DOCUMENT RESUME

ED 239 585 IR 010 947

TITLE	Information Technology for Agricultural America. Prepared for the Subcommittee on Department Operations, Research and Foreign Agriculture, 97th Congress, 2d Session. Committee Print.
INSTITUTION	Library of Congress, Washington, D.C. Congressional Research Service.
SPONS AGENCY	Congress of the U.S., Washington, D.C. House Committee on Agriculture.
PUB DATE	Dec 82
NOTE	367p.; Document contains small print.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (14-795 0).
PUB TYPE	Legal/Legislative/Regulatory Materials (090) -- Viewpoints (120)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Agriculture; Audiovisual Aids; *Computer Oriented Programs; *Government Role; *Information Services; *Legislation; Microfilm; Online Systems; *Technological Advancement; Technology Transfer; Telecommunications; Videotex; Word Processing
IDENTIFIERS	*Information Technology

ABSTRACT

This summary of the combined Hearing and Workshop on Applications of Computer-Based Information Systems and Services in Agriculture (May 19-20, 1982) offers an overview of the ways in which information technology--computers, telecommunications, microforms, word processing, video and audio devices--may be utilized by American farmers and ranchers. Governmental and private sector perceptions of the importance of providing information support to agricultural America described as well as initiatives that have been undertaken to meet the information technology needs of the agriculture industry. Following a detailed treatment of letter narratives taken from letters to the Congressional Subcommittee on Department Operations, Research, and Foreign Agriculture, the formal hearing testimonies augmented by the findings and recommendations of the workshop discussion groups are examined at length. Workshop recommendations are organized by discussion group focus: (1) private sector information services; (2) government information services: management and marketing; (3) government information field operations; (4) user requirements; (5) system implementation: hardware installation training, maintenance, software and data file modification; and (6) present and projected technology. Appendices feature complementary material including descriptions of technology-supported information services, and a list of hearing and workshop participants, information on key legislation, and a five-page reference list. (LMM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED239585

97th Congress } COMMITTEE PRINT
2d Session

INFORMATION TECHNOLOGY FOR AGRICULTURAL AMERICA

PREPARED BY THE

CONGRESSIONAL RESEARCH SERVICE
LIBRARY OF CONGRESS

FOR THE

SUBCOMMITTEE ON DEPARTMENT OPERATIONS, RESEARCH, AND FOREIGN AGRICULTURE

OF THE

COMMITTEE ON AGRICULTURE
U.S. HOUSE OF REPRESENTATIVES

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

DECEMBER 1982

Printed for the use of the Committee on Agriculture

U.S. GOVERNMENT PRINTING OFFICE
14-795 O WASHINGTON : 1983

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

IR010147

ERIC

COMMITTEE ON AGRICULTURE

E (KIKA) DE LA GARZA, Texas, *Chairman*

THOMAS S. FOLEY, Washington, *Vice Chairman*
WALTER B. JONES, North Carolina
ED JONES, Tennessee
GEORGE E. BROWN, JR., California
DAVID R. BOWEN, Mississippi
CHARLES ROSE, North Carolina
FREDERICK W. RICHMOND, New York [1]
JIM WEAVER, Oregon
TOM HARKIN, Iowa
BERKLEY BEDELL, Iowa
GLENN ENGLISH, Oklahoma
FLOYD J. FITHIAN, Indiana
LEON E. PANETTA, California
JERRY HUCKABY, Louisiana
DAN GLICKMAN, Kansas
CHARLES WHITLEY, North Carolina
TONY COELHO, California
TOM DASCHLE, South Dakota
BERYL ANTHONY, JR., Arkansas [2]
CHARLES W. STENHOLM, Texas
HAROLD L. VOLKMER, Missouri
CHARLES HATCHER, Georgia
BYRON L. DORGAN, North Dakota
DON ALBOSTA, Michigan [3]

WILLIAM C. WAMPLER, Virginia, *Ranking Minority Member*
PAUL FINDLEY, Illinois
JAMES M. JEFFORDS, Vermont
TOM HAGEDORN, Minnesota
E. THOMAS COLEMAN, Missouri
RON MARLENEE, Montana
LARRY J. HOPKINS, Kentucky
WILLIAM M. THOMAS, California
GEORGE HANSEN, Idaho
ARLAN STANGELAND, Minnesota
PAT ROBERTS, Kansas
BILL EMERSON, Missouri
JOHN L. NAPIER, South Carolina
JOE SKEEN, New Mexico
SID MORRISON, Washington
CLINT ROBERTS, South Dakota
STEVE GUNDERSON, Wisconsin
COOPER EVANS, Iowa
GENE CHAPPIE, California

PROFESSIONAL STAFF

A. MARIO CASTILLO, *Staff Director*
ROBERT M. BOR, *Chief Counsel*
JOHN E. HOGAN, *Minority Counsel*

SUBCOMMITTEE ON DEPARTMENT OPERATIONS, RESEARCH, AND FOREIGN AGRICULTURE

GEORGE E. BROWN, JR., California, *Chairman*

FREDERICK W. RICHMOND, New York [1]
THOMAS S. FOLEY, Washington
DAVID R. BOWEN, Mississippi
FLOYD J. FITHIAN, Indiana
LEON E. PANETTA, California

WILLIAM C. WAMPLER, Virginia
WILLIAM M. THOMAS, California
PAT ROBERTS, Kansas
BILL EMERSON, Missouri
COOPER EVANS, Iowa

[1] Resigned from Congress Aug. 25, 1982.
[2] Resigned from committee Oct. 7, 1981.
[3] Elected to committee Dec. 16, 1981.

"...in the modern age people routinely rely on ... systems they do not understand...[they are] acting on faith ... in strangers using skills that are as strange to laymen as ... gunpowder was to Gulliver."

George Will
The Washington Post
June 10, 1979, p. D7

A definition of "communications" by a leader on a Navajo reservation: "[his] Ford pickup, a tank of gas, and 40 miles of bad road."

Dr. Louis A. Bransford
Testimony before the Subcommittee on Department Operations, Research and Foreign Agriculture
May 20, 1982

"Technology is not a vessel into which people are to be poured and to which they must be molded. It is something to be adapted to the needs of man and to the furtherance of human ends, including the enrichment of personality and environment."

National Commission on Technology, Automation, and Economic Progress
Technology and the American Economy, February 1966

LETTER OF REQUEST

GEORGE E. BROWN, JR., CALIF.,
CHAIRMAN
FREDERICK W. RICHMOND, N.Y.
THOMAS S. FOLEY, WASH.
DAVID R. BOWEN, MISS.
FLOYD J. FITHIAN, IND.
LEON E. PANETTA, CALIF.
(KIKA) DE LA GARZA, TEX.,
EX OFFICIO MEMBER

CHARLES M. BENBROOK,
STAFF DIRECTOR

U.S. House of Representatives
Committee on Agriculture
Subcommittee on Department Operations, Research, and Foreign Agriculture
Room 1301, Longworth House Office Building
Washington, D.C. 20515

WILLIAM C. WAMPLER, VA.,
RANKING MINORITY MEMBER
WILLIAM M. THOMAS, CALIF.
PAT ROBERTS, KANS.
BILL EMERSON, MO.
COOPER EVANS, IOWA

GERALD R. JORGENSEN,
MINORITY CONSULTANT

September 10, 1982

Honorab. . Gilbert Gude
Director
Congressional Research Service
Library of Congress
10 First Street S.E.
Washington, D.C. 20540

Dear Gil:

I wanted to write and let you know how pleased I was with the Congressional Research Service effort on the combined hearing and workshop on "Information Systems in Agriculture." The session brought together an array of people and ideas to form an excellent record on the topic. This session served to move the discussion on applications of these technologies to a higher level.

For their effort on this project, Bob Chartrand and Barry Carr are to be highly commended. They worked diligently on the project and without them this event would not have been held. I would also like to mention the fine work that Nancy Miller performed. Also, the effort of Hildegard Cote was invaluable.

Having thanked you and your staff for their effort, there is one more request which I would like to make. In order to produce a summary document of the session, I would like to request that your staff review the testimony and recommendations of the workshop and draft a report on the workshop. I will secure permission from the Agriculture Committee for this report to be issued as a committee print when a draft is ready. If the CRS effort on this report is as complete as the work on the workshop itself, I am sure that this report will be a valuable document.

Thank you for your response to my request.

Sincerely,

George

George E. Brown, Jr.
Chairman

Congressional Research Service
The Library of Congress

Washington, D.C. 20540

LETTER OF SUBMITTAL

October 12, 1982

Honorable George E. Brown, Jr.
Chairman, Subcommittee on Department
Operations, Research and Foreign
Agriculture
Committee on Agriculture
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

I am pleased to submit this report entitled "Information Technology for Agricultural America," prepared at the request of the Subcommittee on Department Operations, Research and Foreign Agriculture, Committee on Agriculture of the United States House of Representatives.

This study offers an overview of the ways in which information technology--computers, telecommunications, microforms, word processing, video and audio devices--may be utilized by the farmers and ranchers of America.

Featured in this overview of salient issues, trends, and action alternatives are an executive summary and an introductory chapter which sets forth the context of this often complex area, followed by a description of key governmental and private sector perceptions of its importance and initiatives which have been undertaken to meet the needs of the agricultural industry. A. xamination of the application of the various technologies, as they
ed over the past decades, furnishes meaningful background infor-
when scrutinized along with a chronology of selected events of note
governmental support of agriculture and the enhancement of the tec
role. The substantive focus of the report, in accordance with the
from the requester, is contained in three core chapters which present the highlights of commentaries offered in written and oral form by experienced individuals in all sectors of society. Following a detailed treatment of letter narratives taken from letters to the subcommittee, the formal testimonies presented during two days of hearings, augmented by the findings and recommendations of the workshop discussion groups, are examined at length. A series of appendices present relevant examples of technology-supported systems and services, key reference material concerning the topic, and other pertinent background information.

The direction of this project was performed by Robert L. Chartrand, our Senior Specialist in Information Policy and Technology, who was the chief author and editor. Dr. A. Barry Carr, Specialist in Agricultural Policy, who was responsible for Chapters II and III, served as senior advisor throughout the project. Nancy R. Miller, Research Assistant to the Senior Specialist, authored Chapter IV, helped assemble the numerous appendices, and performed a variety of requisite background research. Manuscript preparation was undertaken with significant contributions by Madeline S. Simon, executive secretary to the Senior Specialist; and Linda S. Kline, Administrative Assistant, and Michelle Coleman, Editorial Clerk, both of the Office of Senior Specialists. This contribution to the House Subcommittee on Department Operations, Research and Foreign Agriculture was coordinated with and reviewed by Robert A. Stiles of the staff of Representative Brown.

On behalf of the Congressional Research Service, I should like to express my appreciation for the opportunity to perform this timely and challenging assignment.

Sincerely,

Gilbert Gude

Gilbert Gude
Director

ERIC

GEORGE E. BROWN, JR., CALIF.,
CHAIRMAN
FREDERICK W. RICHMOND, N.Y.
THOMAS S. FOLEY, WASH.
DAVID R. BOWEN, MISS.
FLOYD J. FITHIAN, IND.
LEON E. PANETTA, CALIF.
E (KIKA) DE LA GARZA, TEX.,
EX OFFICIO MEMBER
CHARLES M. BENBROOK,
STAFF DIRECTOR

U.S. House of Representatives
Committee on Agriculture
Subcommittee on Department Operations, Research, and Foreign Agriculture
Room 1301, Longworth House Office Building
Washington, D.C. 20515

WILLIAM C. WAMPLER, VA.,
RANKING MINORITY MEMBER
WILLIAM M. THOMAS, CALIF.
PAT ROBERTS, KANS.
BILL EMERSON, MO.
COOPER EVANS, IOWA
GERALD A. JORGENSEN,
MINORITY CONSULTANT

October 12, 1982

Honorable E. de la Garza
Chairman,
Committee on Agriculture
1301 Longworth House Office Building
Washington, D.C. 20515

Dear Mr. Chairman:

At my request, the Congressional Research Service has prepared a report summarizing the workshop held by this subcommittee on computer-based information systems and services for rural America. This workshop, held May 19 and 20, 1982, was a valuable session which explored one of the fastest growing areas of technological application and one which holds great promise for agriculture and rural areas of this country.

The report contains a summary of the sessions held at the workshop as well as the findings of the various work groups. There is as well a wealth of background information which should prove useful to anyone examining this field. I feel that the Congressional Research Service has done an excellent job.

I am pleased to make this report available to the Agriculture Committee.

Sincerely,

George E. Brown, Jr.
Chairman

ERIC
Full Text Provided by ERIC

CONTENTS

9

APPENDIXES

ERIC

LIST OF FIGURES

EXECUTIVE SUMMARY

A heightening awareness of numerous governmental and private sector initiatives designed to improve information support for agricultural America, particularly through the utilization of computer and telecommunications technology, caused the Subcommittee on Department Operations, Research and Foreign Agriculture of the House Committee on Agriculture to request the preparation of this report by the Congressional Research Service.

The purpose of this study, in the words of Chairman George E. Brown, Jr, includes taking "cognizance of probably the most rapidly developing technology in the world and in the United States society ...we think it is helpful and constructive to review this situation as a part of our general responsibility of oversight of agriculture." Preliminary to this more comprehensive insight into an often complex area still in evolution had been the development, at the direction of the Subcommittee, of a booklet entitled "Computer-based Information Systems for Rural America" that was to be used during the two days of formal hearings and workshop sessions, conducted on May 19-20, 1982. Utilizing this background material, and the ensuing contributions emanating from hearings testimony, workshop findings, and other ancillary offerings, this report could serve as an instrument for viewing broader trends involving information technology as well as setting forth delineated options for subsequent congressional action.

Participants in the 1982 hearings and workshop were to become fully aware of the Subcommittee desire to ensure that farmers and ranchers had full access to all resources, including an array of technologies, which would allow them to continue making, in the words of the late Senator Hubert H. Humphrey, "a lasting contribution to our health, to our national prosperity, and to peace in the world." The needs of the agricultural community for a variety of information --about impending weather conditions, marketplace activities and projections, and factors affecting crop and livestock management--had become increasingly strident, and in many instances appeared to exceed the capacity of existing institutions to provide responsive service. It seemed to some Members of Congress, along with concerned individuals and organizations in many sectors of society, that such requirements, often of gripping urgency, must be confronted and solved. Preparatory to convening the Subcommittee-sponsored sessions, extensive background exploration was undertaken by staff in order to scrutinize existing policies and programs, as reflected in public laws and executive branch promulgations, focusing on this area. In addition, care was taken to examine the genesis of private sector endeavors which had led to the establishment of pilot projects and operational support systems designed to serve the agricultural industry.

Response to the Subcommittee declaration of interest and intent to act prompted a widespread expression of willingness to actively participate in the announced hearing and workshop. Among those who ultimately gave testimony, and led or were involved in the discussion group meetings, were university extension directors, State and local government representatives, information industry executives, farm organization (cooperatives, granges, associations) leaders, senior Federal officials, media management, special information service providers (including librarians), and consultants in information systems analysis and design. Through their thoughtful contributions, based on experience and unique perceptions of how technology could be applied to the problems of the farming and ranching communities, both the congressional listeners and others in attendance during these legislative convenings benefitted significantly. The impact of information technology and its ability to transmit selected narrative and statistical data with great swiftness seemed of especial importance. And while the benefits of such expedited transfer were obvious, it had to be noted that in many cases the traditional "measured response" was threatened or obliterated. The limited experience gained thus far might prove to be a portent of even more impactions to come, as Marshall McLuhan once averred:

> Electric circuitry profoundly involves men with one another. Information pours upon us, instantaneously and continuously. As soon as information is acquired, it is very rapidly replaced by still newer information... instant communication insures that all factors of the environment and of experience co-exist in a state of active interplay.

In considering the several dimensions of mounting and sustaining an imaginative support effort which could adequately furnish far-flung rural dwellers with timely, comprehensive, accurate, and relevant information of considerable variety, policymakers and program implementers were faced with a spectrum of issues to be addressed:

- The kaleidoscopic roles and responsibilities of established and emerging entities, both in the public and private sectors, who served as information providers for the agricultural community.
- An ever-pressing requirement to determine to what extent and under which conditions governmentally collected data could be accessed by private vendors.

ERIC

- o The conditions under which individuals or groups at the local level could influence, even to a modest degree, the information offerings—content, frequency, form—made available to them.
- o The extent to which formalized responsibility could be assigned to information providers and systems implementers regarding such post-installation activities as training, maintenance, and the modification of files and software.
- o The ramifications of private organizations acquiring government-developed data files and/or software which would then be modified, resulting in "value-added" products and services, with particular attention to ownership of such improved elements.
- o The diversity of hardware and software offerings which has raised vociferous arguments for and against standardization, either through a government mechanism or imposed by the information industry.
- o The desirability of continued, or enhanced, governmental subsidization of research and first-phase enterprises leading to new or improved information services.
- o The need to look ahead at efforts which could be undertaken at present to protect the confidentiality of personal and corporate data being entered into some of the agriculturally-oriented on-line files.

During the hearings and workshop these issues surfaced again and again, with various stratagems being employed in order to press a point or counter opposing views. Repeatedly, the requirements of the end users were articulated, with examples drawn from recent experiences with traditional or innovative information delivery systems. Possible incentives to private sector information providers which would lead to the placement of services in remote or sparsely settled areas drew their share of attention. On the whole, the attendees at this congressional event were not overawed by the present or potential capabilities of the various technologies—computers, telecommunications, microforms, word processors, audio and video devices—nor were many unready to learn about how best to improve agricultural performance. While concerns were voiced about being led into technological cul-de-sacs, there appeared to be a feeling that the new technology might offer a more complete, stereoscopic perception of management and marketing functions and opportunities.

Periodically throughout the two days of hearings, Chairman Brown emphasized that the Committee on Agriculture and "the Congress as a whole," looked for guidance to the participants.

> This hearing and workshop grew out of a perception that information and communications technologies are entering the agricultural sector at a dizzying rate.
> The Kellogg Foundation estimates that by 1990, three-quarters of the commercial farms and 90 percent of the county extension offices in this country will be equipped with computers or intelligent terminals.
> The application of these technologies holds great promise, but this promise can only be realized if we do an adequate job of planning in the early stages.

The need for <u>action in the near future</u> was stressed many times, with a number of specific action alternatives identified in the findings and recommendations of the discussion groups, as well as appearing in various witness statements:

- o Long-range studies which would attempt to delineate responsive information delivery and access systems;
- o Analysis of existing Extension Service and private sector delivery capabilities, including enhancements featuring utilization of advanced technology;
- o Creation of "clearinghouses" which would centrally store key material, along with requisite indexes, with subject contents of priority value to farmers and ranchers;
- o Development of a system that would allow monitoring of the varied information products and services available to the agricultural community, and a means of describ-

ERIC

ing these on-going resources to users;

- Creation of scenarios, employing dynamic computer models, that could project the impact of information technology on existing agricultural management and marketing tasks;
- Periodic reviews, through surveys and polls, of user requirements, including those of the smaller family farms and agri-businesses;
- Simply formatted comparisons of equipment and software products which would enable would-be buyers to understand the benefits and limitations of the devices, program packages, and systems being acquired; and
- Design of initial orientation and technical training sessions that would allow new system users to grasp the fundamentals of performance in a minimum period of time.

Within the lifetime of millions of Americans there has been an ever-increasing reliance on technology. The telephone and radio, once the primary conduits of information from afar, have been augmented by sophisticated technologies that include telecommunications networks, satellite linkages, television (in various configurations), and computers. And yet there is a reluctance to sever our ties with the past, for there is a lasting legacy of working parameters that still seem serviceable. Bruce Catton expressed it this way:

> We are people to whom the past is forever speaking. We listen to it because we cannot help ourselves, for the past speaks to us with many voices...We cannot cut ourselves off from it. It is as real to us as something that happened last week. It is a basic part of our heritage as Americans.

Featured in the Introduction of this report are the guidelines which led to the convening of the Subcommittee hearing and workshop, with a depiction of the vital role which agriculture has fulfilled throughout the history of the United States. The domestic and international significance of our agricultural productivity is noted, along with the spectacular advances in electronic technology. Corollary to these themes are expositions of congressional challenges which many believe can be the forerunner of initiatives undertaken by State and local governments and the private sector. An estimation of the significance, and convolutions, of this problem area is offered through an inspection of views presented by those with experience in originating, evolving, implementing, utilizing, and evaluating the series of products and services supported by information technologies. Alternative methodological approaches are outlined by which the Congress could undertake ameliorative or other focal action.

The emergence of modern information delivery mechanisms from an established tradition of reliable services for the citizenry is the opening phase of a discussion in Chapter II which traces governmental initiatives leading to the creation of agriculture support systems and a communications (telephone) network across the land. After noting the evolving pattern of access to electricity, radio, and more sophisticated services, a description of the information needs of the farming community and certain institutions which strive to fulfill them is offered. And finally, key technology forms are set forth within a context of their application to the routine and identifiable special needs of the agricultural industry.

Past congressional initiatives leading to technology-oriented information collection, processing, and dissemination are discussed in Chapter III, together with a chronology of salient events in agriculture and the expanding realm of electronic technology. Value can be derived from this reflection of unflagging change, not only in the products of human inventiveness but the subsequent framework of reference. In his Autobiography of Values, Charles Lindbergh opines that "the past is changed by time...through man's own changing viewpoint," and nowhere is this more clearly reflected than in the three chapters which follow.

Here are contained the core commentaries of the formal witness testimonies and interaction with the Subcommittee, small group discussions, and other views of an often perplexing topic. Chapter IV contains the highlights of a score of letter responses to the prehearing communication from Representative Brown, including useful mentions of computer-based projects which are lesser known and forthright recommendations of significant potential. A detailed treatment of all witness statements and the often extended exchanges with the Subcommittee comprises Chapter V. The representative viewpoints offered by those testifying were of notable value, since this group of senior observers constituted a cross-section of nonpareil interest and expertise. The best efforts of 105 ably-led workshop discussants are reported in Chapter VI, with the findings and recommendations organized in accordance with the charters of the six discussion groups:

Group 1—Private Sector Information Services
Group 2—Government Information Services: Management and Marketing
Group 3—Government Information Field Operations
Group 4—User Requirements
Group 5—System Implementation: Hardware Installation, Training, Maintenance, Software and Data File Modification
Group 6—Present and Projected Technology

A series of appendices features complementary material to many of the major points developed in the hearings and workshop narratives. Illustrative descriptions of technology-supported information services are included, along with listings of hearings and workshop participants, information on key legislation, and selected references.

The great promise, and the pitfalls, inherent in these technologies designed to bolster and better agricultural management and productivity are to be found in this study, and have been presented in accordance with Subcommittee direction. From the experience and intuitive understanding of the contributors to this endeavor have come an understanding of the role of information technology in agriculture, from its recent origins to the present status, and as it could evolve via innovations yet to emerge. With this foundation of fact and interpretive commentary, the Congress can assess its alternatives for optimizing the use of these vital resources in the foreseeable future.

I. INTRODUCTION

One hundred and fifty years ago, during his extensive travels through the fledgling United States of America, the observant Alexis deTocqueville recorded his belief that he had found "the country which, proportional to its age and means, has made the greatest efforts to procure easy communications."[1/] In the ensuing years, as cities and towns flourished and proliferated, there was concomitant expansion into the far-flung reaches of the continent. And along with this movement, the establishment of increasingly sophisticated information services for the settlers. Those who farmed, along with their products, were viewed as the essential underpinning of the nation, and the Jeffersonian concept of the yeoman society became firmly enmeshed in the popular perception of our societal infrastructure. The productivity of the American farmer, a result of imagination and industry combined with a largely congenial environment, soon became an accepted domestic asset and a significant factor on the international scene. Perhaps no more eloquent testimonial to the crucial role of agriculture has been voiced than that by Williams Jennings Bryan during his notable "Cross of Gold" speech:[2/]

> ...the great cities rest upon our broad and fertile prairies. Burn down your cities and leave our farms, and your cities will spring up again as if by magic; but destroy our farms and the grass will grow in the streets of every city in the country.

The agricultural scene in the 1980 decade offers many variations of this traditional dependency on the farmers and ranchers who fulfill the wants of a nation. The smaller farms of the legendary "sod-house frontier" have been replaced increasingly by "agri-businesses" of great holdings and financial resources. Nonetheless, the family farm

1/Reeves, Richard. American Journey. New York, Simon and Schuster, 1982. p. 127.

2/Peterson, Houston, ed. A Treasury of the World's Great Speeches. New York, Simon and Schuster, 1965. p. 641.

has survived, withstanding--in the words of former Secretary of Agriculture Orville Freeman--"the test of time and competition...[making] this country the envy of the world and American farm production the greatest production miracle in the history of mankind."3/ Countless innovations have enhanced the production process, and although the number of practicing farmers continued to decline, the agricultural output increased with each passing year. At this time, other factors including greatly inflated equipment and financing costs as well as fluctuations in the marketplace have combined to bring about a serious state of affairs. In his testimony before the Subcommittee on Department Operations, Research and Foreign Agriculture, self-professed "dirt farmer" Roy Meek declaimed that:

> ...the agriculture industry is experiencing some of the most difficult times since the Great Depression ...we have met these problems in the past by increasing our efficiencies of production and increasing our volume of production.

It is the belief of many agricultural leaders, specialists, and practitioners that the traditional list of agricultural essential inputs--land, labor, capital--must be expanded in today's world to include "information." A number of spokesmen and interested parties in both the public and private sectors have gone on record as saying that this new element must be considered the "glue" that melds all of these ingredients in a way that maximizes success. Reliance upon the American farmer has not diminished in the least, indeed, foreign difficulties (Soviet Union, India) in crop production have sharpened the focus on the critical support furnished by our agricultural community.

3/Bradley, John P. The International Dictionary of Thought. Chicago, Ferguson Press, 1969. p. 25.

But change is "in the wind" and the consensus exists that an era of reassessment has been entered upon by governmental agencies and private groups with responsibilities related to the agricultural industry.

A parallel pattern of change with far-reaching ramifications, including some for the agricultural community, has been that brought about by the cascading improvements in "information technology"—computers, telecommunications, microforms, word processors, audio and video devices. During the past half-century, the impacts of these often astonishing tools and techniques have been felt in every segment of our business and personal lives. Listen to the optimistic prognostication of David Sarnoff, President of the Radio Corporation of America, as he spoke in 1927 of one such invention, "radio-television:" 4/

> The possibilities of the new art are as boundless as the imagination. But this much is certain: in the sphere of communication man will forever seek a medium of transmission in pace with his thoughts and desires.

Another form of "electronic information processor" soon was to join the array of "wizard machines," and its potential is noted in these modest words of computer pioneer Samuel Alexander, in 1952: 5/

> They may enable science, industry, and government to tackle large-scale complex problems which heretofore could not be handled very effectively in the time allowed. They may eventually reduce the necessity for centralization and attendant overcrowding by permitting the dispersal of people and equipment without sacrificing some of the advantages of centralized control.

The outreach and information access afforded by these technologies, often used in combination, epitomize the changing nature of our society. The "Information Age" has arrived, and institutions and

---

4/Remarks of David Sarnoff, President of RCA Corp., before the Chicago Association of Commerce, June 8, 1927.

5/Remarks of Samuel N. Alexander before Eastern Joint Computer Conference, 1952.

individuals everywhere are striving to understand and cope with it. Not only must its offerings be recognized by those who dwell in our sprawling metropolitan complexes, but comprehended by the citizens in Sweet Home, Recluse, Chewsville and other tiny towns, and by the inhabitants of the 2,400,000 farms[6/] in every corner of the land. The dynamic nature of this "information revolution" can hardly be overstated for even as the cognoscenti grapple with one group of hardware or software, yet other improvements appear on the scene. The full impact of such recent innovative products or systems as direct broadcast satellite (DBS), cable services, and fibreoptics or lasers is yet to be absorbed. The introduction of such innovatory devices or methods places stresses upon existing relationships and routines; in this regard, the words of Robert Boguslaw in The New Utopians merit recall:[7/]

> Computers are not found in nature. They have to be built. And they must take their places within a framework of existing social systems. A decision to place them within a framework redefines existing system arrangements in significant ways.

The agricultural milieu does not stand apart in this matter. The needs of the farming and ranching communities for better information and ways to manage it have been identified and discussed at length. Currently, the debate centers increasingly on the best means of obtaining needed data--market, weather, pest-oriented, etc.--and the trade-offs inherent in acquiring technology-supported information services. The technologies now being tested or used operationally to disseminate information to more remote areas are only the leading edge of systems already under development. Significant, proven advantages

---

6/U.S. Department of Commerce. Bureau of the Census. Statistical Abstract of the United States: 1981. Washington, U.S. Govt. Print. Off., 1981. p. 660.

7/Boguslaw, Robert. New Utopians. Englewood Cliffs, N.J., 1965. p. 182.

have been derived from the miniaturization of components in computers and telecommunications and an unremitting trend toward less costly configurations. The result: large numbers of new users, both individuals and organizations, who are purchasing or leasing the technology-supported systems. Thus, government at **every level and** all major segments of society are undergoing changes—sometimes spectacular but more often subliminal—which stem from these new ideas and methods, an occurrence which caused the late Marshall McLuhan to comment that:[8/]

> The medium, or process, of our time—electronic technology—is reshaping and restructuring patterns of of social interdependence and every aspect of our personal life. It is forcing us to reconsider and reevaluate practically every thought, every action, and every institution formerly taken for granted.

There is general acknowledgement, on the part of those who develop as well as use these evolving information resources and services, that their integration will take time, and in many instances will cause unanticipated changes which are often even more disconcerting. In order to minimize this disruptive dimension, every effort must be made to design and conduct orientation sessions where users can learn not only the rudiments of the new systems but how they will fulfill known information needs, what is expected of them as users, and to whom they can turn for aid when problems arise.

Many misconceptions can arise regarding the efficacy and utility of external information which is made accessible to the farming community. No magic is wrought by the collection, either within government or as an entrepreneurial endeavor by a private sector

8/McLuhan, Marshall. The Medium is the Massage. New York, Bantam Books, 1967. p. 8.

"information provider," and possible subsequent interpretive handling of narrative, graphic, or statistical information. Norman Cousins cautions that:9/

> ...in a computerized age...there may be a tendency to mistake data for wisdom, just as there has always been a tendency to confuse logic with values, and intelligence with insight. Unobstructed access to facts can produce unlimited good only if it is matched by the desire and ability to find out what they mean and where they would lead.

In contemporary America, there are several focal developments which embody key facets of interaction between farmers and ranchers and those entities which are responsible for acquiring, indexing, abstracting, storing, processing, retrieving, and disseminating selected information of proven value to that user community:

- During the 1970's counties with no settlement as large as 2,500 persons and not adjacent to a metropolitan area grew by 14.6 percent, faster than the metropolitan growth rate; the rural population increased by 5.9 million persons.10/
- Although the emphasis on productivity has continued unabated, and technologies have been utilized to that end to the utmost, there appears to be a growing feeling that the role of technology-supported information services can become critical in improving the management and hence the productivity of farming units.
- For those living at "the end of the road," who often see themselves as being informationally disadvantaged, any move toward establishing a better balance in the of-

---

9/Pylyshyn, Zenon W., ed. Perspectives on the Computer Revolution. Englewood Cliffs, N.J., Prentice-Hall, 1970. p. 499.

10/Long, Larry, and Diana DeAre. Repopulating the Countryside: A 1980 Census Trend. Science, v. 217, Sept. 17, 1982. p. 1112, 1114.

fering of advanced information services is viewed with enthusiasm, although this may place new burdens on Federal services and local government.

- The "internationalization" of American agriculture, which had its genesis nearly a decade ago, has included the creation of an awareness on the part of the American farmer--through such services as AGNET--of market opportunities akin to those existing in an adjoining county or State in earlier periods.

Within the United States Congress there has been a growing concern about the shortcomings involving information services for those living in more remote areas. Hearings have been held on salient aspects of rural telecommunications' service, the changing role of rural libraries, and alternatives for providing educational opportunities for inhabitants of areas beyond suburbia. In addition, Members have exhibited interest in the potential of present and projected technologies, particularly computer and telecommunications, for offering a wide range of information products and services to rural citizenry.

Although relatively few major reports have been issued on this area of burgeoning interest, three are noteworthy:

1978 — Communications and Rural America, prepared by the Office of Technology Assessment for the Senate

Committee on Commerce, Science and Transportation.[11/]

1980 — National Symposium on Electronic Marketing of Agricultural Commodities, conference proceedings.[12/]

1982 — Report on U. S. Department of Agriculture Electronic Information Exchange and Dissemination.[13/]

Two other reports of more than tangential value deserve mention because of their treatment of certain developments in the subject technologies and their application, and the invaluable broader context which they provide:

1978 -- Into the Information Age: A Perspective for Federal Action on Information, prepared by Arthur D. Little, Inc.[14/]

1982 -- Public Sector/Private Sector Interaction in Providing Information Services, issued by the National Commission on Libraries and Information Science.[15/]

Drawing upon the analytical and factual material embodied in these milestone studies, cognizant congressional oversight groups have been able to delineate an agenda which would lead to a further rewarding exploration of this priority legislative concern.

11/U.S. Congress. Office of Technology Assessment. Communications and Rural America. Washington, U.S. Govt. Print. Off., 1978.

12/National Symposium on Electronic Marketing of Agricultural Commodities, 1980. Proceedings. College Station, Tex., Texas Agricultural Experiment Station, 1980.

13/U.S. Department of Agriculture. Office of Governmental and Public Affairs. Report on U.S. Department of Agriculture Electronic Information Exchange and Dissemination. Washington, 1982.

14/Arthur D. Little, Inc. Into the Information Age. Chicago, ALA, 1978.

15/U.S. National Commission of Libraries and Information Science. Public Sector/Private Sector Interaction in Providing Information Services. Washington, U.S. Govt. Print. Off., 1982.

14-795 O - 83 - 3

Objective of the Report

The culmination of the initiative taken by the Subcommittee on Department Operations, Research and Foreign Agriculture during the 97th Congress is the preparation of this report by the Congressional Research Service, at the request of Chairman George E. Brown, Jr. Contributory to this effort were the public and private sector responses to the Subcommittee request for commentary on the focal topic, and the wide range of material obtained during the two days of combined hearing and workshop sessions. Also utilized was the special booklet entitled "Computer-based Information Systems and Services for Rural America," [16/] which was made available to the participants in the Subcommittee hearing/workshop activities.

In determining the scope and nature of this report, cognizance was taken of the philosophical context articulated by Chairman Brown prior to the opening of the hearing and workshop sessions:

> Our farm sector is rapidly entering the computer age, with all of the promise and problems that this progress entails. The application of any complex and sophisticated technology requires a great deal of thought and planning if success is to be attained. It is my hope that the hearing and workshop we are holding will contribute to that process.
>
> We have brought together experts from Congress, the federal executive branch, state and local governments, universities, the farm sector, and the information industry, to begin a comprehensive discussion of the applications of computer-based information systems and services in agriculture. Over the course of the hearing and workshop, I hope that this group will provide some insight and guidance that will assist all of us in our future decisions on these technologies.

Affirmation of the importance of this legislative endeavor was offered by Representative William C. Wampler, the ranking minority member of the Subcommittee:

16/U.S. Library of Congress. Congressional Research Service. Computer-Based Information Systems and Services for Rural America. Pamphlet produced by R.L. Chartrand and A. Barry Carr for Hearings held by the Subcommittee on Dept. Operations, Research and Foreign Agriculture of the House Committee on Agriculture, May 1982.

> I share Mr. Brown's enthusiasm for this relatively new concept of computer-based information systems and services for agriculture in rural America... it is intriguing, to say the least, and we in Virginia feel that we are among the innovators in this.

It is noteworthy that the hearing witnesses and workshop participants were unstinting in their efforts to share experiences derived from experimental and operational technology-supported projects, besides being willing to discuss their views of the potential spread and utility of such systems. Although many of the attendees possessed the highest credentials as a result of their innovative thinking and efforts, the quality of testimony and corollary discussions was such that participants repeatedly declared that they had learned many new things and gained useful insights into common problems.

