base for a large number of specialized application programs. Yet, the limitations of spreadsheet templates in educating the user about the decision making process have led many people to try "expert systems" programs.

Applications of artificial intelligence in the form of expert systems decision support programs are quite diverse. There are many differences in expert systems software and development approaches, leading to different outputs aimed at different goals. Some programs concentrate on making a decision, while others seek to educate users about the decision-making process.

Therefore, the objectives of this paper are to present three different expert system applications that identify and evaluate alternative livestock marketing methods, and to discuss differences in how these programs assist producers in their decision making. First, expert systems are defined. A brief description and evaluation of alternative marketing methods is presented next to familiarize readers with the choices. Then, three different expert systems are

¹The authors are Extension Economists in the Agricultural Economics Department at the University of Arizona.

presented briefly. Finally, an evaluation of expert systems is outlined from the view point of university research and extension staff.

Expert Systems

The recent explosion of literature on artificial intelligence has provided many definitions of "expert systems", typified by the example below.

"An expert system is regarded as the embodiment within a computer of a knowledge-based component, from an expert skill, in such a form that the system can offer intelligent advice or make an intelligent discussion about a processing function. A desirable additional characteristic, which many would consider fundamental, is the capability of the system, on demand, to justify its own line of reasoning in a manner directly intelligible to the enquirer."
(Forsyth)

The definition above has two components. In the first sentence expert systems are described as tools for decision making. In the second sentence, it is noted that expert systems should be able to educate the user about the decision-making process, although this is not required. Therefore, expert systems can have two goals, but that of education may be optional.

The primary goal of standard expert systems software is to assist in processing decisions by "forward-" and/or "backward-chaining" (which are, respectively, reasoning from data to hypotheses, and finding data to test hypotheses). This is an application of the rule based approach to problem solving. The knowledge engineer (program developer) defines rules which can be used to sort through the data base to determine an answer. These rules are normally expressed in terms of logical comparisons. After the user inputs data about the problem at hand by responding to a series of questions, the program reaches what is calculated to be the best answer based upon the rules.

Livestock Marketing Alternatives

Nine alternative marketing methods are identified and described briefly below.

Private Treaty

The first, and still the most common, method of marketing livestock is through private treaty. This approach simply involves individual buyers and sellers negotiating on a one-to-one basis. The terms of trade are arrived at in whatever fashion is agreeable to the parties involved; there is little standardization in the procedures. Today most negotiations are done through telephone conversations. However, sometimes it still may be necessary for one or both of the people and/or the animals to travel, such as for the purposes of inspecting the quality of goods before a price can be set.

Local Auctions

Local auctions were the first type of centralized markets to develop. For this type of market to operate, buyers, sellers, and products must travel to a particular location at a specific time. Usually, livestock auctions are organized so that sellers take turns displaying their animals in a central ring or pen while buyers look on and call out bids as requested by the auctioneer or market manager. After the auction, buyers and sellers arrange delivery details, often with the aid of the market management.

This type of centralized market requires more organization than private treaties and, therefore, has higher total marketing costs associated with it, but can generate higher net returns to producers. Factors which add to the cost of this marketing process include: transportation for all participants, shrink/weight loss of animals due to increased transportation and handling, and the cost of maintaining market facilities and staff at the site of the auction.

Ranch Tour Auction

This marketing approach attempts to reduce total marketing costs by "bringing the buyers to the animals". Buyers are transported in a group from one seller's ranch to another by organizers. While the buyers are on each ranch, livestock lots are auctioned just like a local auction. In this way, livestock are transported only once, direct to the location specified by the buyer, which reduces shrink as well as transportation costs.

Marketing Association Forward Contract Sales

By forming livestock marketing associations and/or cooperatives, sellers are often able to spread fixed marketing costs across larger volumes and negotiate lower rates on variable expenses, thus reducing per unit costs. One method used by cooperatives to market livestock is to act as an agent for members in arranging forward cash contract sales. The process is simple: a cooperative contacts buyers regarding specific lots offered for forward contracting. This relieves individual members of the marketing tasks. Also, the cooperative employee which performs the marketing function often is a specialist with greater market familiarity and skills, which lead to better prices received on contracts negotiated (Early).

Association Sales

Another approach aimed at increasing buyer attendance at local auctions is to have livestock associations hold special auction sales. By sponsoring an auction, an association can lend greater credibility to a sale by assuring buyers of the quality and quantity of livestock to be sold. Also, an association can advertise a sale widely and cover those costs from sale revenues by charging a minimal fee to each seller.

Telephone Auction

The first step in establishing this type of "electronic market" is for producers to join a marketing cooperative. All producer members sign a consignment agreement indicating that they will market their animals through the cooperative. In preparation for a sale, livestock are graded on the owner's ranch by trained graders who work for the cooperative. Load lots are "assembled on paper" with the location, number, weight, quality grade, and description listed. Prospective buyers are contacted by the cooperative before the sale and assigned a buyer number.

At the prearranged time of the sale, all buyers are connected to the auction via telephone conference lines. The auctioneer reads the sales order and data on each lot. Lots are then auctioned off in order. Buyers simply call out their identification number over the phone if they wish to bid at the current asking price.

After the sale, successful bidders are called by the cooperative for shipping instructions. Producers are notified of the date, time, and place for delivery. Livestock are weighed as delivered, then co-mingled in lot loads for shipment. The livestock become the buyer's property when weighed. Each producer is paid on the basis of weight less any agreed upon shrink. The cooperative collects the gross sale price from buyers, deducts marketing charges, and remits the net revenues to producers.

Video Auction/Satellite Video Auction

Video auctions are very similar to telephone auctions, but they try to give potential buyers more information on livestock being offered for sale. Specifically, video pictures are taken of all livestock prior to a sale. At sale time, buyers assemble at one or more rooms equipped with large screen video projectors. Lots are then auctioned off while video tape of that livestock is shown. In this way, buyers can see the animals when bidding, as well as hearing a verbal description such as that provided in a telephone auction.

Satellite video auctions are video auctions which broadcast the video pictures of the livestock using satellites. Anyone with a satellite television antenna can receive this broadcast. To participate in the auction a buyer must register with the auction before the sale. During the sale, buyers bid on the livestock over the telephone.

Computerized Auction

Once again, this is a type of auction which is organized in a manner similar to that of telephone auctions. In this case, computer terminals replace telephones as the means of providing information and bidding. Buyers assemble at locations equipped with computers or, more often these days, will connect to a central computer through the use of their own micro-computer and modem at home. A written description of each lot of animals is sent to all computers connected to the central machine. Each buyer can signal any number of bids until

a specified time or until the auctioneer signals the end of bidding on a particular lot. In many cases, all available lots are open for bids simultaneously for the entire auction period. At the end of the auction, the auctioneer notifies successful bidders and can act as a go-between in making delivery arrangements.

Computerized Marketing Information System

This marketing tool does not involve interactive communications between all market participants, as do auctions. Instead, this approach is aimed at facilitating information transfer between market participants, which aids in individual marketing efforts. Computer data bases are used to provide information to prospective buyers about livestock being offered for sale. Buyers can evaluate the information available at their leisure. If they are interested in bidding on a particular lot, the name and telephone number of the seller are provided on the listing so that direct contact can be made. Private treaty sales are then negotiated between buyers and sellers.

Evaluation of Marketing Alternatives

To illustrate the various strengths and weaknesses of each marketing alternative, and to demonstrate the difficulty in judging those characteristics, a qualitative evaluation was undertaken by the authors. The "Delphi" method (Lazer and Culley) results were the basis of the relative rankings given to the marketing alternatives in the expert systems developed.

The first step in the evaluation was to choose appropriate criteria to be used in making judgments. Four factors were considered relevant for such a general evaluation. Those factors were (1) whether more buyers were contacted by a seller, (2) whether there was better packaging, in the sense that the marketing process was more professional and pleasing for participants, (3) the level of marketing costs incurred by sellers, and (4) the extent of cooperation/organization required between participants.

The next step was to assign qualitative ratings to each of the marketing alternatives for the four criteria. An arbitrary scale of 1 to 10 was used. For the first three criteria (more buyers, better packaging, and marketing costs) a rating of "1" was given for "very poor" performance by the alternative, "10" was given for "excellent" performance, with a "5" indicating "average" performance. For example, a rating of "1" for these factors indicates that a marketing alternative, respectively, brings contact with very few buyers; does not provide a pleasant, professional atmosphere to facilitate transactions; and does not facilitate reducing total marketing costs. For the fourth criterion (cooperation/organization required), a poor rating of "1" indicates that much cooperation is needed, while an excellent rating of "10" implies that no cooperation is required.

Table 1 presents the results of independent ratings given by both authors (experts). Those ratings are listed in the first four columns. In the last column on the right is presented

a weighted average score for each market alternative. The various alternatives are listed from best to worst, according to the geometric average score. The geometric (multiplicative) average was calculated to reflect the interaction among the criteria. Under this weighting method an alternative which is excellent on one criteria and very bad on another will not be rated as average, but below average.

Two observations can be made about the results presented in Table 1. First, the ratings given by both authors do not match for any of the marketing alternatives. This illustrates the qualitative nature of such judgments. After making the ratings, the authors discovered that they interpreted each of the four criteria somewhat differently. This problem was complicated by having to rate a general technique rather than specific situations where the method was being applied. The second observation is that, despite differing interpretations of criteria, the relative rankings of the alternatives shows much agreement between the two authors. Video auctions were rated highest on both lists while association forward contracting and ranch tour auctions were consistently the two lowest rated methods.

Expert System Design

After the marketing alternatives were ranked relative to one another, the next decision was to select a software package in which to build the application program. As described below, three different programs evolved as different goals were specified by the authors.

The first goal pursued was to present the information in as simple a format as possible. Also, the need for special software was to be avoided to facilitate the widest possible distribution to cooperative extension clientele. Therefore, a spreadsheet template was the first program developed. It assisted users in creating a ranking of the alternatives by responding to a series of "yes-no" questions about their own circumstances. The template aided users familiar with each alternative, but was judged to be ineffective in educating users about those marketing methods new to them. As a result, the spreadsheet was discarded in favor of the two expert systems described below.

A Rule Based Expert System


Below is a rather simple rule based expert system. The system is based on defining logical rules which lead to conclusions. The rules which lead to the conclusion to use video auctions as a marketing alternative are displayed in the following screen dump.

Screen 1

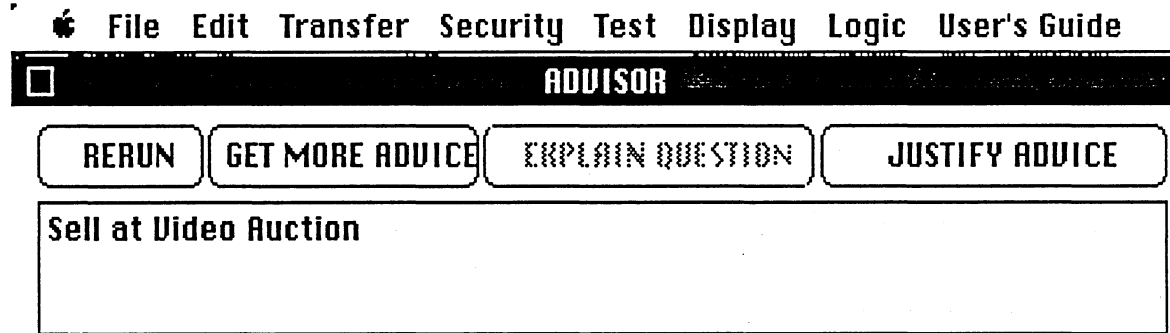
Rule Editor	
Link Graphics	Link Text
OK	
Conclusion Rule 1	Sell at Video Auction
Keyword	Keyword or Abbreviation
Condition 1	Can you sell your cattle in truckload lots?
Condition 2	Are you willing to try new marketing approaches?
Condition 3	Is there a video auction that sells cattle from your area?

The user interacts with the program by responding to questions about the rules. Below is the screen dump for the first question.

Screen 2

ADVISOR	
RETURN	GET MORE ADVICE
EXPLAIN QUESTION	JUSTIFY ADVICE
Can you sell your cattle in truckload lots?	
YES	NO
I DON'T KNOW	
	THIS IS A REQUIREMENT OF VIDEO AUCTIONS.

As can be seen, there is provision for displaying explanatory information about the question on the screen. This information can be either of textual or graphic form. After a series of questions has been answered the suggested alternative which conforms to the rules is displayed, as in the following screen.



A Hypertext Based Expert System

Guide™ is a hypertext program which presents information on the computer screen and has further information and actions linked to certain items of information on the screen.

The linking is done through the device of buttons. A button is simply a "hot-spot" that is created on the screen. By clicking the mouse in a button, Guide will react in some way, depending on the type of button created.

There are three types of button in a Guide document.

- Replacement Buttons

When pointing to a replacement button, the pointer looks like this. ⊕

If clicked on this button, a replacement will appear. Text associated with replacement buttons appears as **bold**.

- Note Buttons

When pointing to a note, the pointer looks like this. ✱

By pressing the mouse button on a note and holding it, the definition will appear in a "pop-up" window. Text associated with note buttons appears as underlined.

- Reference Buttons

When pointing to a reference, the pointer looks like this. ➡

By clicking on a reference, Guide will move to the reference point which can either be in the same Guideline or in another. If the reference point is in another Guideline, Guide will automatically open a new window and display it. Text associated with reference buttons appears as *italics*.

By using replacement buttons to link the text to explanations and/or new questions and by using reference buttons to transfer to new branches in a decision tree, Guide can be used as a very informative and user friendly expert system. The following demonstrates a small part of the Guide based expert system. The first screen is simply a list of marketing alternatives listed in order of preference in the authors' judgements.

Screen 4

SELECTION OF LIVESTOCK MARKETING ALTERNATIVES

ALTERNATIVES IN ORDER OF PREFERENCE

VIDEO AUCTION
ASSOCIATION SALE
LOCAL AUCTION
PRIVATE TREATY

Clicking on the bold title will reveal a replacement that lists the authors and provides a citation for the expert system. Clicking on **PREFERENCE** results in a description of the ranking system the authors used to determine the relative preferences of the marketing alternatives. Clicking on **Video Auction** begins the actual decision-making part of the expert system.

Screen 5

VIDEO AUCTION

A video auction broadcasts over the communications satellites pre-recorded and edited video tape of the livestock offered for sale. Buyers either view the auction by receiving the video via a satellite dish or attend the auction. Bids are received by phone from the buyers not in attendance. Sellers have 5 minutes from the time of the final bid to accept or reject the offer. Delivery and other conditions of sale are described in the sale list and read as the cattle are being shown on the video. Cattle may be sold for delivery in the future.

Requirements
How to
Advantages
Disadvantages

The second screen, which in addition to general information about video auctions, has additional buttons with more specific information as well as questions to determine the suitability of video auctions to the user of the expert system. If the user clicks on the replacement button **future**, the following appears.

Screen 6

Future

Since cattle can be sold for future delivery (forward contracting) , use of the video auction can be a substitute for *hedging using futures or option contracts*. One could consider using the right of refusal if the video sale price is not acceptable or you think that you might receive a better price at a later date. However, for sale at future dates you will probably receive a price close to the futures price for delivery at that time.

If the user clicks on the reference button, *hedging using futures or option contracts*, another hypertext document with extensive educational material on hedging opens. If the user clicks on the **Requirements** button the following screen with the questions which will determine the possibility of the user marketing via video auction will appear.

Screen 7

Requirements

Can you sell in truckload lots?	Yes	No
Do you have prearranged contract with video auction?	Yes	No

If the user clicks on the **No** button of the first question the following advice appears and a link to the next best alternative can be made by clicking on the reference button, *click here for the next best alternative*.

Screen 8

No

It is a requirement that cattle must be sold in truckload lots. You might consider cooperating with a neighbor to get enough cattle for a truckload. If this is not possible, *click here for the next best alternative*.

At this point information and relevant question about association sales are presented in a similar manner. If the user answers yes more information about video auctions can be obtained by clicking on the **How to**, **Advantages**, and **Disadvantages** buttons which appear below the recommendation.

Concluding Comments

Expert systems are real. They are not unicorns (something that everybody knows about but no one has seen). However, so few have been seen that their usefulness in extension programs can only be a matter of conjecture. If experience in other types of extension program delivery can be used to speculate about extension via expert systems, the following hypotheses can be generated:

1. Expert systems which only present an answer will be viewed with suspicion.
2. Expert systems which are not user friendly will not be used.
3. Expert systems with a rigid format for interaction will not be as popular as systems with a flexible user interface.

If these hypotheses prove to be reasonable (as the authors believe), the expert system based upon the hypertext context would be the best of the expert systems discussed in this paper. Hypertext presents a flexible user interface. It can be used to deliver vast amounts of educational material or proceed directly to answer a problem, all under the choice of the user. It also has the advantage of being easily expanded as new hypertext materials are developed and linked to existing materials. The current hypertext programs should prove to be useful tools in delivering extension programs.

However, to be truly powerful for a large number of economic applications, more than the current capability of hypertext programs is needed. Of most importance, hypertext systems need to have the ability to interact with the more traditional decision tools such as spreadsheets, data bases, and statistics programs. In this context, hypertext concepts would be used to guide user through the necessary analysis using the other tools for calculation purposes. Such advanced hypertext systems are now in beta tests.

The usefulness of expert systems to research and extension faculty will not be equal. Even though expert system programs are designed to solve problems, they will be of little use in basic research because the logic and methodology for solving a problem must be developed before an expert system can be created (Garson). In their current forms, expert systems are unable to assist the "expert", they are designed to communicate the expert's knowledge to other people. Therefore, expert systems can be considered a teaching tool. This means that classroom teachers and extension faculty can use expert systems widely in their applied research and education activities.

Expert systems can be evaluated by many criteria. The most obvious evaluation method is to compare the answers of an expert system to those of real experts. Using this

standard, it is possible that an expert system might perform better than human experts, especially in areas requiring processing of large amounts of information. Another way to evaluate expert systems is in terms of the interaction between computer and user. Important questions to consider include "can the user follow the reasoning process of the program?", and "did the user learn about the subject matter while using the program?" Which of these evaluation methods is used will depend upon whether the primary goal of the program is to inform users as to the answer to a problem or to educate them about the subject.

The three different expert systems described in this paper place different degrees of emphasis on the goals of informing and educating users. They also require differing amounts of input and computer skills from users. Taken together, it is hoped that these expert system applications illustrate the variety of options facing someone considering development of a program.

REFERENCES

- Early, John O., "Increasing Returns from Livestock Through Group Marketing," The Cattleman's Library, Publication No. 8075, New Mexico State University, 1982-83.
- Forsyth, Richard, Expert Systems: Principles and Case Studies, Chapman and Hall, Ltd.: London, 1984, Chapter 2.
- Garson, G. David, "The Role of Inductive Expert Systems Generators in the Social Science Research Process," Social Science Microcomputer Review 5(1987):11-24.
- Lazer, W. and J. Culley, Marketing Management: Foundations and Practices, Houghton Mifflin Company: Boston, 1983, Chapter 11.

Table 1. Authors' Evaluation of Marketing Alternatives

Alternatives	Criteria and Ratings				
	More ^a buyers	Better ^a packaging	Reduced ^a costs	Required ^b cooperation	Weighted Score
Video auction	7	7	4	5	5.60
Computerized MIS	7	2	5	10	5.14
Telephone auction	5	5	5	5	5.00
Assoc auction	5	3	3	7	4.21
Computer auction	3	2	4	10	3.94
Assoc forward sale	4	5	3	3	3.66
Private treaty	1	2	5	10	3.16
Local auction	2	2	2	10	2.99
Ranch tour	3	2	3	4	2.91
Video auction	7	8	4	5	5.79
Computer auction	6	5	6	6	5.73
Computerized MIS	8	6	3	7	5.63
Local auction	4	9	6	3	5.05
Assoc auction	2	8	8	5	5.03
Private treaty	1	8	6	8	4.43
Telephone auction	3	4	7	4	4.28
Assoc forward sale	4	4	5	4	4.23
Ranch tour	3	8	4	2	3.72

a 1 = very poor 10 = excellent

b 1 = poor (much cooperation required) 10 = excellent (no cooperation needed)

Measuring the Interdependencies of Agriculture and Rural Communities

Gerald Doeksen and Mike Woods

The farm crisis is well publicized and most everyone is aware of the severe problems faced by many farmers. The impacts of hard times on farmers are also affecting rural communities and businesses. The fiscal problems created by declining agriculture on rural communities and businesses have been slower to surface but are beginning to receive public attention. For instance, a recent U.S. Senate subcommittee (Senate Subcommittee, 1986, pp. 1-2) report on intergovernmental relations states that:

"The human face of the farm crisis has also been the subject of much attention, including dark stories of personal losses and family tragedy. That these dimensions of the farm crisis command center stage is not surprising. But, they are only the first tier of effect from a declining agricultural economy. The farm crisis threatens rural America in other less immediate ways, ways which are far less obvious but potentially as serious. Many rural communities are now questioning whether they will survive the financial stress brought on by declining farm incomes."

The study concludes that:

"small town officials are being faced with a choice between higher local tax rates, or lower quality schools and other local services."
(Senate Subcommittee, 1986, p. 2)

Another illustration is an article in the September 8, 1986 issue of Time. It states:

"Teachers, merchants, veterinarians, and mechanics from the small towns link the farmers and help orchestrate community life. For the moment, some of the small towns are in more distress than the farmers. The government provides no subsidy for grocers and dry good merchants. Publisher Alan Smith of Mount Ayr, Iowa (pop. 1,900) used to run two-thirds of a page of delinquent taxes in his Record-News every year. Now he runs six or eight pages. How long before his Ringgold County must yield on the quality of its schools and public services?"

The Subcommittee report and the article in Time illustrate the severe problems in rural communities as a result of the farm crisis. This paper shows how the decline in the number of farmers will affect, or is affecting, rural communities. In addition, comments will be made about how extension and research must link together to address the crisis in rural communities.

The Linkage Between Agriculture and Rural Communities

To illustrate the linkages between agriculture and rural communities, a community simulation model was applied to a typical rural county and community. Pawhuska, Oklahoma was selected and it is located in North Central Oklahoma and is the county seat of Osage County. This community, 56 miles north of Tulsa, is the main business and service center for most county residents. The population of Pawhuska in 1980 was 4,771 with a total county population of 39,327. From 1980 to 1985, Pawhuska's population increased by 4.8 percent and Osage County's population grew by 5.5 percent. In 1984, there were 1,269 farm proprietors and 1,653 wage and salary farm workers in Osage County. Beef cattle from cow-calf operations were the predominant agricultural enterprise and livestock sales accounted for 93 percent of all agricultural sales in 1984. The primary crops in 1984 were wheat and hay.