In structuring the hearings, careful attention was paid to assembling a group of speakers who could best represent the key action groups involved in providing information support to the farming community. Similar concern for quality was reflected in the selection of the group leaders and rapporteurs who would fulfill vital roles during the workshop sessions. A profile of these individuals shows:

Senior federal executive branch administrators
Academic project directors
Information industry managers
Farm association directors
Extension service senior personnel
State extension specialists
Agricultural librarians
Consultants in information science
Mass media executives

Many of the presentations by witnesses before the Subcommittee resulted in lively, extensive dialogues involving Members and other hearings' participants such as the delegation of Canadian parliamentarians. The diverse perspectives offered by those participating on a spectrum of technical and user-oriented issues, governmental responsibilities and opportunities, and quandaries facing both the private and public sector, more than met the objectives of the Submittee as expressed by Chairman Brown:

1. Provide an opportunity for Members of Congress, their staffs, and activists in the public and private sectors to exchange ideas and experiences in this vital area.
2. Identify and discuss policy and program questions, and obtain realistic recommendations for later initiatives.
3. Increase public awareness of the potential benefits and limitations of advanced information resources and services.

The expectations of the sponsoring Subcommittee were exceeded as a result of the wealth of information that was forthcoming about the information requirements of the user community, basic considerations which must be dealt with in designing and implementing technology-oriented information services, training and system maintenance matters, and future applications of such technology in support of agricultural management and production. A number of specific issues emerged, many of a long-standing nature:

- Roles of public and private sector information providers
- Concern for protecting the confidentiality of system data
- Pro's and con's of hardware and software standardization
- Conditions governing access to government information
- Ownership of "value-added" information products and services
- Local role in determining content of information offerings
- Responsibility for post-installation system support, including software and file enhancements
- Government subsidization of research and pilot projects

These and additional issues of note preoccupied the 150 participants throughout the hearing and workshop meetings, and were often evidence of a desire, in the words of Walter Lippmann, to create policies which "reflect a deference to life's ambiguities and to the necessity of practical human accommodation."17/

Chairman Brown set forth, on the first day of the Subcommittee hearing, his hope that much of value would result from the workshop sessions, "in order to make some progress in clarifying the realistic promise that these technologies hold." Each of the six groups was chaired by an individual with recognized capabilities in the field and the leadership acumen to draw from the participants a series of usable findings and recommendations. Rapporteurs of comparable achievement were recruited to reinforce the execution of the executive role. A listing of the workshop discussion group areas of purview follows:

Group 1 - Private sector information services
Group 2 - Government information services: management and marketing
Group 3 - Government information field operations
Group 4 - User requirements
Group 5 - System implementation: hardware installation, training, maintenance, software and data file modification
Group 6 - Present and projected technology

The highlights of the discussion groups' conclusions appear in Chapter VII, and a listing of all participants is contained in Appendix 2. An enumeration of key questions for consideration by the discussants is found in Appendix 15.

The substance of this report, then, is embodied in the three major resources stemming from the hearings' testimony, the findings and recommendations of the workshop sessions, and the comments prof-

17/Bradley, International Dictionary of Thoughts, p. 659.

fered by the score of individuals whose comments were solicited through the earlier letter from Representative Brown. In the latter instance, the highlights of these responses are presented along with appropriate commentary in Chapter V, and do provide both useful philosophical and technical material, as well as illustrative information on information support activities in various parts of the country. The goal remains one of bringing to the farmers and ranchers of the nation that information which will facilitate their management of crops and livestock, and the marketing of these products in an optimum fashion. Once again, "information" emerges as the essential ingredient in these systems. The role of technology in attaining this elevated status is yet to be fully proven, but the ultimate aim of all such activity is found in Gutenberg Two:[18/]

> All information in all places at all times. The impossible ideal. But the marriage of computers with existing communications links will take us far closer than we have ever been.

Significance of the Problem

Inherent in the legacy of America, which has been passed down from generation to generation, is the pride in our agricultural productivity and a firm belief that through industry and imagination any obstacles to its continued high performance can be overcome. In more recent times, the essence of this truth has been expanded to include what many call "the internationalization of American agriculture." Secretary-Designate John P. Block, in his appearance before the Senate Committee on Agriculture, Nutrition, and Forestry, emphasized the im-

18/Godfrey, David, and Douglas Parkhill, ed. Gutenberg Two. Toronto, Press Porcepic, 1979. p. 1.

portance of this dimension both as a high domestic priority and a cornerstone of foreign policy:[19/]

> During the 1970's, U. S. agriculture broke all previous records for productivity and for exports. The benefits of this tremendous achievement have given the people of this Nation the best food and the highest standard of living in the free world. We must continue to have policies and improve our policies to encourage production and expand export markets to the benefit of all Americans. Exports lead to greater economic activity and more jobs. Exports are as beneficial to the steelworker in Pittsburgh, the automaker in Detroit, as they are to the farmer.

Many of the ramifications of developing and serving foreign markets are imperfectly understood not only by the practicing farmers, but by those responsible for governmental economic policies and their counterparts in private commerce. Oftentimes, as Evelyn Waugh notes in Scoop, we find that we live in "a world in which perceptions count more than facts."[20/] But for those whose daily occupation is the raising and marketing of livestock and grain, it is the "facts," the information that tells them of impending weather, pests and their control, and routine housekeeping management—as well as potential markets, domestic and overseas—that are crucial to their survival and well-being.

President Lyndon B. Johnson declared that agriculture is "our first industry...our greatest. It is the vital center of our economy—fueling our industry and commerce, feeding our people and the hungry of the world."[21/] Changing times, he was aware, bring with them a demand for flexibility that must be anticipated and understood:[22/]

> The American farmer today stands in the proud tradition of his fathers. But he is faced, as no generation before him, with the problems of accelerating technology. It is bringing fundamental and forceful change to the farmer and the rural community.

19/U.S. Congress. Senate. Committee on Agriculture, Nutrition, and Forestry. Nomination of John R Block, Jan. 1981. Wash., U.S. Govt. Print. Off., 1981, p. 9.

20/Waugh, Evelyn. Scoop. Boston, Little, Brown, 1977. p. 91-92.

21/ U.S. President, 1963- (Johnson). Special Message to the Congress: Prosperity and Progress for the Farmer and Rural America, Feb. 27, 1968. Public Papers of the Presidents, L. B. Johnson, 1968-69, v. 1. Wash., U.S. Govt. Print. Off., p. 271.

22/ Johnson, Prosperity and Progress for the Farmer and Rural America, p. 281.

Myriad changes have taken place in the past quarter-century as farmers have moved to stay abreast of the technology which can keep them competitive and productive. Many times they are reportedly at the mercy of the marketplace, and in the past were at a disadvantage in knowing of marketing opportunities, current pricing, or trends in the futures' market. With the introduction of improved information systems which could bring up-to-the-minute information on Board of Trade quotes and analyses of activity patterns across the agricultural industry, agri-businesses and smaller farm units began to feel more in control of their own destinies. These are seen as difficult times for farmers, whose production costs have continued to mount in an unprecedented fashion while the vagaries of the marketplace often have prevented them from obtaining sufficient remuneration for their labors. President Jimmy Carter, when signing the Agricultural Credit Act of 1978, stated his belief that "predictability and stability in farm pricing and farm production are crucial," which reaffirmed his earlier avowal that year to the effect that "Decent farm income and a strong family farm system are vital to our national economic stability and strength." 23/

It may be stated without fear of contradiction that one of the key underpinnings of agriculture today is the series of information networks which serve farmers and ranchers and those with whom they regularly interact—the extension services, local governments, banks, and farmers' organizations. The proliferation of computer-based information systems available to the farmer is bound to impact not

23/U.S. President, 1977- (Carter). Agricultural Credit Act of 1978: Remarks at the Bill Signing Ceremony, Aug. 4, 1978. Public Papers of the Presidents, Jimmy Carter, 1978, v. 2. Washington, U.S. Govt. Print. Off., 1979. p. 1376.

only the business operations but many of the personal living patterns as well. Relationships with Federal, State, and country government agricultural specialists may be affected, and the traditional roles of these organizations altered. Consider these questions which must be addressed in the years to come:[24]

- o Will new information systems be used to increase the capacity of the county extension service to serve farm and nonfarm clients, or will they replace the traditional extension delivery system for certain types of information?
- o Will the adoption of new information technologies require Extension to make tough choices about the audiences it will serve?
- o Should State institutions copyright and franchise their software or do they have an obligation to share it with others?

And perhaps most basic in the minds of the potential user clientele: At what point in the system may an individual gain access to desired information, from which resource, and at what cost?

It goes without saying that a number of vital institutional issues will have to be faced, both in the Congress and the sundry implementing agencies comprising the Federal-State-local triad. Three such specific concerns were identified in the Subcommittee booklet prepared for distribution during the hearing:[25]

> First, the appropriate role for the Federal government in information technology research and development merits reevaluation in view of changing conditions.
> Second, the role of Federal and State agencies in training personnel to use the new technologies should be defined.
> Third, the development of approaches to improve cooperation between the various Federal and State agencies involved in information technology deserves consideration.

Repeatedly, there is an emphasis on raising the level of governmental performance: planning, programming, monitoring, budgeting. In The Recovery of Confidence, John Gardner stresses that:[26]

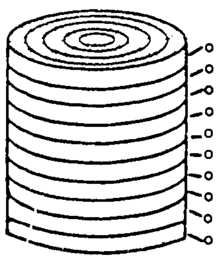
24/Chartrand and Carr, Computer-Based Information Systems, p. 6.

25/Chartrand and Carr, Computer-Based Information Systems, p. 7.

26/Gardner, John. The Recovery of Confidence. New York, Norton, 1970. p. 40-41.

> ...we must build into organizations, particularly in government, the evaluative processes that will permit us to judge performance. This means that government officials must be required to be specific about goals —that is, about outcomes that would have to be achieved to count a given activity successful; they must develop measures to determine whether those outcomes have occurred; and they must ly the measures systematically to performance—al the end that they can say of any program, "It w d" or "It didn't work."[italics added]

As implied earlier, the array of groups involved in the creation, installation, maintenance, and utilization of technology-based information services designed to support the agricultural community is large, and reflects a highly diversified set of private and governmental institutions as well as individuals and families. These include:



- Individual or family-owned farms and ranches
- Agri-business corporations
- Newspapers
- Television and radio stations
- Banks
- University and college agricultural departments
- Town and county governmental units
- Telephone and satellite utilities
- Federal, State and local extension services
- Associations and farm organizations

From their ranks came the witnesses, group leaders and rapporteurs, and workshop participants who made the Subcommittee sessions meaningful. The viewpoints taken and concerns ced by ep ive ments are illustrated through this r om s [27]

> Raymond D. Lett (USDA senior executive)—Ame griculture always has been the envy of the world for basic research and practical application of new production and marketing techniques. A major ingredient in making this system work has been the collection and sharing of information among government and academic sources, private businesses and individual citizens.

27/These quotations were taken from various source documents.

John C. Datt (AFBF administrator)—all parties ought to have equal access to the same government information. And from that point on, then, it is up to each of us to see whether we can package it...and make it meaningful and salable to the membership of our organization.

Dr. M. C. Harding, Sr. (academic extension administrator)—It is estimated that the number of farmers using computers in the next five years will range between five and fifteen percent of commercial farms...management strategies are needed to give guidance to this technological innovation.

Douglas R. LeGrande (corporate division director)—Computers have been successfully used to "model" reality, giving the user answers to "what if" questions, enabling the investigation of alternatives and facilitating decisions which would be most profitable.

Alfred T. Fritts (newspaper executive)—We are not going to offer up a content product in a brand-new business using a whole new presentation and a cost imposition on the farmer without being darned sure that we have a product that will be accessed every day.

Dr. Louis A. Bransford (technology consortium executive)—If we could justify a satellite link, and the average farmer could interface his farm computer to the state extension office, or any one of the agricultural, veterinary or forestry colleges in the United States...the possibility of decreasing the cost of operation or increasing productivity would become evident.

The sweep of the conceptual and practical content of the contributions—through formal testimony, as found in the workshop discussion summaries, or ensconced in the letter responses—is sufficient to raise the level of understanding and commitment, within the Subcommittee and on the part of involved external groups, and provide a strong foundation for further initiatives. Several significant themes are iterated which cut across a number of the overarching issues as well as the more specific arenas of action:

- An imperative need for developing a multi-faceted computer literacy curriculum (basic training, advanced seminars, refresher courses, etc.)

- A way to remain aware of the voluminous information offerings available from government and private sector information providers;
- The need for long-range studies which explore alternatives for providing remote populations with a range of information delivery mechanisms;
- An agreement by all information offerors to delineate all system costs so that would-be clients can accurately assess the burden, and benefits, involved;
- An objective scrutiny of existing delivery capabilities (e. g., Extension Service) and those changes in service which must be considered in the future, if information support is to meet the needs of the users;
- The access to public information holdings which is sought by information providers and end users; and
- The viability of the concept that the Federal government should continue to fund vital research and experimental delivery efforts related to information support for the agricultural community.

On the whole, the formal remarks and occasional dialogues reflect a positive stance regarding the desirability of utilizing computer-based information services in performing agriculture-related tasks, but there are also many realistic concerns which must be taken into account, and fully understood by those who are responsible for their creation as well as the recipients of such systems' offerings. One such observer is Howard F. Lehnert with the USDA Science and Education Administration: 28/

28/Lehnert, Howard. Letter to Rep. George Brown, Jan. 19, 1982.

> The key to the success and public acceptance of any dissemination system rests upon the quality of the information, its accuracy, its timeliness, and how well it is localized.
>
> Many farmers now own small business or personal computers...[but] most cannot make full use of this equipment because of the lack of software that is designed to meet specific farming needs. Too often they are forced to turn to programs that were developed for another business.

The attitude of the potential buyers of such advanced systems also must be taken into account, notes Robert D. Burgener of Telidon Videotex Systems, Inc: 29/

> The final hurdle for technology is not in the laboratory but rather in the consumer marketplace. Tractors didn't replace horses just because someone manufactured enough of them or hired the best salesmen to promote them. No new tool can survive unless someone perceives a value in it for a task already at hand, or an opportunity which it can open that couldn't be reached before.

Concern about the future of the USDA Extension Service was expressed on a number of occasions, with the comments of Joe Belden at the National Family Farm Coalition being indicative of that apprehension: 30/

> ...if Extension moves further into the computers systems area, care should be taken to ensure that information and assistance are available for small-scale farmers. Such farmers must be specifically sought and aided, and services must be specifically designed for them.

The fragmentation which exists in this Nation where agricultural information is involved was commented upon in various settings during the Subcommittee hearing and workshop. One possible solution was raised, and Dr. Mitchell R. Geasler of Virginia Polytechnic Institute and State University put it in these terms: 31/

> A number of farmers now own personal computers but a central general-access, nationwide computer is needed to serve as a library and clearing house. Programs for personal computers as well as information libraries...could be distributed through such a central system.

29/Burgener, R. D. Letter to Rep. George Brown, Nov. 23, 1981.

30/Belden, Joe. Letter to Rep. George Brown, Feb. 15, 1982.

31/Geasler, Mitchell R. Letter to Rep. George Brown, Jan. 28, 1982.

Permeating the commentaries submitted to the Subcommittee and offered both in optimistic or cautionary tones is the underlying message that the ways and means of transfering information are in flux, with the outcome often not yet determined. A provocative admonition to the policymakers and program managers, who must bear the responsibility for shaping the information infrastructure and offerings of the future, is set forth in the volume, Information Technology Serving Society: [32/]

> Those who strive to decide which information will or should have residual value—and if television or the printed word is the best means of ensuring that—are doing a great deal of soul-searching where investments in information systems and services are concerned.

Continuing congressional concern about the state of agriculture has taken many forms, and requests for background information have emanated from Members with constituencies across the country. In response to these requirements, the Congressional Research Service has prepared a series of "Issue Briefs" in recent years which deal with salient aspects of agricultural conditions and problems: "Agriculture: Soil Conservation and Farmland Productivity," [33/] "Crisis in the Farm Economy," [34/] "Rural Development: the Federal Role," [35/] and "Agriculture: Significant Legislation of the 97th Congress." [36/] The importance of these and related matters is comprehended, although not always in a way that allows the formulation of ameliorative action, in many quarters. The viability of American agriculture will depend in large part, in the future, on the perception of Congress, the Federal executive branch, State and local governmental agencies, and

32/Chartrand, R. L. Information Transfer in a Gifted Age. In Information Technology Serving Society. New York, Pergamon Press, 1979, p. 3-4.

33/U.S. Library of Congress. Congressional Research Service. Agriculture: Soil Conservation and Farmland Productivity. Issue Brief No. IB80031, by R. S. Dallevalle, Feb. 6, 1980 (updated May 21. 1981). Washington, 1981.

34/U.S. Library of Congress. Congressional Research Service. Crisis in the Farm Economy. Audio Brief No. AB50056, by J. Womach and others, April 1, 1982. Washington, 1982.

35/U.S. Library of Congress. Congressional Research Service. Rural Development: The Federal Role. Issue Brief No. IB77113, by B. S. Osbourn, Oct. 19, 1977 (updated Sept. 23, 1980). Washington, 1980.

36/U.S. Library of Congress. Congressional Research Service. Agriculture: Significant Legislation of the 97th Congress. Issue Brief No. IB81161 by E. W. Withnell, Aug. 20, 1982 (updated Sept. 15, 1982). Washington, 1982.

cognizant organizations in the private sector, and their willingness and ability to define objectives and instruments of execution which can render the necessary support to the farming industry.

Alternative Methods of Fostering Congressional Initiatives

As indicated in the information provided the Subcommittee on Department Operations, Research and Foreign Agriculture during its exploration of alternative paths of action in enhancing information support for the agricultural community, a range of options for public or private sector initiatives has emerged. In some instances, the expression of a problem or possible solution was phrased in very general terms; on other occasions specific processes or actions by those viewed as having area responsibilities were recommended. Totally innovative action often was not called for, but simply the modification of existing practices or the suggestion of augmenting current services through an overlay of technological support.

Within the Congress, there has been a discernible determination to understand better the value and varieties of information products and services for the national rural constituency. This has necessarily entailed the continuing orientation of legislative personnel regarding which technology existed, how it could be employed, who the potential users were, and when such services could be offered by either governmental or private sector providers.

A number of initiatives have been identified which could be acted upon by the Congress, designated Federal executive branch agencies, State and local governments, or selected private sector groups.

Such delineated action alternatives must be considered, of course, within the context of established congressional oversight functions and protocols, and the traditional ways in which Members interact with the legislative process. Several methods of undertaking legislative initiatives, which constitute specific courses of action, include:

1. Introduction of new legislation -

   - Identify roles and responsibilities for selected public and private sector organizations having missions and resources relevant to technology-supported information services for the agricultural community.
   - Establish a special study commission or task force to explore identifiable user information needs and potential response systems and services.
   - Authorize, where necessary, the utilization of contractor personnel and services to augment in-house capabilities in this area.
   - Provide for the establishment and operation of a support information capability, such as a clearinghouse or network, that could collect, index, store, process, and make available (both electronically and in more traditional forms) requisite data for known user communities.
   - Mandate the utilization, in specific activity areas, of appropriate information technologies and man-machine techniques.

2. Review of existing legislation - may occur as a result of individual Member action, or during the deliberations of the budget, authorization, or appropriations committees in regard to:

   - Adequacy of Public Law goals and provisions, from the vantage point of proven program performance.
   - Perceived effectiveness of present agency or department program implementation, especially as concerns cost-performance measurement (where appropriate) and hindsight assessment of initial project objectives.
   - Possible redirection of departmental implementation and interpretation of directives, conducted through high level executive branch (OMB) action.

3. Analysis of sunset legislation - past valuable initiatives, often forgotten with the passage of time, merit review lest useful analyses of the problem are lost or existing information resources and services already in place be seriously diluted or unthinkingly removed.

4. "Jaw-boning" (persuasion) of responsible Federal executive branch departments and agencies - the varying roles within the Federal establishment (OMB, ED, USDA, NSF) often are diminished or become minimal over time; legislative interest often reinforces the resolve to evaluate anew appropriate organizational frameworks, budgeting goals, program objectives, use of technology, and the implications of applying modern technology to the needs of user groups.

5. Utilization of legislative research and analysis capabilities - by calling upon the extensive resources of the Congressional Research Service, Office of Technology Assessment, General Accounting Office, and Congressional Budget Office (as appropriate), Congress can commission studies of varying scope and depth that then may be applied to selected congressional review or foresight activities.

Through the exercise of such undertakings, which in their variety epitomize the form of government from which they stem, the impregnability of American agriculture can be assured. Drawing upon the strengths embodied in our traditions, yet selectively choosing the best of innovations which have been created through human ingenuity, our progress will continue and a sense of renewal achieved. The essence of that phenomenon is captured in these words: 37/

> Renewal is not just innovation and change. It is also the process of bringing the results of change into line with our purposes.

37/Gardner, John. Self-Renewal: The Individual and the Innovative Society. New York, Harper & Row, 1964. p. 7.

14-795 0 - 83 - 4

II. INFORMATION TECHNOLOGY AND ITS APPLICATION IN AGRICULTURE

> ... there is hereby established at the seat of Government of the United States a Department of Agriculture, the general designs and duties of which shall be to acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word...
>
> 12 Stat. 387 May 15, 1862.

When the European settlers established their first colonies on the shores of America in the early seventeenth century, they brought with them the tools, seeds, and agricultural technology of the old world. In their first contacts with the native American Indian, they were exposed to the tools, seeds and agricultural technology of the new world. The older colonies in New England and Virginia became the first "experiment stations" where the old and the new were tried and proved, and the practical information thus obtained was sought by and shared with settlers at the newer colonies.

In the earliest days information was exchanged among farmers, and almost all of the settlers lived on small farms. That is to say, people traveled from place to place obtaining needed supplies and information on a one-to-one basis. Hand-carried letters were another means of transmitting information. Newspapers eventually became the first mass media, and given the nature of the times, agricultural info. ation was a prominent feature of these publications. In the late eighteenth century, books--for example, The Old Farmers Almanac, published in Sterling, Massachusetts in 1792--became important sources of agricultural information. The American Farmer magazine, which began publication in Baltimore in 1819 at a cost of $4.00 per annum, stated its purpose: "to collect information from every source, ... to enable the reader to study the various systems, ...and to put him in possession of that knowledge and skill."

Besides articles on the main subject of the paper, it promised original essays "for amusement and instruction, substantial detail of passing occurrences--and ... a faithful account of the actual prices" of principal farm commodities for sale in the Baltimore market.

It seems worth pointing out that the explosion of publications in early America was certainly facilitated by the use of a common language--English. Although many tongues were spoken by early Americans, and early publications reflected such diverse readerships, English rapidly became the universal language. Computer-based information systems have not had the advantage of a universal programming language.

Americans early expressed an interest in science. The American Philosophical Society, the first significant scientific society in America, was founded in 1743. The first society devoted entirely to agriculture was the Philadelphia Society for Promoting Agriculture formed in 1785 by a group of citizens, only a few of whom were actually farmers. Many local agricultural societies were thereafter organized throughout the United States.

The beginning of involvement in scientific agri- lture by the U.S. Government is traced to activities of the U.S. Patent Office in 1839 when the Congress appropriated $1,000 for collecting agricultural statistics, conducting agricultural investigations, and distributing seeds. The agricultural collections of the Patent Office library are said to be the beginnings of the National Agricultural Library, now maintained by the U.S. Department of Agriculture. By 1859 there was general dissatisfaction on the part of the Congress and the public with the activities of the agricultural department of the Patent Office. President Lincoln's first annual message to the Congress suggested that "annual reports exhibiting the condition of our agriculture, commerce and manufactures would present a fund of information of great practical value to the country". Congress responded the following year with an act establishing the U.S. Department of Agriculture. The Act of 1862 instructs the USDA to "acquire and diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word".

At the same time Congress was establishing the U.S. Department of Agriculture, it began a series of Acts which collectively created the Land-Grant University system. The Morrill Act of 1862 provided land or funding to each State to endow, support, and maintain at least one college to teach, among other subjects, agriculture. This was followed in 1887 by the Hatch Act which established State agricultural experiment stations for the purpose of "acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture". Additional funding was provided States for the establishment of a separate college "for the education of colored students in agriculture and the mechanical arts" by the Second Morrill Act of 1890. And finally, the Smith-Lever Act of 1914 created a Federal-State-local government partnership to carry out a program of extension work designed not only to diffuse useful and practical information relating to agriculture and home economics, but to also "encourage the application of the same".

Although mass media were being provided an ever increasing stream of information from Federal agencies, State universities, and other sources, the problem of serving a geographically isolated farm population with timely information still remained. Initially farm families could only receive newspapers and magazines when they visited the nearest large town or city.

The first step toward bringing the world to the farm came when Postmaster William L. Wilson ordered that mail would be delivered directly to farm homes. Rural free delivery (RFD) began in 1896 in West Virginia and was enlarged to include all rural residents as successive Congresses provided funds. Now newspapers, magazines and books could be sent directly to rural residents and at very low cost.

Although Alexander Graham Bell invented the telephone in 1876, it was many years before its benefits would be fully available to rural residents. Again it was geographic isolation, and the dispersed nature of farm residents, which caused the private sector to consider telephone service to rural areas an unprofitable business investment. In the early days farmers banded together to form small, mutual (cooperative) telephone companies to serve their areas. There were more than 32 thousand rural telephone systems in the United States in 1912 supplying service through magneto-operated sets and wire strung tree-to-tree. With one circuit often serving 20 or more subscribers, the telephone often became a local news service as well as a communication device.

The heavy capital costs associated with a modern telephone network were beyond the means of most rural telephone systems. The poor service caused by equipment obsolescence was a major problem. Fewer farmers had telephones in 1940 than in 1920. In 1949, Congress authorized an agency of the USDA, the Rural Electrification Administration (REA), to make loans "to assure the availability of adequate telephone service to the widest practical number of rural users". At that time only 38 percent of all farms had telephone service.

Although the first successful radio station, KDKA Pittsburg, went on the air in 1920, the full benefits of radio, and later television, could not be available to farmers until their homes were electrified. In 1920 almost no farms were served by electric utility companies. According to the 1930 census nine percent of the farms were served by utility companies and another four percent generated their own electricity.

Because of the low density of farm population, farmers were charged higher

ERIC

rates for electrical service, and the extension of service was slow. In 1935 President Franklin Roosevelt established by executive order the Rural Electrification Administration (REA) for the purpose of making loans to local organizations to finance the distribution, generation, and transmission of electric power to unserved rural persons. Although nearly half of all farms and ranches still lacked electrical service by the end of the Second World War, today 99 percent of all farms receive electrical service.

Although the first, all-purpose, all-electronic computer was developed in 1946, commercial computers began showing up on Land-Grant University campuses about 1960. Agricultural research and Extension workers were among the first to adopt the use of this new technology. By the early 1960's, a number of State universities had in operation computer-based recordkeeping and farm management programs for farmers and linear programming models were being used on a regular basis. This early exposure of farmers to computer information management prepared the stage for the ready adoption of terminals and personal computers on the farm in the 1980's.

CURRENT INFORMATION TECHNOLOGY IN AGRICULTURE

In focusing on the application of current information technology to a range of farm-related activities, it is helpful to delineate the types of information which are normally used in the daily personal lives and business operations of those who farm and ranch:

1. News and community service information--what's happening
2. Weather forecasts and related emergency or disaster information
3. Crop and livestock production information, including pest management, irrigation water management, and feeding recommendations
4. Marketing information, including current and future prices
5. Selling of farm products through teleauction or computer auction

6. Purchasing farm and home supplies, including teleshopping
7. Banking services including lending and cash management
8. Business management including recordkeeping, budgeting, and planning
9. Information concerning farm and public policy including regulations
10. Personal education and entertainment

Farm families have available to them an unprecedented variety of sources for obtaining information and services such as those just listed. A survey conducted by the National Opinion Research Center at the University of Chicago showed there was considerable variation in the choice of information sources made by individual farm operators. Half of the respondents reported the use of four or more separate information sources. Less than five percent of those surveyed claimed not to use any source of outside information.

One major category of information provider is the public or tax-supported sector, consisting of Federal, State, and local agencies. The USDA is still a major source of technical information about the production and marketing of farm commodities as well as home economics. Weather data are collected, interpreted, and distributed through the facilities of the National Weather Service of the U.S. Department of Commerce. State agencies and institutions, including the research and extension components of the Land-Grant Universities and the Crop Reporting Services, are also an important source of production, management, and marketing information. At the local level, libraries, county Extension Offices, and the local school system, including community colleges, are major sources of information. Local institutions tend to be places where information from other sources is stored and retrieved for local users, or where information is conveyed through formal educational processes such as group lectures.

A second major category of information provider is the private sector. Here, businesses or not-for-profit organizations provide information for a fee which may be paid by the user, by an advertiser, or shared by both. In some cases private sector information sources are called mass media because the individual has no direct control over the content of the information presented. Newspapers, magazines, radio, and television are obvious examples of mass media. Mass media can make large quantities of information available to large numbers of people at a low cost per person. However, it is often not a simple task for the user to sift through this mass to obtain the particular information desired.

When farmers were asked to express dissatisfaction with their current sources of information in the National Opinion Research Center survey, the most frequent complaint regarded a lack of confidence in its accuracy and reliability. Information received from government sources was sometimes felt to be politically slanted. Others complained that available information did not apply to their particular type of farm or geographic area, or was too general or vague, old or outdated, or either unavailable or too costly or difficult to obtain. Yet in spite of these complaints, most farmers expressed the belief that their production and marketing problems could be alleviated if they had access to the specific type of information needed.

With the advent of computer technology, and associated data transmission technologies, it has recently become feasible to offer users direct access to information bases from remote locations such as their home or office. Some of these information bases may contain a narrow range of data related to a specific topic, as for example the CRIS system which lists agricultural research currently in progress. Other systems may offer large collections of data bases networked for access through a single service, as for example The Source system or AGNET. But in either case, users, equipped with a terminal or personal computer to access the system's main computer and a printer or a tube to display the results, can quickly search huge collections of data, retrieve what is useful, and carry out whatever manipulations of the data are necessary to answer their questions or solve their problems.

Farmers who have purchased computers agree that the biggest problem is finding useful programs. For while minicomputers are within the price range of most farmers, without proper programming the units are of little value. Systems should provide more than just basic information. Successful systems also provide the means for analysis of information in ways which assist farmers in their management decisions.

It takes not only hardware and software, but also human and financial resources to build and market a viable computer-based information system which works. Because there are significant costs associated with the development and maintenance of computer-based information systems, users are usually charged a fee before access to the system is granted and a second fee based upon the extent of their usage. These costs have often discouraged commercial firms, leaving the burden of development to State universities and government agencies. It can be expected, however, as the technology is perfected, that the private sector will play an increasingly important role in computer-based information systems.

WHAT DOES THE FUTURE HOLD?

The computer-based information revolution in agriculture is based upon three major forms of technology:

1. Interactive computer systems which involve medium to large computers with powerful computational and information access capability. Users are usually connected to the main computer via terminals and telephones.

2. Videotex systems involving small to medium computers designed to provide a wide range of information. Users require a video device provided with a terminal and telephone system.

3. Microcomputer systems on site in offices or homes can meet the data processing needs of most users in addition to interfacing with large time-sharing systems and many videotex systems. The availability of quality software is important.

New information technology is changing the form in which farm families receive information. Increasingly, information is being brought to the user, via the terminal or the television, rather than bringing the user to the information. Formal courses can take place in the home instead of the classroom. Lectures can be replaced with programmed learning sequences on terminals. Even the tried-and-true Extension demonstration can be videotaped and made available to farm families in their home and at their convenience. More and more, Extension bulletins and research reports, as well as magazines and even newpapers, will be available as videotex on the home television rather than delivered in hardcopy. Even person-to-person communications now limited to personal visits, telephone or letter, will also take place through "electronic mailboxes" provided by many computer-based systems where speed and convenience are important.

The penetration of computer-based information technologies into the farm scene raises some vexing social questions. Proponents of computer technology, such as William Norris of Control Data Corporation, have praised its ability to equalize opportunity by delivering information and services to rural areas or to limited resource farmers. Taking advantage of this technology, however, depends not only upon the availability of hardware, but also on the ability and willingness of farm and rural people to use it. The basic policy issue is: At what point in the system may an individual gain access to desired information, from which source, and at what cost? Promoting equality in this dimension is a major challenge for both the public and private sectors.

The emergence of new information technologies may also have important consequences for traditional agricultural information institutions. Will the new information systems be used to increase the capacity of the county Extension service to serve farm and nonfarm clients, or will they replace the traditional Extension delivery system for certain types of information? Should State institutions copyright and franchise their software, or do they have an obligation to share it with others? Will the important role of farm magazines and other publications be diminished?

Much has been written about the present "Age of Information" and the emphasis has been on the array of electronic devices which can store, process, retrieve and distribute information at incredible speeds and in a variety of forms. One can hardly pick up a farm magazine today which does not contain an article about computers for the farm. Dr. Robert Krammer of the Kellogg Foundation predicts that three-quarters of the commercial farms and 90 percent of the county Extension offices will be equipped with computers or intelligent terminals by 1990. While this prediction may seem far-fetched to some people, the information technology revolution is impacting the farm sector right now. The electronic technology exists now. Literally hundreds of people at universities, on farms, and elsewhere are at work developing software and data collections to utilize this technology. The current use of computer-based information systems by farmers might be compared with the state of the mail in 1896, telephones in 1912, and electrical service in 1930. However, this time the institutions and infrastructure are in place, and one can expect an unprecedented adoption rate.

III. CHRONOLOGY OF SELECTED EVENTS

Although information technology has been evolving since the dawn of civilization, many persons believe that recent developments indicate an "information revolution" is underway. A brief review of significant events is helpful in developing a perspective on where information technology is today and how we got here. The following is a selected sampling of significant events in the history of the United States, including recent Federal initiatives, that have influenced the utilization of new information systems in American agriculture.

1743 The American Philosophical Society, the earliest society in the United States to promote scientific agriculture, is organized.

1785 The Philadelphia Society for the Promotion of Agriculture is founded.

1790 The New England Farmer by Samuel Dean, which became a standard textbook on American agriculture, is published.

1792 The Old Farmers Almanac is founded and published by Robert Thomas at Sterling, Massachusetts. It is one of the oldest running periodicals in the United States.

1819 The American Farmer magazine begins publication in Baltimore.

1831 Many schools and colleges begin to offer courses in agriculture and sciences helpful to agriculture.

1837 Samuel Morse develops the first practical telegraph machine and filed for a patent.

1840 For the first time the U.S. Census includes questions on agriculture.

1858 First successful trans-Atlantic telegraph cable completed.

1860 First pony express mail route between St. Louis and Sacramento.

1875 Frank Baldwin is granted first U.S. patent for a practical calculating machine that performs the four arithmetic functions.

1876	Alexander Graham Bell invents the telephone.
1881	First long-distance telephone line placed into service between New York and Chicago.
1895	Guglielmo Marconi invents the wireless telegraph (radio).
1896	Postmaster William L. Wilson orders rural free delivery (RFD) of mail.
1920	KDKA (Pittsburgh) became first successful radio station
1925	Charles Jenkin invents the television.
1935	President Franklin Roosevelt establishes Rural Electrification Administration by executive order.
1946	Eckert and Mauchly invent and develop first all purpose, all electronic digital computer, the Electronic Numerical Integrator and Calculator.
1955	Transistors perfected which replace vacuum tubes and improve speed and efficiency in moving electrons.
1958	President Eisenhower broadcasts first voice transmission via satellite.
1959	Computer tabulated farm record/management systems begun bv Michigan State University and several other Land-Grant Universities.
1960	Tiros satellites send back pictures of hurricanes and cloud movements.
1969	TELPLAN information system implemented by Michigan Extension Service.
1973	Low cost, limited capacity "micro-computers" are introduced.
1974	Chase Econometrics markets simulation model of U.S. agricultural economy.
1975	TELCOT system for computerized marketing of cotton begins with 15 buying terminals in Lubbock, Dallas, and Memphis.
1975	AGNET information system established at University of Nebraska.
1976	National Agricultural Library combines all bibliographic data bases into on-line AGRICOLA system.
1977	Regional Energy Environment Information Center established at Denver Public Library.
1979	Green Thumb, videotext information delivery system for farmers, begins in Kentucky as test project under sponsorship of Kentucky Extension Service and U.S. Department of Agriculture.

1980 Computerized system for sale of livestock begun by Electronic Marketing Association with 23 terminals throughout the Eastern seaboard.

1981 Iowa Beef Processors establishes a satellite voice communication system.

1982 U.S. Department of Agriculture begins electronic dissemination of news releases and reports.

1982 Federal Communications Commission adopts interim rules for the licensing and operation of direct broadcast satellite.

Congressional Initiatives

1839 Congress appropriates $1,000 to the Patent Office for collecting agricultural statistics, conducting agricultural investigations, and distributing seeds. Library is begun which later becomes the National Agricultural Library.

1862 President Abraham Lincoln signs legislation which created the U.S. Department of Agriculture.

1862 President Lincoln approves the Morrill Land-Grant College Act.

1887 Hatch Act establishes State Agricultural Experiment Stations.

1914 The Smith-Lever Act formalizes cooperative extension work.

1949 Congress authorizes Rural Electrificatinn Administration to make loans to rural telephone companies.

1968 Vocational Education Act (P.L. 90-576) provides basis for subsequent communications demonstration experiments.

1972 Rural Development Act (P.L. 92-419) establishes pilot program for rural development and small farm research and education to be administered through the Land-Grant Institutions.

1977 Federal Program Information Act (P.L. 95-220) transfers Federal Assistance Program Retrieval System (FAPRS) from USDA to OMB.

1977 Subcommittee on Communications of Senate Committee on Commerce, Science and Transportation holds hearings to examine potential applications of telecommunications technology.

1978 Public Telecommunications Financing Act (P.L. 95-567) establishes Public Telecommunications Facilities Program.

1980 Paperwork Reduction Act (P.L. 96-511) strengthens agency information management procedures.

1982 House Subcommittee on Department Operations, Research, and Foreign Agriculture holds hearings on computer-based information systems for agriculture.

IV. ILLUSTRATIVE INFORMATION SYSTEMS FOR AGRICULTURE

As with many sectors of the U.S. economy, farm income is often dependent upon the availability of accurate, up-to-date information necessary for effective decision-making. There exists in the United States today a wealth of information on agriculture and related subjects, along with an expanding foundation of computer-based systems and telecommunications networks to process and distribute these data. Yet in many instances, these information delivery systems are not easily accessible to all members of the agricultural community, particularly limited resource farmers or those outside the geographic range of existing systems. In recent years, Extension agents, farm associations, and USDA officials have expressed growing concern over how to correct this imbalance through the timely delivery of low-cost information to all of the Nation's farmers and ranchers.

The introduction of computer-based information networks and other technology-oriented systems has been accompanied by a cautious attitude on the part of the providers and a wary attitude on behalf of farm users. Nevertheless, the momentum for providing additional information services to the agricultural sector is steadily increasing as farmers are realizing the financial advantages to be gained by integrating these systems into their operations. Both the public and private sectors are actively involved in coordinating advances in computers and communications technology with the vast amount of agricultural information. Corporations, Land-Grant universities, agricultural cooperatives and associations, and the U.S. Department of Agriculture have developed specialized agricultural data bases, time-sharing networks, electronic auctioning systems, and farm management software on either an experimental or operational basis. Sections A and B describe such endeavors and discuss the effectiveness of these programs in meeting the information needs of the agricultural community. A matrix of systems appears in Section C listing the following characteristics: sponsoring organizations; location of use; information and services provided; and key contacts and phone numbers. Figure 1.' includes a map depicting the centers of of operations of these programs.

A. OPERATIONAL SYSTEMS

In many cases, the operational information systems discussed below were designed to enhance the management operations of particular segments of the farm population. For instance, the video-auction used by the Alabama cattlemen's associations and the electronic trading system of the Plains Cotton Cooperative Association evolved from the members' need for more efficient marketing methods. Some systems, such as AGRICOLA, offer access to bibliographic citations of pertinent literature, while others, like the farm management software project of Oklahoma State University, are problem-oriented and allow farmers to insert individual farm data to obtain solutions relevant to their specific situation. Of these operational systems, nine were developed within the Land-Grant University system, seven by agricultural associations, five by the U.S. Department of Agriculture, three by private companies, and one each by the Library of Congress and a State department of agriculture.

AACSys (American Agricultural Communications System)

Over two years ago, the American Farm Bureau Federation (AFBF) initiated development of a computer-based retrieval system designed to improve production and marketing of its members' commodities. Known as AACSys (American Agricultural Communications System), a pilot project began in June 1981 involving eight State Farm Bureaus and over 200 farmers in those states.

14-795 O - 83 - 5

The following examination of the Michigan Farm Bureau's participation in this test program characterizes the operations of a typical AACSys service.

The Michigan Farm Bureau's member only service, known as AgriCom, began with a pilot project involving 25 participants. During the test program, farmers used personal computers to retrieve information on on markets, weather, futures prices, pest management, and legislative developments from the State Farm Bureau's host computer; file data in the host computer were updated every 10 minutes by satellite transmission from the AFBF central office in Park Ridge, Illinois. In addition to national level information in these categories, the Michigan Farm Bureau could enter local information on Michigan markets and weather forecasts before transmission by telephone lines to the farmers' computers. AgriCom also featured daily marketing analyses and advice from the Illinois Farm Bureau's AgriVisor service -- five full-time market analysts offered specific recommendations for hedging, forward contracting, or cash marketing commodities.

Upon completion of a recent analysis of the AgriCom pilot project in June 1982, the Michigan Farm Bureau decided to continue operating the system on a commercial basis. A one-year subscription to the service costs approximately $1200 per year, and all AgriCom subscribers have full access to the system 24 hours a day, seven days a week, via toll-free telephone lines (a change from the pilot program due to complaints from farmers about costly phone bills). For subscribers who do not have a personal computer, the Michigan Farm Bureau is recommending the 32K Radio Shack Color Computer system, at a purchase price of $500; however, any microcomputer that has a terminal software package utilizing standard TTY communications and a telephone modem will be compatible with the AgriCom system.

According to evaluations by the other participating State Farm Bureaus, the AACSys pilot project has generally been considered a success, resulting in the decision to expand the program in other states.

AGNET (Agricultural Network)

This "Agricultural Network" is a time-sharing information delivery system designed to furnish management analysis of complex agricultural problems on the basis of field experience and knowledge of current research findings. Developed in 1975 by Dr. James Kendrick and Dr. Thomas C. Thompson of the University of Nebraska, AGNET currently contains more than 200 programs which are accessed by subscribers in more than 40 states. The problem-solving capability of the various programs offers assistance in such areas as livestock and crop production, grain handling, marketing and finance, and home economics. For example, a specific program can manipulate an individual farm's records to analyze the cost and return for feeder cattle. Another important feature is the electronic mail or message relay system; the MAILBOX program allows the sender to route communications to a single user or a predefined list of users. AGNET also provides access to USDA crop and livestock reports as well as trade leads issued by the Foreign Agricultural Service.

Besides the cost of a portable computer terminal, most users spend about $10 per hour for computer use. This cost is based on a charge for being connected to the computer plus a charge for CPU time. Any regular telephone line can be used to access AGNET, although long distance telephone charges may cost two to three times the amount spent for computer time.

AGRICOLA (Agricultural OnLine Access)

One of the primary roles of the National Agricultural Library is to disseminate information about agriculture to scientists, researchers, administrators, farmers and the general public. To accomplish this mission, AGRICOLA (AGRICultural OnLine Access) was initiated in 1970 as the cataloging and indexing system of the National Agricultural Library -- today, AGRICOLA contains over one and a half million citations from journal and monographic literature, government documents, research reports, USDA and FAO publications, conference proceedings and translations. Prior to 1976, only NAL cataloging and indexing records were included in the AGRICOLA data base. Currently, several thousand records from the Food and Nutrition database, the Agricultural Economic Information Center database, and 4-H and State Extension publications are included annually, along with material from the Brucellosis and the Environmental Impact Statement files. The AGRICOLA system provides worldwide coverage of agriculture and related subjects such as agricultural economics, energy in agriculture, rural sociology, and water management.

Online access to the system is offered by three commercial vendors including Lockheed Information Systems, System Development Corporation, and Bibliographical Retrieval Services. Users can tap into the system through a remote terminal -- communications is established by directly dialing a telephone for search service or for an intermediary communications network, such as Tymshare.

ERIC

ANSER (Agricultural Network Serving Extension and Research)

The University of Kentucky's ANSER (Agricultural Network Serving Extension and Research) is a computerized information network which offers problem-solving programs for farm management applications. Currently, some 25 Extension offices access two minicomputers, located at the University of Kentucky and the Western Kentucky Research and Education Center in Princeton, through remote terminals connected by WATS lines. The eventual goal is to establish a network uniting all 120 counties in the State. To date, 20 interactive computer programs covering such topics as home economics, agricultural engineering, and agricultural economics have been developed; additional work has begun on programs for crop and livestock production. Another central feature of ANSER is the DISK (Development Information System for Kentucky) computerized retrieval system for socioeconomic data. Information on population, incomes, employment, and other social indicators for each county in Kentucky is available for use by local government administrators -- in addition to the data retrieval system, an analysis component is also being designed. (However, progress on DISK has been stalled for more than a year due to elimination of funding under Title V of the Rural Development Act). More recently, the staff of ANSER has directed its efforts toward developing several programs for direct use on microcomputers in Extension offices.

CHASE ECONOMETRICS

During the 1970's, the Chase Econometrics Food and Agricultural Group pioneered the application of large-scale computer models to business-oriented planning and analysis. The product of these efforts, the Domestic Agricultural Service, currently offers a wide spectrum of useful information and analytical services to over 50 agribusiness clients who require ongoing monitoring of the agricultural economy. This timesharing system provides forecast information and historical data along with other user-oriented software for further analysis, reports, tables, and graphics. Subscribers can also monitor agribusiness activities through published reports, personalized telephone consultation and client seminars. In addition to these information services, the Domestic Agriculture Service offers access to the Chase Econometrics "Agricultural Model" which is a computer-based econometric model simulating the operation of the U.S. agricultural economy. (See Figure 1). By enabling clients to perform a range of agricultural business analyses, this model can be a useful tool for strategic planning and forecasting purposes. Chase Econometrics also offers local support to clients through 22 offices in major cities in the U.S., Canada, and Europe; each office is staffed with planning consultants who provide technical assistance in connection with the computer system.

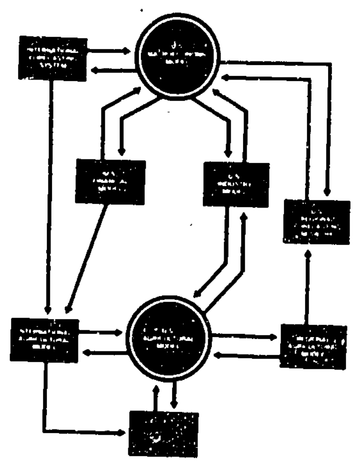


FIGURE 1. -- Chase Econometrics "Agricultural Model". 38/

38/Chase Econometrics. The National Agriculture Service (brochure). Bala Cynwyd, Pennsylvania, Chase Econometrics. p. 2.

CMN (Computerized Management Network)

Developed by Virginia Polytechnic Institute and State Unversity as a national information system for use by State Extension services, the "Computerized Management Network" assists Extension workers in solving problems, retrieving information, and evaluating programs. To date, many CMN programs have provided the foundation for several highly successful Extension programs. Two of the most popular are: the Simplified Dairy Cattle Feeding Program which has had a substantial impact on the economics of feeding dairy herds; and the OUTLK program which provides user access to USDA's Computerized Outlook Information Network (COIN), a system containing the Department's crop and livestock reports. The CMN system is designed to be used by non-computer trained individuals and is currently accessed by more than 500 users in 44 states and Canada.

Honeywell's time-sharing system, DATANETWORK, supplies computer and communications support for CMN users; subscribers access the system with computer terminals via telephone lines. The costs of running CMN programs vary from $0.50 for very simple problem-solving to $15 for complex linear programming models. The charge for terminal connect time in the United States is $18 per hour. Generally, light usage of the CMN system costs $15 per month, while moderate and heavy usage averages $50 per month and $300 per month, respectively.

COMNET (Communications Network)

COMNET (Communications Network) of Michigan State University serves as a connecting link to various computer systems that in the past have been unaccessible through a single source. By providing access to a number of computer databases, COMNET functions both as an information dissemination system and a central system for gathering research data from remote sites in the areas of agriculture, natural resources, and family living needs. The service offers an electronic mail capability, as well as text processing for editing and layout of information. COMNET also can transmit news releases, reports, and bulletins to newspapers in a manner similar to wire services. MSU's computerized integrated pest management information retrieval system is a component of COMNET; additionally, future plans call for modifications to enable users to access the University's TELPLAN system. (See TELPLAN).

Funded by the College of Agriculture and Natural Resources, the Agricultural Experiment Station, and the Cooperative Extension Service, COMNET began operation in January 1981. Thus far, access to the system has been limited to Extension offices, but plans have been formulated to start accepting private accounts during the fall of 1982.

CRIS (Current Research Information System)

A growing need for complete and current information on agricultural research led to the development of CRIS (Current Research Information System) which provides USDA/State Documentation for ongoing, publicly-supported forestry and agricultural research in the United States. Specifically, CRIS describes the efforts of USDA research agencies, 58 State Agricultural Experiment Stations, and forestry and veterinary schools.

There are currently over 27,000 entries in the CRIS retrieval system. The database is updated on a monthly basis, and approximately 3,000 new project descriptions are added each year -- completed projects are deleted and their reports entered into the AGRICOLA database. In addition to defining the subject area of the research, each entry contains an abstract which lists the project title, investigator's name, research location, objectives, approach, latest progress, and citations to the most recent publications resulting from the research. CRIS in-house services are provided without charge to authorized users. Private sector access to the retrieval system is available through the DIALOG database of Lockheed Information Retrieval Services, Inc. The charge for connect time to DIALOG is $35 per hour plus $.10 for each full project description printed offline. Communications options for the remote terminal include direct dial, TELENET, TYMNET, WATS, FTS, AND TELEX. In order to speed response time, CRIS is now accepting information retrieval requests in the DIALCOM Cooperative Systems Mail Network; this option saves users an estimated three to five days required for delivery by regular surface mail.

DIXIE-STYLE SELLING

Cattlemen's associatons in Alabama have relied on a video-auction method of marketing their livestock for the past 10 years. Known as "Dixie-style" selling, seven cattle-selling associations across the state have 160 members who sold 17,700 head of yearlings for $8 million this past spring via the video-auction system. Each spring, association members escort prospective buyers to their farms to view sale cattle which are sorted into uniform lots according to sex, weight, and grade. When the sale is held a few days later, buyers and sellers congregate at a predetermined meeting place and begin the process of bidding; during this time, slides of each group of cattle are shown to refresh the buyer's memory. Under Dixie-style selling, the costs for auctioneer fees, advertising, telephone hookup, and slide-show equipment are divided evenly among the ranchers participating in the auctions. In the event of a "no-sale", the producer pays the highest bidder $1 a head to defray part of the buyer's expenses of attending the sale.[39/]

Dixie-style selling has resulted in higher prices for producers and better quality feeder cattle for buyers. Since the program's inception, savings have been estimated at $59 per head or approximately $18 million. Producers have realized higher prices for their cattle not only through volume sales but also because buyers are willing to pay a premium for farm-fresh animals that go through a limited amount of stress. Prior to video auction, the cattle lost up to ten percent of their body weight going through ...al marketing channels before reaching their destination. A further indication of the program's success is the formation of six additional selling associations during the past seven years to coordinate local producers' efforts in marketing cattle.

ECI (Egg Clearinghouse, Inc.)

When Egg Clearinghouse, Inc. (ECI) was formed in 1971, buyers and sellers called the organization's office to make bids and offers for eggs. Today, ECI offers an electronic information and trading system through which buyers and sellers obtain information and prices on bids and make transactions. Access to P.E.T.S. (Public Egg Trading Systems), allows ECI members to participate in either of two trading sessions held daily. During the first part of the morning session, blind bids and offers are made by buyers and sellers. If a match occurs, the system notifies the

---

39/ Copeland, Ken. Slide-Show Selling Gets Fresh Stockers to Midwest. Farm Journal/Beef Extra, v. 105, April 1981. p. 24.

traders that a sale has been made; any unsatisfied bids or offers of this period are moved into the next phase of the morning session. At this time, buyers and sellers may adjust their bids and offers to make sales. In the third period of the morning session, all unsatisfied bids or offers left from the previous period are open to trading by all members, regardless of whether they participated in the beginning of the opening session. 40/ The entire process is repeated during a second trading session held in the afternoon; traders from the morning session have the option of carrying earlier bids and offers into this second session.

This system of daily closed, then opened bidding provides hard data for what buyers are willing to pay for eggs and allows small packers and producers to be part of the pricing process. In addition to entering bids and offers, the nationwide network enables ECI members to obtain current data on public trading and to selectively retrieve marketing reports. During the trading, buyers and sellers access ECI's main computer through remote terminals in offices or by placing a direct telephone call to an ECI coordinator for detailed trading data. Experience has shown that members generally use their terminals to acquire informaton prior to a transaction; however, when the final decisions are reached, buyers and sellers telephone ECI headquarters to place actual bids and offers. ECI currently has 160 members who participate in the P.E.T.S. system. The program has demonstrated the advantages of other electronic trading systems such as improved information among traders, rapid execution of

---

40/ U.S. Department of Agriculture. Agricultural Marketing Service. The Feasibility of Electronic Marketing for the Wholesale Meat Trade AMS-583, May 1979. Washington, 1979. p. 30-31.

transactions, and direct movement of products from sellers to buyers. Currently, ECI charges $1000 for a membership fee, plus $50 per month for services which includes access to P.E.T.S. and regular publications such as the weekly "The Egg Price Report."

EMA (Electronic Marketing Association)

The Electronic Marketing Association, Inc. of Christiansburg, Va. first offered its computerized auction system for cattle and lambs in 1980. The members of the association had earlier participatd in a pilot electronic trading program which had resulted in higher prices for livestock and a decrease in the costs of marketing. Through a telephone hookup to computer terminals in any location, buyers and sellers are brought together at a specific time to determine the price, on a competitive basis, for the animals being offered for sale. The EMA system permits prospective buyers to obtain written descriptions (see Figure 2), on the animals several hours before sale time. During the auction itself, the computer drops the asking price until a bid is received, then continues upward from that point. At the end of a sale, a high bidder receives a summary of his purchases plus a summary of the entire sale. Presently, EMA is providing computer auction services not only to the Eastern Lamb Producers Association of Virginia, but also to two other lamb marketing cooperatives located in Wisconsin and Indiana.

FIGURE 2. -- Sample of an EMA screen display. 41/

```
OPTION: LIST

HERE ARE YOUR CHOICES FOR LISTING LOTS:
     1=LOTS TO BE SOLD TODAY
     2=LOTS BOUGHT TODAY AND YESTERDAY
     3=ALL LOTS
ENTER CODE 1, 2, OR 3:  1
ENTER FC, SL, SC, FE, ALL, OR A SPECIFIC LOT NO.  SL
SUMMARY OR DETAIL LISTING:  DETAIL

                      LISTING OF SLAUGHTER LAMBS
                     SELECTING LOTS TO BE SOLD TODAY

       DATE      10/13/81                        TIME.     09.48.40
----------------------------------------------------------------------
LOT NUMBER        200                   TYPE OF LIVESTOCK   SLAUGHTER LAMBS
                                        TELEPHONE CONTACT   (703) 674-5311
                                        LOCATION.  ELKINS WVA
SALE PRICE    0                         AUCTION DATE:  10/13/81
TOTAL PRICE   0                         WEIGHTS ARE ESTIMATES
 (IF SOLD)                              NUMBER OF HEAD:  382
                                        TOTAL WEIGHT:  38874
                                        AVERAGE WEIGHT:  102
                                        WEIGHT RANGE:  85-115
                                        BASIS OFFERED:  LIVE BASIS
                  QUALITY GRADE DISTRIBUTION -- GRADER:  SG
          QUALITY GRADE      NUMBER OF HEAD       WEIGHT

          -- BLUE O --            362               102
          -- RED O  --             20                95

                  DISTRIBUTION OF LOT      NUMBER OF HEAD
                    EWES & WETHERS              372
                    BUCKS                        10

COMMENTS   100 OF THESE LAMBS ARE CLIPPED WITH #1 PELTS; ADD $2.00 TO YOUR
            BID FOR THESE.
```

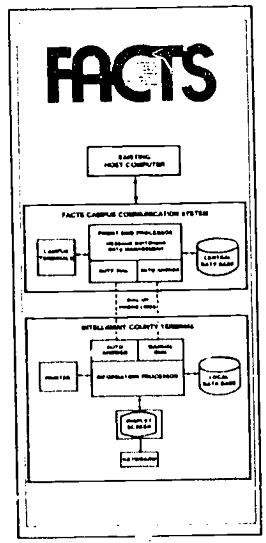
41/Electronic Marketing Association, Inc. Christiansburg, Virginia.

<u>FACTS</u> (Fast Agricultural Communications Terminal System)

The "Fast Agricultural Communications Terminal System" (FACTS) of Purdue University is a statewide Cooperative Extension Service computer network that utilizes a distributed computing concept. The project was initially funded in 1976 by a grant from the Kellogg Foundation, a special challenge grant from the Indiana state legislature with matching funds from the counties, and additional money from Purdue University. Installation of the first county terminals began in late 1978, and by the end of 1980, all 92 county Extension offices had microcomputers in addition to 10 terminals in area Extension offices and 12 on the campus of the university. (See Figure 3).

The software developed by FACTS staff has been designed to enhance the basic educational function and services of Extension offices by facilitating the flow of useful information to people. There are currently some 40 programs which provide communications capability in the nature of electronic mail and rapid transmission of weather releases and emergency information bulletins, as well as problem-solving software for subjects such as crop pest management, crop production, and farm finance and marketing. County Extension agents can operate these programs based on farmers' specific needs to provide tailored services and recommendations. Some FACTS programs have been marketed commercially; the "Garden" program now in use in over 20 states, was run 40,000 times in 1981. A new information service scheduled to begin in 1982 will enable some 75 major news outlets to dial Purdue University for direct electronic transfer of new releases.

FIGURE 3. -- Diagram of FACTS network. 42/



42/Purdue University. Cooperative Extension Service. FACTS (brochure). West Lafayette, Indiana.

FANI (Food, Agriculture and Nutrition Inventory)

In an effort to gain control over the growing number of Federal food, nutrition, and agriculture programs, the Subcommittee on Agriculture of the Senate Committee on Appropriations requested that the U.S. Department of Agriculture and the General Accounting Office compile an inventory of these in 1978. The initial Food, Agriculture and Nutrition Inventory (FANI), completed in March 1979, indicated that there were 359 programs; subsequent updates of the inventory in 1980 and 1981 revealed a 35 percent expansion each year. Each program listing includes information on legislative authority, program function, intended users or beneficiaries, budget authority, and responsible congressional committees.

To date, access to FANI has been free since most requests for information come from USDA or congressional committees. However, in an attempt to reduce costs, USDA no longer maintains the inventory on-line and has loaded the data onto tape; thus, individuals making requests must wait 24 to 48 hours for information from FANI.

INDAX

Based on experience gained from field tests in San Diego, Cox Cable Communications began offering the INDAX home information service to its cable subscribers in the Omaha area in June 1982. INDAX utilizes a cable distribution network in either a one-way mode (teletext) or two-way mode (videotext). The teletext service enables subscribers to retrieve information on news, weather, and financial data, while the two-way option allows users to perform financial transactions and to shop from home. Additionally, users have access to THE SOURCE videotext service which features national and international news as well as the "Commodity News Service" which reports on daily price activities for 22 commodities. (See THE SOURCE).

Participants in the INDAX service must purchase a decoder to translate the incoming signals into a video display format. The cost to Cox Cable subscribers for INDAX ranges from six to ten dollars per month.

INSTANT UPDATE

The Professional Farmers of America, Inc. (PFA) developed the "Instant Update" videotext system in order to offer its members rapid access to current data on market conditions and weather as well as staff analyses and recommendations. In an effort to improve the farmers' ability to minimize expenses for purchased commodities and to maximize receipts for products sold, farm commodity and futures prices are updated every 10 minutes. One of the main features of the service is "Pro Farmer Today," a daily newsletter consisting of 12 pages of current news and analysis. Other services include recommendations for market strategy and tactics, state weather forecasts, and "Washington Watch" which alerts members to current Federal policies and new government reports of interest. Instant Update subscribers can tap into other information delivery systems such as the Dow Jones newswire service.

To access the Instant Update system, users connect a receiver manufactured by Tandy Corporation to a telephone and either a color or black-and-white television set. (See Figure 4). A PFA member dials the master computer located at headquarters in Cedar Falls, Iowa and requests information; the data are then transmitted and stored in the receiver so users can view the pages on the TV screen at their pace. The charge for Instant Update service is $95 per month plus the cost of a two- to four-minute station-to-station telephone call which ranges from $1 to $2 each in most states.

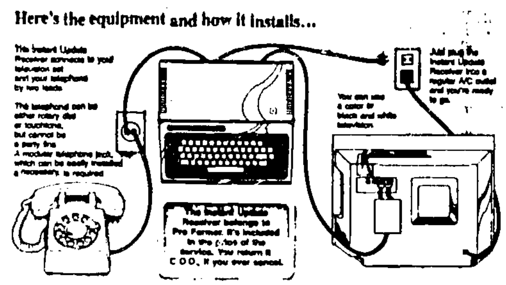


FIGURE 4 -- Diagram of Instant Update configuration. 43/

Iowa Beef Processors Satellite Communications System

During the upgrading of its communications operations in 1981, the Iowa Beef Processors, Inc. (IBP) installed a satellite voice communications system linking the company's headquarters in Dakota City, Nebraska to mobile radio units in Kansas. A satellite network was chosen as the communications design since the options of rebuilding the existing microwave system or constructing dedicated telephone circuits were considered too expensive. The current satellite system is a network of 14 earth stations which "talk" through a channel assignment on Western Union's Westar III communications satellite. Each earth station is collocated with VHF base station equipment. The VHF base stations provide reliable communications with mobile units at distances up to 40 miles; the VHF stations are interfaced with the nearby

---

43/ Professional Farmers of America, Inc. Instant Update (brochure). Cedar Falls, Iowa.

earth stations for long-range communications with IBF headquarters and two processing plants. (See Figure 5). This network offers field cattle buyers with mobile radio units a means of rapid communications which is essential for timely information on price variations. If the Kansas satellite system proves to be efficient and cost-effective, the IBF may establish similar communications links to buyers located in Minnesota, South Dakota, Nebraska, and Iowa.

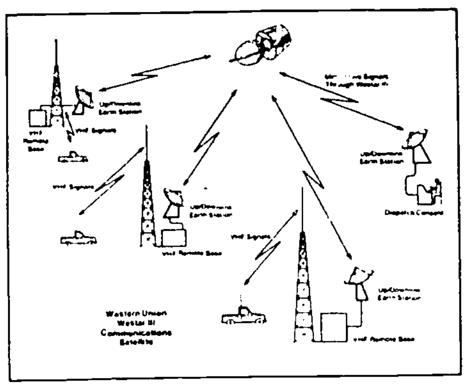


FIGURE 5 . -- Diagram of IBP satellite network. 44/

44/ Stevenson, Carl R. Communications Satellites. Communications, v. 18, September 1981. p. 60.

NARS (Narrative Accomplishment Reporting System)

In order to enhance the information dissemination of program achievements of State Cooperative Extension Services, the USDA Extension Service developed the NARS (Narrative Accomplishment Reporting System) database. Through remote terminals, State and county Extension agents can search the database by either broad topics such as "natural resources," "energy," and "food and nutrition," or more specific subjects such as "farm credit," "range condition," and "wood use." The ensuing response includes a detailed summary of a related program as well as the name and address of the contact person. Prior to the introduction of NARS, these reports on accomplishments were mailed to the Federal Extension Service and frequently were inaccessible to other Extension agents for possible adaptation in their localities. Furthermore, USDA Extension personnel often found that they were unable to rapidly access status and program information in these documents when responding to requests for such data from funding agencies and government officials.

Since the two-year pilot project for NARS proved to be effective in accelerating the rapid communication of such information, the database became fully operational in 1982. Currently, some 20 to 30 State Extension offices use the NARS data base on a regular basis. Access to NARS is available through a time-sharing arrangement with Control Data Corporation.

ERIC

Oklahoma State University Farm Management Programs

One of the primary drawbacks in the use of microcomputers on small farms has been the lack of adequate and helpful programs that can be tailored to an operator's specific needs. The Oklahoma State University Extension Service has responded to this problem by developing a wide range of farm management programs that can be used in the daily operations of small agricultural enterprises. The programs assist farmers in all phases of financial recordkeeping and accounting procedures as well as in decision-making for crop and livestock production. For example, the "Grainstorage" program computes the cost per bushel for on-farm or commercial storage for six time periods selected by the user. "Graph" produces a graph on the screen for commodity prices stored from 1970 to 1979 for wheat and beef, while the "Government Program" compares participation with nonparticipation in wheat-feed-grain-cotton programs based on various assumptions about yields, production costs, and market prices.

Programs are generally compatible to microcomputers manufactured by Radio Shack and Apple, Inc. The costs for software range from $5 to $30, although one program currently sells for $100. Thus far, some 1800 requests for OSU farm management programs have been made from all parts of the nation.

SCAMP (System for Computer-Aided Management of Pests)

Cornell University's SCAMP information delivery system for pest management began serving portions of the New York agricultural community in 1978. Remote terminals in 30 county Extension offices, various research laboratories, the New York Department of Agriculture, and the New York Department of Environmental Conservation are connected by telephone lines to the computer center at the New York State Agriculture Experiment Station in Geneva. Additionally, there are some 170 individuals in the private sector who access SCAMP without charge.

Beginning as a computerized-retrieval system for pest management on tree fruit, the SCAMP project has been broadened to cover other subject areas. The "Blitecast" simulation model predicts the incidence of potato blight and suggests a spraying achedule, while "Weevil" forecasts the occurrence of the alfalfa weevil in five regions in New York. The most popular feature is the electronic mail program which enables users to communicate. Through this program, farmers can report field observations as well as retrieve summaries and interpretations of other reports, and pest management strategies. Updated weather forecasts for each of the 16 forecast zones in New York are also available. For broader information on pest control recommendations, monitoring techniques, and the latest peaticide labels from the U.S. Environmental Protection Agency and the New York Department of Environmental Conservation, users can access the "Library" reference program. The information in this file is permanent as opposed to the reports of field operations and interpretations of events in the electronic mail program -- these data are erased after seven days.

Long-range development plans call for adaptation of certain SCAMP programs for more widespread use on farmers' personal computers. An integrated pest management computer system, based on the SCAMP model, is currently operating successfully in New Hampshire.

SCORPIO (Subject-Content-Oriented Retriever for Processing Information On-Line)

SCORPIO, the computer-based retrieval system of the Library of Congress, has provided automated access to a large number of items in the Library's collection for more than ten years. Beginning with citations to English-language books received in 1969, the system has expanded to include references to congressional reports and journal articles, from 1976 to present, on a wide array of subjects including agriculture. Other files offer abstracts of the four parts of the Congressional Record as well as information about the content and status of legislation since the 94th Congress. The National Referral Center Master file (NRCM) lists more than 12,000 organizations and individuals qualified and willing to provide information on topics primarily in science, technology and social sciences.

THE SOURCE

The Source Telecomputing Corporation, a subsidiary of The Reader's Digest Association, Inc., offers access to more than 1,200 programs and services in a variety of subject areas through THE SOURCE videotext system. Of particular use to the agricultural community is the Commodity News Service which features general news reports and daily price activities for 22 commodities. The system also supplies news and commentary on current business trends along with updated listings of stocks, bonds, commodities, and futures. (See Figure 6). SOURCEMAIL enables subscribers to correspond with one another via electronic mail. In May, THE SOURCE introduced an electronic mailgram service.

Currently, some 18,000 subscribers access THE SOURCE through various models of personal computers. The standard usage fee includes a $100 one-time membership fee plus hourly charges which range from $18 during weekdays to $4.25 after midnight. The rate for sending a single MAILGRAM is $[illegible] for messages up to 100 words, with an additional $1 charge for each additional 100 words.

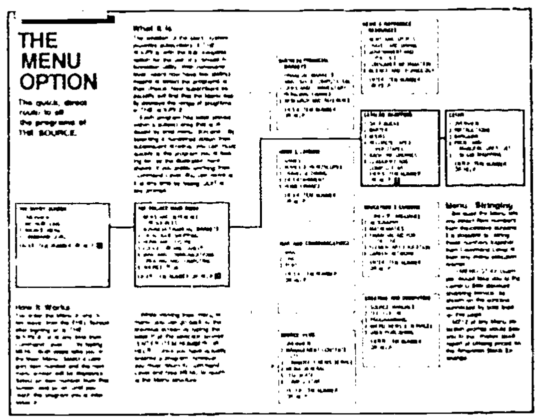


FIGURE · -- Programs available through THE SOURCE "Menu Option." 45/

45/ Source Telecomputing Corporation. THE SOURCE Digest: A Directory of Services on THE SOURCE (brochure). McClean, Virginia, Source Telecomputing Corporation, 1982. pp. 18-19.

TELCOT

Conceived by the Plains Cotton Cooperative Association of Lubbock, Texas as a means of helping members achieve more competitive marketing, the TELCOT electronic trading system began operating in 1975. The computer-based service works as a centralized clearinghouse which swiftly acquires information on members' cotton and then transmits the data to remote terminals in the offices of buyers and sellers for trading on a competitive bidding basis. Trading over the TELCOT system begins when a producer contacts his local gin for an estimate of the market price based on the class and grade for his lot(s) of cotton. If the producer wishes to sell through the "regular auction" market, the information is transmitted simultaneously to the remote terminals in the buyers' offices. During the bidding period which lasts 15 minutes, buyers submit their offers by "blind" bids; the computer selects the highest bid and announces it to all buyers and sellers. If the highest bid is more than one-fourth of a cent per pound below the estimate from TELCOT, a "no sale" is reported. The "firm offer" option, which has become the most popular choice among members and buyers, allows a producer to specify his own price for cotton if he believes the market will go higher than the TELCOT market price estimate.[46/] With this option, an offer remains outstanding until someone buys it or it is withdrawn by the producer -- the cotton is sold to the first buyer who meets the offer price. In addition to information on cotton, TELCOT also provides futures trading data on five other major agricultural commodities.

46/ U.S. Department of Agriculture. Agricultural Marketing Service. The Feasibility of Electronic Marketing for the Wholesale Meat Trade. AMS-583, May 1979. Washington, 1979. p. 29.

TELCOT has expanded significantly in the past few years. Beginning with 15 buyer terminals in 1975, the current network has grown to over 40 terminals in the offices of buyers and approximately 250 in the offices of cooperative gins.

TELETIP

The University of California Cooperative Extension Service offers home and gardening information through its educational service, TELETIP. During a pilot project in Sacramento County, Cooperative Extension advisors and specialists prepared approximately 300 units of information dealing with a variety of topics such as pesticides, poultry and livestock production, pest control, vegetable gardening, and food preservation. Today, area residents can access these recorded messages 24 hours a day with touch-tone telephones or from 8 a.m. to 5 p.m. on weekdays using rotary dialing unit.

Usage records reveal the enthusiastic response to the TELETIP project by citizens of Sacramento County. In July and August 1981, there were 3,000 to 4,000 calls per month, a high rate even after allowing for seasonal variation. During the summer of 1982, calls averaged 2,000 per month. A further indication of the programs's popularity has been the formation of TELETIP-type programs in 21 counties throughout California.

TELPLAN

Michigan State University's agricultural information system, TELPLAN, offers agricultural management programs to assist Extension workers in providing decision-making aids and educational services for farmers and rural businesses. Implemented in 1969, TELPLAN was initially confined to use by Extension specialists and field staff in Michigan; now, the system is currently used by Extension agents and some farm businessmen in over 30 states. TELPLAN offers approximately 100 programs covering a wide range of farm management topics. Some of the more popular programs include "least-cost dairy ration", "crop farm planning guide", and "financial long-range whole-farm budgeting". In the future, TELPLAN will be accessible through MSU's COMNET computer system. (See COMNET).

The system supports a wide variety of terminals ranging from touch-tone phones to printing terminals; the main computer is located at Michigan State University. All users are charged a fee for the operation of the programs plus an additional amount to cover some of the fixed costs associated with maintaining the system. The charge for access to a program in an initial operation averages from $3 to $5 -- any additional processing of the same program generally costs $1 per pass. In some states, special grant funds are available to cover these costs, while in others, the charges are passed directly to the users.