The simulation model used to link agriculture and rural communities is a recursive system of equations with an input-output model as its basic component. Location quotients and a gravity model are used to make the model community-specific. The driving forces behind the model are the final demand equations. As changes occur within a community, they cause changes in output and employment.¹

Community Simulation Model Results²

The Pawhuska simulation analysis used to link agriculture and rural communities was run under two scenarios. One to develop a baseline, while the other assumed that about 20 percent or 200 farmers would go out of business in 1986. This percentage was chosen because agricultural economists working with depressed farmers in Oklahoma have projected that 20 percent of the farmers are in financial trouble and will go out of business in the near future. The reduction in number of ranch or farm proprietors is treated differently than an industrial plant going out of business. The main difference is that when a farmer or rancher is forced out of business, a new farmer or renter works the land and agricultural production continues. New owners' agricultural input purchases may differ slightly, but total impact will change little. Agricultural production may even increase if the new operators are more efficient. Thus, the linkages with the agricultural input sectors will not change much. The major impact is that 200 fewer families will be purchasing goods and services in Pawhuska. Since the community has a very limited industrial base, jobs for displaced farmers will be difficult to find in the area. It was assumed that unemployment would increase to 10 percent and that out-migration would begin to occur at that point. Based on these assumptions, employment, population, and selected community service data are presented for each scenario.

¹ For an overview of the model, see Appendix A. For a complete, detailed description of the model, see Drs. Woods and Doeksen.

² This section of paper is taken from Doeksen (1987).

Employment

Employment projections for the baseline, or Scenario 1, are presented in Table 1. Under baseline conditions, which place a large emphasis on what has occurred over the past 10 years, employment is projected to be very stable from 1986 through 1990. In general, agricultural and mining employment are projected to decrease slightly, while the government sector is projected to increase slightly. The employment projections under Scenario 2, or the assumption that 200 farm families will exit agriculture, are presented in Table 2. Total area employment is forecast to drop by 346 jobs in 1986 and 478 jobs by 1990. This drop is shown in Figure 1. The model predicts that it will take time for the main street businesses to feel the impact, with marginal firms going out of business during the early years. After these fail and economic activity further declines, other less marginal firms will see the impact in later years.

Population

The impact of the reduction in population for Pawhuska and the service area is presented in Figure 2. The population of the service area is projected to remain stable in Scenario 1, with 21,857 in 1985 and 21,807 in 1990. With the reduction of 200 farm proprietors in 1986, service area population in Scenario 2 is expected to decrease from 21,807 in 1985 to 20,306 in 1990 and Pawhuska population from 4,683 in 1985 to 4,303 in 1990. Some residents will lose their employment due to fewer farmers and closing main street businesses and will be forced to move to jobs in urban areas.

Selected Community Services

The reduced number of farm proprietors will affect the employment and population of Pawhuska. In addition, the community will have to adjust to the projected decline in revenue and services. Illustrations of decreased usage for selected community services are presented in Table 3. Water usage is projected to decrease from baseline usage (Scenario 1) by 1,987,200 gallons in 1986 and 9,108,000 gallons in 1990. Fire and ambulance calls are also expected to decrease.

Estimates of water and solid waste revenue reductions are presented in Table 3. The impact is over \$5,000 in 1986 and over \$28,000 in 1990. These numbers do not seem large, but if the reductions in sales tax and other taxes are added to these declines, community decision makers will face a host of difficult decisions as they reduce services to stay within their budget.

Summary Comments

The above example illustrates vividly the relationship between the economy of the farmers and ranchers and the impact on the rural community. Another important point is to realize that this is not an isolated case. The USDA, in a study that classified counties identified 720 counties in the U.S. as farming-dependent (Bender et. al.). Counties dependent on farming account for 29

TABLE 1
BASELINE EMPLOYMENT FIGURES FOR PAWHUSKA SERVICE AREA,
1972-1990

TYPE OF EMPLOYMENT	Year							
	1972	1980	1985	1986	1987	1988	1989	1990
PROPRIETOR EMPLOYMENT								
FARM	1,138	1,092	972	968	963	959	955	951
NON-FARM	686	866	889	892	896	897	898	899
WAGE AND SALARY EMPLOYMENT								
AGRICULTURE AND MINING	496	1,228	1,510	1,503	1,494	1,490	1,483	1,477
CONSTRUCTION	256	450	541	551	563	574	586	598
MANUFACTURING								
NONDURABLES	429	348	288	277	267	257	248	239
DURABLES	86	277	307	315	324	332	340	349
TRANSPORTATION AND								
PUBLIC UTILITIES	205	317	390	407	425	443	462	482
WHOLESALE AND RETAIL	1,625	1,440	1,328	1,307	1,287	1,266	1,247	1,227
FINANCE, REAL ESTATE AND								
INSURANCE	401	303	231	219	207	197	186	177
SERVICES	1,470	1,284	1,156	1,134	1,112	1,091	1,071	1,052
GOVERNMENT	926	1,243	1,406	1,441	1,477	1,514	1,552	1,591
TOTAL	7,718	8,848	9,018	9,014	9,015	9,020	9,028	9,042

TABLE 2

**PROJECTED EMPLOYMENT FOR PAWHUSKA SERVICE AREA
1986-1990 GIVEN LOSS OF 200 FARM FAMILIES**

TYPE OF EMPLOYMENT	YEAR				
	1986	1987	1988	1989	1990
PROPRIETOR EMPLOYMENT					
FARM	763	757	751	745	736
NON-FARM	870	870	875	870	858
WAGE AND SALARY EMPLOYMENT					
AGRICULTURE AND MINING	1,489	1,487	1,477	1,467	1,455
CONSTRUCTION	549	521	569	569	575
MANUFACTURING					
NONDURABLES	269	263	251	240	228
DURABLES	314	295	317	334	336
TRANSPORTATION AND					
PUBLIC UTILITIES	398	416	423	449	464
WHOLESALE AND RETAIL	1,301	1,283	1,251	1,240	1,218
FINANCE, REAL ESTATE AND					
INSURANCE	212	201	191	180	168
SERVICES	1,107	1,098	1,069	1,042	1,012
Government	1,396	1,455	1,463	1,497	1,514
TOTAL	8,668	8,646	8,637	8,633	8,564

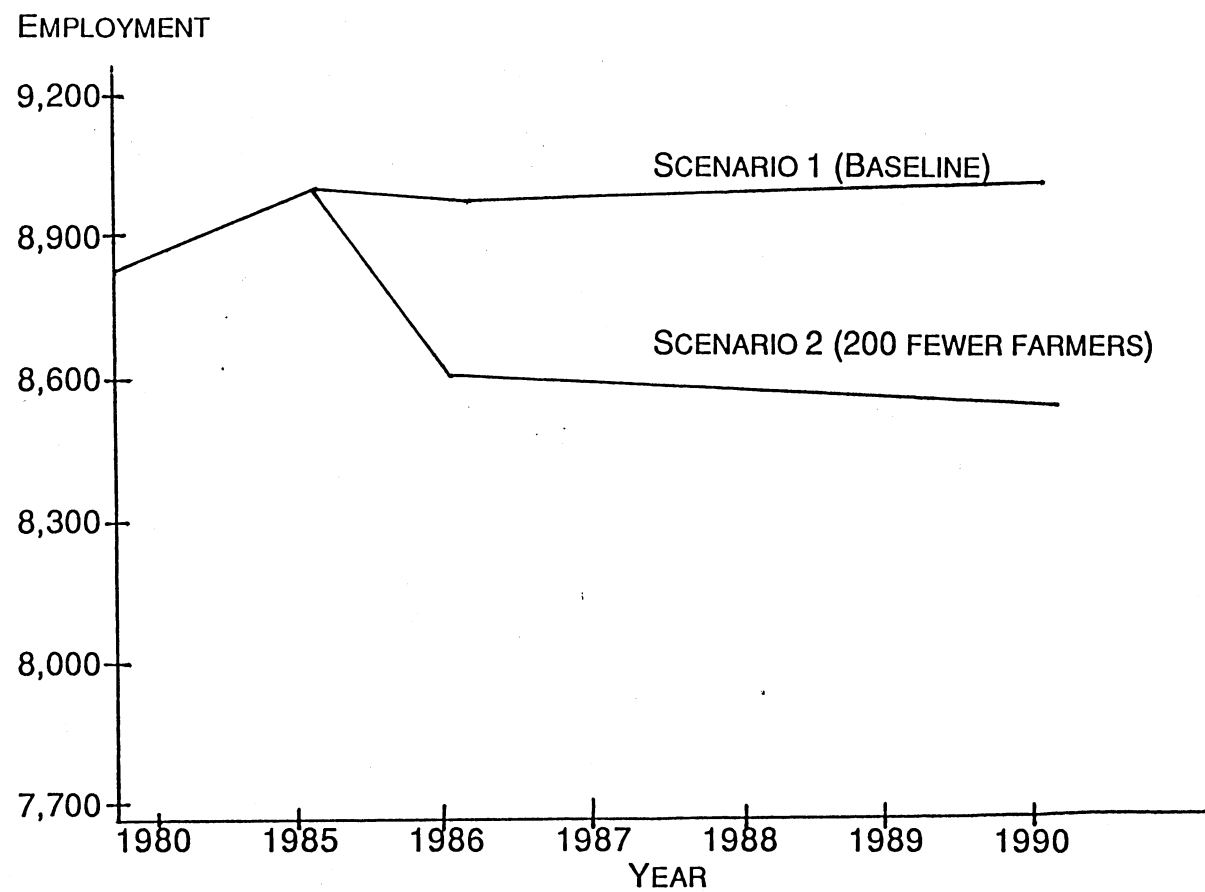


FIGURE 1. ESTIMATED EMPLOYMENT IN PAWHUSKA SERVICE AREA

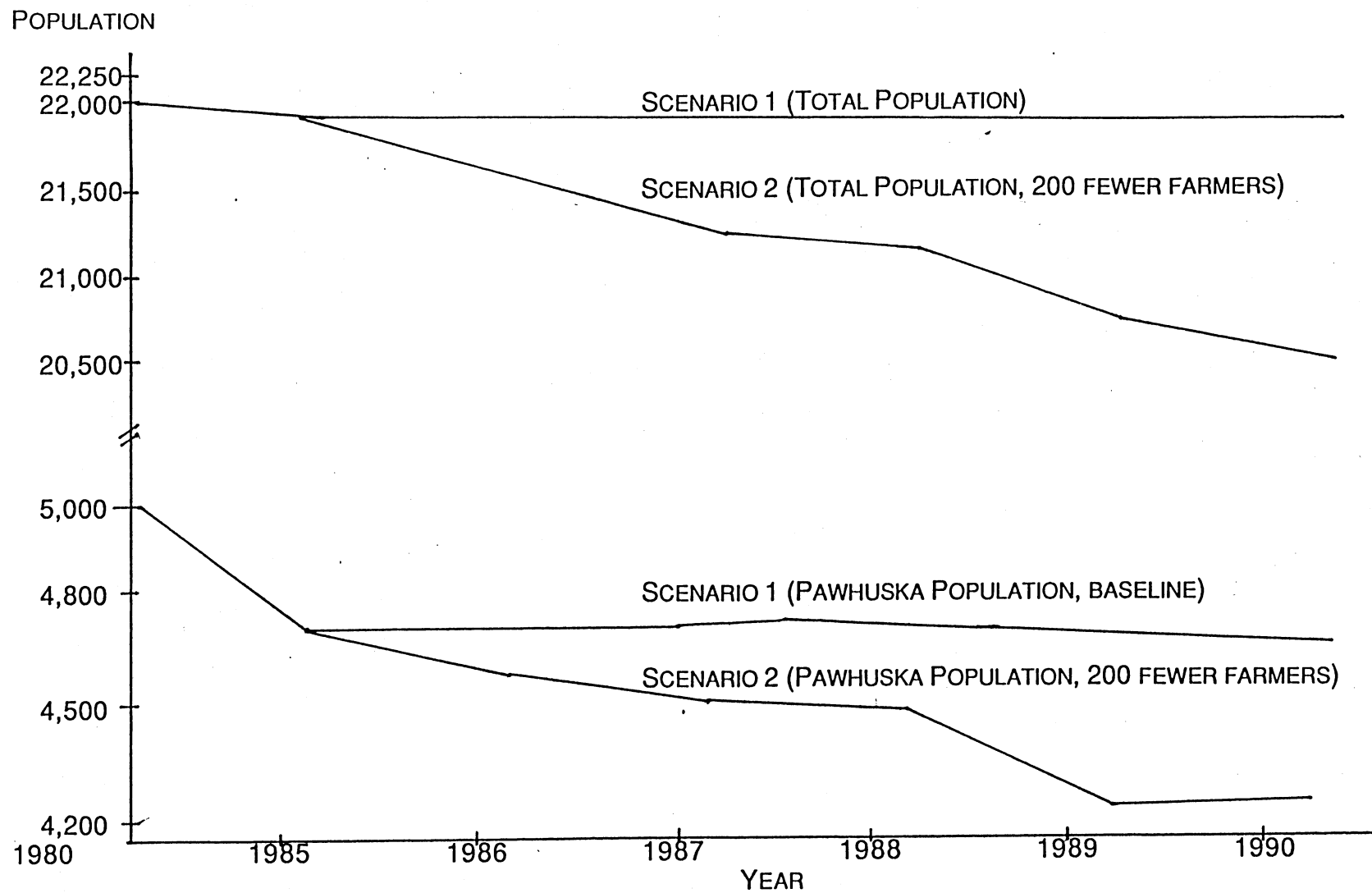


FIGURE 2. ESTIMATED POPULATION FOR PAWHUSKA AND SERVICE AREA

percent of all non-metro counties and tend to be regionally concentrated. Half are in the North Central region, especially the Great Plains. Other smaller concentrations, comprising another third, are along the Mississippi River Delta in Arkansas, Mississippi and Louisiana, in parts of the Southeast, or in Montana, Idaho or Washington. Thus, large regions of the U.S. will be impacted severely as the farm crisis continues.

Extension and Research Linkages

One important issue that we were asked to address is how extension and research should link together to provide our clientele the types of programs they desire and need. The program objectives we were asked to address include: (1) improve the working relationship between extension and research; (2) strengthen the extension economists' ability to identify research needs; (3) identify the appropriate economic theory; and (4) assist in designing research projects that will provide material for extension programs. We will discuss issues which we feel have helped us develop our research and extension programs. We feel there is no one answer to the objectives, but that there are several things that can aid us as we try to use our limited resources most efficiently.

Before discussing experiences at Oklahoma State University, everyone should be reminded of the Extension Committee on Policy (ECOP) Subcommittee on Community Resource Development (CRD) Report. The subcommittee did an excellent job of summarizing important points about linkages between CRD extension and research. Our comments will expand some of their points and provide additional ones which we feel are important. If extension personnel are going to meet the needs of their clientele, a strong and continuous research base is imperative. The points which allow us to have a research base at OSU are:

1. Long-run as well as short-run focus. Our department is divided into work groups where all professionals in rural development prepare a long-range plan. The document is completed by researchers, extension workers, and teachers. The activities of each group are integrated so that everyone knows where we have been, where we are, and where we are going. The long-term perspective for research is important, but it must remain flexible to handle some of the short-run problems.
2. Joint appointments and central location. It is extremely useful to have a joint extension and research appointment. This allows the extension worker who sees the problem at the local level to design research projects to meet these needs as well as obtaining resources to get the job done. If the joint appointments are not there, the researcher may have interests which are completely different than the clientele's needs and he will not have an appreciation for the project. Three-way appointments (teaching, research, and extension) should be reserved for special cases. Three-way

TABLE 3

**ESTIMATED DECLINE IN SELECTED COMMUNITY SERVICES
RESULTING FROM DECREASE IN NUMBER OF
AGRICULTURAL FAMILIES IN PAWHUSKA, OKLAHOMA**

SERVICE	YEAR	
	1986	1990
<u>USAGE</u>		
WATER ¹ (ANNUAL GALLONS)	1,987,200	9,108,000
SOLID WASTE ² (CUBIC YARDS)	1,083	5,024
FIRE CALLS ³	1	6
AMBULANCE CALLS ⁴	2	10
<u>REVENUE</u>		
WATER ⁵	\$4,320	\$19,800
SOLID WASTE ⁶	\$1,872	\$8,580

¹ ASSUMES 6,900 GALLONS PER MONTH PER HOUSEHOLD (GOODWIN AND DOEKSEN).

² ASSUMES 16.42 CUBIC YARDS PER PERSON PER YEAR (GOODWIN AND DOEKSEN).

³ ASSUMES ONE FIRE FOR 54 PERSONS PER YEAR (NELSON AND DOEKSEN).

⁴ ASSUMES 34.25 AMBULANCE CALLS PER 1,000 POPULATION PER YEAR (DOEKSEN, ANDERSON AND LENARD).

⁵ ASSUMES AVERAGE MONTHLY BILL OF \$15.00.

⁶ ASSUMES AVERAGE MONTHLY BILL OF \$6.50.

appointments may spread the individual in too many directions. It is also very important that professionals be housed together. In fact, researchers and extension personnel should be next door. With extension on one floor and research on another, communication is not what it would be if they were next door to each other. By all means, extension and research should be in the same building and mechanisms should be instigated to make sure they see each other often (such as a joint coffee room). In our opinion, effective extension and research linkages cannot be arranged if research and extension are in different buildings or worse yet, in different communities.

3. Link with clientele. We feel that it is crucial that a good extension and research program have links with clientele. This may be formalized with a committee structure as is the case at OSU or it may be informal. Our formal arrangement is a county committee system where local people present their concerns. This is aggregated into district and state committees and reports. Equally important are the informal arrangements where extension and researchers interact with local decision makers, listening to their problems and concerns. This may be done at association meetings such as those for county officers or just through regular meetings. It is important to listen and then relate what is heard to a researchable project. Again, the joint appointment allows the researcher direct access to extension clientele and further supports joint appointments.
4. Work with other agencies. Community development work is different from agriculture in that we have many agencies and departments out there also trying to help local leaders. There is more than enough work to do, so rather than compete, a joint working arrangement should be developed. We have developed strong ties with many agencies. In fact, when we deliver many of our extension programs, we have other agencies as co-sponsors and if we produce a written report, we make them a co-author. This type of trust and relationship makes everyone happy and is a must. Personnel from these agencies become some of our strongest supporters and will often help us gather research data, get us grants, or assist us in getting grants.
5. Aggressively seek grants. Our program is where it is because we have been very aggressive in seeking grants. With tightening budgets at the federal level and hard times in many states, we can not expect new positions or increased funds for research and extension. Funds can be used to support research projects which directly fill a local need. These are often very applied projects funded by state agencies. Again, the working relationship discussed above has opened these doors. Since CRD personnel are limited, it is also crucial that the Regional Centers and USDA fund research that is regional or national in scope. Many states do not have researchers, thus their research base must come from other states,

the centers, or USDA. Even states with resources must share with everyone to insure that our limited resources are used efficiently.

6. Regional and national networks. We have developed programs from other professionals as well as shared our programs with others. For instance, we have borrowed heavily from Wisconsin in building our economic development program and others have borrowed heavily from OSU regarding our community service programs. The centers and others need to continue to support regional and national seminars, workshops, and projects. It is imperative that we share research and extension knowledge.
7. Reward system. Regardless of the format used, it is important that there is an adequate reward system. Our administrators have been good to us and have rewarded extension and research. If an institution has a publish or perish philosophy, the extension component may suffer. Likewise, if the other extreme is in place the research component will suffer.
8. USDA linkage. The research efforts of the USDA have been very useful to developing the community facilities extension program at OSU. We are concerned about the fact that there are no ERS personnel in the field and how we can have input to guide the research efforts of ERS and USDA. We do not mean to dictate their efforts, but to provide input regarding national and regional programs that many states need but can not conduct themselves.

Extension Programs for Rural Communities

This paper illustrates that rural communities will have serious adjustments in the coming years. It further illustrates the vital importance of extension/research linkages. This section of the paper attempts to illustrate how we are working with community leaders as they make adjustments. Our research base as well as research from others has allowed us to develop three specific programs which may help local decision makers. These include economic development planning, assisting community businesses, and planning community services.

Planning Economic Development³

If community leaders decide they do not like the results as predicted by the simulation model, they may wish to attempt to expand their economic base. Extension personnel can assist leaders in organizing for economic development, analyzing resources, and developing appropriate economic strategies. Leadership training and organizing an economic development team are activities which a practitioner may undertake in the organization phase.

³ This section of our extension program borrows from information obtained from Wisconsin.

During the analysis phase, practitioners may wish to provide background economic data, conduct an economic base study, complete an impact study or a retail sales study. Assisting community decision makers in delineating a community economic development strategy is another activity with which the practitioners may be involved. The practitioner may also be involved in various community economic development strategies. For example, the practitioner may train a team to work with local industries and businesses with the goal of retaining an expanding them. Another example would be to train an industrial recruitment team. This has been a high priority in Oklahoma in recent years. Extension educational programs have been eagerly received and the existing research base has been very useful. Many current research activities are a result of the needs identified through extension economic development activities.

Assisting Community Business⁴

The simulation model indicates that rural businesses will face declining sales if farmers move and the economic base is not expanded. Educational programs to help the local business community are extremely important. Some examples include:

- | | |
|-------------------------------------|--------------------------------|
| 1. effective advertising techniques | 4. time and office management; |
| 2. effective customer relations; | 5. financial management; and |
| 3. consumer opinion surveys; | 6. inventory management. |

The purpose of these programs is to make the local businesses more competitive and thus, more profitable. This is an important part of over-all economic development efforts in a rural community.

Planning Community Services

The simulation model also projects estimates of community service usage and revenue. Community development practitioners can use this information to assist community leaders in planning community service delivery systems. Alternative delivery systems for community services can be presented with related costs. For example, fire protection or emergency medical services may have to rely on volunteers rather than an existing delivery system with paid personnel. Practitioners can help prepare budgets for these alternative delivery systems for local decision makers. Another example is the combining of some county or community services. A good example is sharing a landfill. Again, a practitioner can assist in preparing budgets of alternative systems. In addition,

⁴ This section of our program borrows from researchers and extension professionals in Texas and Iowa.

budget information is extremely important to local decision makers as they plan community services. The model can provide this data to help leaders develop alternative revenue sources.

References

- [1] Senate Subcommittee on Intergovernmental Affairs. Governing the Heartland: Can Rural Communities Survive the Farm Crisis? 1986.
- [2] Sidey, Hugh. "Bitter Harvest-There is a Sadness on the Land." Time. September 8, 1986.
- [3] Woods, Mike and Gerald A. Doeksen. A Simulation Model for Rural Communities in Oklahoma. Oklahoma Agricultural Experiment Station Bulletin B-770, October, 1983.
- [4] Doeksen, Gerald A. "The Agricultural Crisis as It Affects Rural Communities." Journal of the Community Development Society. Vol. 18, November 1, 1987. pp. 78-88.
- [5] Bender, Lloyd D., et. al., The Diverse Social and Economic Structure of Nonmetropolitan America, USDA, ERS, Rural Development Research Report No. 49, September, 1985.
- [6] "ECOP Task Force on CRD Research/Extension Linkages." CRD Research/Extension Linkages. December, 1985.
- [7] Goodwin, H.L., et. al. Economics of Water Delivery Systems in Rural Oklahoma. Oklahoma Agricultural Experiment Station Bulletin B-745, Oklahoma State University, Stillwater, 1979.
- [8] Goodwin, H.L. and James R. Nelson. Analyzing Economic Feasibilities of Rural Solid Waste Management Systems. Oklahoma Agricultural Experiment Station Bulletin B-748, Oklahoma State University, Stillwater.
- [9] Nelson, Marlys K. and Gerald A. Doeksen. Fire Protection Services Feasibility Guide for Local Decisionmakers in the Rural Ozarks. Oklahoma Agricultural Experiment Station Bulletin B-764, October, 1982.
- [10] Doeksen, Gerald A., et. al. A Community Development Guide for Emergency Medical Services. Oklahoma Cooperative Extension Publication, 1983.

Appendix A

Summary of Oklahoma Simulation Model

The simulation model was originally developed in Oklahoma [4]. The model has been used by Community Development professionals in Oklahoma and Texas. The data necessary for the operation of this model are divided into five accounts: an economic account, a capital account, a demographic account, and municipal accounts for community services and community revenue. The accounts are then linked through a series of equations. Figure A1 presents an overview of the accounts.

The economic portion of the model is the driving force. It includes a community specific input-output model and a gravity model. The gravity model is used to determine the service area of a community, based on population levels and distance to nearby communities. A location quotient technique is applied to a regional or state input-output model to derive a community specific input-output model. The community model is made dynamic through the use of equations which predict final demand over time.

The capital account allows for the simulation of investment and its effects on the economy. Capital transactions by industry sectors are included in the capital coefficient matrix. Capacity levels and capital-output ratios describe the relationship between capital investment and industry output. The capital data are related to the inter-industry information included in the input-output model.

The demographic account contains information on community population. A gravity model (based on distance to other communities and population) is utilized to estimate the community service area. A cohort survival sub-model predicts population by age-sex categories based on birth rates, death rates, and migration. Population information is stored for both the community and the service area.

The community service account contains usage coefficients for services provided in the community. Services analyzed include hospitals, clinics, emergency medical services, fire protection, water, sewer, and solid waste. Community requirements for each of these services are estimated based on model output. The community service information is based on research conducted for each service in Oklahoma.

The revenue account provides projections of local revenue by sources such as sales taxes, licenses, permits, and user charges for various services. The revenue projections are based on community specific revenue data available for Oklahoma communities.

Figure A2 presents an overview of major computations contained in the model. The economic account contains a local input-output model. Equations for each category (households, capital investment, inventory change, federal government, state and local government, and exports) predict final demand

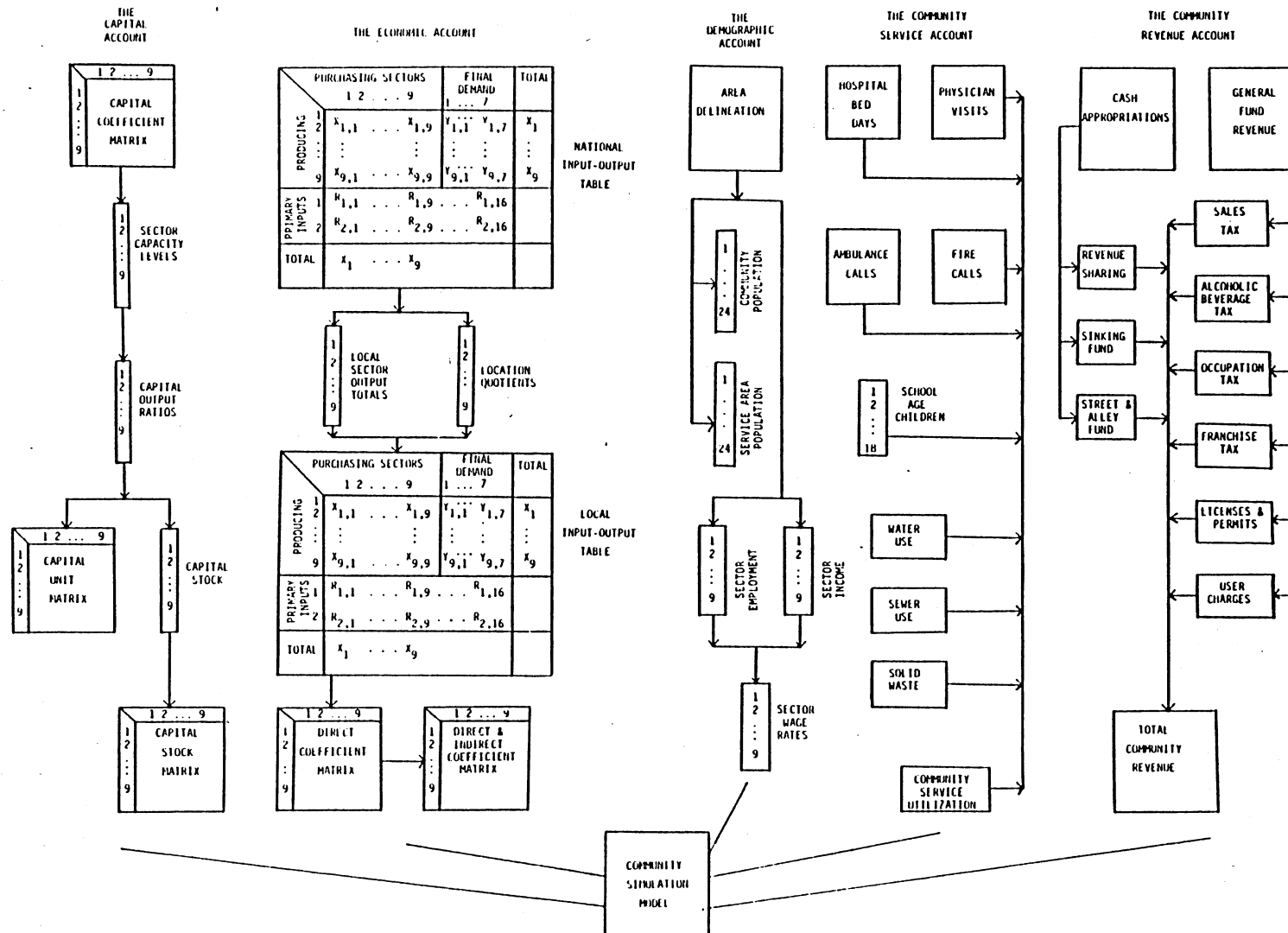


Figure A1. OVERVIEW OF SOCIAL ACCOUNTS

over time. Production relationships then determine output levels by economic sector. Labor productivity rates are used to estimate employment requirements by sector. At the same time, the demographic account is estimating population using an age-sex cohort survival technique. Using local labor force productivity rates, the available labor force is then estimated for each year. The resulting final population values are then included in the next year's calculations. The complete model has over 200 equations describing the economic and social relations within a community.

The model is designed to be easily adapted to a wide range of community applications. Specific information on the community is requested variables, employment data, and geographic location. These data are readily available from Census Publications and State Employment Agency reports. A large secondary data base is included with the model to minimize data collection. Growth rates, input-output parameters, and community service coefficients are included in this data base. The computer model is interactive and asks a series of questions to which the user responds by providing the input data required. The model is written in FORTRAN and compiled on an IBM 370/168 computer. At the time of development, the data base and equations required so much storage space that a main frame computer was required. However, given the rapid developments in the micro-computer field, conversion to a micro-computer may be possible in the future. Table A1 provides a summary of the information provided by the model.

COMMUNITY SIMULATION MODEL

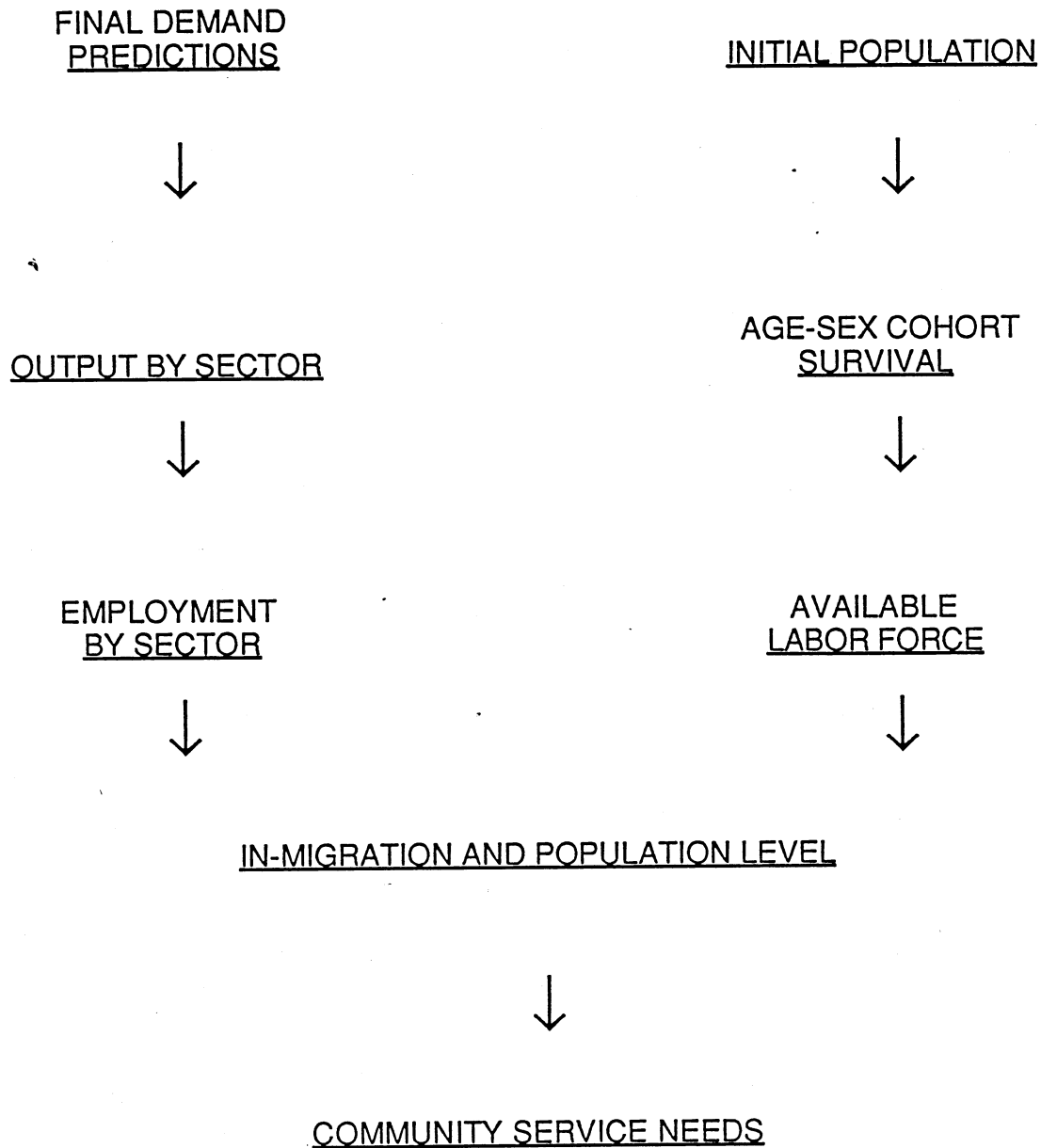


FIGURE A2. OVERVIEW OF MAJOR COMPUTATIONS IN THE COMMUNITY SIMULATION MODEL

Table A1
SUMMARY OF ANNUAL PROJECTIONS PROVIDED BY
THE COMMUNITY SIMULATION MODEL

Category	Model Output
Economic	Employment by Industry Sector Income by Industry Sector Output by Industry Sector
Demographic	Population by Age-Sex Cohort Population for Community and Service Area
Service	Hospital Bed Days by Age-Sex Cohort Physician Visits by Age-Sex Cohort Ambulance Calls Number of Fires

Table A1 (Continued)

Category	Model Output
	Water Requirements Sewer Volume Solid Waste Volume
Revenue	Community Revenue by Source

Table A1 (Continued)

Category	Model Output
	Water Requirements
	Sewer Volume
	Solid Waste Volume
Revenue	Community Revenue by Source

DISCUSSION OF "MEASURING THE INTERDEPENDENCIES
OF AGRICULTURE AND RURAL COMMUNITIES"

F. Larry Leistritz and Arlen G. Leholm*

The findings of Doeksen and Woods are reinforced by Leistritz and Leholm with North Dakota data about recent trends in retail sales and employment and with data from a six-community survey of residents and of current and former businesses. Most observations by Doeksen and Woods about extension-research linkages are supported.

Our approach to discussing the paper by Drs. Doeksen and Woods will be to first present a few results from our own research which seem to reinforce their findings and then to offer a few comments regarding their observations concerning extension and research linkages.

The fact that the farm crisis is having a major impact on rural communities is particularly evident in North Dakota, where agriculture accounts for a high percentage of the economic base. Statewide, sales of crops and livestock accounted for about 42 percent of total exports (sales to final demand or basic income) in 1984, and in several state planning regions agriculture constituted more than half of the total economic base (Coon et al.). Another indication of the extent to which North Dakota communities are economically dependent on agriculture is provided by a recent study that classified 39 of the state's 53 counties as "farming dependent" (based on the fact that farming contributed a weighted annual average of 20 percent or more of total labor and proprietor income over the five years from 1975 to 1979) (Bender et al.).

Examination of recent trends in retail sales reveals that North Dakota's rural communities have been experiencing a substantial recession. Taxable retail sales, adjusted for inflation, declined 12.5 percent on a statewide basis from 1980 to 1985 (Table 1) and have receded to levels experienced in the early 1970s. The 1980 to 1985 decrease was 23.9 percent for towns under 10,000 compared to 6.4 percent for towns over 10,000. When sales are aggregated to the county level, it can be noted that the state's 39 agriculturally dependent counties experienced a decline of 20.3 percent from 1970 to 1985 while the remaining counties actually increased 13.9 percent.

*The authors are, respectively, professor and extension economist, Department of Agricultural Economics, North Dakota State University.

TABLE 1. TOTAL RETAIL SALES AND CHANGE IN SALES IN NORTH DAKOTA COUNTIES, 1970-1985 (CONSTANT 1985 DOLLARS)

County Group	No. of Counties	Total Retail Sales ^a				Percent Change		
		1970	1975	1980	1985	1970-85	1970-80	1980-85
		-----dollars-----				-----percent-----		
Agricultural counties	39	773,849,645	964,371,060	755,165,843	617,061,526	-20.261	-2.414	-18.288
Other counties	14	2,100,282,978	2,780,379,900	2,682,964,915	2,391,816,314	13.880	27.743	-10.852

Counties with town(s) over 10,000	8	1,892,500,812	2,506,098,320	2,454,568,753	2,213,259,475	16.949	29.700	-9.831
Counties with no town(s) over 10,000	45	981,631,812	1,238,652,640	983,562,005	795,618,365	-18.949	0.197	-19.108

All counties	53	2,874,132,623	3,744,750,960	3,438,130,758	3,008,877,840	4.688	19.623	-12.485

^aBased on sales reported in North Dakota's 200 largest towns. In 1985, these sales amounted to 88 percent of total taxable sales reported in the state. The reader also should note that, prior to 1976, sales from consolidated firms (those firms filing a single return including data for several plants) were assigned to the city (and county) containing the plant that filed the return. Since then, consolidated returns have not been included in city or county totals but, instead, have been reported in a category called "consolidated returns." The consolidated returns amounted to 10.3 percent of total in-state taxable sales in 1985, and sales of businesses located outside the largest 200 cities were 1.7 percent of the total (North Dakota State Tax Department).

Recent trends in employment are similar to those in taxable sales except that the percentage changes in employment are somewhat less. From 1980 to 1985, total employment increased about 1 percent on a statewide basis but decreased 10.6 percent in the agriculturally dependent counties. Similarly, employment declined by 8.8 percent in counties with towns under 10,000 people but increased 8.8 percent in counties with towns of 10,000 or more.

Thus, recent trends in sales and employment point to a stable or even decreasing level of economic activity in the state, especially in the smaller trade centers and in the more agriculturally dependent areas. As a result, many business proprietors, residents, and public officials in such areas are experiencing substantial adjustment problems. In an effort to better understand the situation faced by rural businesses and residents, our research group undertook a survey of selected North Dakota communities. The survey was conducted during the period March through July 1986. Six communities were selected for intensive analysis: Carrington, Casselton, Grafton, Hettinger, Jamestown, and Stanley (Figure 1). An attempt was made to select trade centers of various sizes and in different regions of the state. The six towns range in population from about 1,700 to about 16,000. The smaller towns should be representative of many of the state's smaller agricultural trade centers while the larger communities (Grafton and Jamestown) should be reflective of the situation in the state's larger, nonmetropolitan shopping centers. Five of the six towns experienced modest growth during the 1970s, although four of the counties had population declines during that period.

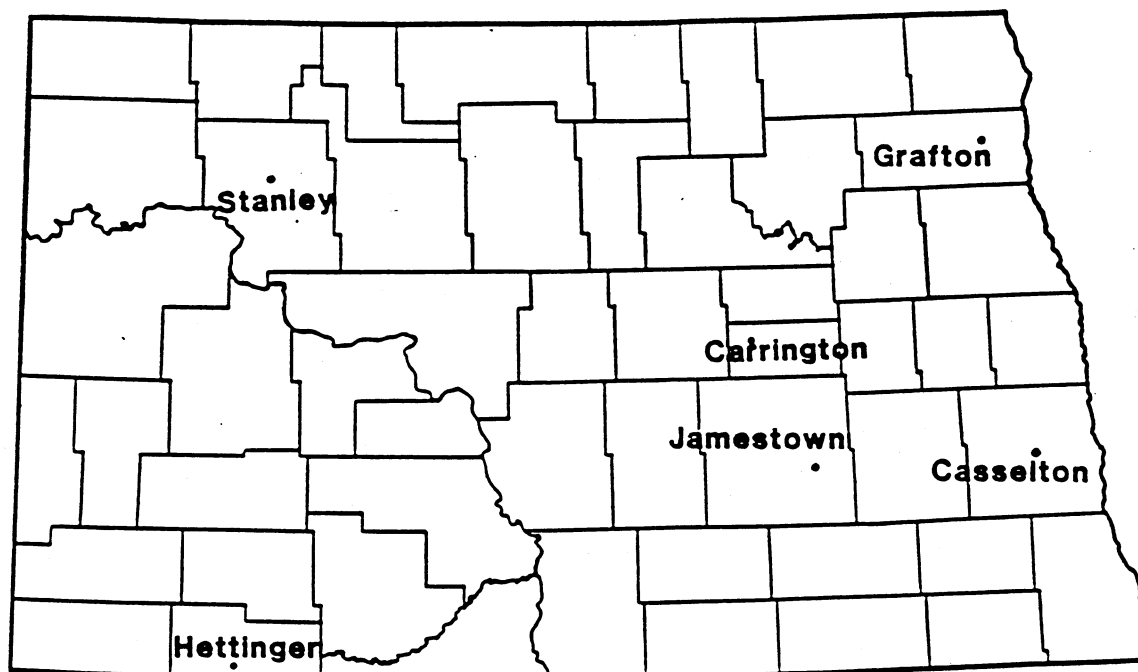


Figure 1. Communities Selected for Analysis

The study communities are all located in heavily agricultural areas. Of the six counties, four had one-fourth or more of their labor force directly employed in agriculture in 1980. Several indicators suggest that the communities' economies have been experiencing negative effects associated with economic stress in agriculture. Retail sales, measured in constant 1985 prices, declined in all of the six communities between 1980 and 1985, and four of the six counties experienced a decrease in total employment between 1980 and 1985. (For a more detailed discussion, see Leistritz, Ekstrom, and Vreugdenhil and Leistritz et al.)

In order to study the effects of the farm crisis on these communities, informal interviews were conducted with community leaders to identify the various forms of impacts that had been experienced. Then three formal research instruments (questionnaires) were developed and administered to three separate groups: current business operators, former business operators, and other community residents.

The results of the surveys of business operators and former business operators in six North Dakota communities lead to a number of conclusions. The most salient of these include the following:

- Farmers are important customers for many businesses. Overall, businesses surveyed reported that direct sales to farmers accounted for more than 40 percent of their business volume.
- The viability of the local community is critical to area businesses. In each community surveyed, residents of the town together with farmers accounted for about 75 percent of the total business volume of local establishments.
- Financial resources of the businesses surveyed were quite variable. About one-third of the current business operators reported no debt, while about 19 percent had debt-to-asset ratios greater than 70 percent. High debt-to-asset ratios tended to be associated with operators less than 45 years old and those who had been in business less than 10 years.
- The variability of financial circumstances of the businesses surveyed is also revealed when their levels of net profit are examined. About 21 percent of the respondents reported negative levels of net profit in 1985, and half had a net profit of less than \$13,000. The level of net profit was inversely associated with the businesses' debt-to-asset ratio; i.e., the higher the debt ratio, the lower the net profit.
- A substantial percentage of the businesses surveyed were not current on their debt payments. Overall, about 12 percent of the businesses with debt surveyed fell into this category, and 21 percent of the businesses with debt-to-asset ratios exceeding 70 percent were in this situation.
- Business managers are responding to current financial pressures in a variety of ways. More than two-thirds reported they had

stepped up collection efforts on overdue accounts while almost half had attempted to reduce inventories. Almost 40 percent had reduced their labor force in the last three years, and about 38 percent had started charging interest on overdue accounts.