Tennessee Telephone Auction System

In an attempt to increase profits of livestock producers, the Tennessee Department of Agriculture initiated a telephone auction system for the sale of feeder pigs, feeder calves, and yearling feeder cattle in 1980. Through this electronic marketing application, buyers are linked by telephone to auction centers -- after the livestock has been assembled and graded, buyers are contacted and the bidding process begins. The first sale of feeder pigs via telephone auction occurred during 1980 when pigs at two locations were sold simultaneously; weekly sales have continued since that time at the same locations. Twice-yearly, sales of feeder calves by telephone auction have been operating successfully for two years in three locations. For sales of yearling feeder cattle, the telephone system has been combined with the video-auction method of marketing. (See Dixie-Style Selling). Under this arrangement, buyers view cattle on the producers' farms, and later congregate at a predetermined meeting place to begin bidding over telephone lines. During the auction, slides of the cattle are shown to refresh the buyers' memories; a video-tape of the cattle is also available for buyers who were unable to tour the farms prior to the sale.

The adoption of the telephone auction system for livestock in Tennessee has generally resulted in greater buyer participation and increased profits for producers. Originally, these electronic marketing projects were supported by matching grants from the Agricultural Marketing Service of USDA; however, today, the telephone auction programs are operating almost entirely with private funds. Additionally, the success of the telephone auction system has generated strong support from the State's two major livestock agencies: the Tennessee Livestock Association, and the Tennessee Livestock Producers, Inc.

<u>USDA Electronic Mail Network</u>

Based on the positive results of a year-long test, the Office of Governmental and Public Affairs of USDA began electronic dissemination of the Department's news releases and current reports through the DIALCOM electronic mail service in January 1982. The system was adopted in response to the need for more efficient communications between USDA and the Land-Grant University system and the State departments of agriculture; prior to the acceptance of DIALCOM, USDA officials relied on surface mail and telephone facsimile, both of which proved to be somewhat unsatisfactory for the rapid transmission of current information. Through the electronic mail service, an individual can send a message to the receiver's "electronic mailbox" where it is stored until that person is ready to receive and read the information. Additionally, the DIALCOM service provides the capability of handling automatic distribution lists as well as providing access to United Press International's national and international news files.

The USDA electronic mail network supplies several categories of information. USDA ONLINE offers the "News" file, which contains nationally significant news releases, along with summaries of the various "outlook and situation reports" issued by the Economic Research SErvice and the "highlights of crop and livestock reports" issued by the Statistical Reporting Service. Another file, "FAS Reports", ' les the Foreign Agricultural Service's weekly roundup of world agricultural ; ction and trade. (FAS trade leads, along with the "News" segment of USDA ONLINE are transmitted to the University of Nebraska's AGNET system). 47/ Plans are underway to include the full texts of crop, livestock, and outlook reports on the DIALCOM system; these USDA reports are generated under the name of COIN (Computerized Outlook Information Network) and are available on the CMN system under the OUTLK program. The USDA electronic mail network will not necessarily replace traditional methods of information dissemination such as printed publications and radio broadcasting tapes. Rather, its purpose is to enhance the effectiveness of USDA information distribution by offering farmers and State and local agricultural officials a means of obtaining USDA reports and news releases as soon as they are announced.

47/ U.S. Department of Agriculture. Office of Governmental and Public Affairs. Report on U.S. Department of Agriculture Electronic Information Exchange and Dissemination. July 1982. Washington, 1982. p. 7, 12.

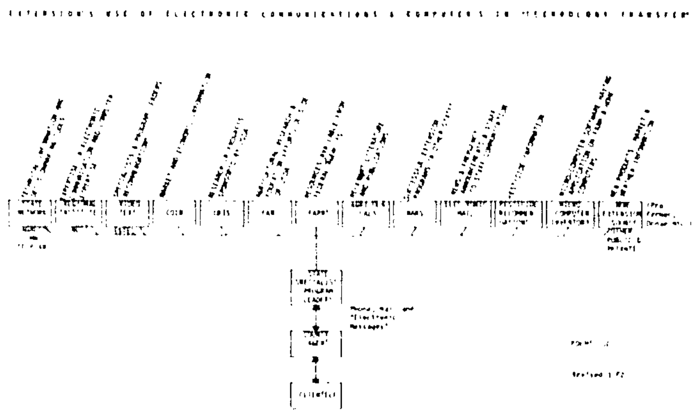
B. EXPERIMENTAL SYSTEMS

 lthough the experimental agricultural information projects have been designed in response to specific needs, several programs mav also be described as forward-looking in that they combine technology, information and resources in a new approach, or that they assemble diverse types of information not previously av ... from one source. The Rural Ventures' small farm project in Princeton, Minnesota emphasizes computer-based management techniques, training, and education in addition to individualized assistance for families with no farming experience. Other test projects, such as FIRSTHAND and ESTEL, are offering information services based on videotext technology. Seven of the following experiments were developed by corporations, seven within the Land-Grant University system, and one by the Public Broadcasting Service in conjunction with USDA.

AGRISOURCE

The "Agrisource" system is being developed by the Computer Corporation of America in conjunction with the Agricultural Extension Service to provide users with access to geographically dispersed and heterogeneous information systems. Among its representative databases are USDA's AGRICOLA, Current Research Information System (CRIS), and the Food, Agriculture, Nutrition Inventory (FANI) which contains information on all Federal food, nutrition and agricultural programs currently in progress. (See Figure 7). Other sources of information found in the Agrisource system are the National Newspaper Index, the Smithsonian Science Information Exchange (now part of NTIS), and FEDREG, a database containing Federal regulations, proposed rules, public law notices, and Presidential proclamations. Thus far, no date has been established for placing agrisource in an operational status.

FIGURE 7. -- Some databases available on Agrisource. 48/



48/U.S. Department of Agriculture. Science and Education Administration (chart).

CATS (Computer-Assisted Trading System)

In 1978, the Secretary of Agriculture appointed a Meat Pricing Task Force to examine the adequacy of market information and price reporting in the wholesale market, especially beef. The group recommended several actions to improve the performance of markets for meat products, including the establishment of an electronic trading system. In response to this suggestion, the Agricultural Marketing Service of USDA awarded a grant (which required local matching funds) to the Agricultural Experiment Station associated with the University of Illinois at Urbana-Champaign to sponsor a pilot project testing a national electronic meat auctioning system.

CATS (Computer-Assisted Trading System) One, the first of two experimental systems, began operation in June 1981; approximately 15 retailers, packers, and wholesalers participated in the project. With substantial assistance from the American Meat Exchange and General Electric Information Services Company (GEISCO), a network of remote access terminals was installed which enabled traders to access GEISCO's Mark III Computer through a local telephone line or WATS line. Trading was initiated when sellers entered data on offerings including market item, quantity, delivery data, and price. Buyers and sellers could then obtain information on offerings and/or bids by examining the listings from the public files -- traders could also obtain market information on completed transactions in summary form. During private negotiations between potential traders, buyers and sellers entered bids and counter-offers. Once an agreement was reached, a printed confirmation of individual trade report was produced at each trader's terminal listing the names and addresses of traders, item traded, terms of payment, delivery date, and shipping and billing instructions.

An evaluation of the CATS One project, which ended in October 1981, led to several modifications designed to enhance the system's efficiency by allowing for more rapid execution of commands. However, the major change involved the private negotiation phase of trading. CATS Two did not allow private bid/offering models as in CATS One; rather, traders entered information directly into the public bid or offering file. The operation of the CATS Two experiment was suspended at the end of 1981.

The pilot project demonstrated several advantages of an electronic trading system. Despite the high start-up costs, several traders stated that they achieved substantial savings compared to conventional trading systems that often involved long distance telephone WATS lines and brokers fees. The electronic auction system also dispelled concern over the system's ability to describe different products and to account for the variation in product quality. Although the CATS project was successful in these respects, the analysis highlighted a distinct and overriding disadvantage, namely an insufficient number of traders. Since the CATS project did not completely replace the existing trading method, a dual marketing system evolved. This situation, coupled with an inadequate number of traders, resulted in an insufficient volume of trade to make overhead costs reasonable. Preliminary findings from an evaluation of CATS Two indicated a lack of interest on the part of large meat packers

14-795 0 - 83

to continue the system despite the potential economic viability shown by the electronic trading experiments. 49/

CATTLEX (Cattle Exchange)

CATTLEX (Cattle Exchange), a recent pilot project sponsored by Texas A & M University, demonstrated the electronic marketing of feeder cattle. Funded by a matching grant from the U.S. Department of Agriculture, CATTLEX was a fully-computerized system operating in 22 locations in Texas -- participants included producers, livestock auction markets, order buyers, and feedlots. The operation began when a seller called the nearest terminal location and arranged for a third-party grader to inspect a lot. A detailed description was then entered into the computer system, along with a minimum or "no-sale" price specified by the seller. All auctions were conducted by computer at designated times; if bids were below the minimum price, the seller had the option to "counteroffer" or have the cattle listed the next day. When a bid and offer matched the computer printed a "confirmation of sale" listing the sale price, time of sale, number of head, buyer and seller names, and addresses and phone numbers. The CATTLEX system also utilized electronic transfer of funds, thus reducing the "float" on the money to 24 hours. 50/

49/ Sarhan, M.E. Computer Assisted Trading System (CATS) for Wholesale Meat in the U.S. Paper presented at the Electronic Marketing of Agricultural Commodities Seminar, Winnipeg, Manitoba, Canada, November 2-4, 1981. (Conference sponsored by Agriculture Canada, Ottawa, Ontario).

50/ Schotsch, Linda. CATTLEX: What It Is; How it Works; Where It's Going. Farm Journal/Beef Extra, v. 105, February 1981. p. 5.

The CATTLEX system was tested from October 1980 to November 1981. Although several private sector companies have expressed an interest in taking over the service, there are currently no immediate plans to continue the program. However, this reluctance on the part of private business is not a reflection of the economic benefits of the CATTLEX system. Recently, Thomas L. Sporleder and Kathleen A. Mahoney of the Department of Agricultural Economics at Texas A & M University compared the price levels in conventional auction markets with price levels in the electronic marketing system. Their analysis reveals that prices were significantly higher using the electronic market, even though the precise magnitude could not be determined with accuracy.[51]

CONTROL DATA CORPORATION (see also Rural Ventures and DEVELOP)

According to Control Data Corporation chairman William C. Norris, "responding to the technological challenges of small-scale agriculture... is vital to the preservation of our American heritage..."[52] Against this background, Control Data has embarked on a program designed to apply existing and emerging computer technologies to the operations of family farms and other small businesses in rural communities. Drawing on the experience of a Rural Ventures, Inc. project in Princeton, Minnesota (of which CDC is a shareholder), the Agricultural Technology Products and Services division is currently engaged in a program that will establish 10

51/ Sporleder, Thomas L., and Kathleen A. Mahoney. Allocative Efficiency in Electronic Marketing for Feeder Cattle. (Unpaged technical article, Texas Agricultural Experiment Station, Texas A & M University).

52/ Norris, William C. Responding to the Technological Challenges of Small-Scale Agriculture. (No. 15 in a series of perspectives on employing technology to solve the pressing problems of society). Minneapolis, Minnesota, Control Data Corporation, 1981. p. 18.

"agriculture and bus ness services centers" to disseminate information on research and the latest technologies that could enhance the economic viability of small farms.

The CDC approach involves a computer-supported system that features existing and emerging technologies, preparation of computer courseware for education and training, and establishment of service centers to offer courses, assist in farm management planning, and serve as an access point to CDC resources. (See Figure 8). The AGTECH database contains practical information on a variety of agricultural topics such as livestock and crop production, pest management, and equipment maintenance. Each data base unit runs from 20 to 30 typed lines and lists the name of the agricultural expert who supplied the information; about 80 percent of the entries focus on "how-to" technology, while the balance covers farm processes and diagnostic information. Farmers are taught how to utilize various technologies through the specially-developed programs or courseware which are part of the PLATO computer-based education system. Developed by agricultural experts, some 30 programs offer advice on topics such as getting started in small acreage farming, sheep production and management, alternative energy uses and conservation methods for farm operations, and financial management. Access to the AGTECH data base and courseware is available through "dealers" who establish and administer the CDC agriculture and business service centers. In addition to distributing information and technical education and training, the dealers assist clients in preparing farm business plans and in analyzing actual financial and production results.

The CDC project recently began operation when 10 dealers invested \$15,000 to \$25,000 each to purchase small business microcomputers and the education and training material needed to operate a service center. These dealers represent various interests of rural communities, including a rural bank, a feedstore, a farm supply store, a private education company, and a fertilizer business — all are locally-owned and operated in Minnesota and Wisconsin. Control Data is planning to deliver its services to farmers through more than 100 independent rural businesses by the end of 1983.

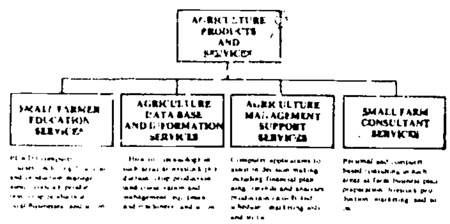


FIGURE . -- Services provided by CDC agriculture and business service centers. 53/

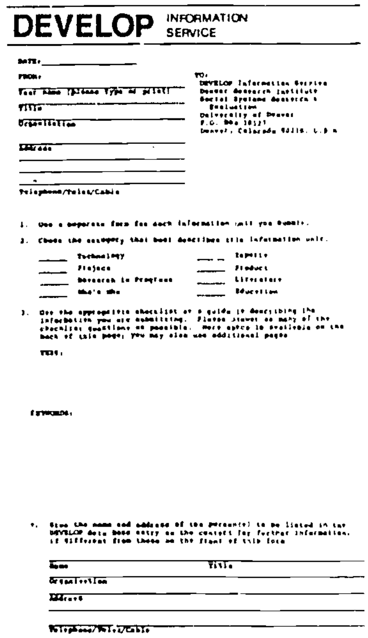
53/ Control Data Corporation. Bringing Better Management to Small Farms. Contact (CDC publication), May-June 1981. (unpaged).

DEVELOP

Control Data Corporation is building a unique computerized information resource capable of locating technologies, products, services and providers of development assistance around the world. Through the DEVELOP database, CDC intends to promote the sharing of solutions among its users (see Figure 9)by providing access to relevant technologies and identifying sources of technical assistance in such areas as agriculture and food production, conservation, health, education, and housing. Each information unit in the system offers extensive detail including technology specifications, resources required, mode of operation, environmental setting, costs, scale of operation, and appropriate users. In addition to providing access to ongoing research and current technologies, DEVELOP also lists some bibliographic entries, but only for studies or reports not found in other information retrieval systems,

Control Data Corporation recently began marketing the DEVELOP database to agribusiness organizations. Current plans call for an annual subscription fee of $3,000 which will provide users up to 200 hours of on-line access to DEVELOP. For usage on an hourly basis, the cost will be $500 for an annual subscription, in addition to a $40 per hour charge for on-line access to DEVELOP.

ERIC



DEVELOP INFORMATION SERVICE

DATE: ____________

FROM:

Your Name (please type or print)

Title

Organization

Address

Telephone/Telex/Cable

TO:
DEVELOP Information Service
Denver Research Institute
Social Systems Research & Evaluation
University of Denver
P.O. Box 10127
Denver, Colorado 80210, U.S.A.

1. Use a separate form for each information unit you submit.

2. Check the category that best describes this information unit.

____ Technology ____ Expertise
____ Project ____ Product
____ Research in Progress ____ Literature
____ Who's Who ____ Education

3. Use the appropriate checklist as a guide in describing the information you are submitting. Please answer as many of the checklist questions as possible. More space is available on the back of this page; you may also use additional pages.

TEXT:

KEYWORDS:

4. Give the name and address of the person(s) to be listed in the DEVELOP data base entry as the contact for further information, if different from those on the front of this form.

Name Title

Organization

Address

Telephone/Telex/Cable

FIGURE 9. — Data input form for DEVELOP Information Service. 54/

54/ Control Data Corporation. DEVELOP Information Service: User Handbook. CDC, Minneapolis, Minnesota, 1981. p. 49.

ESTEL (Extension Service Telecommunication System)

The Universi of Maryland's Cooperative Extension Servi to offer a videotext information service, ESTEL, to area farme near future. Although the system is not yet fully operational, the tension Service is currently planning a pilot demonstration project to potential users in the counties of Somerset, Worcester, and Wicomico. The ESTEL service will feature market reports, futures prices, and local weather conditions, along with news bulletins and recommendations from the Extension Service. (See Figure 10). Access to the microcomputers located at the University of Maryland and in the Extension offices of the participating counties will be via telephone; Radio Shack will provide the videotext terminals for hookup to home television sets and telephones.

Menu #	Topic
General Information	
2	ESTEL Concept
3	Operating Instructions
4	ESTEL Divisions
10	Marketing
20	Agriculture
30	Home Economics
40	4-H
50	C & RD
60	Marine
70	Weather
Marketing Information	
1032	Corn (Close)
1033	Corn (Open)
1034	Soybeans (Close)
1035	Soybeans (Open)
1036	Wheat (Close)
1037	Wheat (Open)
1038	Corn Mid-day
1039	Soybeans Mid-day
1040	Wheat Mid-day

Menu #	Topic
Agricultural Information	
2101	Custom Rates
2201	Somatic Cell Count
2602	Apples
2604	Peaches
2605	Pears
2701	Strawberries
2702	Blueberries
2703	Disease Resistance
2901	IPM Scouting Report
6100	12 Steps to No-Till Corn Production (7)
6101	Corn Variety-Trials Early (7)
6200	10 Steps to Soybean Production (7)
4-H Information	
4010	
4020	
4030	
CRD/Energy Information	
5010	Home Insulation

FIGURE 10. -- Portion of ESTEL "menu option." 55/

55/University of Maryland. Cooperative Extension Service. Maryland Cooperative Extension Service Telecommunication System (ESTEL). (Mimeographed description).

FARM MARKET INFODATA SERVICE

In August 1982, Public Broadcasting Service, in conjunction with the U.S. Departmen Agr ture began a one-year test of the "Farm Market Infodata S. locations across the country. This tel ext project was desig to provide farmers and ranchers with low-cost, current agricultural marketing information. Stations involved in the Infodata test receive farm market news over phone lines, then encode it into public television's captioning system, originally designed for the hearing impaired. Infodata news is transmitted over one of two additional channels that were built into the captioning system during its development. To access the service, farmers within the broadcast coverage area of a participating public television station need a Sears decoder connected to their television sets -- the Sears decoder, which was developed for deaf captioning, is currently priced below $300. If the test marketing proves successful, PBS may begin distributing farm market information on a wider scale using an existing satellite delivery system.

FIRSTHAND

Using French videotext technology known as "Teletel," the First Bank System of Minneapolis introduced its FIRSTHAND system late last year. This fully transactional v eotext system began with placement of 15 pilot terminals in the rural a utside Fargo, North Dakota. A pricing structure for continued service of FIRSTHAND will be examined after the initial testing period ends in October 1982. FIRSTHAND offers information on weather, commodity and financial reports, and local and national news. Additionally, the interactive feature allows project participants to execute financial transactions such as transfer of funds between banking accounts or to "teleshop" by looking at advertisements of products and placing orders with the retailers. The system can also aid clients in managing finances through its agribusiness bookkeeping capability.

At present, information providers for the service include three newspapers from the Fargo-Wahpeton-Valley City area as well as several local retail stores. First Bank System plans on expanding the project to include 200 farmers and ranchers during 1982.

GENETIC PROFILES

Designed as an alternative to traditional visual appraisal, the "Genetic Profiles" cattle measuring system of Applied Genetics International in Wyoming provides a more accurate method for taking linear measurements of cattle in order to select the best animals for breeding programs and testing. The system, which is currently in the final stages of development will be placed on the market in early 1983. Genetic Profiles links 35-mm cameras and computers to calculate internal bone structure and determine the fertility, reproductiveness, feed efficiency, and "gainability" of each animal in a herd. The procedure begins by placing an animal in a special chute for filming -- multiple frames are then made of the side and top profiles. After all the cattle are recorded, the film is sent to a computer center in Denver along with a data sheet containing weight, age, sex, breed, and registration number of each animal. The computer compares the measurements of the cattle against a set of cattle evaluation standards developed by Dr. Jan Bonsma, a South African animal scientist. The computer then prints a 'profile card' which ranks each animal for reproductive efficiency and an 'in-herd summary' which ranks the animals for each of 14 trait measurements. In order to ensure confidentiality, the film will be returned to the producer when the computer analysis is finished.

The cost of a complete set of such equipment will be between $7,500 and $10,000; the computer center will charge between $8 and $12 per animal to process the information. Despite this high price, Genetics Profiles officials claim that the system will make money for a registered breeder or a commercial producer with a 100-head herd since it costs about $400 to maintain a beef cow for a year. Applied Genetics International is currently working with a leasing company to furnish this Genetics Profiles' service to cattlemen on a rental basis or to provide custom measuring. 56/

GRASSROOTS

Frittsco., Inc., the holding company of The Bakersfield-Californian, recently announced the "Grassroots" project which will provide videotext services to agriculturally-related industries in the San Joaquin Valley sometime in 1983. This commercial service will be undertaken cooperatively with Videotext America (a joint venture between Infomart, a Canadian firm, and The Times-Mirror Co.) who will be a minor partner. Based on Telidon technology developed by Canada's Department of Communications, the Grassroots project will draw on the experience of a similar system currently used in Manitoba. The Canadian project is the first commercial videotext system in North America serving the agribusiness community with comprehensive, up-to-date

---

56/ Earle, George. Electronic Eyeballs See Your Best Cattle. Farm Journal/Beef Extra, 105, April 1981. p. 10.

information. As envisaged, the California Grassroots system will be a decision-making tool offering three basic areas of service: essential agribusiness information such as weather forecasts and frequent reports from commodity markets; interactive transactional features including financial analysis models, banking, and purchasing; and general news items and entertainment features.

The projected price for a subscription to Grassroots will be around \$125 per month. The Telidon equipment will be marketed separately on either a lease or sale basis; the current cost of this equipment ranges from \$600 for a simple decoder hooked to a television set to \$1,800 for a more complex videotext terminal.

GREEN THUMB

Green Thumb, an experimental videotext project funded by the U.S. Department of Agriculture and the National Weather Service, began operation in two counties in Kentucky in March 1980. Two hundred participants received "Green Thumb Boxes" which were connected to their home television sets and telephone lines (see Figure 11) and provided the capability to enter and receive information from microcomputers in the counties' Extension offices. From a "menu" of options, farmers could retrieve data on weather, futures prices, and market conditions through a variety of information providers including the Chicago Board of Trade, the National Weather Service, and the USDA Agricultural Marketing Service. State and county Extension agents could also enter information of local interest such as home economic features or 4-H club activities. Weather updates ranged from an hourly to [illegible] basis, while renewal of crop and livestock futures' data was [illegible]ed every [illegible] minutes but generally occurred every 30 minutes

By far, the most frequently-requested categories of information were marke`ing and weather.

At the end of the Green Thumb experiment in July 1981, the Stanford University Institute for Communication Resear " and the University of Kentucky College of Agriculture studied the impact of the videotext project on the farmers' agricultural operations and assessed the technical aspects of the system. While users found the overall system to be workable, about half of the farmers experienced technical problems and two-thirds reported inadequate updating of information; thus, farmers tended to rely on more conventional sources of information such as newspapers and radio broadcasts. Due to these findings, efforts have been made to improve the reliability of the Green Thumb system. Currently, a videotext service is being offered to 20 farmers in Davis County, Kentucky under the direction of the Kentucky Cooperative Extension Service. The project will be evaluated during the next few months to determine if reliability has improved and if the program should be continued. 57/

57/ Ragland, John. University of Kentucky. Cooperative ...ion Service. Telephone interview. July 26, 1982.

FIGURE 11. — Gr[illegible] numb videote[illegible] equipment. 57/

57/ Tandy Corporation. (Radio Shack TRS-80 brochure).

<u>HAMS</u> (Hog Accelerated Marketing System)

In order to test the feasibility of electronically marketing slaughter hogs, the HAMS (Hog Accelerated Marketing System) project was launched in 1980 in Ohio and the surrounding areas. The experiment was a joint effort by the College of Agriculture at Ohio State University, the Ohio Department of Agriculture, and the Producers Livestock Association (a regional livestock marketing cooperative); the Agricultural Marketing Service of USDA provided matching funds.

The 50 participants in the project included 17 stockyards in Ohio and eastern Indiana, nine large hog-producing farms, 17 meat packing plants in Ohio and nearby states, and the Producers Livestock Association. Each participant had access to the Hewlett-Packard 3000 mini-computer located at Ohio State University through remote computer terminals connected by leased wires or telephone lines. Using this computerized auction system, sellers could obtain data on prices and marketing information as well as list their hogs for sale. Packer buyers could then examine sale offerings and enter bids. This system maintained complete records of all transactions including the number of hogs consigned by location, actual sales price, gross dollar outlay for each consignment and purchase, and the traders involved in the transactions.

When the HAMS project ended in June 1981, some 5,200 transactions had been completed involving the sale of 190,000 head of hogs. Besides demonstrating the technological feasibility of computerized trading, this electronic marketing system also revealed [illegible]l benefits. Due to the high level of competition, producers realized higher prices for hogs. Buyers were generally pleased with access to a large supply of hogs with accurate grading descriptions and maintained consistent participation despite the higher prices. However, an evaluation uncovered some problems with the system. Many buyers disliked the system design which allowed only the sales manager at the Producers Livestock Association to know, on a lot-by-lot basis, who purchased each lot; the packers felt that since the cooperative was also a buyer, the association could exploit this advantage. Furthermore, farmers selling less than 50 head were not eligible for an on-site inspection by an employee of the cooperative, resulting in costly truck deliveries to the stockyard prior to inspection and listing. The operating costs of HAMS also proved to be expensive -- the average cost was $2.60 to $3.10 per head compared to the price of $1.40 to $1.50 per head at country auctions. The analysis concluded that volume would have to be tripled in order for HAMS to be cost effective. In general, while this electronic trading system for hogs is technologically feasible, the economic viability of the project remains in question since there is little expectation that such an increase in volume can be attained. 59/

Integrated Pest Management Program at the University of Kentucky

Integrated pest management (IPM) programs generate large amounts of data. In Kentucky alone, the 1981 IPM program employed 84 investigative field scouts who worked in 32 counties and monitored 150,000 acres of alfalfa, corn, soybeans, small grains, and grain sorghum on a weekly basis. 60/ In an effort

59/ Henderson, Dennis R. The HAMS Experiment with Electronic Hog Marketing. Paper presented at the Electronic Marketing of Agricultural Commodities Seminar, Winnipeg, Manitoba, Canada, November 2-4, 1981. (Conference sponsored by Agriculture Canada, Ottawa, Ontario).

60/ Sutherland, Stu. Computer Uses in Pest Management. Extension Review, v. 53, Spring 1982. p. 8.

to improve the management of this data (50,000 scout reports per year), Dr. Grayson Brown of the University of Kentucky's Entomology Department developed a computer data base management system in 1979 to rapidly process IPM information that was collected by the scouts and then forwarded by mail to the central computer facility for processing. However, problems with this system soon became apparent. The time required to move the scout-collected data to the computer housed in a remote location limited the utility of the database since timely information is essential in IPM programs. Furthermore, system access and information retrieval were considered too involved and inconvenient by county agents which in turn decreased receptivity to the service. To remedy these difficulties, a microprocessor-based distributed system was designed for a pilot test in 1981.

The county Extension office chosen for the experiment received a Radio Shack TRS-80 model II microcomputer. Data collected from the scouts in the county were entered and revised daily; additionally, this information was transmitted to the central computer at the University of Kentucky where a duplicate of all data was stored. The database contained files on: pest names; information for each field in the county including owner identifcation, crop, tillage method, yields, and pesticides applied; the name, address, and phone number of each farmer; and scouting observations on specific crops and the presence of pests. Once the scouting information on pests had been entered, the county agent could quickly respond to specific farmer requests as well as produce

14-795 O - 83 - 8

county-wide pest reports.[61] Officials involved with the project hope to eventually expand the system to all 35 counties currently participating in the Kentucky IPM program.

National Pesticide Information Retrieval System

A pilot project testing the National Pesticide Information Retrieval System began operating in June 1982 at Purdue University. With substantial funding from USDA's Cooperative State Research Service, this computer-based information retrieval system was developed as part of Purdue's pest management program; the long-range goal is to establish a nationwide network in the next few years. Currently, each of the four participating states -- Kansas, Minnesota, Illinois, and Indiana -- has two terminals which are connected by telephone lines to the host computer at Purdue University. The terminals in each state are generally located in an Extension Service office located at a Land-Grant university and the State agency responsible for pest control. In addition to charges for on-line connect time, project participants must also pay a subscription fee that averages $300 per month.

Users can search the database by pest, chemical, product, and location for current information on what pesticides are available to treat specific problems. Much of the information in the database is derived from pesticide registration information filed at the U.S. Environmental Protection Agency. Current plans call for the addition of five more states to the system in the fall of 1982 in order to achieve greater geographic diversity in the test program.

61/ Grayson, Brown. Microprocessor-Based Information Management System for an Integrated Pest Management Program. Bulletin of the Entomological Society of America, v. 28, June 1982. pp. 135-136.

ERIC

RURAL VENTURES, INC.

Rural Ventures, Inc., a consortium of corporations, agricultural cooperatives, a foundation, religious organizations, and individuals, is a for-profit company engaged in rural development and revitalization. By emphasizing computer-based management techniques, training, and education, Rural Ventures plans to demonstrate the economic viability of family farms and small businesses in rural communities.

One of Rural Ventures' major efforts is the Princeton, Minnesota Small Farm Project. For this program, Control Data Corporation, a Rural Ventures stockholder, has purchased some 1,500 acres to be divided among 15 families with no farming experience; the main objective is to establish successful farms, ranging in size from 80 to 120 acres, that ~~can be used~~ as models for other rural areas. Control Data is also funding the construction of energy-efficient earth sheltered homes designed for passive solar hearing. At present, eight families have occupied the homesteads and have begun raising crops and livestock. With the resources of the Rural Ventures service center located in Princeton, farmers have access to computer-based education and training programs as well as computer-optimized selection of crops, equipment and livestock through hookup to the agricultural data base in CDC headquarters. The members of the staff at the service center assist project participants in interpreting and analyzing data. Once families have established profitable farming operations, Control Data will sell farms to participants at the cost paid for the land plus the cost of improvements. Eighty percent of the occupancy fee paid by the farmers to the corporation will be credited against the purchase price. Rural Ventures' predicts that the Princeton Small Farm Project will continue for another several years since that much time will be needed for additional families to settle the remaining homesteads and establish profitable enterprises.

Rural Ventures is also operating several other projects around the nation. One program in Selawik, Alaska is attempting to integrate crop and livestock production, thereby reducing dependence on outside food supplies while at the same time providing increased employment opportunities for residents. In New England, the Rockefeller Brothers Foundation and Control Data Corporation have funded a project designed to improve the production and marketing skills of sheep producers in Vermont, New Hampshire, and Massachusetts. And, through a contract with the Oklahoma Department of Economic and Community Affairs, Rural Ventures is working on an economic development strategy for a seven-county in southeastern Oklahoma. 62/

62/ Rural Ventures, Inc. Fact Sheets on Organization and Project Sites. (Public Relations Division press releases). March 10, 1982.

September 1982

C. CHARACTERISTICS OF OPERATIONAL AND EXPERIMENTAL SYSTEMS

Operational

System Name	Sponsoring Organization	Location	Information and Services Provided	Key Contact and Phone Number
AACSys	American Farm Bureau Federation	8 State Farm Bureaus and participating members	. information retrieval: market data, weather, pest management, legislative developments, . specific advice from market analysts	Mr. Kim Wells 312-399-5770
AGNET	U. of Nebraska	more than 40 States	. problem-solving for farm management . information retrieval: USDA reports on crops, livestock, markets, trends, and trade leads	Dr. James Kendrick 402-472-2033
AGRICOLA	USDA/NAL	nationwide	. information retrieval: bibliographic citations to books, journal articles, govt. reports in field of agriculture	Mr. David Hoyt 202-334-4248
ANSER	U. of Kentucky	25 Extension offices in Kentucky	. problem-solving for farm management . information retrieval: socioeconomic data for counties in Kentucky	Mr. John Byars 606-257-3335
Chase Econometrics Domestic Agricultural Service	Chase Econometrics	nationwide, Canada and Europe	. information retrieval: agricultural statistics, historical data, and forecast information . "Agricultural Model": econometric model for agricultural business analyses	Ms. Donna Palgiatore 215-896-4756
CMN	Virginia Polytechnic Institute and State University	Extension offices in 44 States	. problem-solving for farm management . information retrieval: USDA reports on crops, livestock, and marketing	Mr. Craig Woods 703-961-5184
COMNET	Michigan State University	Extension offices in Michigan	. information retrieval: serves as connecting link to several agricultural computer databases . electronic mail capability	Dr. Steve Harsh 517-355-3776

ERIC Full Text Provided by ERIC

System Name	Sponsoring Organization	Location	Information and Services Provided	Key Contact and Phone Number
CRIS	USDA	nationwide	. information retrieval: publicly-supported agricultural and forestry research in U.S.	Mr. Ted Bauer 202-344-3846
Dixie-Style Selling	Alabama cattle marketing associations	7 cattle-selling associations in Alabama	. video-auction with slides	Mr. Dan Linton 205-826-4963
ECI	Egg Clearinghouse, Inc.	160 members nationwide	. electronic trading for eggs	Mr. Frank Koelbrich 603-868-2899
EMA	Electronic Marketing Association	lamb marketing cooperatives in Virginia, Wisconsin, and Indiana	. electronic trading for lambs	Mr. Kenneth Neel 703-382-1781
FACTS	Purdue U.	92 county Extension and 10 area Extension offices in Indiana	. problem-solving for farm management . information retrieval: weather, market prices, emergency information bulletins . electronic mail	Dr. Eldon Fredericks 317-494-8396
FANI	USDA	nationwide	. information retrieval: Federal food, nutrition and agriculture programs	Mr. Tom Tate 202-344-3750
INDAX	Cox Cable Communications, Inc.	Omaha, Nebraska	. information retrieval: news, weather, financial data, commodities prices . transactional features: banking, shopping	Mr. David C. Andersen 404-393-0480
Instant Update	Professional Farmers of America, Inc.	nationwide	. information retrieval: market conditions, weather, futures prices . staff analyses and recommendations from PFA	Mr. Stewart Cross 319-277-1278
Iowa Beef Processors Satellite Communications System	Iowa Beef Processors, Inc.	Kansas	. satellite communications system linking headquarters to field buyers in Kansas	Mr. Dean Houle 402-241-2630

System Name	Sponsoring Organization	Location	Information and Services Provided	Key Contact and Phone Number
NARS	USDA	approximately 30 State Extension offices	. information retrieval: program accomplishments of State Cooperative Extension Services	Mr. Tom Tate 202-344-3750
OSU Farm Management Programs	Oklahoma State U.	nationwide	. problem-solving for farm management	Dr. Ted Nelson 405-624-6081
SCAMP	Cornell U.	30 county extension offices, N.Y. State agencies, 170 private sector users in N.Y.	information retrieval: pest control and pesticides . simulation model; potato blight and alfalfa weevil . electronic mail: for reporting field observations and retrieving pest management strategies	Dr. Jim Tete 315-787-2208
SCORPIO	Library of Congress	Library of Congress	. information retrieval: citations to books, journal articles, congressional reports in the Library of Congress; abstracts from Congressional Record and information on legislation since 94th Congress	Mr. Jeff Griffith 202-287-8768
THE SOURCE	Source Telecomputing Corp.	nationwide	. information retrieval: Commodity New Service, current business trends, updated listing of stocks, bonds, commodities, and futures . electronic mail	Ms. Jane Brown 703-734-7500
TELCOT	Plains Cotton Cooperative Assoc.	Texas and Oklahoma	. electronic trading for cotton	Mr. Jack Kenwright 806-763-8011
TELETIP	U. of California Cooperative Extension Service	Sacramento Co., Calif.	. telephone access to recorded messages on a variety of agricultural topics	Leila Betts 916-366-2013

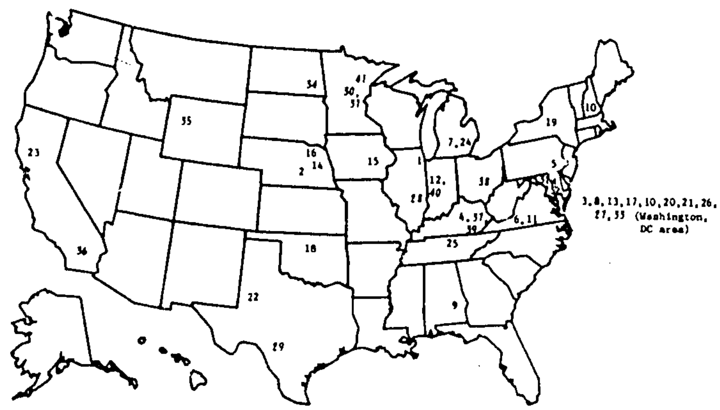
System Name	Sponsoring Organization	Location	Information and Services Provided	Key Contact and Phone Number
TELPLAN	Michigan State U.	Extension agents and farm businessmen in over 30 States	. problem-solving for farm management	Dr. Sherill Nott 517-353-4522
Tennessee Telephone Auction System	Tennessee Dept. of Agriculture	Tennessee	. electronic trading for feeder pigs, feeder calves, and yearling feeder cattle	Dr. John Ragan 615-741-1441
USDA Electronic Mail Network	USDA	Land-Grant University system, some State departments of agriculture, and various farm magazines and agricultural news services	. electronic dissemination of USDA news releases and reports over DIALCOM and AGNET systems	Mr. Stan Prochaska 202-447-7454

Experimental

System Name	Sponsoring Organization	Location	Information and Services Provided	Key Contact and Phone Number
Agrisource	CCA/USDA	nationwide	. information retrieval: provides access to dispersed agricultural databases	Ms. Rita Bergman (CCA) 703-243-8664
CATS	U. of Illinois	Illinois	. electronic trading for wholesale meat	Dr. M. E. Sarban 217-333-6465
CATTLEX	Texas A & M U.	Texas	. electronic trading for cattle	Dr. Tom Sporleder 713-845-2116
CDC Agriculture and Business Service Centers	CDC	Minnesota	. information retrieval: 'how-to' technology for farming . education: PLATO computer-based courses for small farmers . problem-solving for farm management and personal consulting	Mr. Brian Roth 612-853-6770
DEVELOP	CDC	Minnesota	. information retrieval: identifies sources of technical assistance in areas such as agriculture, conservation, education and housing	Ms. Beth Holmgren 612-853-7895
ESTEL	U. of Maryland	Maryland	. information retrieval: weather, market reports, futures prices, news bulletins . recommendations from Extension Service	Mr. Ralph Adkins 301-454-4848
Farm Market Infodata Service	PBS/USDA	5 test markets nationwide	. information retrieval: commodities prices, market news	Mr. Ben Kittner (PBS 202-488-5129
FIRSTHAND	First Bank System of Minneapolis	Fargo, N.D.	. information retrieval: weather, financial and commodity reports, local and national news . transactional features: banking, shopping . home computing	Ms. Wendy Bollum 612-370-5154

System Name	Sponsoring Organization	Location	Information and Services Provided	Key Contact and Phone Number
Genetic Profiles	Applied Genetics International	Wyoming	. computer analysis of cattle measurements to determine reproductive efficiency and gainability	Mr. Norm Hayes 307-527-7173
Grassroots	Bakersfield-Californian	San Joaquin Valley in California	. information retrieval: weather, commodities prices, market reports . transactional features: banking, shopping . home computing	Mr. Ron Montgomery 805-395-7222
Green Thumb	USDA	200 farmers in Shelby and Todd Counties, Kentucky	. information retrieval: weather, futures prices, market conditions, local news	Mr. Howard Lehnert 202-447-4681
HAMS	Ohio State U.	Ohio and nearby States	. electronic trading for slaughter hogs	Dr. Dennis Henderson 614-422-2701
IPM in Kentucky	U. of Kentucky	Kentucky	. information retrieval: scouting data on crops and presence of pests, information on each field, pesticides	Dr. Grayson C. Brown 606-258-5638
National Pesticide Information Retrieval System	Purdue U.	pilot project in Illinois, Indiana, Kansas, and Minnesota	. information retrieval: pest control, pesticides	Dr. John Osmun 317-494-4565
Rural Ventures		Princeton, Minn.	. computer-based education and training programs . information retrieval: crop and livestock production, equipment selection . problem-solving and personal consultation in interpreting data	Mr. Robert Rumpza 612-853-3886

FIGURE 12. -- Location of Operational and Experimental Systems.