- The economic outlook of the current businesspersons surveyed can best be summarized as cautious. While more than three-fourths felt they could continue to operate for at least three more years, only about one-fourth felt they were likely to expand their businesses during that period. Retail proprietors were the least optimistic concerning business continuation.
- Comparison of salient characteristics of current and former businesses provides several insights. Current and former business operators reported similar reasons for establishing their businesses. When the types of businesses are compared, the former businesses were found to be dominated by retail establishments. Fewer former businesses than current establishments were found in the finance, insurance, and real estate; and professional services categories. Former business operators had been involved in their business for a substantially shorter period than their counterparts who were currently operating, and their businesses had been established for a much shorter period. There was little difference in the types of customers they served, but the former businesses had fewer employees. They also had substantially lower levels of financial resources.

The dominant pattern that emerges from the business surveys, then, is that the businesses that have failed were similar to other firms in the study communities with the exception of being smaller and less well-established. The majority of these businesses were started in the 1970s suggesting that the impact of economic stress in agriculture on business operators may be similar to its effects on farmers and ranchers. Business operators who established their firms in the 1970s, like persons who began farming during that period, appear to have been severely affected by declining revenue and falling equity. Circumstances rather than individual actions, may thus have been the major cause of failure for many rural businesses.

The survey of other community residents also produced some interesting findings. Some of these were:

- A number of survey respondents reported that they were former employees of a business that had closed or made personnel cuts in the last three years because of the depressed farm economy. Overall, about 30 percent of respondents and spouses had been employed at their present jobs less than three years. About 18 percent of this subgroup (or one in 20 of the total sample) reported that they were former employees of firms that had closed or made personnel cutbacks. These persons tended to be somewhat younger than the overall sample; about 78 percent were less than 45 years old. About 70 percent of these former

employees were married, and 59 percent had children at home. About 79 percent of the men, but only 61 percent of the women, were currently employed; about 36 percent of the women planned to look for a different job in 1986.

- The financial resources of these displaced workers were relatively limited. Their median family income in 1985 was \$20,000 (compared to \$23,000 for the overall sample), and their median net worth was \$34,000 (the same value as that for the total sample).
- About 20 percent of men and 16 percent of women responding to the survey indicated that they were likely to look for a different job in 1986, and about 72 percent of these persons would be willing to relocate. Persons who would relocate were generally younger and better educated than average, and most would seek to relocate to one of North Dakota's larger cities. Thus, one effect of the current economic stress in agriculture may be to stimulate additional migration from the state's rural areas.

In summary, this survey of residents of six agricultural trade centers suggests that secondary effects of current economic stress in agriculture are now being experienced by many rural nonfarm residents. Some of these individuals have experienced job loss as their employers ceased operation or initiated personnel cutbacks, while others are contemplating relocation in hope of finding more satisfactory employment. Thus, while the initial effects of reduced farm income have been largely experienced first by farmers and then by local businesses, particularly those dealing in durable goods, the reduced business volume and associated problems experienced by many businesses have led to layoffs, reduced hours, and decreased income for many employees. For rural nonfarm residents, as for farmers and rural business persons, adverse economic trends in agriculture have posed substantial adjustment problems.

Extension and Research Linkages

Against this backdrop of rural economic stress, we (like others) have been concerned with developing more effective research and extension programs. Regarding linkages of research and extension, let us first emphasize that the work on which we have been reporting is the result of a three-year cooperative effort between research and extension at North Dakota State University. The effort was somewhat unique at North Dakota State University in the sense that research and extension have been separately administered and joint appointments are rare. Based on our experience, we would support most of the observations made by Drs. Doeksen and Woods. Specifically,

- Long-run Focus--We would strongly support the need for some long-run planning of research efforts while recognizing a need for some flexibility to deal with short-run problems.

- Joint Appointments and Colocation--Our institution may soon be experimenting in these areas. We can give you a report next year!
- Grants--Our work has been funded primarily by grants, from sources as diverse as the Economic Research Service, Federal Extension, private foundations, and the North Central Rural Development Center.
- Networks--We feel that we have benefited greatly from interactions with colleagues at a number of institutions and in USDA. In the work we have been describing, we have worked very closely with Steve Murdock and his associates at Texas A&M. We jointly designed the questionnaires and survey procedures, and surveys of businesses and residents have also been conducted in several Texas communities.
- Reward System--It would seem almost axiomatic that adequate reward systems are essential. Sometimes, however, it appears that this belief is not universally held.
- USDA Linkage--As I mentioned earlier, we have benefited from both the financial and personal support of the USDA. In particular, Fred Hines, Tom Carlin, and Sara Mazie have been extremely supportive.
- Future Programming--As we look at the needs of rural North Dakota, we too plan to emphasize economic development, assistance to rural businesses, and community service planning, and we have created a Center for Rural Revitalization as a vehicle for focusing program efforts in this area.

References

- Bender, Lloyd D., Bernal L. Green, Thomas F. Hady, John A. Kuehn, Marlys K. Nelson, Leon B. Perkinson, and Peggy J. Ross. The Diverse Social and Economic Structure of Nonmetropolitan America. Rural Dev. Res. Rpt. No. 49. Washington, D.C.: U.S. Department of Agriculture, Economic Research Service, 1985.
- Coon, Randal C., F. Larry Leistritz, and Thor A. Hertsgaard. Composition of North Dakota's Economic Base: A Regional Analysis. Agr. Econ. Rpt. No. 209. Fargo: North Dakota State University, Dept. of Agr. Econ., 1986.
- Leistritz, F. Larry, and Brenda L. Ekstrom. Interdependencies of Agriculture and Rural Communities: An Annotated Bibliography. New York: Garland Publishing, Inc., 1986.
- Leistritz, F. Larry, Brenda L. Ekstrom, and Harvey G. Vreugdenhil. Selected Characteristics of Business Operators in North Dakota Agricultural Trade Centers. Agr. Econ. Rpt. No. 217. Fargo: North Dakota State University, Dept. of Agr. Econ., 1987.
- Leistritz, F. Larry, Brenda L. Ekstrom, Janet Wanzek, and Harvey G. Vreugdenhil. Selected Socioeconomic Characteristics of North Dakota Community Residents. Agr. Econ. Rpt. No. 218. Fargo: North Dakota State University, Dept. of Agr. Econ., 1987.

IDENTIFYING THE FINANCIAL STRESS OF RURAL GOVERNMENTAL UNITS AND METHODS FOR ASSISTING THEM

by
J.M. (JACK) WHITMER*

The presence of financial stress of rural Iowa local government units is not easily documented if several aspects of local financial information are considered. Logical economic conclusions are often modified by political decisions and shallow perceptions of reality. In Iowa, structured lags in the revenue generation process, a conceptual perception of financial conditions distorted by inflation, non-existent management information systems and other factors, have masked the true financial stress in rural Iowa local government from all but the very active professional staffs. A rural community "Glocal (1) Reality Check" will provide local government officials and community leaders an opportunity to express and defend their personal perceptions of the financial conditions of their community.

Financial Stress as Perceived by the Typical Local Government Leader.

A local government official talking to a friend or stranger will relate that citizens are complaining about high taxes. Not just property taxes, all taxes. The paid city-county staff want, maybe need, higher pay. Everything the cities-counties purchase is costing more. The money from Federal (General) Revenue Sharing: GRS is no longer available. An agricultural recession has a full head of steam and there are many layoffs and some plant closings. Yes, Local Government Units have fiscal stress.

That same local government official will be hard pressed to furnish any detailed, factual information to further defend the above general statements. Typical local government officials are not likely to plot GRS in current and constant dollars or as a percent of total budget over a number of years. Nevertheless, this general perception of financial stress is reflected in many official actions. This paper is an attempt to provide factual information to support or challenge this general image of financial stress.

* Extension Political Scientist, Iowa State University

(1) Glocal is a word used by Perdita Huston to describe issues on which people are going to have to think Globally as they act Locally.

Examples of Financial Stress (?) in Rural Government

The depressed agricultural economy with the accompanying declining Ag land values are common topics in the popular press in Iowa and other North Central and Ag dependent states. Figure I reports the estimated market value of one acre of Ag land in an Ag dependent county in Iowa.

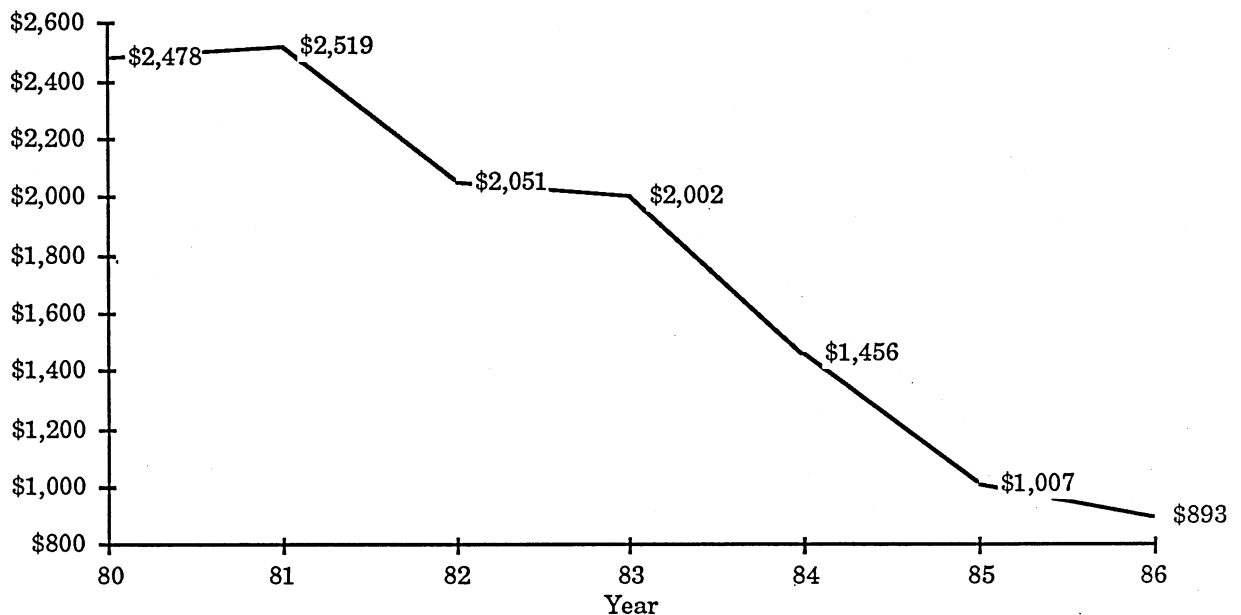


Figure I: Est. Per Acre Value of Ag Land in an AG Dependent Iowa County. (1)

The declining value of Ag land is often used as a major factor in the vanishing wealth of rural Iowans. Similar declines in rural residential and commercial property are not as publicized or documented but are present. The significant information for this paper is that these declines in the value of real rural property are not reflected in taxable values of the same property. (see figure II) To date vanishing wealth has not eroded the local property tax base. There appears to be two factors that are preventing the tax base from declining as rapidly as property values. One is unique to Iowa. The Iowa legislature has politically altered the linkage between actual value and taxable value of all classes of property. This was done when inflation was pulling property values up so rapidly. Iowa has a complex 4% annual growth limit that dampered the effect of inflation on land values. However, the market value in excess of 4% was, figuratively speaking, put in the bank. Then when market value grew at less than 4%, prior accumulations in the bank were incorporated in the equalization to obtain the 4% growth rate. Thus, the law passed to hold down market (taxable) values held them up during the early stages of the depressed agriculture economy.

The other factor is individual perception of value. Most people do not realize how much the value of their property has declined until they attempt to sell it. Most rural areas do not have a high property turn-over, therefore, the perception of many property owners is that the value of their assets has not changed much.

Figure II reports the taxable value of all the Ag land in the same Ag dependent county.

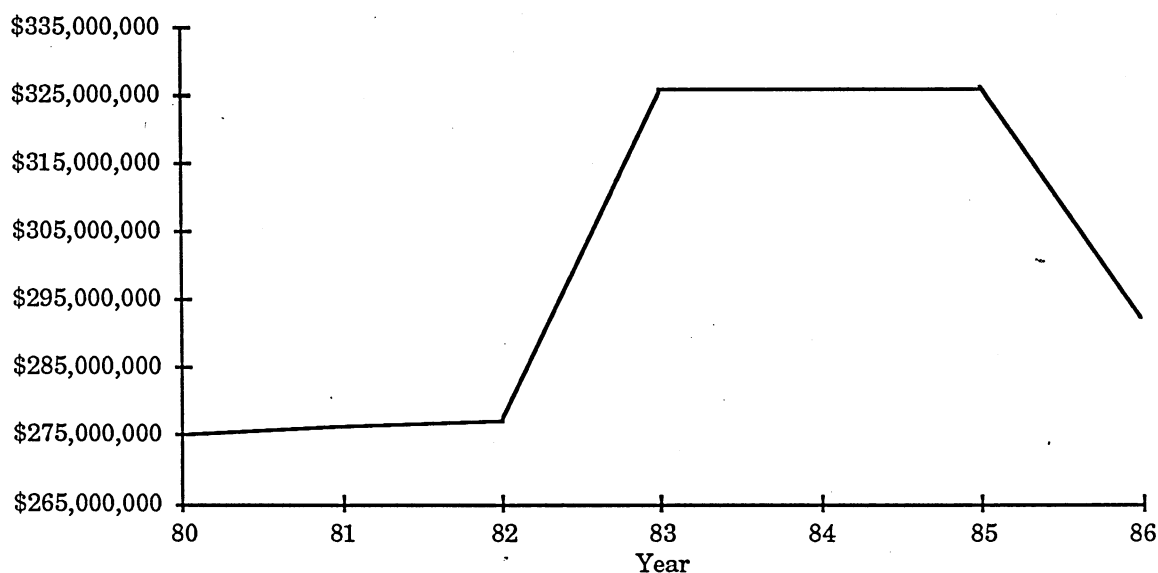


Figure II: Taxable Value of Ag Land in an Ag Dependent Iowa County.

It appears that the taxable values in figure II lag the market values reported in Figure I and that taxable value will now follow the market values in the steep decline. This may or may not turn out to be the case. Because of the way a law limiting the growth of all taxable value was interpreted to operate, in conjunction with an earlier Iowa statute that stipulates that taxable value equals 100% of market value, Ag land taxable value is now (1987) equal to 100% of market value as calculated by the Iowa Department of Revenue. Ag land prices are predicted to drop up to 10% in 1987 but if productivity stays the same or goes up the taxable value may just level off at its present value.

The other major class of property in terms of total value is non-Ag Residential Buildings. Figure III reports the taxable value of all the residential buildings (non-Ag) in our example Ag Dependent County.

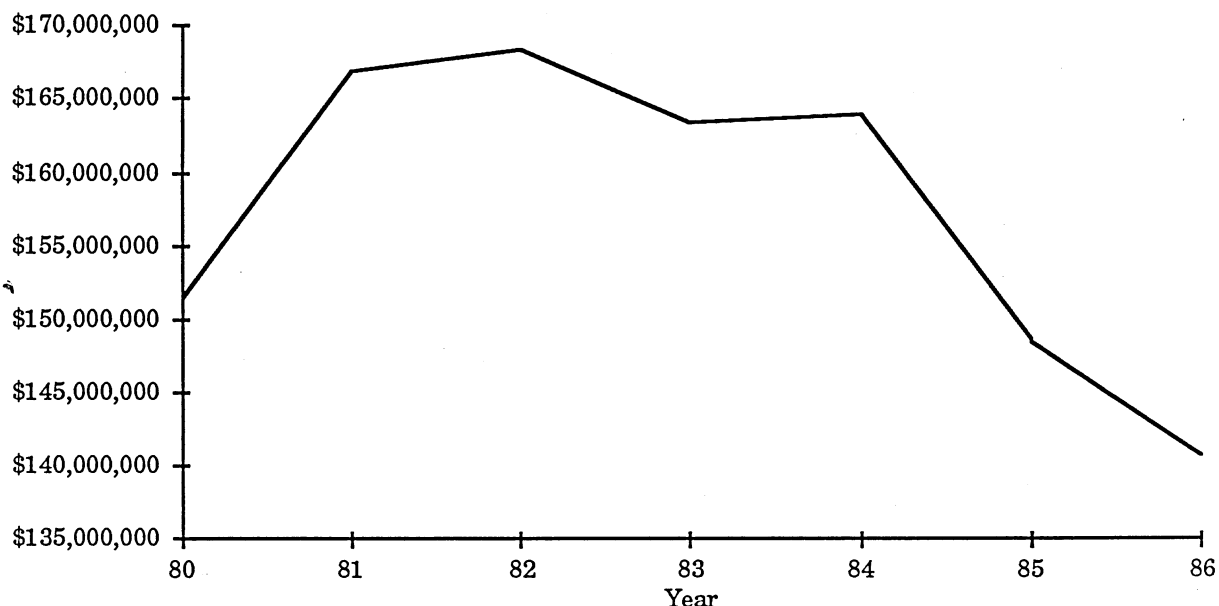


Figure III: Taxable Value of Residential Building in an Ag Dependent Iowa County.

The information reported in Figure III appears to report that taxable value of residential buildings are reflecting vanishing wealth. However, the taxable value of residential property is indirectly tied to Ag land values by the limiting growth statute. The end result will be that the taxable value of Ag., commercial and industrial taxable property will be 100% of market value and the taxable value of residential will be about 83% of market value until the law is changed. I would not be surprised if there is an attempt in the near future to change the criteria for setting the value of Ag land.

Another potential factor contributing to financial stress of rural local governments is delinquent property tax payments. For example, it might appear that if 10% of the property owners did not pay their taxes, the revenues of the local governments would be significantly reduced. This is moderated in Iowa by the sale of delinquent taxes to private individuals. The law provides that property owners that have delinquent taxes pay 10.3% to 13.0% interest on the delinquent amount to whom ever holds the delinquent tax receipts. After three years of delinquent taxes the holder of the tax receipts can begin a process to acquire title to the property. When the interest paid on CD's and other investments is 8-9% and three years of tax receipts total to less than the value of the property, there are many people ready and willing to pay other peoples taxes - buy up the tax receipts - as

good investments. The process is designed to enable the local government units to get their tax revenues within the fiscal year it was levied.

Figure IV reports the total property taxes levied by all Iowa cities expressed in current dollars and constant dollars. The constant dollars are derived using GNP Price Deflators 1929-1985 (government purchases of goods and services) from the National Data Book and Guide to Sources; "Statistical Abstract of the U.S. - 1987 - 107 edition."

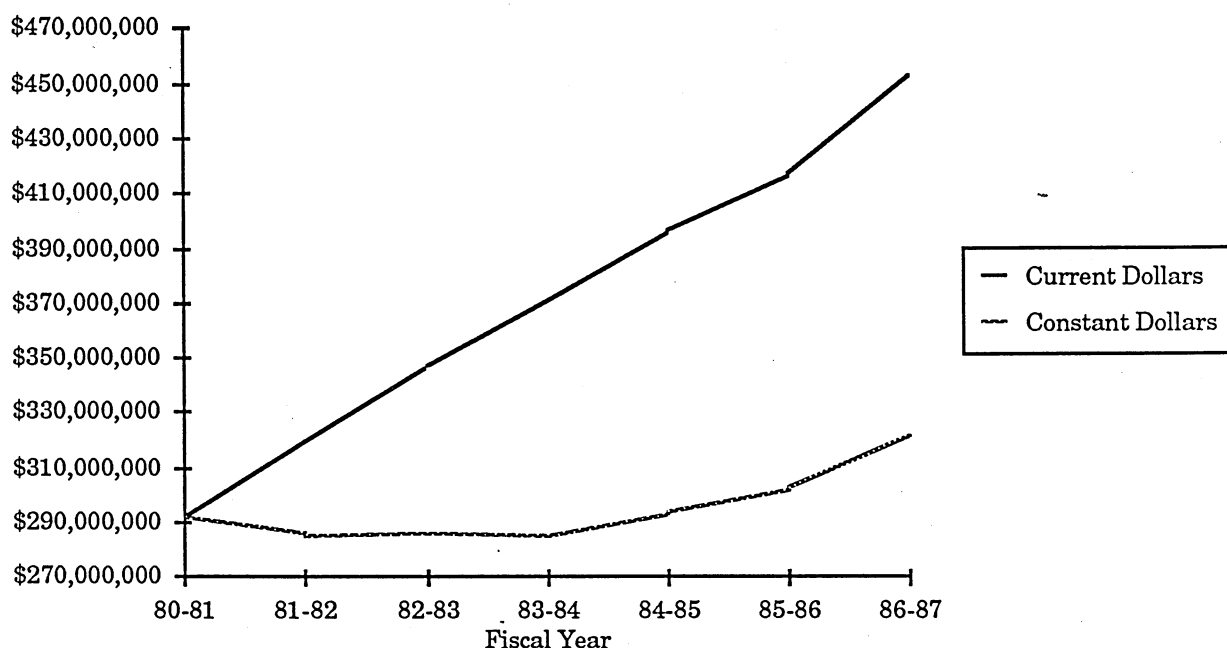


Figure IV: Total Property Taxes Levied by All Iowa Cities.

It appears that the vanishing wealth - eroding tax base phenomena, has not adversely affected the revenue from city property taxes. If the revenue is viewed as purchasing power, its rise begins in the middle of the decline of the Ag economy. In Iowa, local government financial stress is not reflected in past taxable value or property tax revenues. This phenomena could be caused by local government units raising their tax rates. All local government units in Iowa have limits on the tax rates they levy. Iowa cities have a maximum tax levy of \$8.10 per \$1000.00 of taxable value.

Figure V reports the number of Iowa cities that were levying the maximum of \$8.10 per \$1000.00 taxable value for general operations.