Operational

System Name	Center of Operations
1 - AACSys	Park Ridge, IL
2 - AGNET	Lincoln, NE
3 - AGRICOLA	Washington, DC
4 - ANSER	Lexington, KY
5 - Chase Econometrics Domestic Agriculture Service	Bala Cynwyd, PA
6 - CMN	Blacksburg, VA
7 - COMNET	East Lansing, MI
8 - CRIS	Washington, DC
9 - Dixie-Style Selling	Auburn, AL
10 - ECI	Durham, NH
11 - EMA	Christiansburg, VA
12 - FACTS	W. Lafayette, IN
13 - FANI	Washington, DC
14 - IN[illegible]	Omaha, NE
15 - Instant Update	Cedar Falls, IA
16 - Iowa Beef Processors Satellite Communications System	Dakota City, NE
17 - MARS	Washington, DC
18 - Oklahoma State U. Farm Management Programs	Stillwater, OK
19 - SCAMP	Geneva, NY
20 - SCORPIO	Washington, DC
21 - The SOURCE	McLean, VA
22 - TELCOT	Lubbock, TX
23 - TELETIP	Sacramento, CA
24 - TELPLAN	East Lansing, MI
25 - Tennessee Telephone Auction System	Nashville, TN
26 - USDA Electronic Mail Network	Washington, DC

Experimental

System Name	Center of Operations
27 - AGRISOURCE	Arlington, VA
28 - CATS	Urbana, IL
29 - CATTLEX	College Station, TX
30 - CDC Agriculture and Business Service Centers	Minneapolis, MN
31 - DEVELOP	Minneapolis, MN
32 - ESTEL	College Park, MD
33 - Farm Market Infodata Service	Washington, DC
34 - FIRSTHAND	Fargo, ND
35 - Genetic Profiles	Cody, WY
36 - Grassroots	Bakersfield, CA
37 - Green Thumb	Lexington, KY
38 - HAMS	Columbus, OH
39 - Integrated Pest Management in Kentucky	Lexington, KY
40 - National Pesticide Information Retrieval System	W. Lafayette, IN
41 - Rural Ventures	Princeton, MN

V. HIGHLIGHTS OF PUBLIC AND PRIVATE SECTOR RESPONSES TO SUBCOMMITTEE LETTER SEEKING VIEWS ON APPLICATIONS OF COMPUTER-BASED INFORMATION SYSTEMS AND SERVICES IN AGRICULTURE

Preparatory to scheduling a "workshop on applications of computer-based information systems and services in agriculture," to be held under the aegis of the House Subcommittee on Department Operations, Research and Foreign Agriculture early in 1982, Chairman George E. Brown, Jr. sent letters to selected public and private sector individuals and organizations seeking their views on this important topic:

U. S. House of Representatives
Committee on Agriculture
Subcommittee on Department Operations, Research and Foreign Agriculture
December 4, 1981

- - - - - - - - - - - -
- - - - - - - - - - - -
- - - - - - - - - - - -

Dear ________________:

Early in 1982, my office is planning to sponsor a Congressional Research Service workshop on applications of computer-based information systems and services in agriculture.

As chairman of the Subcommittee on Department Operations, Research and Foreign Agriculture of the House Agriculture Committee and as past chairman of the Subcommittee on Science, Research and Technology of the House Science and Technology Committee, I have an abiding interest in the proper synthesis of developments in these two fields. More importantly, in accordance with my current subcommittee chairmanship, I am interested in the contributions that computer-based technologies can make for the benefit of the farm community.

It is my objective, therefore, to initially present an historical overview of the whole spectrum of tandem developments in agricultural operations and information sciences. I hope that the workshop will also focus on future agricultural applications of these technologies. Key in this regard are the roles of government, universities and the private sector.

I believe that by our careful and thorough exploration of some key matters of interest in this area, the workshop will prove of value to all Members of Congress, and not just to those concerned with agricultural and information science issues.

I am seeking the views of a small number of selected persons concerned in various ways with some of these issues. Therefore, I am requesting that you forward to my office written comments on the following—

(1) Specific needs of the agricultural sector that might be met through the application of computer-based technologies
(2) Specific technological devices and processes that might be especially well-suited to agricultural operations
(3) The role of federal and local government agencies—the role of the Department of Agriculture, of the Extension Service; the role of the Congress; the interrelationship among agencies involved in this area; programs and policies that are or might be appropriate and effective for directing activities in this area
(4) Major trends, and key factors in the application of these technologies in agriculture in the future
(5) Issues of concern in the application of these technologies in agriculture

Please forward your comments to the attention of Sonja Powell.

Your interest and cooperation are very much appreciated.

Sincerely,

George E. Brown, Jr.
Member of Congress

P. S. I have enclosed a few articles that describe some of the kinds of things that have prompted my interest in this area.

This letter stimulated replies from a score of governmental and private sector interested parties. Included among the respondents are spokesman for Federal and State level governmental groups, farm organizations, extension services, and corporations. An analytical summary of these comments, including actual excerpts from the letters of response follows.

EXCERPTS FROM PUBLIC SECTOR RESPONSES, WITH SUMMARY COMMENTS

Among the four letters of reply from the U. S. Department of Agriculture was one jointly prepared for the Extension Service by Dr. David L. Holder, a Program Leader for Livestock and Meat Marketing, and Dr. Buel F. Lanpher, a Program Leader for Farm Management, both of whom would serve as Group Leaders during the ensuing (1982) workshop. The context of their answers is concentrated "on those applications which impact on agricultural economics, including agricultural marketing and the management of farms and other agribusinesses." Their remarks, like a few others responding, are placed within the framework of the original questions in the Brown letter.

EXCERPTS

Specific Needs (Question One)

Modern farmers and agri-business firms need better access to information and markets and need more efficient ways of handling information to fit each individual situation.

1. ...need assistance in making effective evaluation and application of computer technology.
2. ...need access to timely information about market prices and the many factors that affect those prices so that they can make better production and marketing decisions.
3. Sellers and buyers need better access to markets: sellers need a better way to search out buyers as the number of buyers continues to decline; buyers need to reduce their costs of seeking out sellers.
4. Farmers need access to technical information and projected cost and return data on crop and animal production enterprises: they need analytical procedures for evaluating the economic consequences of making changes in farm investments and enterprise combinations.
5. Firms need better ways of collecting, analyzing, and recording information...monitoring devices that automatically record information on various production factors and machines that automatically provide decisionmakers with signals about needed action.
6. Firms need better ways of making decisions by assimilating large quantities of data and automating many of the calculations, yet keeping the results specific to the individual firm (italics added).

Technology (Question Two)

1. For about 25 years, farm management records and dairy herd improvement (DHIA) records have been kept on central computers...In the next generation...producers will key most of the data directly onto their own terminal...and receive reports instantly and as often as needed.
2. Technological advances making micro-computers available at reasonable costs will revolutionize farm recordkeeping. Various types of portable remote terminals

and even remote sensors will make information gathering and recordkeeping more comprehensive and efficient. This will also lead to improvements in decisionmaking. A large amount of software is still needed to make all this happen [italics added].

3. Information networks are being used by Extension Service to deliver information from national and State levels to county Extension offices. Farmers and others gain access by calling their local Extension office. Experiments are underway to provide farmers and others direct access...CMN, AGNET, Telplan...FACTS (Indiana)...EXTEL, a derivative of the Kentucky "Green Thumb" project.
4. Problem solving routines are available on all of the above except EXTEL. These routines enable a user to input many of his own parameters from which the computer works out an optimum solution.
5. Computerized market systems currently are facilitating transactions among buyers and sellers of cotton (TELCOT), lambs (TMA), and eggs (ECI). Recent pilot tests have also been conducted for hogs (HAMS), feeder cattle (CATTLEX), and meat (CATS). [Chapter IV more fully describes these systems.]
6. An inventory of almost 1,000 software programs for mainframe and micro-computers has recently been compiled by the University of Florida with a grant from Extension Service-USDA. [See Selected References, Appendix 4.]

Government Role [Question Three]

Government has a responsibility to sponsor research and development and to disseminate information about useful technology which the private sector...may be hesitant to provide. As computer technology has been adopted, it has resulted in greater efficiency in agriculture as well as in the function of government itself as it serves agriculture [italics added].

The Extension Service at the national and State levels has taken the leading role in applying computer technology to agriculture by developing and demonstrating a variety of systems. At first...farm management recordkeeping reporting systems. As remote technology developed, Extension developed a demonstration project to help farmers analyze data and make better decisions. Currently, Extension is assuming an additional computer role—that of channeling government-generated information from the national level to regional and State levels and to county Extension offices...The systems are currently being extended directly to farmers and others.

The increasing availability of micro-computers at reasonable costs has prompted Extension to demonstrate their use and to provide a variety of agricultural software packages which are not available commercially.

Several federal and some State agencies have the responsibility of maintaining public data bases. Most government data bases are now on computers, but these systems need to be adapted for access by remote computer terminals. Eventually this procedure could eliminate the need for printed government statistics. Individuals without computer terminals could buy the information from a number of commercial firms that would have such access.

Electronic marketing projects have been sponsored by the Agricultural Marketing Service (AMS) and Extension Service -USDA in cooperation with State Departments of Agriculture and land-grant universities...Each new system was conceived as being mainly of benefit to producers, but they were not sufficiently organized or financed to pilot test the projects without government assistance.

Many USDA agencies (Extension Service, Agricultural Marketing Service, Foreign Agricultural Service, Statistical Reporting Service, and Economic Research Service) are currently cooperating on plans to generate and distribute information via a computer. In the future, we expect more agencies, both from within and outside of USDA, to cooperate on computer systems [italics added].

Trends [Question Four]

Computerized recordkeeping systems, information transfers, marketing systems...are going to increase in use. Equipment will continue to become less expensive and more powerful and more widespread in use.

We feel that Congress and the Administration should continue to support the widespread use of computer technology in agriculture to further develop the ideas that have been tried and to explore a number of new ones.

Issues [Question Five]

1. How will farmers and agri-business receive timely information and objective analyses from Extension Service given widespread availability of computer technology and high speed telecommunications?
2. What will be the future of government publications of both data base series and textual material?
3. When information is stored on machines, who should control access and how? Will large institutions and firms enjoy an even greater advantage in accessing such information relative to individuals and small firms?
4. What should be Extension's role in developing software and in evaluating software developed by commercial firms?
5. How should a public agency respond to the myriad of equipment available and the lack of a common language and protocol among the major brands of computers and other equipment?
6. How does a government agency or a private party make decisions about appropriate equipment knowing that in two years any purchase may be obsolete?

Useful descriptive material on the CMN and AGNET systems also was provided the Subcommittee by Dr. Holder.

Also emanating from the USDA was a response from the National Agricultural Library (NAL), prepared by its Acting Director, Dr. Richard A. Farley. He prefaced his disquisition on the focal topic by stating the mission of the NAL:

- ...to acquire and diffuse among the American people information about agriculture in the broadest and most comprehensive sense of the word.
- ...to support agricultural research by bringing the literature of science under bibliographic control and to serve as a national backup for the information needs of the nation's agricultural scientists.

EXCERPTS

We could not accomplish these purposes without computer-based information systems: they are essential to our work...[which] includes selecting, acquiring, and organizing the world's most comprehensive collection of literature pertaining to food, agriculture, and related disciplines; cataloging, indexing, and announcing the availability of this literature through the AGRICOLA data base, and making this data base available to the scientists; providing information and retrieval services; providing current awareness literature services to scientists; and making printed information from the collections of the National Agricultural Library available for loan and on-site use.

NAL also provides leadership, support, and assistance to a national agricultural information network--both computer-based and personnel oriented--consisting of agency field libraries, land-grant college libraries, specialized information centers, extension information centers, nutrition information centers, forestry institutions, and other cooperating agricultural information providers.

With reference to the CRS workshop and the specific needs of the agricultural sector [Question One] that might be met through the applications of computer-based technologies, our chief problems fall into three areas: 1) the need for expanded subject coverage of our online data bases to meet the emerging needs of the agricultural scientists; 2) the need for improved and extended access by the scientists and researchers to the data bases themselves; 3) and, the need for speedier and more efficient ways to collect, store, preserve, and deliver the agricultural information itself.

With reference to [Question Two]...a full range of new equipment should be discussed and demonstrated at the workshop..: large scale computers, mini and micro computers, videotape and disc storage devices, viewdata and teletext transmission technology, mechanical storage devices, and preservation technology.

14-795 O - 83 - 9

> Item three in your letter...is considerably more complex and difficult to address summarily. It has always been the role of the Federal Government to do, or provide, for the American people collectively what they could not do or provide for themselves individually...No single, private sector enterprise could or would duplicate the consistent, patient, and historical acquisition policy of the National Agricultural Library. On the other hand, the NAL could not provide the information services it does without the technological and intellectual support of a great many companies and private individuals.
>
> Finally, the major trends [Question Four] and key factors in the application of these technologies in agricultural information services are many, varied, and competing. While the technological capabilities of information storage and transmission systems are increasing, so are their complexities and costs. *At the same time that the technology of agricultural information systems is more readily available, the financial and personnel resources to support its use are more scarce. The demands for information service have grown with use, but the number of Government personnel available to offer the service has declined* [italics added].
>
> A host of issues [Question Five] related to availability, use, and training or the use of the systems might also be explored at the CRS workshop along with the physical trends of information equipment and the consequences of these trends.

A third USDA reply was received from Thomas F. Hady, Acting Director of the Economic Development Division, Economic Research Service, who noted that with the demise of the Community Services Administration --responsible for collecting outlay data for counties and cities--the USDA/ERS had been "forced to discontinue our studies..of government outlays to rural areas." Two recent activities then were cited concerning "applications of computer technology to rural areas:"

EXCERPTS

> A major problem in rural areas is the lack of expert help for local government officials...[who] make decisions involving tens of thousands of dollars...Working with the Extension Service in Oklahoma, and later in Missouri, we developed a series of decision-making guides, which help local officials sort out the cost and revenues associated with several different approaches to a program...Guides have covered rural ambulances, fire services, water, sewers, solid waste, and other subjects.

> The Extension staff at Oklahoma State University have programmed some of these on the OSU computer. As a result, they can take a portable computer terminal out to a community and sit down with the local officials and run the program.
> A second activity...represents an important class of computer applications in rural areas. We are now completing a study of the impacts of coal development in the very sparsely settled ranching areas of Montana, Wyoming, and the Dakotas. One result of that study is a computer model which provides much better data than were previously available on the impacts of mines and thermal generators on population, employment, and local government revenues and services in the small, rural towns they are near. That model has been used by a variety of State and Federal agencies concerned with development in the area.

The last of the USDA contributions was authored by Howard F. Lehnert, Jr., a National Program Leader for Agricultural Weather and Videotex with the Science and Education Administration, who would act as a Group Rapporteur at the 1982 Subcommittee-sponsored workshop. Mr. Lehnert, whose expertise is based on many years of intensive contact with key Federal, State, and local officials responsible for an array of information services, began his comments by stressing that "American agriculture is the most science intensive production system in the world," and continued by affirming that challenges now being posed "can probably be met most effectively by the introduction of computer-based technologies that can give the producer the information he needs and in a format that can be used to solve his local problems."

EXCERPTS

> This technology would include videotex systems now getting ready to go on-line in Maryland and Kentucky, and fully interactive systems such as AGNET, CMN, and FACTS.
> To attain maximum effectiveness, the developers of any computer system must consider the needs of the user, his costs, and the costs to the system operator. For example, the computer needs of Extension specialists within the States are likely to be more complex than those of producers and thus may justify more sophisticated interactive systems. Because of the great number of producers, the most effective way to provide information directly to them is by using batch

dump videotex concepts. These systems have minimum connection times and can handle a large number of users with minimum connection costs.

The videotex systems now going on-line in Maryland and Kentucky are an outgrowth of some early work...known as the Green Thumb system [see Appendix 8]. The second phase systems... will provide users with a wide range of weather, marketing, and production information that can assist farmers in their day-to-day operations. These systems will also carry a wide range of other information such as home economics, community development, and 4-H.

The videotex systems now being planned throughout the country will require considerable cooperation between the Federal, State, and county governments and the private sector. Federal agencies have a tremendous supply of information that is needed by the agricultural community...only USDA's Agricultural Marketing Service has taken action to feed Extension videotex systems.

The key to any information dissemination system to serve agriculture rests with the land-grant university...where inputs from a variety of disciplines can be brought to bear on a specific subject, and then distributed to host computers at the county level [italics added].

The county Extension office is the most cost-effective interface between subject matter and the ultimate users. The county videotex communications computer, in addition to disseminating information produced at the Federal and State levels, can also distribute locally generated information that can meet very specific needs.

The private sector has a key role to play in videotex systems. In some cases...providing funding for the State or county computers. In other cases...giving Extension access to its systems, which can in turn be accessed by the public. Another possible role...is sponsorship of information to be made available to farmers. For example, a sponsor may wish to provide support for localized radar information. In return, the sponsor's name would be listed at the bottom of the screen. This would provide visibility for a prospective sponsor and a valuable informational source for the agricultural community.

The key to the success and public acceptance of any dissemination system rests upon the quality of the information, its accuracy, its timeliness, and how well it is localized [italics added]. Because of its close working relationship with the rural audience, the Cooperative Extension Service is in the best position to provide this type of service. A channel is already established for feedback of information from users through the county office, the State Extension Service, and to the Federal level.

Experience in Kentucky demonstrated that weather-based agricultural recommendations are of key importance to producers. This will likely mean establishment of Extension agricultural weather centers at each land-grant university to interpret the weather information provided by the National Weather Service in terms of the various disciplines that constitute commercial agriculture today. This type of information can greatly improve the efficiency of production practices such as integrated pest management, irrigation scheduling, herbicide placement, and many other production decisions.

Many farmers now own small business or personal computers ...[but] most cannot make full use of this equipment because of the lack of software that is designed to meet specific farming needs. Too often they are forced to turn to programs that were developed for another business.

Issues [Question Five]

Several systems for delivery of information directly to the user have been developed in other countries and some of these are being studied in the United States. There is a serious question about using U. S. tax dollars to establish foreign-based videotex systems. Also, systems that are proprietary to developers would put the videotex industry in the hands of only a small number of manufacturers if they were made a U. S. standard. Only the systems that evolved as an outgrowth of the Kentucky Green Thumb system are U. S.-based and have all their protocols in the public domain so anyone can use them.

Trends [Question Four]

Establishment of videotex services to provide farmers with a wide range of needed information will likely spawn many parallel systems to serve other sectors of the economy and thus increase demand for such terminal devices and therefore reduce their costs. Manufacturers are reluctant to make the terminals until there are systems to access. At the same time, systems are not apt to come on-line until the terminal devices are there. An Extension-based videotex system can serve as the focal point for development of a wide range of other videotex services for the American public.

In a departure from the usual response mode of correspondence, a meeting was held early in 1982 with Dr. Dennis J. Prager, whose duties are two-fold: Associate Director of Human Resources and Social and Economic Services, and Executive Secretary for the Coordinating Council for Science, Engineering and Technology, both of which are integral to the Office of Science and Technology Policy.

EXCERPTS

1) That there are three levels on which information system technologies and applications can be viewed—

(1) How the federal government handles its information, including mechanisms that it may employ in finding out what's going on around the country in this respect.

(2) Interactive communications systems used among farmers
(3) On-farm use of these technologies

2) That the agricultural environment is very advanced in the adoption of these kinds of technologies.

3) The sense that the Extension Service is a hindrance to farmers--not an innovator--in this area.

5) Noting as the Administration's basic policy on the federal role in the development and application of information system technologies--
(1) Support of basic science
(4) Desire and intention to continue basic research role in improving agricultural productivity
(5) USDA's continued involvement in the early development of applications, along with urging of more private sector involvement, as technological development moves closer to implementation

6) That the government-USDA role should be to demonstrate the applicability of these kinds of technologies.

7) That confusion will unfortunately arise as different congressional committees assume their respective responsibilities for different aspects of the same fields or issues.

8) That now is the right time for such a workshop and forum; that is, that five years from now would be too late to try to avoid the otherwise inevitable crisscrossing of systems and soaring costs of implementation.

9) That application of these technologies can contribute significantly to alleviating real problems of water, land, capital, and energy in agriculture.

10) That a real shortcoming in the decisionmaking at the Executive level with regard to development and application of these technologies is being able to "look across the top"--to adopt a broader, longer-range perspective, and that the Executive Branch should do more of this sort of thing. (It was noted that a mechanism for just such policy implementation review was part of Cabinet Council meetings.)

From the legislative branch of the Federal Government useful commentary was submitted by the Office of Technology Assessment, with a key contribution from Dr. Fred Weingarten, Program Manager in Communications and Information Technology, who subsequently served as a Group Rapporteur during the two-day workshop. After listing more than a dozen "new products and services" that will come into use during the next decade--such items as "fifth generation"super computers, graphical display devices, and artificial intelligence based "knowledge" systems—he mentioned two major reports which featured further details on these technologies: Computer-Based National Information Systems and Information Technology and Education [see Appendix 4 for citation of the former].

EXCERPTS

> Computer use, per se, is not new to agriculture...at the Oregon State University computer center in the late 1960's, the largest single computer application...was the dairy herd improvement program used by the extension service. Shortly, I expect that every farmer will have a desk-top computer in the office for herd management, accounting, and many other purposes.
>
> This home computer will eventually serve as a gateway into what could be a wide array of other related information services...such as weather, commodity prices, and agriculture extension bulletins. (The "Green Thumb" experiment recently concluded by the Department of Agriculture used a videotext system to provide such a service. Private industry is now reportedly preparing to offer a commercial system aimed at agricultural users.) The videodisk, coupled with a user-oriented information retrieval system on a small computer, would put an "intelligent" encyclopedia of agricultural information at the finger tips of the farmer. It would also be a facility for providing continuing education courses on new farming techniques.
>
> Modern robotics technology may stimulate the development of a new generation of automated farm machinery, particularly for harvesting and processing...there will be secondary applications of computers and communications that will benefit agriculture...will improve weather prediction...support research in fields such as applied genetics and ecology. Computer pattern recognition systems to analyze the enormous volume of information being returned from satellite photos of the earth will provide more information about land utilization and resource availability.
>
> There are some important roles the Federal government could play [Question Three] that will affect the use of new information technology in agriculture:
>
> - Fund and conduct research and development.
> - Support demonstration projects of new applications.
> - Facilitate technology transfer from the research laboratory to industry and to the end users.
> - Use the technology to support the Government's ongoing work with the agricultural community—e. g., move toward an electronic extension service.
> - Consider the impacts of changes in telecommunication regulation on agricultural users.

ERIC Full Text Provided by ERIC

Many agencies are already involved in these functions, and their roles vary widely...a thorough analysis of Federal roles would require significant effort. This problem is compounded, of course, by current reconsideration of Federal responsibilities in general and, specifically, of the proper role of government in the dissemination of information [italics added].

Regarding your question about issues [Question Five], a number appear at first glance to merit consideration:

Market possibilities - With all the promising market opportunities facing the information industry, will they in fact develop and offer products and services aimed at agricultural users...[especially] the programs and data bases targeted to farm needs?

Concentration - Will there be differential effects of technology use on large and small farms? Will information technology provide economies of scale that tend to favor large agricultural concerns, or will it serve to improve the small farmer's ability to compete?

Access - Will rural Americans have more or less access, physically or economically, to new information technology as result of trends toward deregulation and the pending divestiture of AT&T? The answer to this question could determine whether the promises of the technology to agriculture can be kept.

Educational needs - What will be the impact of information technology on both the educational needs of the farm community and on the ability to meet those needs? This question will be of particular Federal interest in the case of the land-grant colleges and the agricultural extension service ...will also be profoundly important to local elementary and secondary institutions.

Employment - Automated harvesting equipment has already had an effect on the employment of farm labor. Will a new wave of machines using advanced computer technology exacerbate these problems?

Research and development - What is the appropriate role for the Federal government in developing new technological applications in agriculture?

International impacts - Some application of computer and communication-based agricultural systems could be useful in the lesser developed countries. Could information, hardware, and access to communication facilities become significant elements of U. S. foreign aid? Is it possible or feasible to "tailor" some products and services to the specific needs of third world nations?

Also forwarded to the Subcommittee by OTA were a short discussion paper by Alison L. Hess of its Life Sciences Division, a special issue of Interciencia on agroclimate information systems, and other selected articles and papers.

A letter response to the Subcommittee invitation for comments was forthcoming from Brian H. Sway, Chief Deputy Director of the Department of Conservation for the State of California Resources Agency. Although the three programs selected for discussion would tend to furnish requisite information to governmental decisionmakers rather than producing farmers, the kinds of data being collected and processed warrant summarization:

EXCERPTS

The Farmland Mapping and Monitoring Program has been developed to provide the California Legislature and other decisionmakers with reliable, current information on the state's commercially important farm and grazing lands. The data are needed in order to answer questions on the location and status of this land, and to evaluate the need for new preservation policies. The major products will be:

- o Statewide Mapping (by county) of California's commercially important farmlands and grazing lands.
- o A computerized farmland data base, which will be updated annually.
- o County Farmland Reports which will document the location, extent, and type of important farmlands in California counties.
- o Annual Farmland Conversion Reports (county and statewide) to document the conversion of farm and grazing land to non-agricultural uses (and vice versa).
- o Annual Farmland Conversion Maps (by county, region, and state) to show where conversion has occurred and where conversion is imminent.

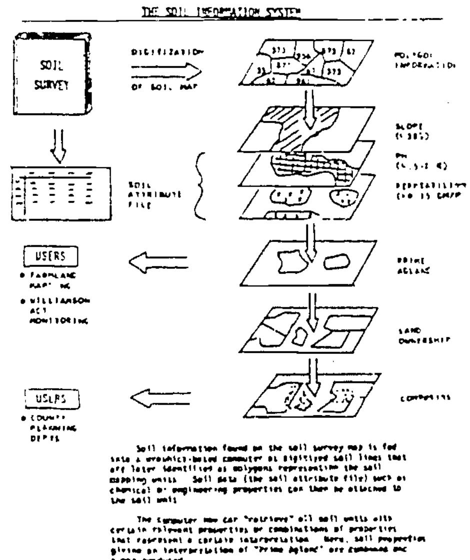
The maps, which are being prepared in cooperation with the U. S. Soil Conservation Service, will show farmland in five categories (prime, state-wide importance, unique, local importance, and commercial grazing land). The program is expected to be fully operational in July 1982. At that time, the public will have full access to the farmland data base [italics added]. Mapping will have been completed for more than 40 counties, incorporating nearly 95 percent of the irrigated crop land and 75 percent of private grazing lands in the state.

The State Soils Information Program involves production of an automated county soils map series. The maps will show soil productivity characteristics, land capability for various crops,

> erosion potential, soil salinity occurrences...Each factor will be cross filed in a soils data base on the local and statewide level. The maps and related materials will be distributed to local government and the private sector to demonstrate the value of readily accessible, computerized soils information. The program has the specific objective of providing a current, detailed map series for the state by 1985...A recent survey indicated that nearly 85 percent of California's counties will use the automated soil information and graphic products when they become available.
>
> The California Resources Information System has been designed as a comprehensive environmental data base for the state. The system is coordinated by the Department of Conservation...can be used as a general research tool, or for specific projects such as the Farmlands and Soils Information programs. The California Resources Information System has the following features:
>
> - Geographic data processing
> - Data base development
> - Use of the State's Environmental Date Catalog and the National Cartographic Information Center
> - Technical assistance for the public
>
> The system can integrate diverse types of data such as coastal zone bounderies and stands of timber throughout California.
>
> A key feature of both the Farmlands and Soils Information Programs is the use of the California Resources Information System computers which *link technical information with graphic production* [italics added]. Specific data such as the degree of soil permeability in a foothill area, or the amount of prime farmland in a valley can be entered in the computer files. The technical information forms an "attribute data base" which complements a "graphics data base" containing geographic coordinates...A diagram showing the computer steps for a hypothetical soils analysis is enclosed [see Figure 13 below].

It should be noted that a reply was received from the National Telecommunications and Information Administration (NTIA), which was prepared by Vincent Sardella, Program Manager, who noted the existence of several on-line projects—AGNET, TELPLAN, CMN, ANSER—and provided copies of the NTIA study entitled Issues in Information Policy and testimony on "Rural Telecommunications Issues and Developments" delivered by Bernard J. Wunder, Jr., the NTIA Assistant Secretary for Communications and Information, before the Subcommittee on Communications of the Senate Committee on Commerce, Science, and Transportation.

FIGURE 13



In addition to the above commentaries. the Subcommittee and staff personnel responsible for this priority area had a number of informal contacts with interested individuals in the public sector.

EXCERPTS FROM PRIVATE SECTOR RESPONSES, WITH SUMMARY COMMENTS

The factual and interpretive narratives sent by various groups in the private sector offered a useful spectrum of viewpoints and experience which would help the Subcommittee better understand the scope and nature of the topic under surveillance. One series of replies reflected the concerns and commitments of corporations involved in the preparation of equipment, software, and in some instances the computerized data files of special value to the agricultural community. Commentary from Telidon Videotex Systems, Inc. was forwarded by Robert

D. Burgener, Director for Special Projects, who enunciated the belief in his opening section that:

> No matter how much the technology is made to sizzle with promise, it will fall short of keeping those promises unless it deals with the substantive needs of the agri-business community.

He then alluded to testimony given by Henry Eschwege, Director of the Community and Economic Development Division at the U. S. General Accounting Office (GAO) before a subcommittee of the House Committee on Government Operations on July 24, 1980. While the system being referenced was not one designed to provide information to practicing farmers, the process involved in determining user requirements and acting to meet those is similar to those of immediate interest to the Subcommittee.

EXCERPTS

The subject was the Farmers Home Administration Unified Management Information System (UMIS) and the failure of that project.

"Farmer's Home had not conducted an adequate requirements study of agency information needs...(p. 5)

"There needs to be a study made of what requirements are so that you can decide what equipment and software you need. "What the Task Force (Department of Agriculture/FmHA) said was that they will do this, but will do it concurrently with implementing the system.

"We are saying that you need to do this sequentially. You first have to know what the requirements are. In the long run you might be wasting time and money if you start to implement the system before you know what the requirements are." (p. 10)

In presenting the historical overview we must also consider the events which may have appeared to be in tandem, but were in fact pulling in opposite directions.

I spoke today with a newspaper publisher in Tiffin, Ohio, Mr. Kaj Spencer. His newspaper (circulation 11,196) is currently delivered to a number of homes by telephone lines and displayed using a TRS-80 computer terminal. Since the bulk of his readers are farmers, he suggested the following categories of information which his paper would like to receive in a computer-based format:

1. USDA commodity market news
2. Weather
3. Research information on crop productions, diseases and prevention measures

He noted the first two items had a perishable news quality and any method which would speed their distribution would be welcome...[The editors] worked closely with the Seneca County Extension office to develop information from the local grain markets as well as those in Toledo and Findlay.

The fact that this relatively small newspaper has a videotex manager, when videotex is still a new technology that many larger papers are just beginning to encourage their data processing managers to take a look at, makes Tiffin, Ohio somewhat unique in today's market.

Our "information marketplace" is changing, perhaps not as fast as some of the new technology vendors would like, but the entire system of delivery, display and storage is evolving as new electronic-based methods take the place of more costly ones that consumed natural resources.

The final hurdle for technology is not in the laboratory, but rather in the consumer marketplace. Tractors didn't replace horses just because someone manufactured enough of them or hired the best salesmen to promote them. *No new tool can survive unless someone perceives a value in it for a task already at hand, or an opportunity which it can open that couldn't be reached before* [italics added].

In terms of perceived value and reliability, the farmer has had at least one source of information that has served a variety of purposes since about 1793. It contains several databases in a central location, can be random-accessed; is highly portable requiring an outside power source only during hours of darkness. The Old Farmer's Almanac is a good example of a successful information provider.

In focusing on the agricultural applications of these technologies [—teletext, videotex or cable—], it will be interesting and rewarding to look at how the various experimenters from AgNet and Green Thumb to Grassroots and the USDA's COMET electronic mail service have viewed the agri-business information consumer.

The communication to the Subcommittee from Texas Instruments, Inc. was prepared by Daniel H. Carter, Manager of Advanced Business Planning for Information Products with the Digital Systems Group, who asserted that "some considerable benefits to the agricultural and rural communities will accrue" as a result of Representative Brown's initiative. Continuing, he emphasized that the "issues involved in introducing and providing computer-based services into ...the agriculture community are many and complicated:"

EXCERPTS

It's increasingly obvious that the challenge is to provide an affordable problem solution through an effective confluence of the right technology, the right user, the right want/need, at the right time! The dilemma is not made any simpler by the rapid multi-directional technology advances, the volatile economic and social pressures, and the unstable copyright, regulatory and other legal issues.