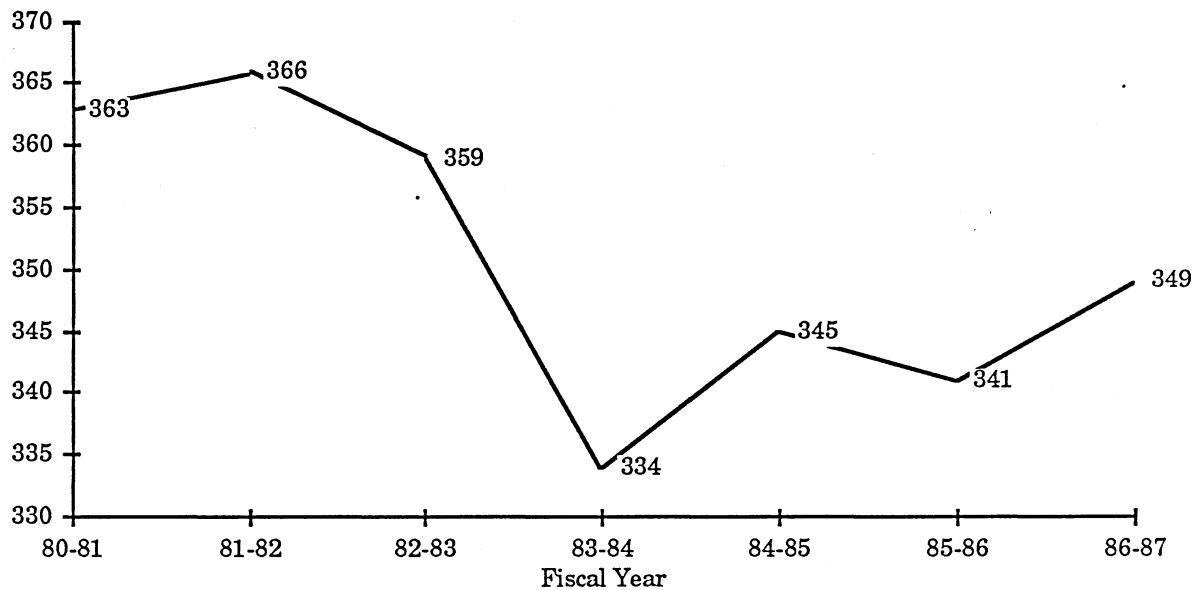


Figure V: Iowa Cities at Tax Levy Limit.

Figure V does not indicate that Iowa cities are handling financial stress by increasing tax rates.

Of 956 Iowa cities the number of cities at the \$8.10 limit has declined from 363 to 349 with a 83-84 number of 334. A third of the cities at the maximum rate is not insignificant. However, of all the aspects of the state statutes, budget regulations and increased cost of services, such as insurance premiums, are considered it is not surprising.

Maybe Local Government units have attempted to ease the impact of the financial stress by using up some of the beginning cash balance.

Figure VI reports the total beginning cash balance of all Iowa cities under 10,000 population expressed in current and constant dollars.

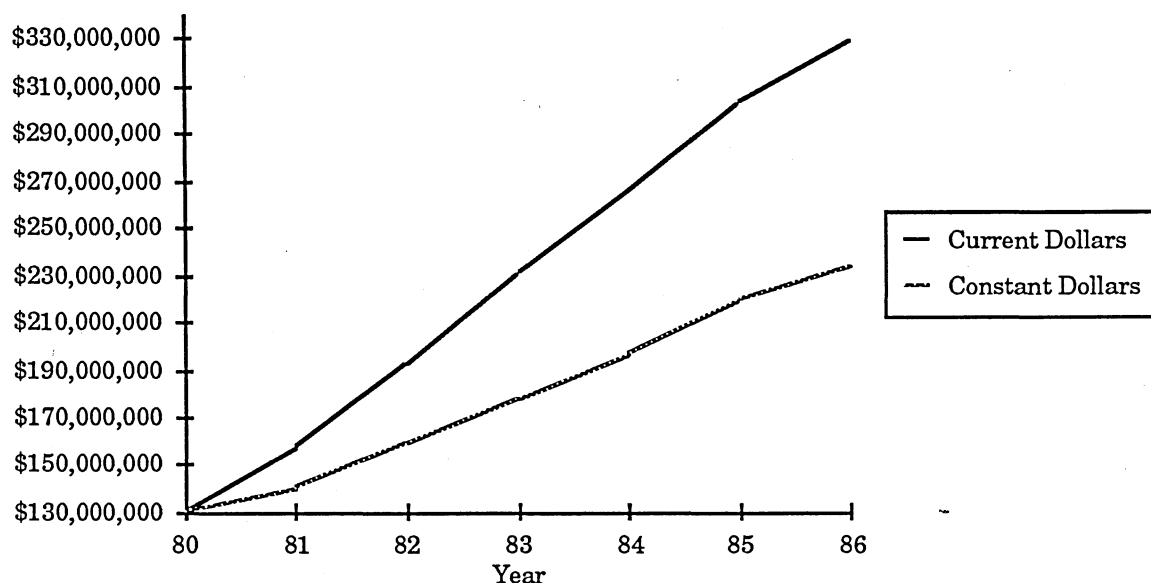


Figure VI: Beginning Cash Balance of Cities Under 10,000 Population.

The beginning cash balances of Iowa smaller cities do not seem to show any signs of financial stress. It appears that in terms of constant dollars the beginning cash balances grew even when property tax revenues were very level. The growing beginning cash balance could be the result of the growth of other revenues or cutting back on expenditures.

Figure VII reports the total state shared revenue for all Iowa cities in current and constant dollars.

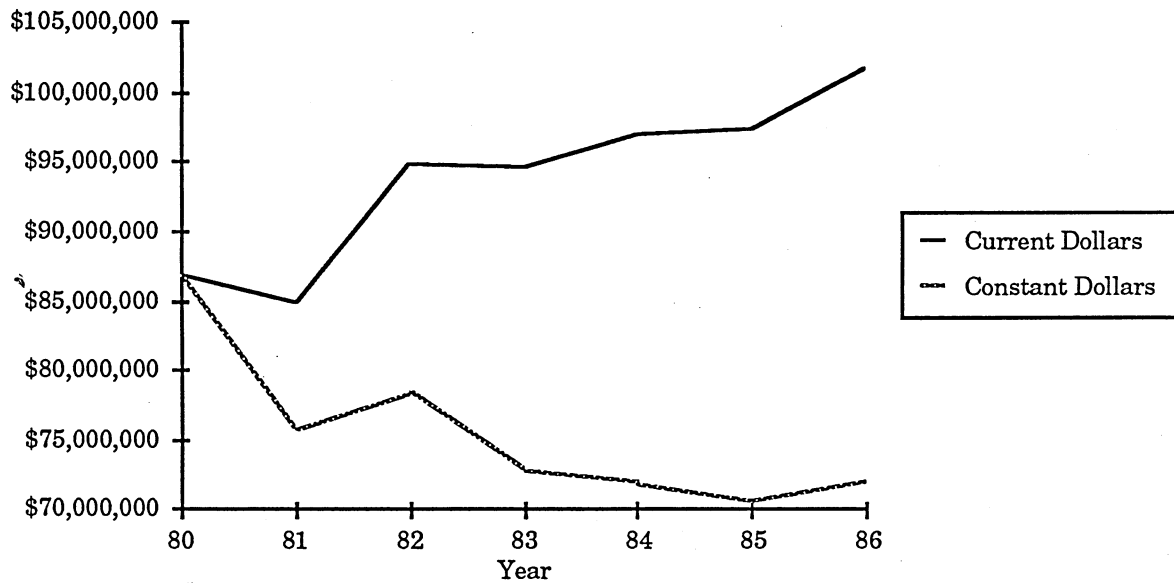


Figure VII: Total State Shared Revenue for All Iowa Cities

It does not appear that the growing beginning cash balance came from state shared revenues.

Figure VIII reports the total general revenue sharing distributed to all Iowa cities in current and constant dollars.

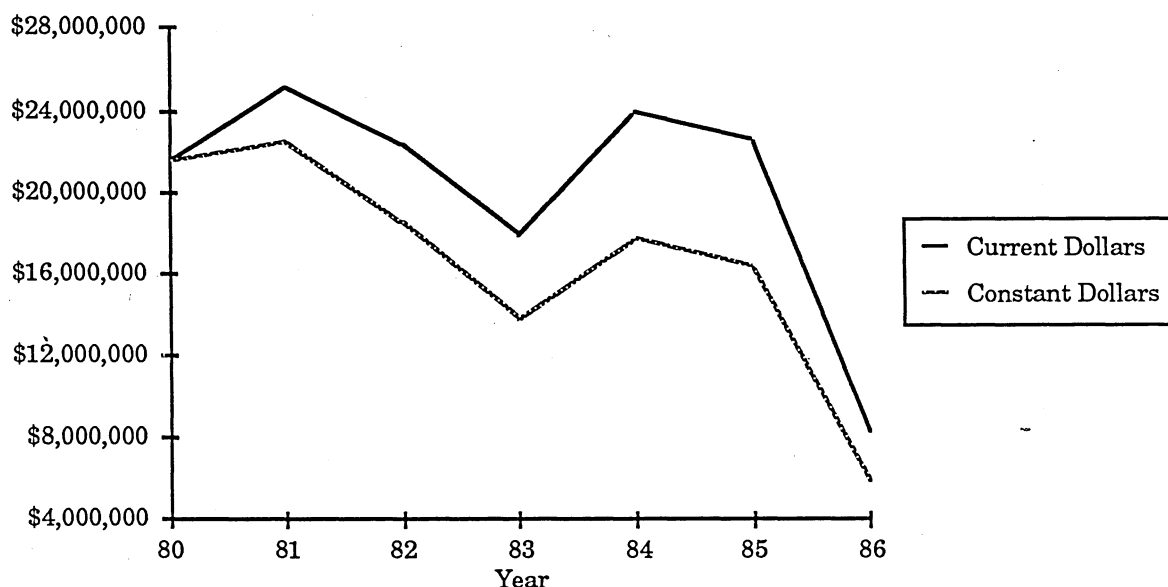


Figure VIII: Total General Revenue Sharing for All Iowa Cities.

It does not appear that the growing cash balances came from General Revenue Sharing funds.

Actual expenditure amounts are not readily available for these same periods but my judgement is that expenditures increased in absolute terms but at a slower rate than property taxes. Expenditures may even have declined in constant dollars resulting in a real increase in beginning cash balances. Finally, I would also speculate that beginning cash balances as a per cent of total expenditures remained constant or may have increased only slightly. The latter in anticipation of constrained revenue in the near future.

Potential Contributors to Financial Stress in Rural Local Governments

The age cohorts in most small, rural Iowa communities are heavily weighted in the older ages. Most of these people have a long residency in their community and therefore aged with the other assets of the community. Also, because of their socialization they have developed an acceptance of less than "first class" in many dimensions of their lives. The results is an unnoticed deterioration of fixed assets, public and private. In these rural communities, neither sector does a very good job of incorporating depreciation information into the decision making process much less actually funding depreciation. The result, in many cases, is that the rural sector is maintaining its apparent level of services using the depreciation of existing assets. This may be very appropriate in the long

run, if the rural decline can not be reversed. A goal might be to have the useful life of the fixed assets end the day the last person moved away.

In declining rural areas there appears to be developing an oversupply of fixed assets and public and private infrastructure. This is a direct result of out-migration and deaths of rural residents. When the proprietor of a local businesses, whose receipts were just sufficient to cover the annual operating costs, w/o depreciation, decides to retire, there are no buyers for the business. Therefore, whatever value remains in the fixed assets is lost to the owner.

This phenomena can be viewed from different perspectives. One is that whatever value exists in the business, inventory and fixed assets of the closed business are a part of the oversupply. They exist physically but because there are no interested buyers the market value is really zero. Another perspective is that the retiring owner/operator of the closed rural business believed that the business and its assets were a positive asset in their personal portfolio and would contribute to the income stream of the retirement years. In reality the reverse may be true. The property is a liability. Taxes, insurance, minimum maintenance must be continued on property that generates no revenue.

In each of the above perspectives it appears to be defensible behavior to live off the depreciation as long as possible. However, when large segments of rural communities do this, it results in the general appearance of decline and this discourages other investments. It also results in a general decline in the quality of services rendered and perceived to be rendered. This discourages in-migration and investment in the community and seems to encourage more out-migration, particularly of young people that have been socialized to expect quality services and want a generous allotment of them early in life.

The result is many rural communities have a broad base of public and private assets that still appear to have value in the eyes of the present owners and community residents but when an attempt is made to liquidate the physical assets the results are very depressing. Even in urban areas, it is not uncommon for a house buyer to have to buy down the mortgage in order to sell the house at its present market price. Water and sewer utilities that were constructed, and still physically very functional, based on past usage are having great difficulty making the principal and interest payments because of the reduced revenue paid by fewer users.

Summary

It is my judgement that the significance of the information presented in this paper is not readily apparent to many of the residents of small rural communities and many state and federal policy makers. I am predicting that the true significance will become apparent to most everyone about 1991. The Census of Government information they are collecting in 1987 will then be available and, the results of the 1990 Census of Population will be coming

in focus. This will trigger a larger number of school reorganizations and political redistricting. I believe at that level the unguided evolution of rural America that is eliminating the family farm and bringing about the loss of the last remaining value of the farm dwellings will eliminate many, if not most, of Iowa's rural communities of less than 350. In the transition many, if not most, of the fixed assets of these communities will become liabilities to the remaining population and local government agencies.

The above information is a quantitative description of the financial stress of rural Iowa communities. Almost any interpretation of that information leads to the same discouraging conclusion: Rural government units have few if any political or economic controls that will significantly influence their own fate thus, there is no way to save small rural communities without injecting massive amounts of outside resources. However, small rural communities in Iowa have had similar characteristics for at least the last 2-3 decades and in the twenty years I have been in Iowa two cities have officially disincorporated. The quality of the individuals is such that acceptable adjustments are made to intervene in the evolutionary process.

Method of Assisting Rural Units of Government.

I believe that people are better off when they have an adequate amount of objective information and they are aware of most or all of the alternatives that are available to them. In this setting I believe that Extension Service can be of real service to people, lay citizens as well as local leaders, by guiding and supporting their participation in "Community Glocal Reality Check." This "Community Glocal Reality Check" would consist of an opportunity for these people to share and defend their perceptions of reality with their fellow citizens and the Extension staff's objective information.

After, or in conjunction with the "Community Glocal Reality Check" if local governments decide to be proactive, I would think the residents of small rural communities will be best served if the alternatives that are: 1) least capital intensive, 2) most mobile 3) most flexible in usage and 4) require very low maintenance, be given high priority. Alternatives that meet the above criteria will not be abundant and may not be the least expensive in the short run. However, I am not at all optimistic that the unguided evolution that I referred to earlier can actually be intervened upon with significant positive results. Therefore, the best strategy appears to be to minimize the real losses in the long run.

Finally: Most of the human services that will be needed by these people are provided by State, Federal, or Regional units of government, and these people are going to have to be very politically active to be sure they do not fall between the cracks in the political process. Full access to these non-locally financed services will enable these people to sustain themselves comfortably in their rural communities for a number of years.

Source: The information used in this paper is from unpublished records at the Iowa Department of Management and the Clay County Auditors Office.

References: Number 1. Duffy, Mike, "Iowa State Land Value Survey" ISU Cooperative Extension Publication FM-1825, Feb. 1987.

IDENTIFYING THE FINANCIAL STRESS OF RURAL BUSINESSES
AND GOVERNMENTAL UNITS AND METHODS FOR
ASSISTING THEM: DISCUSSION

Financial stress is a key concern for many business owners and managers, government officials, and other community leaders in rural areas. Based on recent experiences in Iowa, Stone and Whitmer provide some important insights into the art and science of analyzing financial stress in businesses and local governments and outline some useful educational program suggestions for helping them cope with it. These insights and suggestions are highlighted. Several additional considerations important for those conducting financial stress analyses and for users of those analyses are also outlined.

Introduction

Financial stress in both businesses and local governments is a complex notion. Defined in simple terms, it means that a business firm or local unit of government is running out of revenue to meet its expenditures and cannot easily raise more. To have analytical and predictive value, however, this simple conception of financial stress must be broadened to incorporate economic, institutional, managerial, and social as well as financial factors. Any of these factors alone or in combination can cause financial stress.

Analysis of financial stress poses difficult methodological and operational problems. As a consequence, the results of financial stress analyses must be interpreted with care. Those experienced in conducting and interpreting these analyses indicate that they are as much art as science. This important point must be kept in mind when developing and implementing research activities to identify financial stress and when designing public policies, management strategies, and educational programs to help business people and government leaders deal with it.

Based on recent experiences in Iowa, Stone and Whitmer provide some very important insights into the art and science of analyzing financial stress in businesses and local governments and outline some useful educational program suggestions for helping them cope with it. These insights and suggestions are highlighted below. Several additional important considerations are also outlined.

Theodore R. Alter, Associate Professor of Agricultural Economics and Extension Economist, Community Economics, Department of Agricultural Economics and Rural Sociology, Penn State University.

Insights and Suggestions

While Stone's discussion is primarily descriptive, detailing the results of recent research on retail sales levels, changing numbers of farm-related businesses, and attitudes and financial status of rural business owners and managers, it does provide at least three useful analytical insights. First, Stone suggests, although not explicitly, that business financial stress can be examined from an aggregate or community-level perspective and from a firm-level perspective. Examination of retail sales levels, gains and losses in numbers of businesses, and town pull factors which measure power to pull or "capture" retail sales from outside the town exemplify the former perspective; analysis of firm financial statements is an example of the latter perspective.

Second, Stone identifies several useful business financial stress indicators: number of retail firms in rural areas as a percentage of total retail firms in a state, value of retail sales by firms in rural areas as a percentage of the value of total state retail sales, town pull factors, gains and losses in numbers of businesses by business type (e.g. farm-related and nonfarm businesses), and firm net profits before taxes.

A third important analytical insight is the reminder that relying solely on secondary data to monitor indicators of business financial stress may be misleading. Stone points out that it is important to check the validity of indicator estimates through variable decomposition (e.g. change in total number of firms equals start-ups plus losses) and "on-the-ground" observation in the community.

In addition to these analytical insights, Stone also provides a comprehensive list of activities that private and public sector providers of assistance and education might undertake to help business people deal with the potential or the reality of financial stress. The list is deliberately skewed toward those activities for which the Cooperative Extension Service has or could have a comparative advantage. Stone makes the distinction between activities that have a firm-level and those that have a community-level orientation. This is an important distinction for recipients of educational and other assistance. It helps make the point that businesses generally have relatively greater control over firm-level factors than community-level factors related to financial distress. Local governments, like businesses, also tend to have greater control over jurisdiction-level or internal factors, such as revenue policy adjustments (given existing enabling legislation) and management practices, than community-level or macro factors such as outmigration, labor costs, recession, and inflation.

For business people and local government officials alike, recognizing that some factors are relatively more controllable than others is useful. It helps them identify specific actions they can take now to help prevent or alleviate financial stress. Understanding which people shop where and why is important in tailoring long-run marketing strategies and trying to improve sales. But, analysis of balance sheets and profit and loss statements and use of cash flow budgets are doable activities likely to help improve firm financial performance in the near term as well as the long run.

If educational programs addressing "controllable" factors are responsive to the immediate concern of business people and local government officials to act now, then perhaps Cooperative Extension and other providers of educational and technical assistance should give relatively greater emphasis to such programs as opposed to programs on "less controllable," community-level factors and issues. On the other hand, programs with a community-level orientation are helpful in identifying the broader economic, political, and social context of financial stress and clarifying the limits of firm and local government action. A mix of both program types is likely the most sensible basis for providing educational assistance on financial stress.

Stone's list of programs for helping business people deal with financial stress is a good one. Business retention and expansion programs (Morse, Rohrer, and Crawford) and community simulation analyses (Doekson) should be added to that list. Community simulation analyses can be helpful for both businesses and local governments. These analyses can help anticipate the implications of emerging changes in the community and in the local economy for retail sales, efficient delivery of public services, and other factors. Results of these analyses can help business people and government officials plan for economic development and develop public service delivery systems.

In discussing research needs, Stone makes the important point that the development of annual operating standard (business ratio) analyses for small businesses in rural areas would be extremely helpful for financial planning and management. Ratio analysis, of course, is a normal part of most small business management education programs. But availability of an annually updated time-series of such analyses specifically for rural businesses based on a regional or nationwide sample could be a useful tool in helping business owners and managers to anticipate and identify financial stress.

Whitmer's analysis of local government financial stress in Iowa provides two useful insights. First, it makes explicit the importance of understanding and integrating institutional considerations such as real property valuation and assessment practices, procedures for handling delinquent taxes, and tax rate limits, into any analysis of local government fiscal stress. Failure to do so may lead to misunderstanding of the financial stress situation and possibly inappropriate government policy and financial management actions. Second, Whitmer's comments suggest that when trend analysis is used to examine local government financial stress, it is best to analyze and compare several key variables (e.g. real property values, taxable real property values, total real property taxes, tax levy limits, and state and federal shared revenues), rather than a single indicator. The multi-variable approach is important because fiscal stress in local governments may not be evidenced by a single variable alone.

Whitmer's idea of a "Glocal Reality Check" for government leaders and citizens concerned about local government financial stress is an interesting one. It would be helpful to learn how best to implement that method of assistance in a community setting. It would also be helpful to examine in detail other methods for helping local governments identify financial stress, such as the International City Management Association's system for monitoring and evaluating local government financial conditions (Groves and Valente) and Municipal Finance Officers Association program for monitoring and guarding against fiscal decline (Government Finance Research Center). Flynn and

McDowell, from the University of Massachusetts, have had experience adapting and implementing the International City Management Association's financial trend monitoring system with Massachusetts communities.

In addition to helping local government officials identify financial stress, educational and technical assistance providers are likely to be involved in helping these officials better understand methods for managing financial stress. Most discussions will address methods such as local revenue diversification; tactics for stabilizing or cutting expenditures; practices for improving financial management; and alternative ways to provide community services and facilities, such as intergovernmental cooperation, public-private sector contracting, and privatization. Other strategies that merit consideration include finding ways to increase intergovernmental revenues; changing the structure of local government; and reducing local government responsibilities, perhaps through reallocation to other levels of government (Bradbury, p. 38). These latter strategies are long-run alternatives that address structural factors underlying local government financial stress.

Additional Considerations

While Stone and Whitmer provide some useful insights and suggestions, there are other important considerations not explicitly mentioned that anyone conducting financial stress analyses and users of those analyses must address. Several of these considerations, stated as questions, are outlined below.