In addressing the questions you've asked, I plan to respond ...in a brief outline format. [Selected examples of outline elements appear below.]

Question 1: Specific Needs - - :

A. Operations and Production Management
   1. Process controls
   3. Experiment/data analysis
   7. Access to technical programs
B. Financial Management
   1. Standard Accounting systems
   4. Profit and Loss programs
   6. "What-if" models/analysis
C. Community Interaction
   2. Access to information
   5. Community business interaction
   6. Marketing - buy/sell
D. Personal and Family concerns
   1. Education - training - job services
   2. Health - nutrition - homemaking
   7. Family and home logistics support

Question 2: Technology, device and process needs - - :

A. Accessing devices
   1. Textual based terminals
   2. Pictorial and graphics based terminals
   5. Personal computers
B. Local Processing Devices
   2. Intelligent terminals
   5. Small business systems
   6. Programmable calculators
C. Remote Processing Devices/services
   1. Main-frame hosts
   3. Co-op based computer systems
   5. Extension service systems
D. Network/Communication services, two-way
   1. Telephone linked
   2. Cable links - FM/AM/microwave/etc
   6. Two-way TV & SSTV

Question 3: The Role of Government Agencies - -:
The government/public agencies must take the leadership role in encouraging the private sector to develop programs and services designed specifically to respond to the wants/needs of the agriculture and rural communities. More specifically they should:

A. Sponsor broad-scope workshops involving Public and Private Sectors
    1. Establish wants/needs
    3. Organize action teams
    4. Set specific "go-dos" and dates!
B. Initiate Pilot programs/tests
    1. Community information and service units
    2. Agri-business "local" systems services
    3. Agri-business "remote" systems service
C. Increase availability of Public information
    1. Offer at cost to private sector
    2. Convert rural/agri information to electronic availability
    4. Assist small business information ventures
D. Develop national level imperatives
    1. Agriculture well-being is crucial
    2. Rural vs. urban services equality
    4. Agri-business productivity
E. Other
    1. Service standardization
    2. Creditability and critical-mass implications
    3. Legislative and legal support

Question 4: Major Trends and Forces - -:

A. Process control and automation
B. Computer based services
C. Electronic technology advances
D. Economy of scale
E. Productivity squeeze
F. Inflation and profit trends
G. Urbanization
H. Absentee farming
I. Home businesses
J. Other

Question 5: Issues of Concern:

A. Total system solutions
B. System management and maintenance
C. Diffusion rates/critical mass
D. Protocol and connectivity
E. Software compatibility
F. Will private sector support wants?
G. Will productivity improve?
H. Survival of rural communities
I. Other

...Regardless of the user's occupation, business or interests, a large percentage of the listed concerns, issues and wants apply directly. I've frequently described the "Information/Services Business" as a "large anomalous mass that defies simple understanding or description."

It is hoped that through the Congressional Research Service's workshop, an approach to the understanding of the agricultural sector needs will be realized, to the end that some meaningful efforts toward resolution and implementation will result. It s most obvious that the role of government in these early efforts will be that of a leader in bringing together those entities who can and will solve this agri-business and rural population dilemma [italics added].

The third corporate reply came from International Business Machines Corporation, under the authorship of Douglas P. LeGrande, a Division Director of the Industrial Sector in White Plains, New York.

EXCERPTS

[Question One] The agricultural sector is concerned with planning, operations, marketing, and accounting and record management functions which can be implemented through computer based technology. The farmer, as an entrepreneur, with ultimate economic responsibility for the success or failure of his enterprise, needs arrays of information and the ability to make consistently successful decisions on how and when to use the resources at his disposal.

Computers have been successfully used to "model" reality, giving the user answers to "what if" questions, enabling the investigation of alternatives and facilitating decisions which would be most profitable. Systems currently in use have captured the logic involved in deciding, for example, whether to buy or lease land, permitting a farmer to enter current data on costs and returns unique to his conditions. Mo t planning oriented agricultural applications are technologically and economically feasible for the individual farmer [italics added].

Agronomic operations...daily decisions or watering, fertilization, pest control, harvesting and storage require information ranging from simple table look-up, using on-site current measured values, to complicated infestation progress and control reports, all of which can be readily accessible, as required, on the farm [italics added]. In addition, electronic ordering of seed, fertilizer, insecticides...can be accomplished via computer link from farm to supplier providing immediate confirmation of quantities and deliveries.

Electronic marketing of agricultural commodities has already been accomplished. Producers' terminals are linked to potential buyers' terminals via a central or host computer system...all details of sales are conducted, including auctions and fixed price offerings.

Accounting and records management applications can assist in analyzing and reporting expenditures, crop and livestock yields, income and resource usage. Required reports as well as Federal and State tax preparations can also be handled. In addition, livestock and dairy herd breeding information can be maintained along with current measurements such as individual animal growth, feeding specifications and yields.

[Question Two] Devices and processes suited to agricultural operations can be related to the complexity of the problem requiring solution in terms of the quantity of data, the characteristics of the data (whether of global value to all farmers or unique to one farmer), the data manipulation needed to produce a desired result, the frequency of producing the same output, and the time in which the answer must be available to be useful.

The simplest system would be an "on-the-farm" home computer with user written or purchased pre-written application programs... the time and talent required to develop individual applications may limit the user to the availability of commercially offered program application code. IBM recently announced Farm Accounting and Dairy Management packages for this marketplace.

Higher level systems, using a home computer as a terminal to communicate with a larger, more powerful "host" computer, address the potential problems of: time or talent to develop specialized application code; large bases of globally useful data; and limited usage applications providing valuable decisions, but prohibitively expensive for one farmer. Shared systems such as AGNET...spread the cost of development and operation...The same computer which serves as a terminal in communicating with a host system also has the capability of functioning in stand-alone mode for local use.

A variation of the shared system uses remote terminals as communication devices to enter and display data with all processing capability located in the host computer. TELCOT, the cotton marketing system developed and operated by Plains Cotton Cooperative Association of Lubbock, Texas, is of this type.

[Question Three] As a major vendor to the successful AGNET and TELCOT systems, IBM's role is secondary in defining the relationships between the sponsoring/operating organizations and their users and government agencies, and we therefore defer response on this question to those who have already established working relationships.

[Question Four] The significant major trends in application of technology in agriculture are the costs of computing and the development of communications capability. The prices of currently available computers are already in the affordable and justifiable range for individual farmers. Communications technology ranging from a telephone call to satellite transmission is also available. In fact, IBM has already done a presentation for the agricultural community on "Computer Networking" using our own worldwide computer network as a model to discuss design considerations, operational capabilities, and control techniques.

The key factors in the application of technology are the education of the potential users and the development and accessibility of application programs.

14-795 0 - 83 - 10

The potential user needs to know what computers can and cannot do and how to identify the potential benefits as well as the costs involved [italics added]. He needs to be able to assess the capabilities and limitations of a decision to use a computer, particularly in regard to communication possibilities.
[Question Five] Our greatest issue of concern is the efficient deployment of existent and emergent technology, providing the greatest benefits to as many users as possible.

The final submission from industry was that sent by Peter V. Murphy, Director of Dynamac Corporation, who informed the Subcommittee that his company "has gained its perspective in your area of interest during a multiyear contract with the USDA" which called for:

> ...development of a market research approach to improve information and education services provided by USDA. In developing the market research approach, we examined the effects on business and consumer decisionmaking of computer-based information systems and other channels of information.

The Murphy commentary often is couched in terms of his corporation's "Market Research Approach to Information Services (MRAIS)," an outgrowth of a model that shows "how information services affect the adoption and diffusion of agricultural innovations."

EXCERPTS

[Question One] The use of computer-based information systems for irrigation management, livestock monitoring, feed ration, and gestation management and accounting is well documented in other sources. Our efforts have examined this question in two contexts: (1) how are computer-based information systems...used by people in the agricultural sector to make better decisions about the problems they are faced with; and (2) how can a computer-based marketing approach be used to help develop more responsive information and technical assistance programs.
In the first context...technologies are used to draw upon centralized information banks to help solve problems that require rapid decisions as well as to employ highly distributed data processing (like home computers) to solve local site specific problems. Examples of the former are centralized information banks, linked to the user by telecommunications, that provide information on commodity prices or weather. Examples of the latter are home minicomputers with specialized software to solve pest management or irrigation scheduling problems.

<u>Linkages between centralized information banks and distributed data processing are needed</u> [italics added]. For example, to make the most efficient use of limited water resources a user should be able to access information on weather conditions and then be able to process this information in a distributed mode to consider local factors such as soil, crop type, slope, and antecedent moisture to solve his own site specific problems...the centralized information must be available and the user must know of its existence. Further, it means that <u>the development of specialized software in agriculture must keep pace with the proliferation of hardware</u> [italics added].

In the second context, we took a look at how the USDA Extension Service and other agricultural change agents provide information services...we developed a model that shows how information services affect the adoption and diffusion of agricultural innovations...For any given combination of local circumstances, the MRAIS [model] can help to assess innovations in terms of their likelihood for widespread adoption and diffusion.

[Question Two]...our comments on this topic are restricted to MRAIS applications. As mentioned in the first comment, MRAIS must be accessible to change agents at the local level, such as Extension agents, experiment stations, and land-grant university programs. This would mean a primary user population of three to four thousand. To achieve this level of service, two things must happen...[1] the MRAIS software must be improved so that a large number of noncomputer professionals can operate the system... [2] The user population must have access to computer terminals that are compatible with the mainframe computer that houses MRAIS in Washington. It is doubtful whether MRAIS alone can support the use of local based computer terminals.

[Question Three] The role of the Department of Agriculture, either through its Extension Service or some other departmental agency, will be to implement MRAIS or a system similar to it. Specifically this means making further improvements in research methodologies and software, informing the user population of MRAIS availability, and training them in its use.

The role of Congress should be to provide for additional research on information services and the way they relate to the adoption and diffusion of innovations. In 1978 Congress provided the initial mandate for USDA to develop MRAIS. With the delivery of a prototype of MRAIS in September of this year, Congress should provide for the continuance of this work.

The role of other Federal agencies should be to support the compilation of data in MRAIS for the subject areas that they are interested in [;]...U.S. Army Corps of Engineers, U. S. Geological Survey, U. S. Fish and Wildlife Service, U. S. Environmental Protection Agency and U. S. Agency for International Development.

[Question Four] An important trend in the agricultural sector which argues for decentralized availability of MRAIS is the growth of the home computer industry...this trend will accelerate with further reduction in hardware costs.

[Question Five] The principal issue...is the quality and timeliness of information provided, not only by MRAIS, but by other centralized data bases as well. The computer medium has the capability to meet tomorrow's information needs but can only succeed if it supports accurate and up-to-date information.

Among the organizations which represent and serve the farming community—variously called unions, coalitions, cooperatives, granges, etc.— were a number which chose to answer the questions set forth in Chairman Brown's letter. The response from the Rocky Mountain Farmers Union, with a membership of 11,000 family farmers and ranchers, was prepared by John Stencel, its president. He observed, in opening, that agriculture "now needs a very rapid and timely information system" to cope with the changing marketplace and reflect developments in new technology and research.

EXCERPTS

We have been following several programs very closely. One is the Green Thumb program...it is the kind of system that all Cooperative Extension Service programs should provide for farmers and ranchers in every state.

We also have been following the Agnet program which is somewhat more sophisticated in the area of marketing data. It has been highly useful to hay growers in our area in providing names of buyers and sellers.

As more marketing associations or marketing cooperatives are developed on a commodity-by-commodity basis, electronic marketing will become more prevalent. It is my hope that any electronic marketing system will be owned by farmers and ranchers and not the processing, wholesaling, or retailing firms that move the products presently.

We would like to see more electronic marketing associations developed like Tel-Cot, a fully integrated system that allows a producer to get the best price for his commodity...can be applied to most any commodity and the Texas A & M project with feeder cattle is a prime example.

The Congress and the USDA can provide more money for developing prototype electronic marketing systems and assisting cooperative marketing associations that are electronically oriented. Informational systems that are provided through the Cooperative Extension Service should be funded in partnership by the federal and state governments. This is a great opportunity for the Extension Service to build upon the well known service and educational information programs that it has provided in the past. It might even provide for the survival of the Extension Service.

...it would be encumbent upon Congress to pass the National Marketing and Bargaining Act [H. R. 4975] to allow producers to join together on a commodity-by-commodity basis.

I do want to make certain that farmers and ranchers be in control of any system that will be put together in the future and therefore the Farmer Cooperative Service of the USDA be highly utilized in developing these programs.

My primary concern in the application of these technologies in agriculture is that the producer does not end up getting the short end of the stick, and that computer technology is used against him. Producers need to be able to use computers to make the best possible marketing decisions based upon all available information.

Another group which replied to the Subcommittee communication was the National Family Farm Coalition. After expressing "the realization that computer-based systems are already on the scene and will be used more widely in the future, Joe Belden of the NFFC Washington, D. C. office identified several concerns and questions:

EXCERPTS

o Who will control the available information?
o Will information technology be an input which only relatively affluent farmers can afford? Could this enhance their already growing economic dominance?
o What information will be available? For example, will it be more difficult to secure access to alternative technologies and production systems?
o Is it possible that farmers could become highly dependent on information technology?
o Will some firms in the inputs or marketing industries make information technology available to farmers in order to secure larger market shares?
o In an era of fiscal austerity, what role for government, particularly for the Extension Service, will be possible?

The role of Extension could be crucial...In the past research and extension have often most benefited the larger, more aggressive farm operators who come forward seeking sophisticated assistance. These successful business people--aware of technological advanced and eager to adopt new innovations--may be much quicker than small farm operators to adopt computers and use them successfully. Thus, if Extension moves further into

> the computer systems area, care should be taken to ensure that information and assistance are available for small-scale farmers. Such farmers must be specifically sought and aided, and services must be specifically designed for them [italics added]. It is not enough to say that research and extension are size-neutral or available.

A brief answer to the Subcommittee letter was submitted by James Miller, Assistant Legislative Director for the National Grange. Pointing out that this organization "represents family farmers which are on the smaller end of the scale," he proceeded by saying that:

> Information on computer application for small scale and moderate size farming is needed. Particularly, we are interested in how dairy and other livestock operations could benefit by this technology.
>
> The size of investment will be a major factor in how easily small scale farming can adapt to the technology. Emphasis on the cost aspects, including tax advantages, would be appreciated.

The response from the Winrock International Livestock Research and Training Center in Morrilton, Arkansas, was prepared by R. O. Wheeler, the president of the organization. Acknowledging that the "growth in use of computers...since the late 1950's in areas related to agriculture has indeed been astounding," his commentary concentrated on the equipment and its applications utilized by Winrock International:

EXCERPTS

> Our activities employ the following types of computers:
> - o Large mainframe computers, such as the CDC CYBER system, which we access through the CDC PLATO terminal and the TI Silent 700.
> - o Minicomputer. Winrock owns a PDP 1170, which serves most of our institutional computing needs.
> - o Microcomputers, such as Apple II, TRS, and MicroPlato, which we use for special field applications.
> - o Small programmable calculators, which are primarily used by our field scientists in developing countries.
>
> These computers are employed in a variety of applications pertaining to agriculture, including:
> - o Computer-Aided Instruction. Using Control Data's PLATO

terminal, Winrock has developed two individualized training programs for use by farmers...sheep production and... dairy goat production.

- o Analysis of Research Data. Winrock employes a PDP 1170 minicomputer to perform statistical and economic analyses of farming systems data from both developing countries and the U. S. Other applications include economic and mathematical modeling of agricultural systems.
- o Data Bases. Utilizing both the mainframe and the minicomputer, Winrock is currently developing several data bases ...[which] contain units of technical information that can be accessed by users via a portable terminal with printout capabilities. Subject areas include:
  - Sheep production, dairy goat production, and meat goat production. Primarily intended for the benefit of producers, these data bases will contain thousands of units of practical information on every aspect of production.
  - Technical assistance on animal production. Data on worldwide animal production will be available to animal scientists who receive requests for technical information from private voluntary organizations such as CARE, Catholic Relief Services, etc. Winrock's information retrieval service will be continuously updated.
  - International bibliography of goat literature. This online bibliography contains nearly 3,000 entries, indexed by topic and region, to facilitate literature searches requested by research or field scientists.
- o Demographic Mapping. Based on the most recent U. S. Farm Census data, the PDP 1170 is being used to produce detailed maps of agricultural enterprises in the southeastern United States. These production units can be mapped by location, size, and type of production.
- o Recordkeeping...At present, Winrock is using the Apple II microcomputer to keep track of farm financial data for a cooperative of small swine producers in Arkansas. The PDP 1170 is being used to store production information from the Petit Jean Goat Dairy on stock inventory, body weights, milk production and composition, breeding, and kidding.
- o Marketing. An electronic telemarketing system utilizing a mainframe computer and printer unit (TI 700) will be used by local sheep producers to market their products to buyers across the U. S. and Canada.

Two Cooperative Extension Services elected to send comments in reply to the Subcommittee letter of inquiry: University of Maryland and Virginia Polytechnical Institute and State University. In relating the views of the former institution, C. S. Cliver, Director of the Cooperative Extension Service at College Park, Maryland reflected accurately that "computer needs and usage in American agriculture are increasing at a rapid pace with the development of new and low cost computer hardware." He then identified three types of problems facing the Cooperative Extension Services throughout the country as they strive to adapt computer systems to their offerings and the needs of their clientele:

EXCERPTS

> (1) availability of funds to purchase appropriate hardware;
> (2) ability to network through other computer systems that have software packages suitable for use in a given state; and
> (3) maintaining interest and technical competence in the development of computer hardware packages among faculty when (1) and (2) above seem to be such difficult problems to resolve.
>
> It is ironical that ten to twenty years ago universities were leaders and innovators in the computer technology field. Today, we are an equal number of years behind in our ability to utilize computers as management and technology transfer tools. One of our problems, in addition to funding, is *the feeling that hardware purchased must last a lifetime and must be fully adaptable to interact with all systems across the country. Obviously, this is an impossibility* [italics added].
>
> Let me state that my greatest concern is that most of us are still standing at the gate after the race has already begun. Agricultural production and marketing is an increasingly complex and interrelated system. To assist either the small or the large farmer with their current problems, *interactive computer capabilities are as essential to the specialist or agent as is the typewriter to the secretary* [italics added].
>
> USDA could be of enormous help to the states if they could assist in the development of a national computer clearing house. ...There would have to be a separate system for each agency—ASCS, SCS, CRS, etc. Via the system proposed, I would hope there would be a computer at the national level that could be accessed by the states and could lead to networking between the states. Obviously, funding for such a system presents a problem, but unless we cast a direction we will continue to fall further behind.

Two responses were received by Representative Brown from Virginia Polytechnic Institute and State University in Blacksburg, Virginia. The first came from Dr. Mitchell R. Geasler, Interim Dean of the Virginia Cooperative Extension Service:

EXCERPTS

[Question One]...some segments of agriculture have been using computers since the 1960's. Livestock ration formulation, whole farm planning, cash-flow analysis, investment analysis, recordkeeping and many other functions have become everyday tasks for many farmers. These programs have been offered to farmers by Extension Services, private consultants, farmer owned assocations and others.

Personal computers have the potential to move the process away from large computers and into the farm office. A number of farmers now own personal computers but a central general-access, nationwide computer is needed to serve as a library and clearing house [italics added]. Programs for personal computers as well as information libraries such as the U.S.D.A. crop and livestock reports, market reports, U.S.D.A. supervised programs and other universal information could be distributed through such a central system.

Electronic computer-based livestock auctions have been proven to be highly successful at much lower cost and more convenient than traditional on-site auctions.

[Question Two]. Improved personal computers with greater reliability and accuracy are needed to replace the poorly designed units introduced initially. These computers need systems capacity to handle the variety of management and analysis programs applicable to the farm. An easy to use access capability is needed for personal computers to communicate with large computers to retrieve shared information and to submit data to computer programs too large for running in-house on personal computers.

Computer directed servicing and control devices that measure and distribute feed to livestock, measure milk production by cow and store the results, control temperature and humidity in storage devices and livestock housing, detect and alert farmers to potential livestock ailments before symptoms are noticeable to farmers (animals going off-feed, for example), measuring contents and conditions of products in storage facilities and similar technologies need to be improved or developed.

[Question Three]. Federal and local governmental agencies, especially state extension services, have a specific role to play in the computer era. An objective evaluation and analysis can be obtained only from an agency not directly involved or having a vested interest in a product [italics added]. Salesmen often do not understand production agriculture and lead farmers to expect performance from their equipment that is not realistic. This is especially true during this initial phase of using personal computers on farms. It will become less important as farmers are educated and gain experience so they can question salesmen on relevant qualities and capabilities of personal computers.

U.S.D.A. can provide information useful to farmers nationwide. Such information placed on a central computer for access by all

ERIC Full Text Provided by ERIC

states can make the information available immediately while it is still useful. U.S.D.A. is now using several computers in a somewhat disorganized fashion which complicates ease of access and use. An example of U.S.D.A. information is the COIN system which is also on the Virginia Tech Computerized Management Network [CMN] servicing 45 states.

Congressional support is needed for funding high-risk projects and introductory costs for any national system [italics added]... implemented through U.S.D.A. and state extension services.

[Question Four] Personal computers are being purchased in increasing numbers by farmers. Reasons cited are to keep more accurate financial records, be able to retrieve management information, provide for more detailed analysis of proposed investments, cash-flow, loans and other financial and physical information.

Marketing strategies can be analyzed easily and rapidly. Breeding may be improved by better genetic matings. Pest control may be simplified by better aggregation and analysis of weather data, insect populations, natural predators, and the like which have the potential of greatly reducing chemical applications.

Farmers will be using information banks and computer programs too large for personal computers. Thus, a combination of small computers interfacing into a central easy-access computer will become quite important. Much developmental work remains to be done before easy-to-use interfaces are operational.

[Question Five] One area of concern appears to be the trend towards blind acceptance of computer output as being correct. Computer programs are only as good as the accuracy and completeness of programs and the use of valid input data...A massive educational program is needed to teach new and potential users how to evaluate and interpret computer output [italics added].

A second concern is the qualification of programmers to produce good computer programs. A necessary and sufficient condition for good programs is the combination of subject matter and computer trained people working jointly to ensure subject matter validity combined with reasonably efficient utilization of the computer. Few people are qualified in both areas but this has not hindered one group from assuming input from the other group is unnecessary for good results. Neither group is capable of producing quality educational programs and useful computer programs alone.

A third concern is the attempt to down-size computer programs designed for large computers to run on personal computers. Quite often critical variables are omitted to conserve space so the program will run on a personal computer. Less than desirable results are obtained.

Dr. M. C. Harding, Sr., Administrator of the 1890 Extension Program at Virginia Polytechnic Institute and State University, submitted a separate series of comments, which were prefaced by the opinion that "Information and communication are becoming the core commodities of our post-industrial society," and further that "the influx of computer-based technology is impacting on all branches of science, all fields of knowledge, all sectors of business and government."

EXCERPTS

> Despite the apparent need for, wave of optimism about, potential for, and expected speed of adoption of this technology, it has not materialized. There has been growing criticism in recent years that county extension agents have not been able to stay abreast of the latest information in many subject matter areas. As a result, commercial farmers have increasingly by-passed county offices and sought assistance directly from state specialists or other sources...Probably the first and greatest need existing relative to this new technology has to do with the dearth of knowledge...about the hardware and its operation, the software and its use.
>
> Currently there are several systems (hardware and software combinations) that are being used by several states throughout the country. Examples of these include CMN...Telplan...FACTS ...and AGNET. Additionally, USDA has made use of computer systems to share information with the several states through COIN ...NARS...Electronic Mail...and a host of relevant data bases. Beyond this, systems have been designed to replace traditional methods of information transfer such as teaching, meetings, conferences, etc.
>
> Computer technology can not only enhance the problem solving capability, but has enormous potential as an instrument of storage and transfer of information, all so vital to the agricultural industry.
>
> A theme underlying a recent conference at Purdue University was that micro-computer technology is the fastest changing technology that farmers have encountered in years. The typical family farm operation will find it difficult to make successful use of this technology alone. Thus, for farmers as well as for agricultural professionals, someone needs to assume the leadership role(s) to harness and make practical application of the computing explosion [italics added]. Congress can set the tone by assessing the current situation to determine what programs, policies, guidelines, legislation...are needed. Agencies of government need to be identified which can give leadership to the various components of systems implementation. Extension should gear up to perform its usual role of helping to make a down-to-earth, unbiased evaluation of the relevant aspects of this new technology's use. For example, computer dealers do

ERIC

not understand farmers' needs and farmers do not understand computer jargon, thus the need for education and the role for Extension. Suffice it to say all levels of government need to collaborate on the monetary resources required to effectuate a practical and beneficial application of this technology.

There are an estimated 60 or more kinds of micro-computers and all have come along in the last five to eight years... Several brands of computers may have some advantages cost-wise, but they pose other problems for the customers, especially farmers. It is estimated that the number of farmers using computers in the next five years will range between five and fifteen percent of commercial farms. If these projected trends materialize, then it is quite obvious that _management strategies are needed to give guidance to this technological innovation_ [italics added].

Some general concerns related to computer technology in the industry of agriculture are expressed in the questions that follow:

1. What is the proper role for and responsibility of political, social, and economic institutions to the consumers (farmers and the public-at-large)?
2. Who should make decisions and formulate policy with reference to the cost effective applications of computer technology in the industry of agriculture?
3. Should computer technology be categorized as either a private or public resource or some combination thereof?

Through these thoughtful commentaries, the Subcommittee was aided significantly in its understanding of an often complex area and its groundwork in preparing the ensuing hearings and workshop.

VI. HIGHLIGHTS AND COMMENTARY: HEARING ON APPLICATIONS OF COMPUTER-BASED INFORMATION SYSTEMS AND SERVICES IN AGRICULTURE, MAY 1982

The initial hearing, during the 97th Congress, on "Applications of Computer-based Information Systems and Services in Agriculture" was convened on May 19, 1982 under the auspices of the Subcommittee on Department Operations, Research and Foreign Agriculture of the House Committee on Agriculture. The two days of sessions, combined with a "technical workshop," were held in Washington, D. C., and were presided over by the Subcommittee Chairman, Representative George E. Brown, Jr. In a statement prepared prior to the opening day, Chairman Brown identified three specific objectives of this milestone series of sessions:

1. Identify and discuss policy and program questions regarding this key area, and obtain realistic recommendations for possible congressional (and other) initiatives.
2. Increase public awareness of the potential benefits of advanced information resources and services—especially those utilizing computers and telecommunications--for individuals and groups in our nation involved in agriculture.
3. Provide an opportunity for Members of Congress, their staffs, and activists in the public and private sectors to exchange ideas and become aware of "pilot" projects and operational programs affecting the farming and ranching communities, with an emphasis on those drawing upon the unique capabilities offered by information technology.

In attendance during the first session, at the invitation of the Subcommittee, was a delegation of Candadian parliamentarians representing both houses and all parties. Following an introduction of these guests by Senator Lorne Bonnell, the delegation spokesman, Representative Brown stated his pleasure at their presence and noted the on-going practice of reciprocal visits between the two legislatures.

In his opening remarks regarding the scope and nature of the hearing, Chairman Brown remarked that the Committee was looking forward to "the guidance that we will receive from our distinguished witnesses and participants in this complex area." He went on to point out that "information and communications technologies are entering the agricultural sector at a dizzying rate," and that the Kellogg Foundation has estimated that by 1990, "three-quarters of the commercial farms and 90 percent of the county extension offices in this country will be equipped with computers or intelligent terminals." While acknowledging that these technologies hold "great promise," the Chairman suggested that "this promise can only be realized if we do an adequate job of planning in the early stages."

> These technologies offer the potential for replacing resources with information, as these technologies can help save unnecessary application of water, chemicals, labor and other inputs to agriculture.

In illustrating this approach, he cited the problems involved in integrated pest management, saying that "The better we understand the pests, the more information we have about their incidents and controls, the easier and more economical it is to manage these. The advantages of these technologies are several:

- o Many farm management functions will be made easier.
- o Accurate market information can be delivered in a more timely manner.
- o Information delivery functions at the cooperative extension service can be made more efficient and less costly.
- o Electronic auction systems can expand marketing opportunities.

Turning to the role of the Department of Agriculture and "our fine agricultural research institutions," Representative Brown underscored the importance of utilizing the "vast stores" of information being collected, and making it "compatible with computer-driven systems." Three questions were articulated which centered on the numerous hardware and software options available to the farmer:

1. Who is to help the farmer decide which system is right for his needs?
2. Who will insure the compatibility of the systems being set up by the various levels of government, the land grant institutions and the private sector?
3. Where is the line between government involvement and private sector involvement?

Concurrent with "clarifying the realistic promise that these technologies hold," Chairman Brown noted, is the need "to begin identifying potential problem areas and ways that we in government and in the private sector can work together to avoid them." He then outlined the schedule for the workshop groups, which would be focusing on six broad issue areas and reminded hearing attendees that a few information systems —from the Department of Agriculture, the University of Maryland, and the University of Nebraska—would be on display later in the hearing room.

The first witness of the day was Raymond D. Lett, Executive Assistant to the Secretary of the U. S. Department of Agriculture, whose role was described by Representative Brown as placing him "at the center of the policymaking in the area of information systems for the agricultural community." Mr. Lett was accompanied by Ernie Matthias, Staff Chief for USDA Information Resource Management. Early in his testimony, Mr. Lett noted the value of these congressional sessions, which would serve as a "valuable forum for exchanging information and technology which, in turn, will help us in modeling the Department's services to better meet the needs of rural America." But rent conditions in this country pose a problem:

> In this period when profit margins in agriculture are suffering, and budget austerity is essential, it is sometimes difficult to convince people that space-age electronics are cost-effective and essential.

The witness next brought to the Subcommittee some "significant guideposts" that reflected the Department of Agriculture's progress in utilizing electronic technology, but first offered this preamble:

> American agriculture always has been the vy of the world for its basic research and practical application of new production and marketing techniques. A major ingredient in making this system work has been the collection and sharing of information among government and academic sources, private businesses and individual citizens.
> However, this produces mountains of paperwork. When multiplied to include all government-wide paperwork systems, these information networks become extremely costly in the eyes of congressional bodies that are called upon to appropriate funds for storage and retrieval.

The concern of the Congress about this proliferation of information led, Mr. Lett noted, to the passage of the Paperwork Reduction Act of 1980 (P. L. 96-511). This measure helped provide the impetus within USDA for efforts which would "capitalize upon the use of computer-based systems for collecting, storing, sharing and delivering information." A reassessment of the Department's "motives" and "measures" for collecting and disseminating information to rural America revealed "a multitude of data collection and dissemination networks " which often lacked"compatibility with each other."

Several facets of this discovered incompatibility were identified:

- ...it makes it difficult—and sometimes downright impossible—for one arm of the Department to electronically share its information with another arm for policy-making purposes.
- ...also leads to costlier investment in hardware.
- ...makes it difficult for non-Department users of our data to efficiently tap into our respective systems for maximum use of all available information.
- ...[illegible]n means that data which the Department has spent tax dollars to gather and store cannot be retrieved in a form that is readily useable by the public for whom it was intended.

Mr. Lett stated that the goal of USDA in implementing the Paperwork Reduction Act was being viewed as three-fold:

1. to ensure that funds for computer systems are spent as economically as possible;
2. that internal data collection by respective agencies can be linked together for maximum effectiveness; and
3. that data collected worldwide will be readily available and accessible within the Executive Branch, to the Congress, to universities and other institutions, to private organizations and businesses, including those maintaining private computer information services, and to individual farmers.

He then stressed that "<u>we do not foresee USDA becoming the sole source of computer-based information for rural America</u>," but rather "primarily that of a fact-gathering one. We are still considering the extent to which USDA should function as a disseminator of data." In amplification of this latter point:

> We firmly believe that these other public and private computer services can and should continue to serve the kinds of functions they presently fulfill, as well as whatever additional role they can perform for the benefit of their constituencies.
>
> The Department does not seek to compete against these other services. Rather, we feel strongly that we can and should augment their collection and dissemination efforts.

14-795 0 - 83 - 11

At this juncture, Mr. Lett presented commentary on several USDA-sponsored information systems; additional information on these is contained in Chapter IV.

AGNET is an electronic network operated by the University of Nebraska which provides information collected by the Foreign Agricultural Service to a wide range of subscribers mostly located in the Midwest and Northwest but encompassing users in 40 States. Subscribers include farmers and ranchers, farm managers, agricultural lenders and bankers, consulting firms, and exporters of agricultural commodities. User reaction has been very favorable, resulting in the addition daily of trade leads from Agricultural Attaches (as obtained from foreign importers). Such timely information, added at the rate of 60 "leads" per week, means expanded export sales for rural America. (See Appendix 6)

Another recently introduced FAS service is a "minicomputer-telecommunications hookup" in cooperation with the U. S. Department of State which will link the 67 Agricultural Attaches and Counselors abroad with headquarters in Washington. Satellite data on worldwide crop production, along with marketing statistics, will be available to headquarters analysts. In parallel, U. S. overseas representatives will be provided data on domestic crop production and marketing developments.

The "wire market news network" offered on a lease basis by the Agricultural Marketing Service to individuals and firms was upgraded two years ago and now transmits vital information at 1,200 words per minute over 14,500 miles of leased wire between 140 terminals. Typically, 700 to 900 different reports are sent daily, each an average of 30 times. Transmission of these reports occurs between market news offices, for "consolidation and dissemination to the news media and other major users or disseminators." The witness noted that the next generation of market news communication equipment "might well be high-speed computers," which would permit users to "selectively receive prices and market data on any of the more than 150-plus commodities now carried via their own home computer terminals."

A series of experimental projects, in conjunction with several States, was funded by AMS to test the electronic marketing of lambs, hogs, feeder cattle, eggs, and wholesale meat. These endeavors met with mixed success, due to insufficient volumes being generated to permanently sustain such operations.

The Office of Governmental and Public Affairs ,through a private contractor, disseminates news releases, reports, and other information to a variety of recipients including news media, State departments of agriculture, and extension services. In many cases, this information is in turn distributed through computer-supported systems such as:

- University of Nebraska's AGNET
- Michigan State University's TELPLAN
- Purdue University's FACTS
- Virginia Polytechnic Institute and State University's CMN
- University of Kentucky's ANSER

Each of these systems was developed with support from the Federal Extension Service (FES).

The Computerized Outlook Information Network (COIN) was initiated in 1974 by the FES to disseminate copies of various statistical and economic reports, which are also available to all State Extension Services through the CMN system. It should be noted that some States send these reports to their county offices, which in turn make them available to the citizenry.

The "Green Thumb" videotex project of the FES, a test conducted on 200 farms in Todd and Shelby Counties in Kentucky, is now being followed by a "second generation" test of the concept in two other States. A detailed discussion of the "Green Thumb" project appears in Appendix 8.

An older service, called the Current Research Information System (CRIS), went "on-line" in 1969 and provides access to the details of activities with the USDA research agencies, 58 State agricultural experiment stations, 15 schools of forestry, 30 schools of veterinary medicine, 16 (1890 vintage) land-grant colleges, and the Tuskegee Institute. This system encompasses about 95 percent of the Nation's publicly supported agricultural research.

Here, Mr. Lett cited the critical need for a "clearinghouse of information on computers services and software programs available to rural America." He reported to the Subcommittee that the USDA Science and Education staff is developing a "catalog" plus an "on-line retrieval service" to fulfill the need for such information on the part of agricultural scientists, Extension specialists, and other researchers and educators.

The witness' final reference to a specific USDA-developed program was the Federal Assistance Programs Retrieval System (FAPRS), now under the aegis of the Office of Management and Budget. It was originally designed, he said, "to aid small, rural communities that were unfamiliar with Federal assistance programs or were unable to identify those with the greatest funding potential." Accessible on-line in 44 States, FAPRS has proven useful in assisting small communities such as the town of Adelanto, California, which was provided information relevant to financing a new water system, community center, and an addition to its public library. (See Appendix 10)

After mentioning that USDA increasingly is using word processing equipment and "eletronic mail" systems, with some of the latter accessible to non-government subscribers, Mr. Lett turned his attention to the problem of coping with the volumes of reports and other papers which have been printed and distributed free to millions of Americans. "As costs have risen, we and the users have begun to question the need to continue this practice." In addition, requirements for timely information—available through the use of high-speed communications technology—is causing a demand for replacement of mail-oriented delivery systems.