1. What is meant by financial stress in businesses and local governments? What is the appropriate conceptual basis of this notion? What factors cause financial stress, and how do these factors interrelate? Understanding the concept is crucial to operationalizing it, using it to identify businesses and local governments facing financial stress, and developing policy and management strategies to alleviate stress (Advisory Commission on Intergovernmental Relations; Bahl, pp. 33-64; Clark, pp. 8-13; Eberts and Lifton; Government Finance Research Center; Hite and Ulbrich, p. 1188; Lawson, p. 18; and Reeder).
2. What approaches are useful for identifying financial stress in businesses and local governments? For local governments, analysis of financial stress can be approached using comparative stress, effort and capacity, and fiscal trend analyses (Bahl, pp. 51-64; Government Finance Research Center; Groves and Valente; and Reeder). Analysis of business financial stress can be approached through community-level analyses of key variables (e.g. retail sales, unemployment, underemployment, and business starts and stops) or through firm-level financial ratio and cash flow analyses (Beierlein, Schneeberger, and Osburn, pp. 251-81). Each of these types of analysis suggest multiple and different financial stress indicators. What are the appropriate indicators to use in financial stress analyses? This is a key question.
3. What are the methodological pitfalls and operational problems in applying these different approaches? Here are some of the important considerations.

What are the most important characteristics to look for in a set of indicators designed for conducting comparative financial stress analyses for local governments? What are the limitations on inferences drawn from these analyses? How applicable are the approaches for analyzing local government fiscal stress to nonmetropolitan areas (Reeder, p. 1)? Since most financial stress indicators for both businesses and local governments reflect the past, how useful are they in elucidating the future (Bahl, p. 54; Beierlein, Schneeberger, and Osburn, p. 274)?

For analysis of fiscal stress in local governments, Bahl suggests that a proper set of indicators has the following characteristics (p. 54):

- it permits comparisons with other units of local government;
- it is derived from analysis of the past and the current situation as well as that projected for the future;
- it reflects consideration of the economic and social structure of the local area as well as the financial conditions of its governments; and
- it should be based on an underlying theoretical model that enables evaluation of fiscal health with respect to clearly defined criteria.

A key to identifying financial stress is having accurate, timely data aggregated in such a way so as to adequately measure appropriate indicators. Are data available to conduct financial stress analyses for businesses and local governments in rural communities? Are available data based on standard concepts comparable over time? Stone, Whitmer, and others (Hite and Ulbrich, p. 1188; Reeder, p. 42) indicate that data availability and quality is a problem. For Iowa local governments, Whitmer suggests that well-organized management information systems, necessary for providing such data, are virtually nonexistent. Sjo and Biere have had extensive involvement in developing management information systems for county governments in Kansas. Familiarity with their work is likely to help in understanding, and perhaps contribute to improving, the data availability and quality issue for local governments.

4. Identifying policy and management strategies that businesses and local governments can use in managing financial stress is one thing. It is quite another to design a programmatic framework for helping business people and local officials learn about these strategies.

What are the important considerations in developing and implementing educational and technical assistance programs on financial stress? Should programs be directed to all business and government units or just some? Is the purpose of these programs remedial in that only those businesses and governments in trouble

REFERENCES

- Advisory Commission on Intergovernmental Relations. The States and Distressed Communities. A-101. Washington, D.C.: Advisory Commission on Intergovernmental Relations, November 1985.
- Bahl, R. Financing State and Local Governments in the 1980s. New York: Oxford University Press, 1984.
- Beierlein, J., K. C. Schneeberger, and D. D. Osburn. Principles of Agribusiness Management. Englewood Cliffs, NJ: Prentice-Hall, 1986.
- Bradbury, K. Structural Fiscal Stress in Cities: Causes and Consequences. New England Economic Review. Federal Reserve Bank of Boston. (January/February 1983): 32-43.
- Clark, T. N. "Urban Fiscal Strain: Trends and Policy Options." Financing State and Local Governments in the 1980s: Issues and Trends. Ed. N. Walzer and D. Chicoine. Cambridge, MA: Oelgeschlager, Gunn and Hain, Publishers, Inc. 1981.
- Doekson, G. A. "The Agricultural Crisis as it Affects Rural Communities." Journal of the Community Development Society 18 (1987):78-88.
- Eberts, P. R. and L. R. Lifton. "Toward Conceptualizing and Building a Measure of Local Fiscal Stress." Unpub. Ithaca, NY: Department of Rural Sociology, Cornell University, August 1985.
- Flynn, C. and G. R. McDowell. Financial Trends in Massachusetts Communities. Amherst, MA: University of Massachusetts Cooperative Extension, 1985.
- Government Finance Research Center. "Measuring Governmental Financial Condition." Elements of Financial Management. Washington, D.C.: Municipal Finance Officers Association, 1980.
- Groves, S. and M. G. Valente. Evaluating Financial Condition: A Handbook for Local Government. Washington, D.C.: International City Management Association, 1986.
- Hite, J. and H. Ulbrich. "Fiscal Stress in Rural America: Some Straws in the Wind." American Journal of Agricultural Economics 68 (1986):1188-1193.
- Lawson, M. "The Impact of the Farm Recession on Local Governments." Intergovernment Perspective. Washington, D.C.: Advisory Commission on Intergovernmental Relations, 1986.
- Morse, G. W., J. D. Rohrer, and S. J. Crawford. Retention and Expansion Business Visits: A Guide For An Effective Economic Development Program. Columbus, OH: Ohio Cooperative Extension Service, The Ohio State University, 1985.
- Reeder, R. J. Nonmetropolitan Fiscal Indicators: A Review of the

Literature. Economic Research Service Staff Report No. AGES 830908.
U.S. Department of Agriculture, January 1984.

Sjo, J. and A. Biere. The Development of the Government Information
Management System, GIM-SYSTEM. Ames, Iowa: North Central Regional
Center for Rural Development, 1986.

ALTERNATIVE STRATEGIES FOR EXPANDED RURAL ECONOMIC DEVELOPMENT*

Glen Pulver & Ron Shaffer**

The purpose of this paper is to describe the response of the Department of Agricultural Economics, The University of Wisconsin-Madison and Extension, to the need for expanded rural economic development. The Department's effort is aimed directly at generating more useful rural economic development knowledge and providing educational assistance to policymakers at all political levels. The paper outlines the fundamental concepts underlying the research and extension activities of the community economics program. It describes the importance of the research-extension linkage, how resources to support the program were assembled, the general focus of the program and the Community Economic Analysis effort in some detail.

Nonfarm rural economic development is a topic of increasing importance throughout America. Larger numbers of farm families are more dependent on nonfarm income than farm income. Today, well over 50% of the personal income of farm families comes from off farm earnings. The current rural crisis characterized by losses of farms and rural jobs has heightened the need for alternative sources of income [Economic Research Service, 1987; Joint Economic Committee, 1986]. Community leaders, government agencies, University research and extension workers and others are seeking ways to improve jobs and income across rural America.

The Program Foundation

The program grew out of an observed need for more rational planning and action in local and state economic development. In an effort to generate more jobs in rural areas, state and local leaders often concentrate their effort in attempts at attracting manufacturing plants from other states in the face of declining opportunity. Public investments in open land, water systems and streets result in large acreages of empty industrial parks. Often fruitless organizational attempts such as technical action panels, rural area development committees, regional development efforts, overall economic development plans, etc. frequently lead to intense frustration and few new jobs. There is little recognition in policy development of major shifts in

* Prepared for Extension Workshop, American Agricultural Economics Association, East Lansing, Michigan, August 1, 1987.

** Professors, Department of Agricultural Economics, University of Wisconsin-Madison.

economic structure. Ignored is the fact that most new jobs are generated by the service-producing sector. Social security, dividends, interest and rent are increasingly important as personal income sources but are rarely included in local development strategies. A wide spectrum of regional economic analysis tools are available but seldom used by rural policy leaders. Consequently, a conscious effort is being made by the UW Agricultural Economics faculty to identify the appropriate theory base (economics, regional economics, community development, public finance), to assemble the applicable community economic analysis tools and to build a closely linked research and extension program of direct policy relevance.

The major mechanism linking the community economics research and extension program at the University of Wisconsin has been joint appointments. The Department of Agricultural Economics faculty involved in the community economics program for the most part have joint extension - research appointments. This legitimizes involvement in either of the activities. Although the faculty most directly involved hold appointments primarily in Extension, they have been encouraged to conduct a relatively major applied research program. Extension administrators recognize the need for accumulating applied research to support the Extension program. Strong ties have been built with research faculty in business, urban and regional planning, and rural sociology. For the most part, these faculty had no extension appointments but were sufficiently interested in applied research to find some common interests. These linkages took time to establish and require maintenance.

The Research Program

Both formal and informal research programs were initiated. Some of the informal aspects of the research program consisted of doing a lot of reading in the professional journals. It is important not to limit reading to just agricultural economics journals. Regional science journals, geography journals, business journals and magazines, and the newsletters for such professional organizations as the Council for Urban Economic Development, American Economic Development Council and the Corporation for Enterprise Development ought to be included. It is important to stay current in these other professional journals simply because local economic development is such a minor component of the agricultural economics literature that one will find himself severely limited by that literature base. An important component of the informal research effort is staff papers, papers at meetings and phone calls from others interested in community economic issues.

The formal graduate research program might be divided into two parts. The first responds to questions that arise in current extension programs. The second component responds to emerging issues perceived as important to longer term rural community economic development policy. The extension part of the research program is relatively applied, and generally conducted by masters students. It focuses on the generation of numbers and analysis of specific questions. Some examples are the impact of shopping centers on downtowns; the development of computer

assisted software to aid in the community economic analysis; and the compilation and structuring of data to support the extension program. It is worth noting that the major focus of the extension program is less on technology (numbers) transfer and more on strategies and policy education.

In the area of emerging issues, much of the research focuses on such things as the importance of nonmanufacturing activities; the functioning of rural capital markets; the targeting of economic development efforts for particular types of worker groups; and the analysis of the job generation efforts.

A wide range of funding sources has been used to support the research program. Title V of the 1972 Rural Development Act funds were very helpful in initiating relatively short term, very specifically focused efforts. Hatch dollars have been used to support the long-term more basic type of research. The UW Graduate School helped fund part of the research program. In several cases, funding from the North Central Regional Center for Rural Development was used in order to reach out and involve the research skills and talents of colleagues in other states. This mechanism supported the development of the Community Economic Analysis Software system and the handbook and some of the work on shopping center impacts. Outside agencies have also supported some of the work. The Economic Research Service of the United States Department of Agriculture supported much of the rural capital markets work. Likewise, the Upper Great Lakes Regional Commission supported the new small business financing research. And finally utility companies are helping fund the analysis of the sources of job generation.

The research program is very applied in its orientation, but geared to developing insights for policies and strategies and anticipation of emerging questions in rural areas. The research program supports the extension effort, and the extension effort generates part of the research agenda.

The Extension Program

The current Extension program reflects three major decisions made in the mid-1970s. The first decision was to improve the understanding of the county Extension faculty in community economics theory, tools and policies. It is important to remember that although Wisconsin has more county level community development agents than other states, most of those people were initially trained in planning and natural resource areas. Economic development was of little interest and even subject to a substantial amount of skepticism. Agents actively engaged in economic development activities for the most part limited their efforts to industrial attraction. In the mid-70s, agent training programs were started, including the explaining of different types of community economic analysis tools, interpretation of the results from those tools, and how they could be used. This training was repeated several times because of changing extension faculty, interests and understanding of the tools.

The second major decision was to engage in educational programs on community economic development that had a policy focus rather than a technical transfer focus. Help was not provided to communities in planning local industrial parks or organizing tax incremental financing districts. The educational target was to help people know what some of their local policy choices might be and which had the highest probability of achieving their desired goals.

The third decision, and probably the one that has done more to create a reputation for the program than anything else, is to use Community Economic Analysis as an identifiable focus for both Extension agents and administrators. Over time, agents have developed a clear understanding of the program approach and content, and the program has gained visibility with others in the state. This visibility is such that people (in Extension, on campus, in other agencies, and outside Wisconsin) recognize the label "Wisconsin Community Economic Analysis program." This doesn't mean the program is better than any other, but it has an identity. Another aspect of having an identifiable label is that it made it relatively easier for Extension administrators to grasp what the program was and what it was attempting to do. It represents an organized effort, rather than a morpheous collection of activities. It generated something that permitted them to respond to external requests about what UW-Extension was doing relative to economic development issues.

The Community Economic Analysis program evolved over a period of time. In the early 1970s, a series of single topic workshops were presented. In the mid-70s, a comprehensive program was started focusing on the county level. The most gracious evaluations labeled it something less than successful. The participants liked it, but little economic development occurred. While politically important in Wisconsin, counties are not very active in economic development. The county level program brought together several people from different communities, but when they returned to their home communities, where the action really is, they did not have a critical mass to implement the effort. Now the program is limited to the community level. Thus there is a critical mass of people going through the program possessing some commonality of concerns, and therefore able to respond in a coherent fashion.

Rural Economic Development Alternatives

Community Economic Analysis is the examination of a community's economic structure and the nature of its response to internal and external stimuli. It is concerned with labor and other factors of production as well as the various business sectors in the community. It is also concerned with the impact of forces external to the community. These forces could be farm commodity prices, location of an interstate highway, the general aging of the population, etc.

One of the critical aspects of community economic analysis is organizing and synthesizing the theoretical foundations for the types of activities and policies suggested. Figure 1 summarizes those theories. First, it is important to remember that the values of the community filter the choices perceived as available and desirable to the community, and the judgements the community makes about the outcome of various policy suggestions. Demand and supply forces are both important to keep in mind. It only takes a brief review of the various suggestions that people offer as solutions to local economic development problems to recognize the strong tendency of most policies to emphasize either demand or supply -- seldom both of them simultaneously. No doubt there are situations where one or the other is the constraining force in the community's economic development. It is important, however, that regardless of which is perceived as the constraining force, both receive consideration in the thinking of community residents [Shaffer, 1988].

The demand aspect of community economic development activity really emphasizes what people want. What are the new markets? What are the growing markets? What are the market niches? What new products might be needed? What types of new uses can be generated for old products? What are the new emerging lifestyles? This approach tends not to consider how those markets are supplied. Policy efforts take the form of such activities as export base expansion, characterized by manufacturing attraction, or main street revitalization and work with main street merchants.

The supply dimension of the theory emphasizes expanded local production capacity. What is the capital base of the community? What type of labor does the community have? How is the community adopting technologies? Policies include such activities as bringing in additional funds to support local business development; public infrastructure investment; labor training; examining the vocational program at the school; management education programs; and technology adoption.

The development and modification of institutions also plays an important role in economic development policy. Institutions include two dimensions. The first is how decisions are made and the second is the nature of the rules of the economic game. How decisions are made reflects what the community is doing to distinguish between economic development symptoms and problems and then actually implementing the necessary solutions. The acceptable rules are such things as minimum wages, use of industrial revenue bonds to finance development and local land use ordinances.

Appropriate local economic development policy involves a combination of demand, supply, and institutional strategies unique to the values, needs and resources of each community. Knowledge of the full range of strategies available and the likely consequences of their application in a particular setting is critical in local decision making. UW Agricultural Economists view their research and extension roles as increasing the level of public knowledge of the consequences of

a wide range of community economic development alternatives under varying internal and external conditions.

Five general community economic development options, with specific action strategies for each, have been identified [Pulver, 1986]. The five options are: 1) improve the efficiency of existing firms; 2) improve ability to capture dollars; 3) attract new basic employers; 4) encourage business formation; and 5) increase aids received from broader governments. All encompass some aspects of demand, supply, and institutionally oriented policy. All offer some prospect for increased employment, income and long run economic viability.

As firms become more efficient, they become more competitive in regional, state, national and international markets. The greater their efficiency, the more net income they return to the community. Improved farm and agri-business efficiency is obviously important to rural America. Expanding firms have been the largest source of employment growth in most states [Armington and Odle, 1982].

In every community farmers, the self-employed, workers, retirees and businesses of all types control a substantial amount of funds with which purchases will be made. Every dollar spent in a community adds to its employment and income. Dollars spent locally by non-local people is as valuable as those generated by the exports of goods.

Bringing basic employers to a community will add employment and income directly. Through the multiplier effect, it may also add other jobs and income. New branch plants, offices and other facilities have been major job generators in rural areas [Miller, 1985].

There is a continuing need for new businesses to meet changing demands resulting from population growth or evolving goods and services. A new business can mean new income and employment as well as expanded trade with local businesses. A number of recent studies have placed great emphasis on the importance of the births of new firms, especially small ones, in the creation of new jobs [Birch, 1979; Schweke and Friedman, 1983].

A community may strive to get back some of the dollars taxed away by broader governmental units. Not only are state and national governments major employers, but they also return funds to local governments through grants and aids. Social security, medicare and medicaid payments are of growing importance in rural areas [Pulver and Rogers, 1986; Summers and Hirschl, 1985].

More research is needed on the consequences of known development strategies under unique internal and external conditions. For example, what kinds of strategies offer positive prospects of attracting service-producing firms to remote rural areas? There is also need for analysis of creative new strategies aimed at particularly difficult rural development problems. For example, what kinds of institutions might serve the start-up capital needs of unfamiliar business types in rural areas.

The Wisconsin Economic Analysis Program

Perhaps the most critical restraint of economic development in rural areas is community leaders lack of: 1) knowledge of the potential alternative community economic development strategies which are most apt to produce positive results under their specific conditions; 2) knowledge of internal and external resources which could be applied to local economic needs and problems and 3) time to gather necessary information, prepare critical documents, and see that necessary actions occur. Urban communities have tax bases which are large enough to provide for the employment of sizeable economic development staffs who can perform these functions. Rural areas must depend on volunteers, part-time elected officials and a few public employees, most of whom have full-time obligations to other tasks.

The primary objective of the Wisconsin Community Economic Analysis Program is to help local leaders develop a plan of action aimed at creating jobs and income which is unique to their community. The county extension agent organizes an informal group of 15-20 leaders from one community representing local government, the Chamber of Commerce, industrial developers, bankers, business people, and other concerned citizens.

University specialists and county extension agents then meet with the group in four sessions covering a total of 8 to 10 hours. Session 1 is a review of recent international, national, state and local economic trends and the implications for the local community. Session 2 includes a detailed analysis of the local trade area, present trade activity, the local employment base, prospective sources of income and employment growth and development options. Session 3 is a self-evaluation of current community economic development activities [Pulver, et al., 1980]. The participants develop a specific comprehensive community economic development plan in Session 4. The plan includes what needs to be done and who should do it.

The county extension agent then provides the group a written report of their conclusions with supportive data. The agent commits to intensive follow-up with the community leaders. The agent's role is to act as a catalyst by helping gather critical information of use in the newly formed action plan, facilitating meetings of the group, other community members and external agencies and organizations, and providing other educational programs focused on specific problems. Extension agent follow-up is a key to the success of the program. Absent this resource, critical catalyst with the necessary time and commitment would have to be sought elsewhere in the community. An important aspect of the program is the development of local leadership with the knowledge, time and commitment to sustained community economic vitality.

To date 65 Wisconsin communities have taken advantage of the Community Economic Analysis program. Formal evaluations have shown high participant acceptance of the educational approach. Community leaders are acting on their plans and positive employment and income changes are occurring. Demand for the program by other Wisconsin communities

remains greater than the UW response capability. County extension agents will undoubtedly have to carry a larger share of the future burden.

Summary

Interest in the Wisconsin Community Economic Development program is a reflection of the growing concern for alternative strategies for rural economic development throughout the United States. If the people who currently live in rural America are to have incomes comparable to their urban neighbors, farm incomes must improve, new nonfarm jobs and income must be found and some must be helped in the transition from old to new employment in rural areas and others to urban opportunities.

The economic development policy options open to rural community leaders are varied and complex. The "best" set of policies and strategies for one rural community are apt to be greatly different than those for another because of variations in values, resources, and needs. Rural leaders need to know and understand the likely consequences of a large number of potential actions aimed at economic development.

The Community Economic Development research and extension program of University of Wisconsin Agricultural Economists is aimed at expanding public knowledge of the consequences of community economic development alternatives under varying internal and external economic conditions. Extension and research efforts are closely linked, research adding to extension program content, and extension providing focus for research. Emphasis is given to building a sound theoretical and empirical base for both the research and extension efforts. Accurate and up-to-date economic development information must be available if rural areas are to have a healthy economic future.

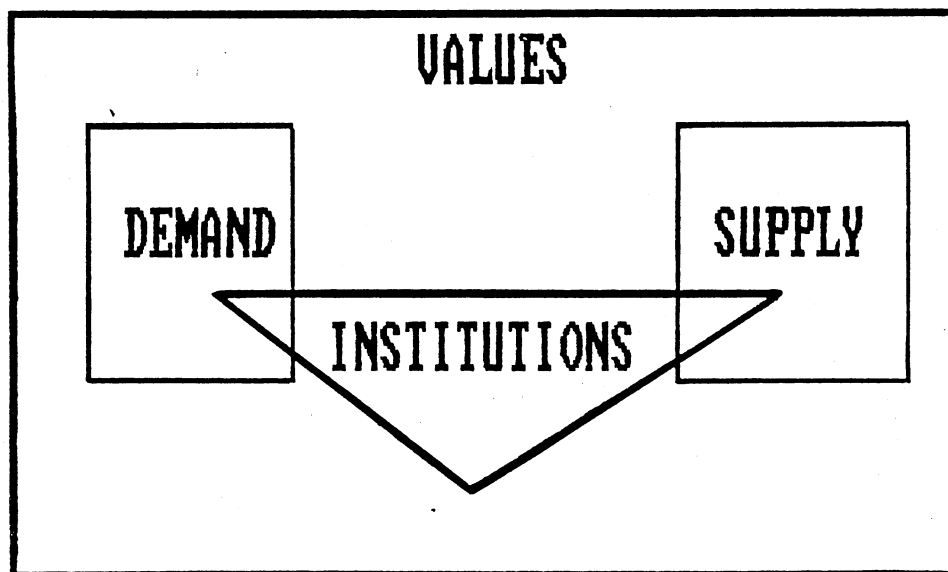


FIGURE 1 THE CRITICAL VARIABLES IN COMMUNITY ECONOMIC DEVELOPMENT POLICY

References

- Armington, Catherine and Marjorie Odle. 1982. Sources of Employment Growth 1978-80. Brookings. Washington, D.C.
- Birch, David. 1979. The Job Generation Process. Massachusetts Institute of Technology. Cambridge, Massachusetts.
- Economic Research Service. 1987. Rural Economic Development in the 1980's. Agriculture and Rural Economy Division. U.S. Department of Agriculture.
- Joint Economic Committee. 1986. New Dimensions In Rural Policy: Building Upon Our Heritage. Subcommittee On Agriculture and Transportation. Congress of the United States.
- Miller, James P. 1985. "Rethinking Small Businesses as the Best Way to Create Rural Jobs." Rural Development Perspectives. Economic Research Service. USDA. Washington, D.C.
- Pulver, Glen, Vance Rayburn, Ron Shaffer, Ayse Somersan and Sydney Staniforth. 1980. Community Economics Preparedness Index, University of Wisconsin-Extension.
- Pulver, Glen C. 1986. Community Economic Development Strategies. University of Wisconsin-Extension, Madison, Wisconsin.
- Pulver, Glen C. and Glen R. Rogers. 1986. "Changes in Income Sources in Rural America." American Journal of Agricultural Economics. Volume 68, No. 5. December.
- Schweke, William and Robert Friedman. 1983. "The Debate Over Who Generates Jobs?" Entrepreneurial Economy. Corporation for Enterprise Development. Washington, D.C.
- Shaffer, Ron. 1988. "Community Economics: Study of the Economic Structure and Change of Smaller Communities," forthcoming Iowa State Univ. Press, Ch. 2.
- Summers, Gene F. and Thomas A. Hirschl. 1985. "Capturing Cash Transfer Payments and Community Economic Development." Journal of the Community Development Society. Volume 16, No. 2.

ALTERNATIVE STRATEGIES FOR EXPANDED RURAL ECONOMIC DEVELOPMENT: DISCUSSION

Philip Favero

Shaffer and Pulver provide a useful summary statement of current ideas and practices in community economics. They offer insights about their previous work on the importance of structural changes as such changes impact community economies and about the menu of community economic strategies; both efforts have contributed greatly to our knowledge of those subjects.

Two topics seem worthy of greater emphasis. The first involves political pressures on community economic decision makers. For example, reductions in Federal grant assistance to local governments have encouraged those jurisdictions in my state to pursue economic growth more vigorously as a means of enhancing their property tax base. Yet, on the other hand, the political issue of growth impacts is also very much evident. Many people are concerned about or hostile toward economic growth for its impacts on traffic congestion, other community facilities and on the quality of the environment.

A second topic worthy of added emphasis is noneconomic objectives of rural economic development. One such objective is justice. By that I mean we should be concerned in our work about making sure that less privileged people get involved in the policy process, and that distributional consequences get considered when optional strategies are being considered. Resource sustainability is also a worthy objective of economic development. Too little attention has been paid in times past to the external impacts of economic growth on precious land and water resources.

Frontier Subjects

As we look ahead to future work in community economic development, there are several subjects which build on the work of Shaffer, Pulver and others and are frontier subjects for research and Extension Service efforts. They include:

1. More accurate diagnostic methods for community economic problems.
2. More sophisticated insights about community economic policy options and their consequences.
3. Better understanding of the influence of national and state policies on community economies.
4. Greater insights into distributional and equity dimensions of community economic decisions.
5. Stronger linkages between the theory and practice of natural resource/environmental economics and community economic development.

Philip Favero is an associate professor, Department of Community Resource Development, University of Maryland.

The Liberating Factor

How can we, as Extension Economists build on good work and expand on the frontier subjects? The factor which is key to our progress is, I believe, augmenting and aggregating our resources. We need, in essence, more specialists specializing more.

Several recent studies, when considered in combination, undergird the argument that we need more specialists specializing more. In 1982 Morse, Youmans, Mallet and Favero wrote a paper for a National CRD Program Leaders Workshop titled CRD Economic Development Programs In The '80s (Morse, et al.) In that paper we argue, with some empirical evidence, that there is a large number of speciality areas in community economics and relatively few people to specialize in them. Honadle in 1985 documented the large number of speciality areas in state Extension programs concerning community economics (Honadle). Although Beth currently expresses, by verbal communication, her sense that the number of Extension people conducting those programs had increased slightly, the number is still small when compared to other programs in the Extension Services.

Goode has presented two papers which support the argument that we are too fragmented in our community economics work (Goode 1985 and 1986). In those papers Goode, a researcher with an interest in extension, indicates that because of academic reward systems, research in community economics has tended to become increasingly theoretical and divorced for practical purposes from problem solving. Finally, Weber argued in 1985 that institutional lag i.e. resistance exists in Land Grant Universities and USDA to the idea that more resources are needed in community economics, even if the goal of these institutions is simply to enhance agricultural profitability (Weber).

Suggested Actions

What steps can we take to build the resource base for doing community economic development in the face of resistance? The following actions should be helpful:

1. Documenting, demonstrating and making known the fact that community economic extension efforts benefit both traditional and new Extension Service clients. Such efforts are, therefore, worthy of support by Extension Service administrators, even in the context of severe budget constraints.
2. Unselfishly support high quality work being done by our colleagues in community economics. We all benefit when our colleagues excel. Support could be in the form of words of encouragement and due praise to the colleagues, their administrators, granting foundations and so forth. By colleagues who are doing high quality work I mean:
 - leading state institutions in community economics such as Wisconsin, Oklahoma State, Iowa State, Ohio State and others;
 - the Extension Service National Program Leader for Economic Development;

- those involved in outstanding multistate projects such as the Western Regional Center's "Coping With Growth" effort a few years ago and the "Small Town Strategy" effort more recently;
- deserving colleagues, both researchers and Extension Specialists who work on practical problems in community economics.

Creative Efforts

We can also use some creative efforts to better utilize existing resources in community economics by establishing links and increasing thereby the scale of projects and programs. These are some examples of such efforts:

1. Regional Rural Development Projects which link Extension Service and research people. An example of this kind of effort is the creation of a data base for local economic development planning in the northeast states. The project, with funding by the Northeast Regional Center, is currently being implemented by a combined research/extension team from Delaware, Maryland, Massachusetts, Pennsylvania and Rhode Island.
2. Multidisciplinary Teams. A good example from the natural resources area is the University of Maryland Water Team which involves researchers and Extension Specialists from Agronomy, Ag Engineering, Agricultural Economics, Community Resource Development and other departments. Team members share the goal of providing educational opportunities and information about water issues.
3. Institutionalized Programs. By that term is meant Extension Service programs which have been well documented, explained and publicized for other states to use. An example is Ohio State's Retention and Expansion Program.
4. Videotapes and Electronic Conferences. A recent example is the May, 1987 National Audio Conference On Community Economics.
5. Sharing information across state lines. An example is the USDA Bulletin Board For Economic Development.

CONCLUSION

We have made good progress in recent years in providing high quality community economic development extension programs. There are, of course, frontier areas of knowledge that demand more work. But the most limiting factor to better serving our clients is, in my opinion, one of resource limitation. If you agree, how can we augment our resources and better utilize the resources we now have to achieve greater economies of size?

References

- Goode, Frank M. "Research Roles and Issues in the '80's" Proceedings: The Northeast Economic Development Symposium. University Park, PA: Northeast Regional Center for Rural Development, 1985.
- Goode, Frank M. "Research-Extension Linkages: Theory and Practice" (Paper presented at Rural People and Places: A Symposium on Typologies, Harrisburg, PA, October 22-24, 1986).
- Honadle, Beth Walter. "The Role of the Cooperative Extension System in Economic Development" (Paper presented at the Conference on the Small City and Regional Community, Stevens Point, WI, March 20-21, 1986).
- Morse, George, and Philip Favero, James Mallet and Russ Youmans. "CRD Economic Development Programs in the '80's" Proceedings of the ECOP National CRD Program Leaders Workshop: Developing and Directing CRD Programs in the '80's. Auburn, AL: Auburn University, 1982.
- Weber, Bruce A. "Developing Perspective, Knowledge, Skills and Institutions: Extension's Roles in Economic Development" Proceedings: The Northeast Economic Development Symposium. University Park, PA: Northeast Regional Center for Rural Development, 1985.

Minisymposia Abstracts

The minisymposia session was designed to provide small group interaction on a variety of economic and professional issues of vital interest to Extension economists. Of the symposia proposals submitted, ten were chosen for presentation. Each consisted of two to six short papers followed by considerable discussion.

The following abstracts provide a quick overview of each minisymposium and identify the key participants to contact for additional information.

David Holder, Organizer
Extension Service, USDA

Identifying the Proper Role for Extension in Educating Debtors and Lenders on Farm Bankruptcy

Stephen Matthews, organizer (University of Missouri)
Ron Plain, moderator (University of Missouri)
Al Schroeder (University of Wyoming)
Paul Wright (The Ohio State University)
Al Bock (University of Illinois)

Farm Financial stress in the U.S. during the 1980's brought much interest among farmers in bankruptcy related farm financial strategies. Cooperative Extension in most farm belt states has done educational programming on bankruptcy pros and cons. The key concern is to keep the programs educational and balanced as between lender and debtor viewpoints. Advocacy of bankruptcy is not an appropriate role for Extension. Another area of concern is the quality of the information being given by Extension employees. It is not Extension's role to give legal advice to farmers.

Discussion centered on Chapter 12 bankruptcy. Group consensus was that it would work successfully in very few cases and that certain administrative procedures, especially payments for trustees, need to be modified.

Why Many Extension Economists Are Not at The Cutting Edge and What They Can Do About Moving The Edge

George McDowell, organizer (University of Massachusetts)

Larry Libby, moderator (University of Florida)

George McDowell (University of Massachusetts)

George Morse (Ohio State University)

The political-economic history and current mission of the land grant system absolutely require defining the "cutting edge" in applied economics in ways that focus in real problems faced by real people within a state or region. Extension economics is central to defining and retaining that cutting edge. The responsibility of the extension economist is to maintain excellence with this discipline, to constantly probe the political-economic system in search of the most pressing issues, and to maintain sufficient professional and programmatic flexibility to respond. Peer review of extension programs would enhance quality and promote excellence. A program certification process is recommended to provide systematic review of content and permit sharing of particular approaches or content among specialists. Such a process would further establish the respectability of extension output and clarify the "cutting edge."

Comparative Advantage and Competitiveness: New Extension Programs to Teach Old Concepts

John Ikerd, organizer (University of Georgia)

Coleman Dangerfield, moderator (University of Georgia)

Kevin Moore (University of Missouri)

Bob Glover (University of Georgia)

Parr Rosson III, Johnny Jordan (Clemson University)

A national task force of Extension specialists has developed a comprehensive set of educational materials to teach the basic concepts of comparative advantage and competitiveness as they relate to farm enterprise selection, interregional competition and international trade. An understanding of international and interregional competition is built on a foundation of individual farm decision making. The concept of opportunity costs is used as a cornerstone for competitive advantage analyses at all three levels.

Educational materials include a base book with separate sections for each level of competition; an instructor's manual with introductory video skits, visuals, a computer game, instructional video tapes and instructional micro spread sheet templates; and specialized analytical tools which include micro spread sheets and an interregional linear programming application.

The symposium discussion followed an exposition of the concepts and materials developed as they relate programs of individual farm decision making, interregional competition and international trade. Discussion centered on potential use of these materials in Extension programs.

Use of Expert Systems in Agricultural Economics

J. William Uhrig, organizer and moderator (Purdue University)
James McGrann (Texas A&M University)
Stephen Harsh (Michigan State University)
William Van Beek, Jerald Fletcher (Purdue University)

An expert system is a computer program that enables a computer to mimic an expert in helping people solve specific problems or to select among alternatives.

James Phillips and Stephen Harsh (Michigan State University) developed an expert system to analyze dairy farm financial records for lenders. They focused on only income statements and balance sheets. The financial analysis was carried out with a Lotus 123 spreadsheet and an expert system shell called Insight Two Plus. The purpose of the expert system was to provide a method of screening loans in a portfolio to select those farms that require further analysis.

James McGrann, Timothy Powell and Daryl Ellis (Texas A&M University) developed software to enhance financial management through more effective use of accounting and financial statements data. The target audience includes farmers and ranchers, the Farm Credit System, commercial banks, and educators. The financial analysis questions addressed include: The financial condition of the farm or ranch business, whether the business can support the present operating loan commitments or additional operating capital requested, and whether the financial condition of the farm or ranch business can be improved by re-structuring debt.

Bill Van Beek, Jerry Fletcher and Dave Mengel (Purdue University) developed an expert system called GUFERT that recommends nitrogen fertilizer rate adjustments for a pre-specified yield goal based on physical characteristics and nitrogen management practices. This was further refined and an economic analysis option added and the name changed to N-Man. N-Man is not an optimization or least cost program. It serves as a guide to users by disseminating large amounts of knowledge about the interaction between nitrogen fertilizers, corn yield, and factors related to specific nitrogen application situations.

AN EXPERT SYSTEM APPLICATION TO THE FINANCIAL ANALYSIS OF LENDER CASE FARM RECORDS

James J. Phillips & Stephen B. Harsh

This research project represents an attempt to explore opportunities for the farm sector to apply expert system technology to discover answers to farm financial problems. The financial information of twenty nine farms from Farm Credit Services and Farmers Home Administration were used to test an expert system prototype. The results of the test indicated that the expert system achieved the same level of agreement found between loan officers. The results of the research uncovered gaps in knowledge and shed light on expert decision making for the financial analysis of farm businesses.

INTRODUCTION

The farm sector is experiencing a period of financial stress. Many farm businesses have been liquidated since the early part of the decade and most experts agree that restructuring in the agricultural sector will continue for the next few years. (Cochrane, 1987)

Due to the recent decline in farm asset values and the low prices of many agricultural commodities the management of a farm operation is becoming increasingly complex. It requires skills and knowledge in such diverse areas as marketing, epidemiology, production economics, plant physiology, soil physics, human resource management and finance.

Managers process a wealth of information before making management decisions. It has been shown that the human decision maker is prone to error, particularly when a decision is made under time constraints (Hogarth, 1987). Human decision makers employ cognitive simplification strategies when making decisions. However, when expert decision makers are given adequate time and encouraged to solve the problem logically, they will often arrive at the best answer for the information available. Experts are encouraged through the decision making process in a similar logical manner during the building of an expert system. This process of obtaining expert advice for solving a given problem is referred to as knowledge engineering (Harmon & King, 1985).

James Phillips is project coordinator for the Integrated Decision Support Systems Project at Michigan State University. Dr. Steve Harsh is professor of Agricultural Economics at Michigan State University. The authors wish to acknowledge the useful comments of J. Roy Black and James Hilker.

Michigan State University Agricultural Experiment Station
Bulletin Number 12394.

Farm managers prepare year end financial statements for tax purposes and for their creditors. This is generally the only time they examine their finances. They have little information on other farm firms and therefore have no means of comparison for analyzing their financial statements. They also have few benchmarks or standards available to them for analyzing financial information.

Computerized expert systems show potential for assisting farm management decision makers to analyze financial statements. They incorporate rules of thumb and are adapted to represent the flow characteristics of a given problem. Information can be extracted from the experts by a knowledge engineering process that encourages the experts to think the problem through in order that a conditional best solution be obtained every time.

Hayes-Roth, et. al. give reasons for the consideration of expert systems or a knowledge based systems approach to problem solving:

"...most of the difficult and interesting problems do not have tractable algorithmic solutions since many important tasks originate in complex social or physical contexts which generally resist precise description and rigorous analysis."

Fiegenbaum indicates that many tasks lack a mathematically tractable core. As a result more and more attention has been focussed in the expert system arena to areas where analytical methods are not well documented but where people are still able to achieve results.

Many farms are experiencing financial difficulties in today's rapidly changing agricultural sector. Both farmers and lenders could benefit from an expert system that would analyze financial statements. The following are some specific tasks an expert system could be used for:

- 1). Diagnosis of financial problems
- 2). Prediction of farm business solvency
- 3). Classification of farm loans according to risk

Many farm accounting systems provide summaries to their users to assist in analyzing the farm business. Accountants at times also provide consulting services related to the analysis of the business. An expert system could take business analysis a step further by using both the summaries available from computerized farm accounting systems and the financial standards from the farm business consultants. These can both be applied directly toward a given business.

Some loan officer decisions on the granting of credit have been assisted with the use of credit scoring models (Pederson & Duncan, 1983). The credit scoring method uses a discriminate

analysis algorithm. This algorithm identifies a linear discriminate function to maximize the ratio of the sum of squares between two groups (Dunn & Frey, 1976). These models rely on statistical relationships and less on financial principals. An analyst does not have the ability to trace the logic of the model and learn more about problem with this method as they would with an expert system.

The potential applications and uses of expert systems in this context are plentiful. An expert system could be used to interface with a farm accounting system to automate the process of financial analysis. Lending institutions would be assisted by having farm cases requiring further attention screened and selected from the portfolio.

Expert systems have already been used by some banks to support decisions on the granting of credit. This facilitates a consistent granting of credit without taking the human decision maker out of the process. Farm managers can be assisted by an expert system of this type in a number of ways. Year end income statements could be screened to highlight potential sources of problems in the business by using benchmarks of good, moderate, or poor performance.

PROJECT OBJECTIVES AND DEVELOPMENT OF FIRST MODEL

The goal of this project was to test the hypothesis that an expert system could make decisions that were consistent with those of human experts. This was accomplished by developing an expert system to analyze dairy farm financial records of the lender. The model is then use to both the lender and the farm manager.

By focussing on dairy farms and using only income statements and balance sheets, a working model was developed within a three to five month period of time.

The following are the goals of the expert system model.

- 1) To assess the overall financial position of the farm as good moderate or poor.
- 2) To predict the likelihood of farm business solvency as good, moderate or poor .
- 3) To compare selected information to management standards in an effort to determine possible sources of business problems.

DATA LIMITATIONS

The names and addresses of the case farms analyzed for this project were unknown to assure anonymity. This prevented the analysis from going beyond the use of income statements (accrual

based) and balance sheets (market based).

The use of balance sheets and income statements put limitations on the amount of detail provided by the analysis. Potential problem areas of the business would only be brought to the attention of the analyst. Assessing the causes of these problems requires cost accounting information or partial enterprise budgets, information that is not usually found in the financial records available to the lender.

The use of balance sheets and income statements presents some other problems because of the wide use of cash accounting. Some expense categories may appear higher or lower than a given standard for a given year solely because part of the expense incurred is associated with income earned in a different year. Interpretation of the results of the expert system is performed with this limitation in mind.

FIRST MODEL

The construction, validation and testing of the expert system discussed in this paper was accomplished in several steps. The first step in building the model was to bring together some notion of what financial variables are important along with the thresholds of good, bad, or moderate for these variables. This was accomplished using texts, extension and research publications and interviews with loan officers and farm management specialists.

The problem was then outlined and developed into a prototype expert system using the knowledge and expertise of Harsh and Phillips acting as both the knowledge engineers and domain experts. The prototype that resulted from this was taken to several loan officers and farm management specialists to obtain their suggestions for improvement. These suggestions were incorporated, resulting in a working expert system model.

The first knowledge engineering interviews with experts were difficult and challenging because experts were either not able to articulate their decision making process or did not feel confident in their expertise. The experts were able to select important variables and the relative thresholds for these variables but had difficulty assessing various combinations for the variables at different thresholds. Better results were obtained when the experts were allowed to react to a prototype.

MODEL STRUCTURE

The knowledge base of the expert system at this stage was partitioned into four categories according to goals. These categories were:

1. To assess the overall financial position of the firm and predict solvency.
2. To compare selected expenses with averages for a given size of dairy farm.
3. To analyze feed and cropping practices using expert rules of thumb.
4. To analyzes selected livestock expenditures.

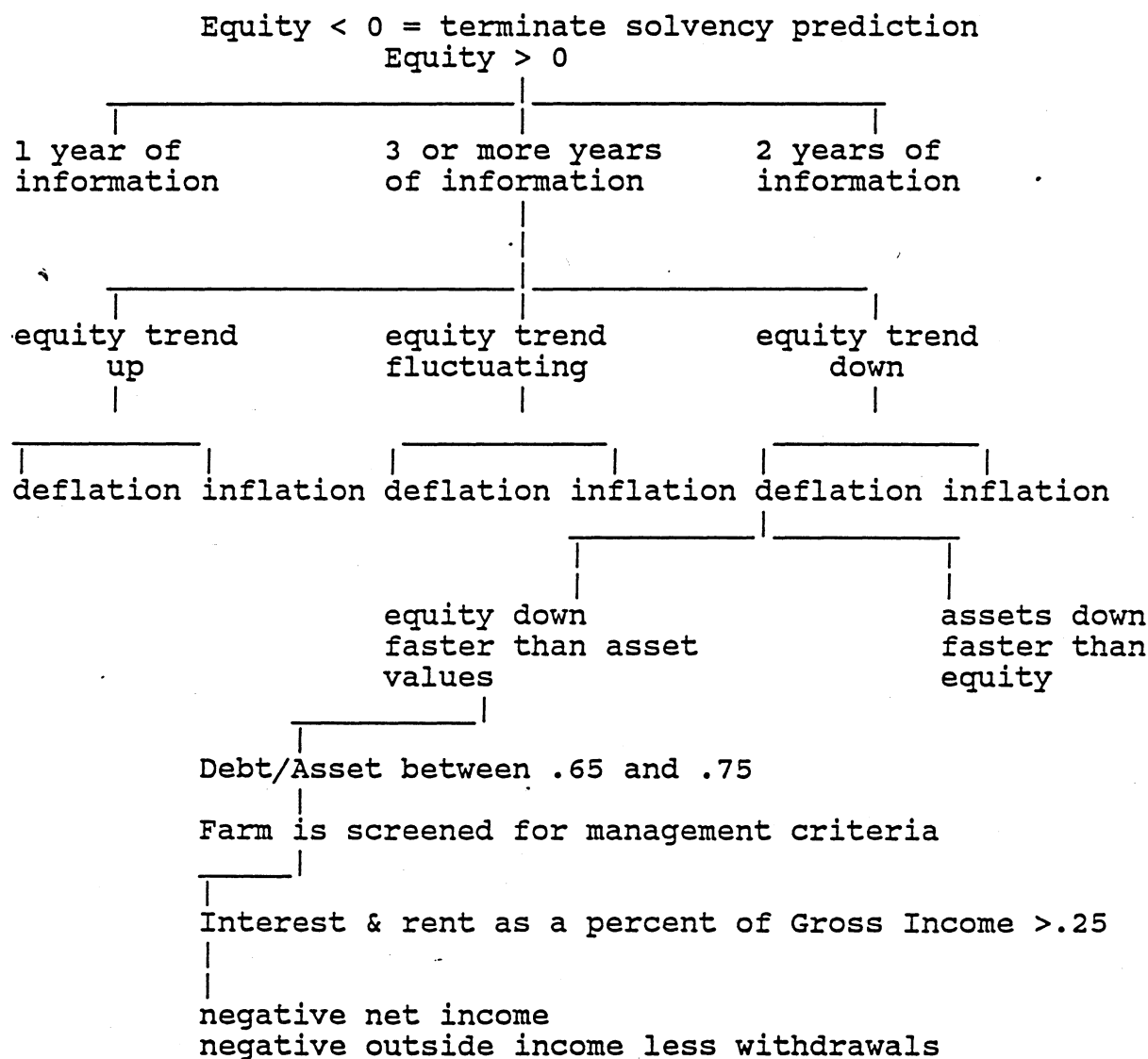
Twenty nine cases were analyzed with the expert system model. Twenty two of these farms came from Farm Credit Services. The other seven farms were obtained from Farmers Home Administration. Seventeen farms had three or more years of financial data, seven farms provided only two years of data and five farms had just one year of data. The financial analysis was carried out with a Lotus 123 spreadsheet and Insight Two plus, an expert system shell. The spreadsheet was used to calculate selected financial variables for each case farm. The variables were written to an ASCII file which was then read by the expert system.