The new era of computers has forced the USDA to reexamine other concepts, as reflected in these three key questions:

1. To what extent should we charge users for the information they receive?
2. Should the USDA build the electronic data base, and leave private industry to do the dissemination?
3. At what point in the overall system should the Department provide private individuals access to its computers, versus disseminating data to private systems that supply paid subscribers?

In closing, Mr. Lett sketched his scenario for future farm use of information resources and services:

> ...the day is not far off when the American farmer, upon getting up in the morning, will flip the switch on his home computer terminal instead of turning on the radio.

> As he keys in the appropriate access codes, his monitoring screen will produce an up-to-date analysis for his type of farm for that day, including weather and growing conditions in major worldwide production areas; pertinent data on prices, market conditions, credit and related forecasts; production factors in his own operation; and finally, a prioritized list of the things he should do that day to take advantage of the day's options. It might even include a reminder of the list of things his wife wants him to buy in town, should his agenda call for him to make the trip that day.

The "electronic gadgetry" exists to do such things, the witness observed, but presently missing are:

- o ...the software to implement such a system,
- o ...the data collection networks to gather the analytical base,
- o ...the financial resources to put everything together, and
- o ...the human resources to make it work perfectly.

After complimenting Mr. Lett for having provided "an excellent road map of what the Department is doing in some of the policy issues that are at work here," Chairman Brown noted that there was a commonality of certain information-related issues across the departments of the Federal Government:

> So, in a sense, you are least participating, if not leading, in an effort to bring about a coherent management system for the whole world of Government data. I think we need to keep in mind the importance of coordinating this policy development as it comes about, and I am sure the Department of Agriculture will be playing a leading role in doing that.

At the invitation of the Chairman, members of the Canadian parliamentary delegation then offered comments or tendered questions. First was Laverne Lewycky, the Member of Parliament for Daupin, who asked:

> ...if you have done any cost analyses or any ballpark figures of...what the difference would mean if you were able to switch more of your paper dissemination onto computers and how practical it is even at this stage, at this state of the art.

ERIC

In response, Mr. Lett iterated the thrust of the Paperwork Reduction Act of 1980, which was to "look at all of the burden requirements that we were laying on the public," reduce them, and within the Federal Government to review the "burden of paper that we are now collecting as it accumulates data both within and from without." He went on to say that it is the policy of the Reagan Administration to discontinue "providing free information to the public via the print media." While not having any precise figures, in answer to the question posed, Mr. Lett estimated that it would be "in the millions of dollars," and furthermore that "We are moving into this whole new era of charging for information."

The next comment came from Charles Mayer, the M. P. from Manitoba, who after commending USDA as "probably one of the best information gathering organizations in the world," told of the TELIDON system (see Appendix 14). Describing it as "a market information gathering service and disseminating service that puts terminals in farmers' homes," Mr. Mayer said that in some areas of Manitoba farms are not serviced by the single telephone lines necessary to furnish computerized system support. He also noted that the capacity to gather information is far greater than that for utilizing it, especially highly detailed data which may have no discernible value for the individual farmer. Finally, he told of systems for scanning animal (hog or beef) carcasses--apparently similar to Genetic Profiles, Inc. in the United States--and assembling essential marketing data on animals at a remote location, thereby offering buyers a form of electronic visualization.

Representative Brown, at this point, chose to comment further on the Paperwork Reduction Act, stressing that:

> ...a large part of the purpose of that Act was to reduce the burden upon the information supplying public by rationalizing the collection system, making sure that it was not duplicative, that only essential information was asked and it was only asked once instead of several times.

The result: economies to the Government and to the public. Appendix 11 features summary information on Public Law 96-511 (Paperwork Reduction Act of 1980).

The Subcommittee was told by Mr. Lett that USDA had been "given the challenge to reduce [the paperwork]...burden by 15 percent the first year and ten percent the succeeding years." One focal point has been checking possible duplicative collection of information by more than one agency. Chairman Brown, in broadening the context of the discussion, observed that "in democratic countries, we face the growing problem of resistance to the pervasive hand of government," and that

> ...we may face major changes in policy initiated by public outrage unless we are able to reduce this unnecessary impact upon the public and provide for the essential information needs of the country with minimum intervention in the private lives of citizens.

It has been the hope of Congress, he said, that computer-based systems can reduce "the pervasiveness of Government intervention," and dispel many persons' fears to the contrary.

Mr. Lett next related an on-going test in the Agricultural Stabilization and Conservation Service (ASCS) involving minicomputers which allows farmers to "reconstitute" their property in a real-time framework, thus providing ready answers which once would have taken many days.

Another aspect of information support for agriculture was raised by Gary Gurbin, M. P. from Ontario, who concentrated on systems which contain management-type data. Mentioned in passing by him were such Canadian information activities as STATSCAN, the Department of Regional Economic Expansion system that is somewhat comparable, and endeavors undertaken by Agriculture Canada. In response, Mr. Lett reminded his listeners that the USDA statistical reporting service:

> ...has, for years, communicated with these farmers gathering the information on crop reports, planting intentions and all these kinds of things directly, both by the mail, through direct contact, and also through studies that they make.

Although unaware of any electronic information handling in this area, Mr. Lett noted that "there might be some hesitancy on the part of the individual farmers as to what they are willing to share." Among the sensitive data would be those on yields and income. Mr. Gurbin then spoke of the experimental CANFARM system which is trying to help individual farmers make use of minicomputer systems, not only for financial management and assessment purposes, but also for monitoring productivity.

A subsequent topic, introduced by the M. P. from Prince Edward Island, Mel Gass, dealt with the farmers' attitude toward computers and having consoles on their own farms, including the cost of tying in to networks. Mr. Lett offered the opinion that farmers are "very enthusiastic" about using electronic media, and pointed out that the Farm Bureau and various universities' extension services have done much to orient and educate the farming community about the potential of computer-based services. He put it this way:

> I think they recognize, just as they chang' farm equipment, that this tool will probably revolutionize agriculture more than any other tool that has come along in the last, say, 20 years, and they do not want to be left behind and not have it there in their management strategies.

The younger generation of farmers in many instances has used computers in college, in various applications, and would like to have such a support capability now. But some of the older farmers who have been exposed to the technology "really do not understand and would have to go throu a training process."

Once more placing the discussion within the rubric of the Paperwork Reduction Act, Representative Brown spoke of the "central coordinating role in each department" and the need to develop indexes to available data, as well as procedures for its accession. His question to Mr. Lett centered on USDA initiatives in this area, to which was the reply that several subcommittees were created unde. the USDA departmental task force charged with implementing P. L. 96-511. Their duties included scrutinizing the need for a "data dictionary," which might provide a common language for those involved in the system, and a look at individual information services and products, with the thought of minimizing duplication. Another focal point: the role of the National Agricultural Library (NAL) in the whole information resource management program. Recently, advisors from the Library of Congress and the National Medical Library urged that the NAL role should be upgraded. Whether NAL should become the "cent al focus unit" for"all information out of agricultural" is yet to be resolved.

ERIC

Heading the next group of witnesses was Harold A. Scott, Director of the Videotex Program for the Tandy Corporation, which has headquarters in Fort Worth, Texas. Accompanying Mr. Scott were Charles A. Phillips, Senior Vice President for U. S. Operations, and Ronald Stegall, Senior Vice President for Computer Services.

After conveying the regrets of John Roach, Chairman of the Board for the Tandy Corporation, for being unable to present his personal comments to the Subcommittee, Mr. Scott set the stage for his subsequent remarks by emphasizing that:

> ...the farmers in this country face a continuing squeeze between the production costs and prices received. The state-of-the-art improvements in pesticides, fertilizers, seed development, et cetera, will not reverse the trend. New costly farm implements are unlikely to help the situation.
>
> Agricultural commodity exports and farm-based computers are the most promising resolutions and probably the two two will work very closely together.

Mr. Scott next talked about the use of computers in "two distinct operational categories:"

1. ...calculations, bookkeeping, problem solving, and other types of normal use.
2. ...commonly called telecommunications, is a type of service which can bring to the farmers up-to-date information from distant sources: farmers' future prices: information on production; weather forecasts; IPM [integrated pest management] programs; irrigation programs.

He then pointed out that "sophisticated computers," which cost less than $3,500, are available now, along with software which can support "all significant farm operations." These computers, variously called "micro's, mini's, personal, home computers, business computers, or just plain computers," can outperform computers which cost hundreds of thousands of dollars only 15 years ago, he said.

Asserting that "every farmer can afford them," and that there are tax advantages in their purchase, Mr. Scott opined that government-supported timesharing networks will diminish in importance in the future, especially where "number crunching types of problems" are concerned.

> ...there will come a point or a time when the continuation of such networks will actually be rather expensive to the farmer and also a disservice...and probably contrary to the best interests of our taxpayers.

Stating that "all businessmen have a critical need for up-to-date information" and that farmers are "very good businessmen to be respected," the witness notified his audience that real-time information such as local weather data is often "non-existent in rural areas," in spite of our media networks (television and radio).

Mr. Scott, in commentary about the recent "Project Green Thumb," said that it had "proved very successful and beyond any doubts whatever the need of real time information for farmers." Furthermore, he stated that:

> ...to conduct further tests by the government for such information services would be rather foolish. It was that conclusive in Kentucky.

Before offering further details about the Green Thumb activity, Mr. Scott remarked that "continuous radio broadcasts on Government frequency channels" offered too much information to farmers, who often would "have to wait much too long" to get the information desired. Similarly, there were negative aspects to "dial-up automatic telephone services" because of the costs involved. In the Kentucky experiment with 200 farmers, a host computer—"an automatic answering device, if you will"—was installed in a local telephone area, thus allowing the user to call in without paying an extra charge to the telephone company. Data from such sources as the Chicago Board of Trade and the Winnipeg Futures Market were continually transmitted to the system host computer. For example, current wheat prices could be obtained, along with opening quotes, etc.

Here was an inexpensive system, available to the farmers on a round-the-clock basis, with hundreds of information items available. The terminals used were connected to the home TV set and plugged into the telephone lines using a standard jack. By calling the local host computer, Mr. Scott noted, the farmer was told by a "beep" that the terminal could be activated. "All of the data that they asked for was loaded down into the memory of this inexpensive terminal,"and after the transfer was completed, the telephone linkage was disconnected. The farmer could then review the data on his own TV set, at his leisure.

Participating in the Green Thumb experiment, in addition to the Tardy Corporation, were: Motorola Company, Western Union Company, University of Kentucky, USDA Extension Service, and the National Weather Service. Official reactions to the project were favorable, with personal endorsements from the Secretaries of Agriculture and Commerce, which included "emphatic direction" that both the equipment and software must be 100 percent American, "but we will call it North American here."

Several things were learned as a result of Project Green Thumb:

- ...local host computer at the local level with the local telephone call ability into it must be ready to accept information from multiple sources.

- We must have that automatic turn-off of the telephone lines [for holding] the telephone lines open...becomes the most expensive part of a recurring cost of any of these services.
- ...must have the capability of electronic marketing, [including]...a peg counter. How many times did someone call for the weather forecast, at what time of the day did they call for it, how many times did they call for, say, home economic news, and at what time of the day.
- ...be compatible with all other systems in existence.

Shifting his discussion to the importance of having "certain standards," Mr. Scott noted that some exist in the communications area, and in the transfer of data from one computer to another. "Where we have the problem is that my software for my computer may not match the software for your computer." He noted that Tandy Corporation, in supporting the Green Thumb project, has made its "so-called protocols worldwide. They are not in any way, shape, or manner proprietary to us. It is open to the public. Any manufacturer can use this."[63/]

Yet another result of the Green Thumb undertaking, the witness averred, was the necessity of having "multiple entry security systems." This could mean that more than one form of identification or password would be required to access certain information, which might include data on the status of a farmer's corn or current production costs.

The subject of computer graphics also concerned Mr. Scott, who observed that they are expensive, and often not essential:

> So, the graphics become dessert. And where many corporations try to sell their computers showing just the graphics...it is really just the games that are being played.

63/In November 1982, Tandy Corporation will begin marketing equipment for the Agristar electronic information service. This agricultural videotext service, offered by Agridata Resources Inc., will provide agribusiness and weather information over telephone lines to farmers with personal computers at a cost of $100 per month.

He then expanded the scope of his commentary to consider the costs of certain services and configurations:

> The equipment for such services is on the shelf today. It is not in the dream world...the telephone companies have found in their weather-by-phone services that this ...cannot cost more than a penny and a half per call.
> Host computers can be purchased for less than $10,000. And what is a host computer? It is a type of computer that will answer up to eight, sixteen telephone lines simultaneously, will store the data in it, can be put in a small entrepreneur's office or in a newspaper. It will carry graphics...too.
> The terminals for the farmer are less than $400 and connect to his TV set and...telephone line. Or better still, he can go out and buy a small personal computer, any one of the American-m· ; ones, and go into this type of service.

Noting that the Tandy Corporation has worked closely for several years with the American Farm Bureau Federation, Mr. Scott suggested that working through that group of "some of the entrepreneurs that want to get started in the farmlands, is probably the way to go because they can provide...Government information and other types of information that would make...a much more viable service to the farmer.

In augmenting Mr. Scott's testimony, Charles A. Phillips who accompanied him emphasized that "we have to focus a perspective on this particular subject in the fact that we represent the private sector... our constant mission in life is to sell products." He next underscored the fact that Mr. Scott's presentation had been centered on two areas in which Tandy Corporation pursued the agricultural market: "one is for the business uses and applications of computers by the farmer to become a better businessman, and the other application is...information delivery." The competition offered in the small personal computer business by "Japan, Inc." and in the"communications aspect" by Canada, Ltd." was acknowledged by this witness, who went on to describe the approach taken by the Tandy Corporation in providing system support for the farmer market:

> o ...conducting training and seminars throughout the farm belts to farmers with our local distribution chain.
> o ...trying to show them that they do not have to wait, necessarily, for specified custom-made software to do a lot of the farm operations.
> o ...trying to tell them that some of our off-the-shelf available software today will satisfy many of their needs, plus we also have a company and corporate commitment to develop software specifically for this market.

The first question to the trio of witnesses was voiced by John Thompson, M. P. from Alberta, who asked:

> First, I would like the know the total cost of putting the system in place. Secondly, how many test farms were involved? And thirdly, was there any real advantage to these people? Has it shown up yet in your observation?

In response, Mr. Scott stated that the initial cost to the Federal Government was $200,000, equally divided between the Department of Agriculture and the National Weather Service. A total of 200 farmers --ranging from the wealthy to the poor, and with various kinds of crops grown--were involved, 100 in each of the two Kentucky counties. The post-project study, performed by Stanford University's Institute for Communication Research, included questions said Mr. Scott which asked "do you desire this? Do you really need this?" He went on to report that:

> ...some of the farmers who we interviewed as it went along...just thought this was great. They received the prices and they were able to buy better on the futures prices...I do not think that any study has been made as to the monetary advantages.

Returning to the question of public-private sector division of responsibility, as initially raised by Mr. Lett, the Canadian M. P., Charles Mayer, inquired of Mr. Scott as to "where you think the Government should be in this business and where you think it should stop and the private sector take over." Saying that there "is certain date that the Government has that would be very useful to the farmer" and that this should somehow be packaged and sent to the videotext services, Mr. Scott offered the opinion that:

> ...the commercial people such as the American Farm Bureau, who could establish these types of services, should be allowed to take over because I think they can bring more information than just Government information into the farm areas.

An example of passing along such information is found, he said, in the Agricultural Marketing Service system which "down loads" selected data into a videotext service.

Mr. Mayer sought to explore another facet of the larger problem of information sharing, which encompasses the "retrieval of information from individual farms" and the possible ramification of confidentiality control, as well as private sector (commercial, academic) possession of information of a potentially sensitive nature. The role of Government in collecting such information also was alluded to, and Mr. Phillips spoke of the "total cooperation from the USDA in supplying information." He also told of "the largest information service to farmers," serving 3,000 farmers across the United States, which operates on a subscription basis out of Iowa. Mr. Phillips then urged that the United States Government <u>not</u> establish, at this time,

14-295 O - 83 - 12

"any kind of communications standard in this industry,"because it is felt by the Tandy Corporation that the industry "is too immature right now to support a standard," and that the marketplace should decide such a standard. He reported that "there is a move underfoot right at the moment with two large organizations to set standards in videotext information delivery."

At this juncture, Chairman Brown returned the focus of discussion to the matter of privacy in information systems, "an overarching kind of problem that runs across all sectors:"

> The question here is indicative of that. There is always the possibility that you would develop computer networks involving a mass of individual farmers which would include in their individual computers, say, income, profits and other data which perhaps should not be distributed.

The question becomes "how do you guarantee the right of privacy or security of that data which should be protected versus that data which should be made public?"

Representative Brown pressed this point further, stressing that no one has "clearly defined or established the policies as to either what data should be publically available versus private, or how to protect it." He observed that the Government now collects data on farm productivity, and tries "to make crop estimates, for example, which will be of benefit in analyzing future market conditions." In fact, this is done on a worldwide basis. Most collection efforts, he noted, are on a sampling basis.

Evolving next into a discussion of standards, the Chairman addressed the incompatibility of video recorder systems, which is "disruptive of mass marketing processes and should be of concern to the private sector." Two questions were posed to Mr. Scott:

1. Do you have any comments to offer as to the degree to which and the timing at which we should make efforts to achieve reasonable standards for the purposes of assuring the greatest economies and the greatest marketability in the private sector?
2. And what role should the standards group which we have in our [National] Bureau of Standards, computer standards operation...play on behalf of the Federal Government?

In response, Mr. Scott mentioned the role of ASCII [American Standard Code for Information Interchange] and also told of a communications standard known as "RS232-C." The former deals with "how characters and letters are held within the computer itself" and the latter governs "how do I send to you." The witness said he doubted that "you will ever get any agreements" about "internal workings of a machine."

A three-way discussion between the Chairman, and Messrs. Scott and Phillips, regarding marketplace determination of standards, including the videotape arena, ensued. After stating that the Tandy Corporation's thrust to "consumer electronics and to the videotex marketplace is cost effectiveness," Mr. Phillips made the point that:

> We would like to think that for a very small investment, the farmer can avail himself of this new information technology and become a better farmer because of it...at the moment, in order to bring the technology and the computer age to the farm, the American TV standard is the most affordable.

Representative Brown, in further seeking to clarify the standards' situation, set forth two major questions:

1. Is there a problem with rationalizing international standards considering the fact that we have Canadian, French, Japanese, maybe others

who are seeking to penetrate the U. S. market and to bring I am sure what they consider the benefits of their superior technology to the U. S. marketplace?

2. Is there a mechanism by which international standards can be reached in those areas where it is important to have international standards?

After Mr. Scott said that "there can be interfaces," Mr. Phillips stated that there "is absolutely no problem of manufacturing a product to be compatible with Canadian, British, French, German technology. Our problem is, can we sell it and can they buy it, can the farmer or consumer buy it?

Returning once again to his concern about "the boundaries between appropriate Government involvement in the providing and processing of data in the private sector," Chairman Brown observed that:

> The Government is the source of a good deal of the data that is useful to farmers, but it does not necessarily always produce it in a form usable to farmers.
>
> In other words, information ranges all the way from broad data of relatively use without massive amounts of massaging to a final product tailored to specific needs.

He then asked: "Is there some line or policy guidance that we should keep in mind as to the appropriate role...because the Congress has a tendency to generally err on the side of doing too much." In amplifying, he noted that:

> ...we need to establish that there are limits to the Government role. They should be fairly precisely defined, possibly along some criteria that Abraham Lincoln once used, that they should only do those which nobody else can do.

But, he continued, "we need to define what nobody else can do."

Mr. Scott chose to couch his answer in an illustrative way, selecting weather forecasts and their handling. There are private meteorological firms that "would like to take the regular weather service forecast and convert it...to the farm level forecast in a far superior format." Such data would lend itself to a matrix-type presentation through a videotext service for farmers. Next, he identified possible sources of revenue for the information provider: advertisements placed by farm credit banks or local co-operatives.

Acknowledging that the Congress is wrestling at present with the funding of "certain specialized weather services" such as those handling fruit frost data and providing fire service warning, Representative Brown said "The question is, is there an aggregate market that would support it?" Mr. Scott replied that his corporation is at work on "your River Station."

A question was enunciated, at this juncture, by one of the Canadian delegation,M. P. Gary Gurbin, who wanted more information about technological factors affecting videotex "readouts" on home units:

> ...the technology is all available so that you can convert...But at the level you are talking about, prices you are talking about, is there any problem with compatibility at that level with Tandy or any other corporation?

The answer by Mr Scott: "They are completely compatible with Canadian TV's. They do not plug into the TV," but "will work with all, even the lower priced models."

Another inquiry for Mr. Scott, raised by M.P. Laverne Lewycky from Canada, was concerned with "mass distribution and production" of host computers and terminals, for the farm marketplace. Although he could not provide such statistics, Mr. Scott said that the Kentucky experiment showed that the average system use per farmer was about two and a half times per day:

> He seemed to call in the morning for the weather and then he called for the commodities as they came on and he would call a little later in the day as, say, the integrated pest management programs were available. And there seemed to be some times when his wife might call for some of their home economic information during off-hours.

Then Ronald Stegall of the Tandy Corporation interjected the thought that "probably, there is a greater penetration right now of the farmer for the use of small computers for managing his business than actual retrieval of information." There is, indeed, a great deal of equipment in existence for use by farmers, "and that is why the information needs to be made available at a low cost."

Appearing as the third set of witnesses on this first day of hearings were Dr. Glenn Wilde, Assistant Dean for Extension at Utah State University, accompanied by Dr. Richard Haycock, Assistant Dean for the College of Humanities, Arts and Social Sciences at the same institution. Dr. Wilde commenced by explaining that the scope of the three-year project to be described:

> ...is generally limited to the inner-mountain states of Utah, Colorado, Wyoming and Montana, where we have undertaken regional research and development to infuse new life into the rural community-supported network of public libraries as a support to rural development and as a compliment to our agricultural programs.

In addressing the "need for improved information services in these rural areas of our United States, Dr. Wilde emphasized three points:

1. the transmission of timely and relevant scientific and technical information is vital not only to the economic well-being of the rural farmer and small businessman, but to the economic health and development of this nation.
2. an improved information delivery system is necessary to diffuse and disseminate information to those who can use it and who can benefit from it.
3. we have discovered the informational needs of rural Americans...especially those who live in our very sparsely populated inner-mountain states where some, by necessity, often commute five to eight hours to get some meaningful information.

The witness, in expanding upon his first point, pointed out that historically the settlement of the West often was viewed simply as "acts of individual courage, struggle and hardship." He broadened the context by observing that:

> ...contributors to this settlement were also men and women of knowledge and intelligence who settled and developed western frontiers through the purposeful use of available research and information.

As a case in point, Dr. Wilde told of Jules Sandosse, a Swiss immigrant living in the Sand Hills region of Nebraska, who effectively combatted drought conditions and short growing seasons by seeking out information on corn with shorter maturation periods and adaptable to the harsh climates of the region. Other quests for critical information included:

- ...materials concerning the cattle disease "blackleg" from the Department of Agriculture
- ...information on horticulture, grafting, plant adaptation from Professor Bruner at the Agricultural Experimental Field Station at the University of Nebraska.

"Old Jules" became a "vendor of information services," Dr. Wilde noted, by providing other settlers with books and pamphlets on forestry and tree-planting. This story can be replicated, he said, in other settlement histories including those of Brigham Young in Utah, who had studied the journals of the region to which he was leading his group.

Dr. Wilde then sketched a few of the key governmental actions over the years, and began by citing the "substantial commitment to research and information transfer" by the Federal Government. This has been possible through use of "one of the most productive and sophisticated agricultural and rural development networks" ever created in the United States. Among the initiatives discussed by the witness:

> o ...As a compliment to the land-grant university system, the Hatch Act of 1887 authorized Federal funds for the establishment of agricultural experiment stations.
>
> o ...In 1914, the final component of the land-grant institution was added, the Cooperative Extension Service, which basically established a network of agents or local community educators who would link the research and improved agricultural and home practices to the farmer and to the rural resident.

This role "remains a vital informational and educational link," he asserted.

In the next portion of his testimony, Dr. Wilde discussed the work being conducted at the experimental stations and the Beltsville Center near Washington, D. C., such as the genetic research producing a new sugar beet variety "which may promise to revitalize our domestic sugar industry." Another endeavor, in this instance at Utah State University, resulted in the development of turkey ham, turkey salami, and other meat products which taste much like higher-cost ham. He continued:

> Our research continues to improve dry land agricultural production, to develop more efficient and economical irrigation techniques, to develop disease resistant plant and crop varieities and to adapt plant varieties to new agricultural locations with different soil, water and atmospheric conditions.

At this juncture, Dr. Wilde informed Chairman Brown that in California "the tomato can now be grown in salt water, rather than fresh water."

Turning to the basic problem of developing a "cost efficient and efficient delivery system to disseminate and transfer this relevant information" to potential users, the witness offered his belief that public agencies and institutions "have an obligation to transfer this information in...an understandable way which can serve the problems of individuals and/or communities." Even the corps of local extension agents has access to only a "limited amount of information" from Federal and state sources; in addition, they are "restricted by their own academic preparations and backgrounds," and cannot "be all things to all people, as vital as they are."

> The community agent, for example, who is specialized in dairy cannot always address the problems of pesticides and herbicides.
> He or she must act as a referral agent to a state or Federal specialist...it is often time consuming and costly.

In amplifying his second major point, Dr. Wilde reminded the hearing audience that while America has entered the information age, "the linkages between the urban and governmental information centers and the rural countryside have not been adequately developed." He alluded to a report by Secretary of Agriculture Block to the Congress in January of 1982 which stated that:

> ...one of the difficulties in developing adequate linkages is that the small rural populations are scattered over large geographic areas, which results in increased costs for the delivery of vital services to communities with fewer than 10,000 residents...rural investment in public facilities and public services seriously lagged behind the community needs.

The regional research being conducted in eight selected inner-mountain communities has confirmed Secretary Block's observations.

Dr. Wilde then gave an example of a person--farmer, medical doctor, or rancher--residing in Meeker, Colorado, situated between two mountain ranges, who must travel at least 250 miles (to Denver or Fort Collins)—"if they can get through the passes in winter"—in order to obtain certain kinds of information. Next, he enumerated some specific <u>regional</u> problems related to informational and educational resource transfer necessary to serve rural needs:

1. a lack of a critical cost-effective, efficient delivery system.
2. The dearth of educational informational resources ...the average number of books and other information resources in most rural libraries is under 10,000 volumes, and many of these volumes are outdated.
3. There is very little and limited scientific and technical information available which can be applied directly to community problem-solving.
4. a lack of what Colorado residents term a critical mass of learners in any professional or vocational group, including agriculturalists, to make private sector services to these areas profitable.
5. National and regional studies indicate that there is a need for advanced training and educational programs for rural professionals, especially medical professionals, teachers, lawyers, social and human service workers.
6. Such training is also necessary for the small businessman and the farmer or rancher who must acquire more sophisticated management skills to remain competitive.
7. it is difficult to meet the number of users neces-

sary for informational or educational services unless they can be aggregated at several remote sites at the same time.

8. there is a lack of technology transfer from the larger cities to the rural areas.
9. there is a failure of the rural people to adapt and adopt the technology.

Two problems were then identified by the witness, in expanding on this latter area of concern: the lack of personnel trained to handle "lower cost communications technologies," and little awareness by rural residents of "the potential of this new technology for improving the efficiency of farms and small businesses." Training programs generally are lacking to help develop requisite skills "to make computers viable information and production management resources. Only recently, he informed the Subcommittee, have Utah's county extension offices been equipped with minicomputer terminals. Indeed, the "agent himself is learning what to do, what capacities and capabilities" are required.

Another significant shortcoming, Dr. Wilde said, is reflected in:

> ...a lack of concern about an acceptable and feasible delivery site in rural communities where informational and educational services can be effectively aggregated.

In underscoring the importance of this matter, the witness articulated three questions:

1. What kinds of information services are really needed in rural America?
2. How can these identified services best be delivered using cost-effective technology?
3. Which is the most feasible location?

Since it is "too costly" to equip and operate "multiple information referral centers" in most rural communities, a "local delivery institution" which can serve both as a "centralized informational source" and provide "referral linkages among Federal, state and private agencies is needed." Dr. Wilde went on to say that their regional assessment team has concluded that "the vast network of publicly supported rural libraries may provide the necessary rural delivery system to serve a broad-based rural constituency." The rural library, he averred, has possessed a "tremendous potential," but has been "severely handicapped" by:

- o small operating budgets
- o dependence on in-house holdings
- o lack of access to the wealth of informational resources available from state and Federal sources
- o limited community perception of the library as a place for general reading and information, but often lacking information specific to individual problem solving or learning goals
- o inability to attract of develop support among the broader clientele

In the opinion of the witness, "with the appropriate development of computer-assisted information linkages, the transfer of relevant problem-solving services and information can be achieved." After stating that "over 950 data bases are currently available in the United States for citizen access," from public and private sources, Dr. Wilde asked again: "will rural residents utilize these new informational services and what are their current information needs?"

The findings of the community-based research project in which he has participated show that:

- o ...over 60 percent of our rural residents had sought specific problem-solving information from some community source, extension, or library [in] the past year.
- o ...the rural library was considered their top primary source of information [among seekers]...65 percent consulted that as the first reference source.
- o ...over 40 percent of those seeking information had to send away for that information. It was simply not available in their local communities.
- o ...over one-third of these rural information seekers

ERIC

> had to travel to other locations in the state or region to get the information necessary to solve their problem.

Stressing that "both training and technology are now within the fiscal means of most rural communities," he remarked that if a rural library is to achieve the necessary support, "it must become a broad-based institution to serve the needs of agriculture." Here, the witness referred to the testimony of the Tandy Corporation representatives which contained commentary on host computers. The rural library could serve, Dr. Wilde said, as "a support for a host computer in this sense, utilizing not only the telephone system, but also a cable television system."

Shifting his focus to the topic of management, production, and marketing skills, he talked about the need to offer opportunities involving "new ideas and new technologies," as well as new information sources. Also, the requirement for continuous updating of personal skills in certain key areas (e. g., health care) was cited. Not only do farmers, ranchers, and small businessmen have needs for such skills, but their elected representatives have comparable necessities: information about "planning, coping with growth, resource management and human services delivery."

Dr. Wilde, while acknowledging that the focus of his testimony had been on "information transfer for relevant community problem-solving," took care to point out that the rural library also serves as an "informal and formal center for education." Among the types of activities possible in this setting:

> ...actual training and educational programs, in-service recertification can take place utilizing the electronic technologies of teleconferencing, televised and telesatellite instruction, electronic blackboards for information transfer, two-way communication with resources in the urban centers by those in the outlying areas.

The final major topic addressed by Dr. Olde dealt with the consumer utilization of information services, the unlikelihood of commercial applications of data bases serving rural areas at present, because of cost-risk factors. He opined that the "valuable services" developed and marketed by the Control Data Corporation for metropolitan centers—Denver, Salt Lake City, Billings, Boise--might be even more profitable if access was extended to rural library learning and information centers. This conclusion, he stated, agrees with the recommendations of the National Commission on Libraries and Information Science report on "Public Sector/Private Sector Interaction in Providing Information Services."

The value of such a rural public facility? Providing "relevant information services and training possibilities," as well as an "economic incentive for the developing information industry and for equipment and service vendors, especially if such a concept were adopted for implementation in other regions of our nation." Admitting that such a concept for rural service delivery would not have been possible five years ago, the witness explained that this was because:

- The cost of telecommunications was too expensive
- ...the informational resources were not developed for user access
- ...training programs for librarians or information specialists in the use of these information systems were not available
- ...more interest in developing the data base of the communications technologies [existed]...than in

> transmitting those informational resources to the user beneficiaries.

There is a new climate, today, with a discernible "interest and need" for providing information resources and training to the "information poor and often educationally disenfranchised rural American." In closing he stated that:

> We are convinced that purposeful implementation of information and learning technologies in rural libraries will enhance the opportunities for rural Americans [and]...at the same time will strengthen the productive capacities of our nation as a whole.

Upon completion of this testimony, Chairman Brown once again invited comment from the Canadian parliamentary delegation, which would soon have to depart. Mr. Gurbin spoke first, submitting an "essential question as to at what level this information use and processing might take place:"

> ...the question is really whether on the farm, as an individual farm unit, we are looking at a system or whether or not a community system is appropriate... the response factor, particularly, argues for an on-farm use, an on-farm system.

Dr. Wilde, in response, provided a framework as to size--160 acres, for example, often being the norm in his area--and then noted that these farmers are "not interested only in information about farm management:"

> He is going to have to become an informational specialist to find out something about horticulture from a data base...what does a consumer report say about a new tractor or a new automobile.
> ...the library can give him a referral base...to other information sources from a central host computer in the library and a person in that library who knows what data bases to go to.

Again, the witness stressed the availability of 950 on-line data bases, with the Lockheed DIALOG system alone offering 126 such files, with "at least ten in there dealing with agriculture alone." In summary, the answer to the question was that:

> ...it is going to be a combination of library, at least in the inner-mountain states, plus maybe one or two data banks right on the farm.

The Member of Parliament from Champlain (Quebec), Michel Veillette, next asked "how many farmers in percentage would be willing to buy the equipment right now to get that type of information?" Observing that both the western United States and Canada are settled around a "hub concept," with a small city serving the needs of a surrounding geographical area, Dr. Wilde suggested that at least in the beginning, central information services could be placed in the city or town for use by the farmers, "and as they become technologically adept, then they can transfer that technology better to their farms."

> ...let them see the operation of something and see what it could do for them <u>before</u> they invest a great amount of money.
> ...we are looking for start-up costs in each of the facilities, publicly supported at the local level, of about $16,000 for equipment, and that includes the television or a big-screen television projection type of equipment, videotape connection to cable, and a computer with a printer.

A subsequent query came from M. P. Stan Hovdebo (Saskatchewan), and focused on "some kind of a team operation between private and Government services." He pointed out that:

> The tendency, quite often, is for the private group to do the profitable operation and the government to do the non-profitable and if it is not done that way, the areas that are isolated tend to become more isolat-

ed or the population tends to centralize to get
the services that are available.

Dr. Wilde proceeded to describe a project undertaken by four land-grant institutions--Utah State University, Montana State University, University of Wyoming, and Colorado State University--which features "the sharing of educational resources as well as informational resources that we have gathered." Private vendors also are involved: Mountain Bell Telephone, the telecommunications vendors, and Control Data Corporation. He went on to say that CDC may place one or more PLATO systems in a library along with a person who knows how to use it. The facility is provided by the community, at its expense, and local users pay a fee for the ensuing services. In Salt Lake City and Denver, he noted, CDC has leased a building and set up a staff in each city to provide services to users.

The role of the land-grant school was then expanded upon by Dr. Richard Haycock of Utah State University, who explained that the interest is not in "developing an organization," but "putting the information out to the user:"

> ...we are talking about rural areas where as a land-grant school, it takes us eight hours or so to get from one end of the state to the other and it is our charge to get agriculture information down to all areas of the state.

Continuing, he emphasized that "what we are looking at is a delivery system." The present individual farmer will not have the technology nor the background to use it but his son, educated at a land-grant school," may have the skills to access the computer."

> Therefore, what we want is a regional hub where anyone can go in...we do not see agriculture backing

> necessary to underwrite the system at this point and if we charge user fees across a broader range, then we see the implementation of the technology.

As an example of public-private cooperation, Dr. Wilde then told of the Regional Energy Environment Information Center at the Denver Public Library (in 19[illegible]). When Federal funding—originally provided by the Department of Energy, Department of Agriculture, Environmental Protection Agency, and Bureau of Land Management—was withdrawn, alternative funding sources had to be obtained. An arrangement was made between a private vendor (The MAXIMA Corporation) and Denver Public Library, with the former handling selected distribution functions and sharing in the profits. This, he termed "an excellent example of public-private inventiveness."

Expressing the appreciation of the Canadian parliamentarians for having the opportunity to attend the hearing, Charles Mayer (M. P.) offered this comment on their behalf:

> We are good neighbors. We are good competitors. And in order for that to happen, we need to get together to talk so that we understand each other's problems, and in many cases and in many ways, we do have the same kind of problems that you have.