The variables used by the expert system were selected through interviews with experts, text books, readings from the credit scoring literature (Phillips, 1987) The following is a list of these variables:

- 1) Number of years of balance sheets
- 2) 1984 equity
- 3) Trend in equity over the period
- 4) 1984 Debt/Asset ratio
- 5) Interest & rent as a percent of gross income
- 6) Purchased feed per hundredweight of milk shipped
- 7) Veterinary expense per hundredweight of milk shipped
- 8) Breeding expense per hundredweight of milk shipped
- 9) Livestock expense per hundredweight of milk shipped
- 10) Machinery investment (market basis) per acre
- 11) Acres farmed per cow
- 12) 1984 net income
- 13) 1984 outside income less family withdrawals
- 14) Number of cows
- 15) Pounds of milk shipped per worker (full time equivalent)
- 16) 1984 repair expense
- 17) 1984 fuel expense
- 18) 1984 fertilizer expense
- 19) 1984 cost of hired labor

After the expert system reads these financial variables they are analyzed by a series of decision rules. The structure of the rules in the knowledge base, work like that of a deterministic search tree. The knowledge base is partitioned into four main goals. Within these goals the rules are nested so that the conclusion of one rule is an antecedent to another rule. The inference engine uses a pattern recognition process to

FIGURE 1. PARTIAL SEARCH TREE REPRESENTATION FOR FIRM CLASSIFICATION AND SOLVENCY PREDICTION



conclusion:

firm has poor overall position
firm is a high credit risk
prospects of short term solvency poor
prospects of long term solvency poor
solvency trend determined

An individualized assessment of the firms position will also be written based on how the above criteria are combined.

recursively work through the rules until each goal is proven (Harmon and King, 1985).

One of the goals of the expert system is to determine solvency trend. This section of the knowledge base, after analyzing the financial information will draw four conclusions. They are:

1. An assessment of overall financial position.
2. An assessment of the farms credit risk.
3. An assessment of the farms short term solvency.
4. A prediction of future farm financial solvency.

The search tree in figure 1 represents a portion of the knowledge base that predicts the solvency of the farm. The center branch of the tree (the only one shown that reaches a goal) represents only 5 rules of the total 256 rules contained in the first prototype system. This is followed by a decision rule example in figure 2., written both with symbols in set theory and using Insight Two syntax or object=>attribute=>value clauses. An example of the printed output from the expert system after solvency of the farm is predicted is illustrated in figure 3.

The rule illustrated in figure 1 can be rewritten using the notation of set theory or logic as shown below. Using the letters to refer to the clauses in the rule, the illustration below written with symbols in set theory says: IF A and (B or C or D) and E and F THEN (G and H) which are contained in the set I.

$$A \wedge (B \vee C \vee D) \wedge E \wedge F \implies G \wedge H \in I$$

The rule as it appears in the knowledge base that reaches this conclusion is shown below in figure 2.

FIGURE 2 DECISION RULE EXAMPLE : FIRM CLASSIFICATION

	RULE	To examine high debt, high interest/rent expense
A)	IF	The farm appears to have too much debt
B)	AND	The farm may not be profitable
C)	OR	Operation of farm is eroding net worth
D)	OR	Fluctuating equity may be due to unprofitability
E)	AND	INRNGI >= .25
F)	AND	NETINC + WITH <= 0
G)	THEN	This is a poor financial position
H)	AND	PRINT poorest position
I)	AND	Solvency trend determined

INRNGI is the variable for interest and rent expenses as a percent of gross income, WITH is the variable for outside income less family withdrawals and NETINC is net income. A farm with debt asset ratio above 70%, with an unfavorable trend in equity,

interest and rent ratio above 25%, and negative net income plus withdrawals will yield the conclusion "This is a poor financial position."

The clause following the IF key word is the conclusion to an earlier rule that puts the farm in the high category for debt asset ratio. The next three antecedents following the AND OR key words are three of the unfavorable combinations of equity trend and inflation that are conclusions to other rules. For example the clause "Operation of farm is eroding net worth" is a scenario where equity trend is down while asset value trend is up.

The clause "poorest position" located after the key word PRINT in figure 2 will print the clause shown in figure 3 for the user. This is an example of how the expert system provides printed output tailored to the specific circumstances found in the financial variables. All possible combinations of the relevant financial variables are represented in this manner.

FIGURE 3 EXAMPLE OF MODEL OUTPUT

DISPLAY Poorest position

This farm has signs of having an unsustainable financial position. High debt asset ratio of [DETAST (4,2)] combined with high interest and rent expenses ratio of [INRNGI (4,2)] indicate high vulnerability to low prices and adverse weather conditions. The income statement analyzed shows losses of [NETINC (8,2)] and is not supported by outside sources. The farm has provided [YEARS(3,1)] of data with an equity trend of [TREND (5,2)]. If the farm can become profitable there is still an opportunity for improving the firms financial condition.

- Overall position of the farm is poor.
- Farm is a high credit risk
- Prospects for firm survival are poor in short or long term.

The expert system prototype categorized farms as good, moderate or poor based largely upon the debt asset ratio. With farms over 70% rated poor, farms under 40% rated good, and the farms in between rated moderate. Credit risk and short term solvency were determined in the same manner. Long term solvency was based upon the firms category then increased or decreased based upon the farms 4 year trend in equity. When all other financial factors were at the opposite extremes from the debt asset ratio value, the farm would be placed in the next highest or lowest category.

This expert system was designed without the use of certainty factors. Conclusions were reached with 100% certainty in the knowledge base. This does not mean that conclusions reached by the knowledge base are definitive assessments as was discussed

earlier. The uncertainty is incorporated in to the language used to write the conclusions regarding the case farm.

VALIDATION AND TESTING

The first version of the expert system was comprised of 256 rules. As part of the validation process and as a means of eliciting additional information from experts, this section of the model was tested against three loan officers. The purpose of this procedure was to test the hypothesis that the opinion regarding the financial position of a farm business using an expert system would not be different from that of another loan officer. The results of this test were encouraging and provided a means for uncovering ways to improve on the rules in the knowledge base.

The process of obtaining expertise from experts using conventional knowledge engineering techniques is not an easy one (Michalski, 1980). Experts are not always able to articulate their decision making processes. Also experts may not be confident in their expertise which was illustrated during the knowledge engineering stage of this project.

An interesting result of performing this test was the accumulation of more knowledge. The testing turned out to be more of a knowledge engineering exercise than a model validation exercise. The interviews with experts illustrated some shortcomings in the knowledge base that arose from the inability to elicit expertise during the earlier knowledge engineering process. The following is a discussion of the problems that surfaced as a result of this test and how the model was adjusted to compensate for this shortcoming.

THE REVISED MODEL

The disagreement between the expert system and experts during the first test was focussed around the same eleven case farms for each loan officer. These farms were for the most part near the borderlines between different categories of firm position. Management criteria were incorporated in to the rules to assist in screening the borderline farms.

MODEL CHANGES

1. In their present form the decision rules do not look at magnitudes for net income, equity, or withdrawals. Rules were added to highlight cases with unusual circumstances to prevent errors in the categorization process. For example a case suffering a large capital loss during one period is noted by the knowledge base.

2. Another obvious weakness of the expert system comes from the dominant role played by the debt asset ratio in many of the decisions. The rules were adjusted so that farms in border areas would be screened through two additional sets of rules. First using rules to examine other financial factors and second rules that analyze farm management factors. Farm management factors were brought to bear on this process by constructing a composite management score based upon the weighted values for production and various cost relationships.

This management score is calculated as a weighted average of production per cow, purchased feed costs and other selected expenditures. The weights were obtained according to the importance of an item to the farm business (proportion to total farm expenditures).

3. The model at this stage did not distinguish between firm position, credit risk and short term solvency. Only with long term solvency did the model use other rules to make its prediction. The predictions and assessments of the expert system were therefore reduced to an assessment of firm position and a prediction of long term solvency.

The modification of the rules in the knowledge base resulted in the recategorization of two case farms. One farm was moved from moderate to poor based upon financial criteria and the other was moved from poor to moderate based upon management criteria.

The test results are shown below from the revised expert system model. Results with eight other loan officers illustrating the level of agreement between the loan officers the expert system are shown in table 1.

Table 1. Measure of Agreement among expert system and loan officers. Second test.

expert system	69%
loan officer #1	64%
loan officer #2	68%
loan officer #3	69%
loan officer #4	65%
loan officer #5	61%
loan officer #6	65%
loan officer #7	68%
loan officer #8	<u>72%</u>
average agreement	67%

Results in table 1 illustrate that the expert system achieved the same level of agreement as the loan officers did with each other.

Evidence that the expert system is a good tool for the purpose of screening financial documents. This table also illustrates that for over 30% of the cases analyzed, the loan officers were not in agreement in their predictions and assessments. This fairly high level of inconsistency in their decision making would be eliminated with a deterministic model such as an expert system. By removing inconsistencies in loan officer decisions the credit institutions would insure that institutional policies were better employed. Loan officers would have a method of checking their decisions against the expert system. This would result in a better documentation of decisions. The more consistent loan officer decisions could also help to improve customer relations.

A properly validated expert system would reduce large variability in decision making by providing the loan officer with a consistent method of screening financial documents as a means of supporting their own decisions.

A better test of the expert system will be a comparison of the predictions from the model with the future outcomes of the case farms. By tracking the case farms over time, we will be able to determine if the predictions of the model correctly used the information analyzed.

CONCLUSIONS.

The purpose of the expert system discussed in this paper was to provide loan officers with a method of screening loans in a portfolio to select those farms that require further analysis. The rules in the knowledge base are deterministic which leads to a consistent method of screening case farms in a portfolio.

This research project confirms the difficulty in using conventional knowledge engineering techniques to elicit expertise. Other approaches were developed such as prototyping and informal testing of the knowledge base to elicit expertise for the expert system knowledge base. These methods resulted in capturing some of the deep expertise that experts may have trouble articulating.

Results of this research indicate that the expert system made decisions that were consistent with those of loan officers. The results also indicate that a properly validated expert system would make more consistent decisions than human experts. This research project confirms that expert systems can be a useful method of solving certain classes of problems (Waterman, 1986). The results also signify that expert systems continue to show potential as important tools for analyzing financial documents.

REFERENCES

- Bratton, C. A., Williams, C. B. 1985
Dairy Management Practices and New York Dairy Incomes 1984,
 Cornell Agricultural Economics Staff Paper No. 85-27.
- Cochrane, Willard W. 1987
Saving the modest sized farm - or - The case for part-time farming, Choices, Second Quarter, 1987.
- Crabtree, J.R. 1985
Predicting Farm Business Viability, Farm Management, Vol. 5
 No. 8, Winter 1984/85 :325-332.
- Davis Randall, Lenat, Douglas B. 1982
Knowledge Based Systems in A.I., McGraw Hill Inc., 1982,
 various pages.
- Davis Randall, 1986
Knowledge-Based Systems, Science, Vol 231, February, 1986.
- Denning Peter J. 1986
The Science of Computing : Will machines ever think?,
 American Scientist, Volume 74, July-August 1986.
- Dunn, Daniel J., Frey, Thomas L. 1976
Discriminate Analysis of Loans for Cash-Grain Farms, Agr.
 Finan. Rev. 36(1976):60-66.
- Harmon, Paul, King, David, 1985
Artificial Intelligence in Business: Expert Systems, John
 Wiley and Sons, N.Y., N.Y..
- Hayes-Roth Frederick, Lenat Douglas B., Waterman Donald A., 1983
Building Expert Systems, Teknowledge Series in Knowledge
 Engineering.
- Hlubic, Joseph G. 1983
The Profitability of Purchasing vs. Growing Feeds On Dairy
 Farms In Southern Michigan, PHD thesis, Michigan State
 University.
- Hogarth, Robin M. 1987
Judgement and Choice :The Psychology of Decision, John
 Wiley and Sons, New York.
- Level Five Research, Inc., 1986
Insight Two Plus Reference Manual, Level Five Research,
 Inc., Indialantic, Florida, 1986.

- Michie, Donald, 1982
Introductory Readings in Expert Systems, Studies in Cybernetics:1, Gordon and Breach Science Publishers.
- Nott Sherrill, Brodek Virginia 1984
Business Analysis Summary For Specialized Dairy Farms, Agricultural Economics Report # 472, Michigan State University.
- Perry Gregory M. et al 1985
An Evaluation of Several Factors Affecting Farm Survival, Unpublished Research Paper, Texas A & M University.
- Phillips James J. 1987
An Expert System Application To The Financial Analysis Of Lender Case Farm Records, Masters Thesis, Michigan State University.
- Posner, John, 1983
Lotus 123 User's Manual, Lotus Development Corporation, Cambridge, Ma, 1983.
- Shaltry, Joseph R., Hlubik, Joseph G. 1985
Dairy Farm Analysis Workbook, Cooperative Extension Bulletin E - 1821, Michigan State University.
- Shepard, Lawrence E., Collins, Robert A. 1982
Why Do Farmers Fail? Farm Bankruptcies 1910-78, Amer. J. Agr. Econ., Nov., 1982 :609-615.
- Spiegelhalter, David J. 1986
A Statistical View of Uncertainty in Expert Systems, In "Artificial Intelligence and Statistics" edited by W. Gale, 1986.
- United States Department of Agriculture, 1986
Agricultural Finance Outlook and Situation Report, USDA, Economic Research Service AFO - 26, March 1986.
- Waterman, D.A. 1986
A Guide to Expert Systems, Addison-Wesley Publishing Company, 1986.

State Initiatives for Agricultural and Rural Development

Rodney Clouser, organizer and moderator (University of Florida)

Michael Green (Council of State Governments)

Phillip Baumel (Iowa State University)

John Holt (University of Florida)

Ron Shaffer (University of Wisconsin)

State legislatures and departments of agriculture have increased involvement in developing state policies that will improve the economic well-being of farm producers and rural residents. Some of these policies address issues such as production, marketing and alternative agriculture, while other policies concentrate on issues such as education, job training, business expansion or retention, and value added industry.

Production, marketing and alternative agricultural crop mixes were reviewed from policies adopted in Illinois. Education, job training, etc. were discussed based on recommendations or suggestions from Governor's Task Force Reports completed in Ohio, Texas, Indiana and Florida.

Consensus by participants was that production, marketing and alternative agricultural crops could help improve the economic well-being of a small segment of rural America; but other programs such as education, job training and business expansion are also necessary to improve the situation in rural areas.

International Trade Considerations for Extension Education Programs

C. Parr Rosson III, organizer (Clemson University)

Earl Brown, moderator (University of Maryland)

Mechel Paggi (Texas A&M University)

Keith Searce (University of Georgia)

C. Parr Rosson III (Clemson University)

Kirby Moulton (University of California-Berkley)

The recent poor trade performance of the U.S. farm sector has caused much concern about the ability of American farmers to compete on a global scale. This symposium addressed this and other key issues regarding agricultural trade. Although the U.S. is not as competitive as in the late 1970's, a comparative advantage has been maintained in most traditional crops. Certain regions, such as the Southeast, appear to bear more of the burden of adjusting to changes in prices of wheat, corn, and soybeans. Recent empirical evidence provided support for the contention that developing countries can increase food production and imports simultaneously. Broad-based per capita income growth in agriculture is a key to successful market growth. U.S. agriculture has much to gain from the upcoming Uruguay Round of GATT, although most benefits will accrue over the long term. Finally, future growth in agricultural exports will be difficult to attain, requiring an extension-research interface that focuses on specific product systems. More regionalization of education activities will follow, resulting in a more diverse clientele base.

Farm Marketing Practices: What Are They and How Can We Improve Them?

James Mintert, organizer (Kansas State University)

William Tierney, Jr., organizer and moderator (Kansas State University)

James Mintert, William Tierney, Jr. (Kansas State University)

Roland Smith (Texas A&M University)

Henry Bahn (Montana State University)

Roland Smith presented preliminary results of a survey of farmers in selected states. Most felt that their market information needs were being met. Most producers used cash marketing rather than forward contracts or futures/options hedges. There was a positive correlation between farm size and the use of advanced marketing techniques. Farm indebtedness seemed to influence farmers choice of marketing practices.

Jim Mintert described the marketing practices of Kansas producers based on surveys done in Kansas. Again, most producers used cash marketing. A higher percentage of farmers attending Extension outlook sessions developed written marketing plans and used advanced marketing techniques. Two surveys on risk perceptions of farmers and agricultural lenders found that both ranked marketing risk as the most important risk element in agricultural operations.

Bill Tierney presented preliminary results of a survey of 55 producer marketing clubs in Kansas. The clubs followed market developments for 3-5 commodities, developed simulated marketing plans, and traded a small number of futures and options contracts. The majority of club members were full-time farmers/ranchers with little experience with advanced marketing techniques. About two-thirds of the club members were using what they learned and were developing their own marketing plans. About half were using advanced marketing techniques.

Henry Bahn reported on an intensive week-long marketing education program limited to 50 farmers. The program's curriculum included market functions and farm marketing strategies. The program included participants, faculty, brokers, grain merchandisers, ag-lenders, and others. Participants rated the program very highly; the majority reported using what they learned in their own marketing activities.

Discussion focused on several issues. Lack of use of futures or options does not imply poor marketing practices. In many cases, these marketing alternatives are inappropriate given the market situation or a farmer's marketing objectives. However, the total absence of ever using advanced marketing techniques certainly would suggest inadequate attention to marketing. Extension may want to develop a program to teach farmers how to "manage commodity speculation" since that may more closely fit their utility functions. Several persons mentioned the need for more research on farmers market risk preferences. Extension programs seem to give inadequate attention to integrating government programs into an analysis of marketing behavior or recommended marketing practices.

Farm Management Associations: Bridging the Information Gap between Agricultural Producers, Extension Educational Programs and Applied Research Activities

Richard Trimble, organizer (University of Kentucky)
Buel Lanpher, moderator (USDA/ES)
Buel Lanpher, Don West (USDA/ES)
Don Pretzer (Kansas State University)
George Young (Auburn University)
Charles Moore, Sr. (North Carolina State University)
Richard Trimble (University of Kentucky)

Farm management association programs have the objective of providing farmers with indepth (largely one-on-one) assistance in farm management decisionmaking. The programs operate under a mutual agreement between the association and Extension under which (1) they jointly employ a farm management specialist (fieldman) who provides the indepth assistance; (2) association members pay fees to cover a major proportion of program costs; (3) members provide record data which is summarized and analyzed, and used in assisting members with management decisions; (4) record data and analysis is used in other Extension and research programs; and (5) fieldmen receive training, organizational support, and subject matter support from subject matter departments of the college of agriculture.

A survey of long-time association members found that they feel they have received substantial benefits from the program and a majority indicated a willingness to pay higher fees for the program. In some states the member fees pay up to 95% of their program operating costs.

Farm management association programs have existed in several midwestern states for many years--over half a century in a few states such as Illinois and Kansas. Some states, such as Alabama, have organized associations in more recent years. For states considering starting association programs, emphasis was placed on: (1) need for strong administrative support; (2) need to employ a highly experienced and competent person as the first fieldman; (3) need for the program to be subsidized during the first year (and possibly second year) until member fees are received; and (4) need for the fieldman and the program to be provided with continuous support and backstopping by other state and county extension staff.

A Multidisciplinary Systems Approach to Farm and Ranch Management

Jose Pena, Ashley Lovell, organizers (Texas A&M University)
Fred Tyner, moderator (Mississippi State University)
Richard Conner, Jose Pena, Ashley Lovell (Texas A&M University)
Rob Martin (Auburn University)

Challenges, including the adoption of research-based knowledge, clientele expectations of new, innovative approaches in Extension educational programming and the financial/profitability crisis in agriculture, have resurfaced interest in the development of multidisciplinary systems programs.

Professor Richard Conner, described the research/extension interface in two multidisciplinary programs: Integrated Brush Management System (IBMS) and Intensified Grazing System (IGS) programs.

Extension economist Jose Pena presented the total Ranch Management (TRM) program, a multidisciplinary systems approach, developed jointly with animal, range, and wildlife scientists to address profitability and competitiveness issue in the southwestern Texas ranching industry.

Extension economist Ashley Lovell described the technical leadership required to develop a multidisciplinary dairy farm business analysis service.

Professor Rob Martin overviewed modeling approaches to a multidisciplinary, multi-agency farm demonstration program in Alabama which focuses on water quality, farm management training, and assistance.

Continuing Professional Education - Imperatives for the 21st Century

John Kornacki, organizer (Resources for the Future)

R. J. Hildreth, moderator (Farm Foundation)

Steven F. Matthews (University of Missouri)

W. Fred Woods (USDA/ES)

John Kornacki (Resources for the Future)

Kim Anderson (Oklahoma State University)

Hank Wadsworth (Purdue University)

The opportunities and challenges that Extension Specialists face in crafting their trade to meet current and future needs were examined. Methods for enhancing the effectiveness of professional performance were identified for practicing specialists and graduate students.

These strategies included both individual and institutional approaches aimed at improving analytical and communicative skills. Among some of the recommendations were: new coursework for graduate students that stress the interpretation of economic concepts; a new "Extension school" program in public policy analysis on national and macro-economic issues; more specialist exchanges and mini sabbatics focused on problem areas rather than academic specialties. It was further recommended that the AAEA and its appropriate committees take the lead in promoting continued professional education not only for Extension agricultural economists but all Land Grant University professionals committed to analysis and outreach.