Representative Brown, following the departure of the contingent from the Canadian Parliament, underscored his interest in the role of libraries and the development of their resources. He told Dr. Wilde that his statement about the expanded role of the rural library was "a very important concept:"

> It will, of course, involve some questions about how we effectuate that, what the relationship between the rural library and other information transfer institutions, possibly the schools...will be. ...we are on the verge of a transition...and we need to think this through very clearly and determine how we can manage this transition in the most effective way.

The Chairman then asked Dr. Wilde if his research was connected with a reported experiment involving "the satellite linkage of local libraries and possibly other institutions in the inner-mountain states."

Dr. Wilde replied that his group has worked with Mary Diebler of the Public Service Satellite Consortium ,but has not participated as yet in the project mentioned by Representative Brown. He noted that one of the rural libraries involved in the experiment was at Utah State University, which in his opinion was not the type which he had been talking about which is "eight hours away from a library with 750,000 to two million volumes." Dr. Wilde stressed that the type of residents his group works with are the "truly rural and the truly disadvantaged." Another PSSC project, proposed to the University of Mid-America (that is affiliated with the University of Nebraska and other institutions), calls for the transmission of academic courses utilizing satellite capabilities. Eight sites, two per state, would be involved, and all except one has a public cable television system which would allow utilizing the existing system, thereby establishing a linkage to the library. Most of these systems, he said, possess a two-way capability, which means that:

...a person in their home will be able to find out what books, references and other things the library holdings have...[as well as] sources outside without leaving the home.

Another interesting policy question, Chairman Brown remarked, concerns "the relationship between the cable systems and Extension and other means of disseminating information."

Cable has been revolutionized because of its capability for networking now by satellite, which really means that anyone with a down-link...can have access to every form of communication that is available in any part of the world.

It is a fascinating potential and one which we need to consider in the overall question of how we are going to facilitate the optimum development of rural America.

The final witness on the first morning was John C. Datt, Secretary and Administrator for the American Farm Bureau Federation, which he described as:

...a private general farm organization made up of farmers and ranchers from all over this country, starting at the county level and then coming together at the state level and eventually federating into the American Farm Bureau Federation.

In addressing the "pilot marketing project of the AFBF", the witness said that an outside consulting firm had recommended (in late 1980) establishing such a program. With the approval by the AFBF Board of Directors in August 1981, a one-year program was begun that October which:

...provided the opportunity for any state farm bureau who chose to participate in this particular program. Part of the participation involved some funding on their part as well as some funding on the part of the individual member who would be a participant. Our part in this involved a substantial part of the financial arrangement.

Enrolled as "full participants" are eight states: Illinois, Indiana, Iowa, Ohio, Michigan, Arkansas, South Carolina, and Georgia. In addition, he said that there are 12 state farm bureaus who are monitoring the program, including California.

The role of the American Farm Bureau Federation has been threefold:

1. pay the cost in each of the states for ten farmers for the videotex unit that they would have on their particular farm.
2. helped to underwrite the computer and other equipment necessary at the state farm bureau level.
3. absorbed all of the cost at the national level that has been necessary.

The headquarters for the project, now serving 250 farmers, is in Parkridge, Illinois and it is here that the central computer system is situated. Data are fed from this facility via a private company in Omaha, Nebraska that has a satellite support capability to the headquarters of the various state farm bureaus (e. g., Bloomington, Illinois). Each state farm bureau has a computer system in its office, which can be accessed by:

> ...the individual member out there on the farm [who] has either a videotex unit that he has assembled to his own television set or...[has]upgraded it to where they have, in effect, a separate computer-type system.

Mr. Daut then described how the AFBF established, in December of 1981, an affiliate called the "American Agricultural Communications System, Inc.," which is a non-profit operation. The pilot system often is referred to as "AACSys," and is listed in Chapter IV.

Details about AACSys and how it serves the participating farmer followed, with emphasis on how the state farm bureaus can add comments to the information received, and that the end user "can make a decision as to what information he wishes to receive."

Market price information, covering the various commodities in various states, is obtained from the Chicago Board of Trade, and is updated every ten minutes. Data on corn, live stock, hogs, soybeans, and cotton are among those provided regularly. Other categories of information available on the system include:

- general weather information [augmented by]...several of the states [which] are purchasing from a private service their own state weather information
- international trade information
- information on the money markets
- a Washington report as to some of the activities here in Washington, both legislatively and administratively
- basic organization information as to the activities of the Farm Bureau

The state farm bureaus often add state legislative information that may be of interest to the AFBF member.

In the opinion of Mr. Datt, "one of the keys to the success of our program,if it is to be successful, is the analysis that we are providing also in addition to this trade market price information."

> We do not attempt to suggest to him that he ought to buy, sell or whatever. That decision is...left up to him. There are some recommendations that are made based on market conditions, but the final decision as to what he does with the marketing of his crop is really up to him.

Another facet of the AFBF support service involves bringing the participating farmers into the state farm bureau offices for training programs:

> One of the things we have found is that simply to put a unit in a farmer's home and not give him the capability of understanding how it can be used and what it means to him is of little value. He has to understand what it will and will not do for him.

Seminars are conducted on a monthly or bi-monthly basis.

Meetings also are held at AFBF headquarters with program operators from the state farm bureaus in order to "discuss what is going on and what we can do to make the system go." A great deal has been learned already, Mr. Datt told the audience, which has resulted in reemphasizing the purpose of this undertaking; specifically:

> o It is geared to try to improve his net income as he markets his product
> o it is a service to member program, and the person has to be a member of the organization
> o We are learning what information farmers want and what information farmers do not want

He also stressed that "all kinds of publications," including a weekly newletter, are sent out to the membership.

Yet another facet of the "learning" process has been the monitoring of system use of marketing information:

> ...we can determine very easily what information is acceptable and what is not, because we have a record as to what on that menu is pulled out and used every day... it is quite different than a publication...where you can say that everybody is interested in everything.

Also, he pointed out that the AFBF is "learning what farmers are willing to pay for," although he admitted that "we do not know at this point how much they are willing to pay."

The "key" to the project, Mr. Datt said, is reflected in two ways:

> 1. ...we have developed the capability, the network, the ability to transmit the information.
> 2. ...is the human resource side of this, the ability to take the information that is available and make that meaningful to that farmer out there.

At this point in his testimony, the witness mentioned that AFBF has worked with the land-grant colleges in some of the states and "used some of their information and given them credit when it was used."

The topic then shifted to the strong feeling within AFBF that "there has to be a limited role of [illegible] ates to this activity." In returning to an earlie[illegible] of discussion, Mr. Datt argued that "all parties ought to have equal access to the same government information."

> And from that point on, then, it is up to each of us to see whether we can package it...and make it meaningful and salable to the membership of our organization.

There have been, he remarked, "from the very beginning, some very serious concerns about the competition that we might receive from some of the government institutions:"

> They could come in and we could find ourselves having spent a great deal of money and then have it wiped out.
> ...there is no way that the Farm Bureau or any other private organization can compete against the government, whether it is the Federal Government, state government, or local government, as it relates to providing this kind of information.

Turning to the potential use of satellite technology, the witness informed the Subcommittee that a shift from [illegible] ephone circuits to satellites may soon occur in transmitt[illegible] tion between the state farm bureau and the national organization headquarters. In his judgment, Mr. Datt opined that "within a matter of several years, we will not be providing the farmer his information by telephone," but by satellite.

In conclusion, this witness stated that he could not say "whether at the end of the year we will continue the project or not. That decision will be made by the decision-makers in the organization."

> But I am reasonably confident that we will because the acceptance among our members who are participating in this has far exceeded anything that I could have anticipated.

In response to a question from Chairman ... regarding an ...BF "evaluation" of the pilot project ... f its specified duration, Mr. Datt said that the Board of Directors would decide its continuation in September of 1982. He explained that:

> Currently, we are paying for this out of membership dues. Our goal is that if we proceed with this that within a three- to five-year period, we could have this as a paying proposition.

No user fee is currently being charged, but the farmer must pay line charges whenever he uses the telephone. He noted that the AFBF does pay all system costs for activity between its headquarters and the state farm bureaus.

After a brief, iterative exchange about the promise of satellite support systems, and the lessons to be learned from existing satellite business services--"the Chamber of Commerce has a satellite system"--Representative Brown expressed a concern that is "widely shared in Congress and in this committee" regarding the provision of equal information opportunities for rural America:

> ...to have access to at least some degree to the same levels of technological systems that are more widely utilized in the urban areas.

And, he told Mr. Datt, the AFBF seems "to be pioneering in that direction." Although agreeing with the Chairman, the witness said that it would be"a mistake if you assume that every farmer someday will have one of these."

When asked whether "there was some merit" in Dr. Wilde's position anent having "nodes in smaller communities that might coexist with local libraries," Mr. Datt responded that "we have really not taken a look at that," but that from two years of working with the Tandy Corporation and Texas Instruments, it was his belief that "an individual farmer, even a small farmer" could afford a market information system.

The final interaction between the witness and Chairman Brown focused on the AFBF system offering of information on activities in Washington and the state capitals. As a matter of fact, Mr. Datt remarked:

> When we put this system together and talked about it, we did not really think that that was something that they would be interested in. It was way down on the list. As it turned out, this has been one of the things that has been dialed in and used more widely than we ever anticipated.

In adjourning the first morning's session, Chairman Brown expressed his appreciation for the contributions of the witnesses and the impressive number of attendees—more than 150 persons crowded the committee chambers—and announced that demonstrations of selected on-line systems would take place in the hearing room during the afternoon. Also, he remarked that the findings of the six workshop groups about to convene would be awaited with anticipation.

On the second day of hearings, May 20, Chairman Brown was joined by two colleagues, Representatives William C. Wampler and E. (Kika) de la Garza (ex-officio). Before listening to the initial witness, the Chairman introduced the Subcommittee's ranking minority member, Representative Wampler, who explained that he has "more than a passing interest in the functions of the budget that pertain to agriculture," and that:

> I share Mr. Brown's enthusiasm for this rela[illegible] concept of computer-based information syst[illegible] [illegible]ices for agriculture in rural America...[illegible] uing, to say the least, and we in Virginia [illegible] that we are among the innovators in this.

He then noted that the day's witnesses included his friend and constituent, Roy A. Meek, Manager of the Eastern Lamb Producers Association in Pulaski, Virginia.

Appearing as the first witness of this hearing session was Alfred T. Fritts, Co-Publisher and Editor of The Bakersfield Californian, who was accompanied by Neil Baird, Vice President for Marketing of Infomart Canada. Mr. Fritts commenced by contending that newspapers as well as other conventional media distributors have recognized that:

> ...not only our content but our mode of transmitting or conveying our message must conform to certain requirements of our reader-viewers...we are enhancing ...our various reasons for being, so to speak, not just to provide printed material to our readers but to provide all information requirements they may ever want using the best means available.

Continuing, the witness identified the program of which he would speak as "a service that is particularly designed for farmers and those businesses or organizations that are closely related to the agricommunity."

Mr. Fritts then gave some background information on Inform[illegible] Canada, which is a subsidiary of two large newspaper groups [illegible] country, Southam, Inc. and Torstar Corporation, both of which [illegible] active in publishing and communications. He declared that the joint venture involving The Bakersfield Californian and Infomart would adapt already developed technology in order to provide a service that would:

> ...conform with the peculiarities and the specific requirements for information services of the San Joaquin Valley in the State of California...the richest agricultural community in the world, currently providing...approximately 43 percent of the State's total agricultural output.

Noting that the Telidon technology, which would be discussed in some detail by Mr. Baird, combines useful information content with a "convenient, accessible, intelligent, and pleasing" form of presentation, Mr. Fritts stated that it is the intent of the new venture to fulfill "the magnitude of the information services that are required in the San Joaquin Valley area."

The portion of testimony furnished by Neil Baird began with background information on Telidon, a technology originally developed by the Canadian Government's Department of Communications. In 1979, Infomart adopted the original system, expanded the software "a great deal," and now supplies four different data bases to various communities in Canada.

Before demonstrating the first of these, called "Grassroots," which originates in Winnipeg, Manitoba, he gave some essential information about this service:

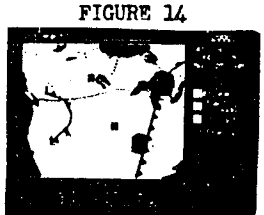
- The data base now available in Manitoba has about 9,000 pages.
- ...about 350 terminals [a[illegible]] sprinkled around provinces of Manitoba.
- ...200 are directly allocated to the farm community.
- ...another 150 [are] in a small town called Ely, for a technical trial of the fiberoptics transmission technology.

This "commercial service," begun in May of 1981, started as a trial project, with people not being charged for the service, but in September it was converted to a commercial basis where each user now pays $47.50 Canadian dollars a month to lease the terminal from the Manitoba Telephone System. In addition, he pays five cents a minute to access the data base, with that payment also going to the telephone company, not Infomart. The role of Infomart: "publisher of the data base and our funds are generated almost exclusively from sponsorship of the content." Participating organizations (e.g., retail shopping companies) pay Infomart an average of $24.00 per page per year for inclusion of their items in the data base, "so that is how the publishing expenses can be covered."

Mr. Baird enumerated the four major items that are featured in this data base: grain information, livestock information, weather service, and news and sports. Sixty different information providers have paid to participate thus far, and about 20 others are waiting in the queue. Included are both government departments and commercial organizations. Asserting that information about the weather "happens to be the most popular item by a considerable margin"—this represents a third of all page accesses—the witness informed [illegible] the weather information is supplie[illegible] Infomart by a group in Toronto called Meteorological and Environmental Planning, which has a satellite-based weather service which stores computerized data on soil moisture content, soil temperature, air temperature, precipitation, cloud cover, and so forth. Infomart has purchased these data, repackaged them along with developing special software, and is able to transfer such information from the originator to Telidon files within six hours.

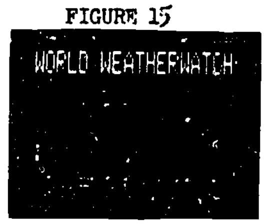
Illustrative of the graphic information appearing on the screen of the terminal in the hearing room are the selections which follow, commencing with an overview of the current weather in North America (Figure 14), which was selected after reference to a master listing (see Figure 15) called "World Weatherwatch."

FIGURE 14



Current weather
in North America
screen display 64/

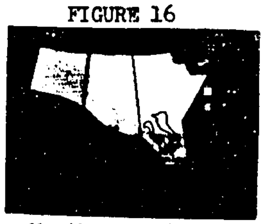
FIGURE 15



"World Weatherwatch"
Master Listing
screen display

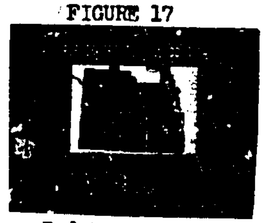
The farmer is able to plan his day's activities, [illegible] to concentrate on the geographic [illegible] concern to him. Figure 16 shows, for example, the [illegible] condition for three of the western provinces on May 6, at 18:00 hours (or 6 p.m.). If a more narrow focus is desired, a screen selection may be made (as in Figure 17) that covers the five districts near Winnipeg in the so-called Red River area.

FIGURE 16



Weather conditions
in three provinces
screen display

FIGURE 17



Red River area
screen display

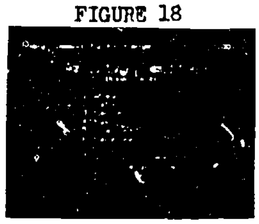
64/ These graphics were originally contained in material prepared by Telidon Videotex Services, Inc.

ERIC Full Text Provided by ERIC

The Telidon system has been designed to facilitate its use, and this was evident in the demonstration by Mr. Baird.

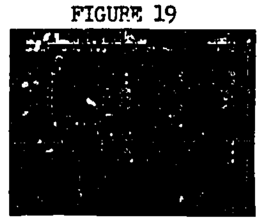
The next phase of the demonstration dealt with the "second most popular feature of the service," grain information. Two commodity exchanges, Chicago Board of Trade and Winnipeg, provide key data every 15 minutes. The "menu" of agricultural commodities, as they are listed on the terminal screen, appear in Figure 18, while essential data on wheat are featuredin Figure 19.

FIGURE 18



"Agricultural Commodities" screen display

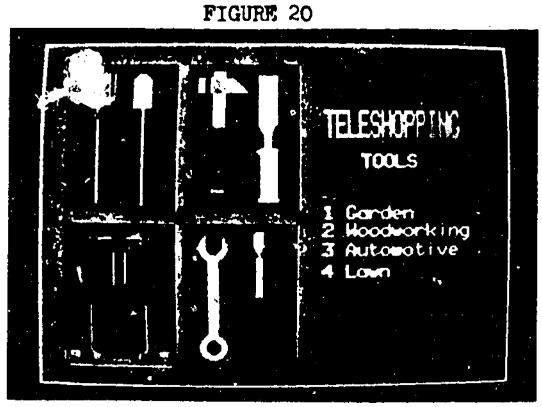
FIGURE 19



Essential market data on wheat screen display

Shifting next to another demonstration series, which he referred to by the generic name of "teleshopping," he described such activities as shopping for various items (see Figure 20), booking airline or recreational pasttimes reservations, or banking.

FIGURE 20



"Teleshopping (Tools)" screen display

His scenario for using the Telidon technology contained a package with four different services for bank clients:

1. You can ask for your bank balance in any account that you like.
2. You can ask for your month-to-date statement.
3. You can transfer funds from one account to another.
4. You can pay bills with it.

This demonstration, as conducted by Mr. Baird, showed how money could be moved electronically from one account to another. He touched on the topic of which institutions (such as those issuing VISA charge cards) know whom is owed, and predicted that in the near future:

> ...the likes of Exxon, Sears, Texaco will be sending you electronic bills rather than...a piece of paper. They will electronically deliver the bill to your pigeonhole in your bank account so that you will be able to access this particular chart any time you like.

Several of the functions delineated above were then demonstrated by the witness, who also pointed out that a hard copy printer, costing around $2,000 can be attached to this configuration. In closing, he mentioned that The Bakersfield Californian had developed a demonstration which reflects the type of information service that could be offered in the future if a serious problem such as the Mediterranean fruit fly were to occur again.

Mr. Fritts resumed his testimony at this point by telling of a service oriented to a "crisis time period," which utilizes data collected at the University of California at Davis. It is part assistance offered to the farmer in planning his entire range of activities for a year, including "acts of God or whims of nature." Certain pests or "spontaneous and devastating" weather conditions can be treated in such a computer-supported file. In the former instance, the essential information might include:

- ...[identification of] the pest, its lifestyles, its life patterns.
- ...how to treat and eradicate it...the control of the pest.
- ...where to purchase certain materials.
- ...[how] to manufacture your own traps, fumigation chambers. If you wanted to purchase Malathion or a spray to eradicate the beast, what are the downside risks?

In organizing his resources and actions for the year, the farmer may want to take an advance look at the "economic, political, and social climate for growing certain crops."

Turning to a broader area for consideration, Mr. Fritts advanced the belief that "the market will be flooded with videotex services," including some like the AGNET system which"inspire programs like ourselves." Although most of the companies offering this kind of service have been "technology-driven," in the opinion of the witness, it is important that there be a:

> ...liaison marriage between an electronics firm, a technology-oriented company, and an information provider, someone who is understanding of the quality of the product that must be delivered.

After stressing the importance of having "relevant, usable content" that can be offered via the Telidon technology in videotex form, Mr. Fritts said that the selection of that technology was the result of a survey that showed it to be "the best on the market."

The content of The Bakersfield Californian offering will focus on three general areas, he explained, and these were developed with the aid of the AGNET system managers. The first of these is the information in the system, which can be either very general or very specific in nature, and which must be responsive to the varying needs of the farmers in the San Joaquin Valley that might range from data on frosting conditions to data on pests and disease. The second category deals with "the ability to communicate among users," or could be thought of as "electronic mail."

> That's the transmission of information from user to user, which means that...you could play poker with some guy in Tennessee if he had a compatible terminal. But more importantly it is dealing with consultants, government officials...newsletters can be transmitted from a source or place directly to the user.

According to a Booz-Allen consulting report, kaffeeklatsches are "very vital" to farmers, who share information of many kinds in this highly information atmosphere. The electronic mailbox could allow a similar type of discussion of any topic "directly over their units with each other, or talk to several all at once and get input from several different places." Also, he mentioned the option of being able to "open up your directory in the morning...and you can choose which mail to open." The third focal area he termed "problem solving," which allows users to cope with factors of specific importance to him; examples might be problems related to irrigation or farm planning.

The costs of the system to serve the San Joaquin Valley residents--$50 basic subscription cost plus a terminal cost of $50 per month--would be more than compensated for by one major decision based on critical information in the system. Kern County, the site of Mr. Fritts' activity, has about 1,800 farmers with "an average agricultural output of about 800 acres...we are talking about a very high volume consideration...and one major decision that affects thousands of acres or bushels or barrels can mean thousands of dollars on the bottom line."

> ...let's face it, farmers ain't in the sticks no more. The good old boys are out there with MBAs and whether or not they are the most articulate,...they have to be... particularly astute, and on a daily basis.

Briefly noting again the importance of good pest management practices, Mr. Fritts identified another "can of worms," the area of water management--access to and the price of water, the water requirements for each individual crop, and even historical data on the possibilities of a drought.

In closing, the witness asserted that it is their intention to "be on-line within the year:"

> We'll roll out to the area of the five major counties that make up the San Joaquin Valley, with an obvious expansion to the entire State of California. Our services will be available, obviously, to any user, whether it be the government...consulting or brokers.

After commenting on the comparability between certain facets of the program described by Mr. Fritts and that of the American Farm Bureau Federation, Chairman Brown aske "How much capital and how much manpower are required to bring this system up to the level of capability that you are presenting here?" He went on to say that the reason for this inquiry stemmed from a look behind the scenes at the Control Data Corporation PLATO activity:

> I just kind of assumed that they....feed something into a computer and it comes out when you push the button, until I visited their headquarters and saw literally hundreds of people working to do the programming, the development of the coursework to go into that computer.

In reply, Mr. Fritts commented first on the desirability of governmental support for such an endeavor—"if the Federal Government is in the posture of handing out money, we'll be first in line"— and pointed out that "in Canada, England, and France, government all helped to underwrite the original exploration and development of the technologies, which spun off to the private sector." Continuing, he said that his group faces "the risk of taking that technology and developing it and making it work or not." In direct answer to Representative Brown's question about the resources required:

- o ...there will be a staff, probably, on board for us alone, of about 30 just to get the skeleton operation going.
- o The start-up capital...is going to be somewhere in the neighborhood of $10 million for this particular application alone.

Mr. Fritts told the Subcommittee that although "a lot of footwork" already has been done, "we are going to go back and refine the content and we'll take it back out to the farmer." He went on to emphasize that "The bottom line of this is if there is no product, there is no business," and then iterated that:

> ...we have to have a marriage between the terminal suppliers, the carriers—which would be the phone companies, cable operators—and the information providers, and if you don't have those three expertises, you don't have a product.

It may be necessary for their "time table" to be shifted, the witness stated, because:

> We are not going to offer up a content product in a brand-new business using a whole new presentation and a cost imposition on the farmer without being darned sure that we have a product that will be accessed every day.

Chairman Brown next remarked that "undoubtedly you will be doing some analyzing as you go along as to just how much the product is being used," for that type of measurement can be helpful. The Bakersfield Californian system will have that capability, Mr. Fritts declared:

> ...every page that is called up is electronically computed...it will particularly identify those information services and specific pages of information that are being utilized. What we really hope to do...is to reduce paper,[and effect a] reduction of manhours compiling irrelevant or non-usable, unintelligible information.

Such action, Representative Brown indicated, may "raise some interesting questions about the quality of information." He observed that there might be "the possibility of systematic bias arising in various types of information," but that it could be presumed that the system could correct such biases over time.

> Any system, any social system which allows control of accesses to information to be too narrowly held has problems with that. In other words, there needs to be competition in the information market, perhaps more than in any other market.

Mr. Fritts' reply centered on a piece of current legislation, H. R. 5158--which is designed to help rewrite the Communications Act of 1934-- and he spoke of the importance of protecting the "quality, diversity, versatility, and fair competitive situation governing the distribution of information."

> If large utilities, whether it be AT&T or other companies, dominate both...the communications network or the quality of information, then we are leading to a problem that has serious and very severe ramifications. It is our particular and somewhat selfish interest to protect our revenue base and business base as well, and reserving that right to continue to produce a variety of information within all available means.

He concluded by saying that "all legislators and the public" should be "very thoughtful of the fact that the 1934 Communications Act must be rewritten in some form or another." The Chairman agreed that this is a "very important" policy issue, but expressed doubt that "we will reach a satisfactory solution to it in the near future because of the rapid transitions occurring within the technologies [and]...the organizational structures of the market."

Turning to Mr. Baird, Chairman Brown professed an interest in hearing more about the utilization of the Telidon system in Canada, and especially wanted to know about the fiberoptics experiment that was alluded to earlier, since this technology reputedly offers a "much broader, larger capability for the transmission of information." Acknowledging the correctness of the Chairman's understanding, Mr. Baird explained that the 150-home trial service in Ely, Manitoba does feature more options—security services, media reading—and that the experiment is being run by the Manitoba Telephone System with collaboration from companies such as Infomart, and government departments.

Next, Mr. Baird discussed the problems related to customer acceptance and the economics of the Grassroots system. It has been learned that this service is "essentially being well received theoretically" as a result of demonstrations, and that the viewers "generally get quite excited about it." But there is a more far-reaching problem:

> ...farmers are generally under substantial economic pressures at this time, particularly grain farmers in the prairies, where prices just haven't kept up with inflation and with high interest rates...and

> general rising costs of their input supplies. They are feeling the pinch and they are not likely to walk out and spend $50 a month on a service of this type very readily. They've got to be fairly successful farmers or have specific needs.

The cost of the Grassroots system to the farmer is being scrutinized closely, he reported, in the hope that the terminal rental price can be lower, thereby getting "the service moving at a faster pace." Mr. Baird finished this commentary by saying that they are "still very bullish about the future of the service."

Upon being asked by Chairman Brown if the Infomart service also has been developed to "meet the needs of the urban market," Mr. Baird elaborated upon three data bases that his company manages:

> 1. ...a government information service, which the Canadian government essentially publishes and we operate on their behalf.
> 2. ...a consumer service, which was initially operated by Canada's largest telephone company, Bell Canada, but has subsequently been handed over to us to manage...that is going to 500 urban households.
> 3. ...a service for visitors to Toronto...[with] stand-alone units that will be in hotel lobbies and shopping malls...where visitors to Toronto will be able to walk up to these things free of charge, press the buttons, to find out where they should stay, what they should do next, where they can eat.

These units are fairly expensive—costing about $1,600 U. S.—which would make their introduction into households somewhat difficult. He suggested, however, that by introducing potential users to a computer-supported system by exposing them to a public service such as that for visitors to Toronto, they can become accustomed to that form of information acquisition.

In talking about subsidiary businesses which might emerge from a Grassroots-type operation--a possibility raised by Mr. Fritts earlier in his testimony--Chairman Brown asked him to comment further regarding "what the prospects are in terms of the changing job market situation?"

> We hear that we are becoming an information society and that more and more of our population are going to be involved in occupations and businesses that involve information handling in one way or another.

Mr. Fritts expounded on this point, saying that:

> ...the excitement generated by the opportunity to develop a new business is one of the things that makes Sammy run in the United States, and makes it the country that it is today. It doesn't take too much imagination to understand what the farreaching considerations and prospective goals can be of this type of service.

He noted in passing that AT&T and Knight-Ridder Newspapers had designed a trial system in the greater Miami area; this is the Viewtron project undertaken in 1980 serving 700 households in Coral Gables, Florida. Expanding the context of his remarks, Mr. Fritts touched on sever other facets of the expanding realm of information services:

- o The international market demands for home terminals [and] electronic games.
- o ...giant warehouses will be behind retail outlets [with]...electronic mail order catalogues. Sears is a leader in developing electronic catalogues.
- o ...the artistic elements of graphic page creation, a whole new area in artists' capabilities [including] advertising lay-out.
- o ...attache cases, pocket computers and screens, and all these types of capabilities.

Then, two related questions from Chairman Brown: "Is your prognosis basically positive or negative on this? Do you see more good than harm coming out of these things, or do you see a lot of problems emerging?" In prefacing his opinion that the prognosis is "good," Mr. Fritts held forth on the several ramifications of having computerized information support systems. Among these were the question of creating "another device that is going to make America lazier than it already is," and the trade-offs in utilizing such an innovation as "an enrichment tool" as opposed to catering to those who are "too lazy to go upstairs or...to the library... or downtown." He then illustrated the "convenience" aspect of their system by telling how tickets can be ordered for concerts, sporting or cultural events.

In conclusion, the witness stated his belief that this type of system "is going to be an inevitable feature in everybody's house," and that he recognized agriculture as an area with on-going needs. He differentiated between the approach taken by Times-Mirror, Time (Inc.), or Knight-Ridder in offering "general information systems" to the "general consumer market," and pointed out that he is "taking a very specific approach...and recognizing my limitations."

> ...I am going to have to have an awful lot of help, some of which will come from this committee. This is not a trial. This is a business. Grassroots went in there, with all respect to their efforts, without half the knowledge that I have gained since their being on line.

In thanking these two witnesses, Representative Brown promised to visit the Kern County operation "at an appropriate time, and make sure that it's delivering the capabilities that you have described. It is exciting and I do appreciate your contribution to our review of this and its impact on the agricultural community."

The next witnesses to appear before the Subcommittee were Dr. James Kendrick, Professor of Agricultural Economics at the University of Nebraska, accompanied by Richard J. Cannon, Assistant Administrator for International Agricultural Statistics within the USDA Foreign Agricultural Service. Dr. Kendrick began his testimony by setting forth the scope and nature of AGNET, the computer-supported agricultural network which he and Professor Thomas Thompson developed.

> AGNET, as you may know, is not a pilot nor a test project, but an existing interactive computer network that has been operational since about 1975. It is designed primarily to serve some of the diverse needs of the agriculturally-oriented clients throughout the nation. This includes farmers, ranchers, agribusiness community, the financial community that is working with agriculture, and so forth.
> Presently, AGNET users, which we consider our clients, are located throughout the United States in about 40 states...and the Western Provinces of Canada, though our concentration of users, of course, is greater in the Corn Belt...the Plains...the Rocky Mountain area and the Pacific Northwest, as well as California.

He continued, grouping the network's clients in four major categories:

1. ...the educational institutions, such as land grant colleges, their researchers, their extension agents; the state and community colleges, the vo-ag schools; adult education units, at night.
2. ...the agribusiness firms, the banks, the PCAs, the cooperatives, the credit institutions, the consulting firms, the equipment manufacturers, the exporters, publishers.
3. ...governmental agencies such as state governments, state departments of agriculture, and the Federal Government.
4. ...finally, and surely not last, are the farmers and ranchers themselves who are clients of the system.

Next, the witness talked about the "200 or so application programs on AGNET" that are authored by subject matter specialists and made available by this network which is "really nothing more than an electronic delivery system that permits the subject matter expert's knowledge to be delivered to the end user." Dr. Kendrick then briefly described three categories, into which he has separated the 200 programs:

- <u>Simulation and problem solving</u>...where we go beyond general advice such as what the weather is , what the prices on the market are...how do they apply that knowledge in a management sense or their particular operation to get definitive advice or answer their particular problem.
  ...the simulation and problem-solving models are able to customize general information into a specific solution.
- <u>Market and information services</u>...again, here the general information is very, very useful and it is a part of our system, but...is is also important to provide rifle shot or more narrow-banded information.
- <u>Electronic mail</u>...and electronic conferencing where you can cut down on travel costs.

The AGNET system "is thought by others to be cost-effective," and though part of the University of Nebraska is a "self-funded project," with its users paying the full cost of delivering the service.

Assuming the responsibility for the next portion of testimony, Richard J. Cannon provided an overview of the mission of the Foreign Agricultural Service which is "to expand foreign markets for U. S. farm commodities:"

- ...gathering, analyzing, and disseminating information of foreign market supply, and demand situations
- ...work to gain access to foreign markets
- ...help to promote foreign consumption and utilization of U. S. agriculture commodities.

By employing electronic dissemination and AGNET, he said, "we feel like we are at least working on two of those three functions...disseminating information...and the other is a tool for market development." Mr. Cannon recalled that he and the FAS Administrator had appeared upon another occasion before this Subcommittee, at which time:

> ...you sort of gave us a shot at that time by saying that we were not moving fast enough...So we began to speed up our activities, at your urging... and we began to search for an electronic system that could handle the kinds of things that we wanted to ...put out there for the farmers and the agribusiness community.

The result of that exploration was the discovery of AGNET, which offers such advantages as:

1. ...it has got professional people running it.
2. ...it's got the capability to handle large quantities of data.
3. ...it is able to expand quickly, not only from a subscription rate but from a data acquisition rate as well.

Mr. Cannon enunciated the FAS belief that "it is important to know who the end users are and that they be able to define what they want on the system." He asserted that thus far:

> ...FAS is pleased with our association with AGNET. We believe the results have been excellent. Better yet, the foreign agribusiness community seemingly is pleased and they are using the system.

Departing from the focal area of concern for a moment, the witness mentioned another unrelated FAS information activity, "a telecommunications system which will move data from our foreign posts to Washington, D. C.," and is fully operational. Four overseas posts are on-line—Brussels, Rome, Bonn, and London—which send all attache reports over this electronic network.

Dr. Kendrick then conducted a detailed demonstration of the AGNET on-line capability, and chose a simulation model dealing with the growing and selling of beef cattle. Noting that weather factors, previously mentioned, are an important consideration, the witness centered this hypothetical exercise in Mead, Nebraska. Utilizing the computer terminal, which was operated by Al Stark of the AGNET supervisory staff, Dr. Kendrick proceeded to deal with the several key parameters that must be used: weight of animal, projected (desired) weight, interest on loan, weight shrinkage during transit of animal from point of origin to receiving location. Of vital concern is "How much is it costing us to feed this animal?" At this juncture, he informed his audience that the "actual automatic weather data system" is being factored into the record on this animal. Next, the focus was shifted to what the beef can be sold for, which means looking at the futures market. Throughout his demonstration, Dr. Kendrick kept the hearing attendees apprised of the several interacting factors--feeder costs, sales price, cost of gain, projected returns, and so forth--with the bottom line being whether or not it is possible to make a profit. Many assumptions are possible, and Dr. Kendrick showed how dealing with the many factors, or even simulating different animals, allowed courses of action to be chosen which would be acceptable to the farmer, and even to his banker. Additional information about the range of actions possible through using AGNET is featured in Appendix 6.

Once again Mr. Cannon was called upon to direct the demonstration of the system, and returned to the matter of "trade leads" that originate overseas from potential buyers who contact U. S. agricultural attaches. But there have been problems in communicating such needs to the end providers in our country:

> ...we could move data from overseas to Washington in a hurry, via cable, but we had difficulty in moving the data from Washington to the potential sellers in a hurry because we were using the U. S. mail system. Getting leads to the State of California often took us as long as five to six days.

He went on to say that most of the products in the system are of the "value-added" type; examples mentioned were rice and green beans. The system is being tested with the State of Illinois, Virginia, and Washington, and two private firms, Sunkist in California and Long Acre in Pennsylvania.

Chairman Brown had two observations here, the first of which led to a question:

> ...the program that you are offering over AGNET here, particularly the problem-solving model that you illustrated, seems to me thoroughly consistent with the longstanding mission of University Extension, to assist farmers in improving their capabilities in managing their agricultural operations. It leads to the question of whether Ag Extension may be keeping up with the potentiality of this electronic system as a means of expanding their own role or effectiveness in their role.

In amplification, he pointed out that the Subcommittee, in a general way, is looking at "how Extension is adapting to the changing needs of agriculture in this country."

The other situation, Representative Brown said, is concerned with the development of a "fairly substantial entrepreneurial activity" and:

> I am wondering how that relates to the university structure within which this is embedded, whether or not you are making the fullest use of the capabilities of the free market to improve and expand this service to the extent that this might be desirable, and how you reconcile it.
>
> We've got a problem here of how we define the roles of government-supported institutions and programs versus the role of the private market institutions and how they would best function in this.

Dr. Kendrick responded to the first part of the Chairman's commentary by saying that the beef model which had been treated in the on-line demonstration was developed by Paul Gire, an Extension animal nutritionist, who drew upon his experience to create a program that is now "used three or four thousand times a month across the nation." The witness iterated that AGNET functions as the delivery system and does not author the programs. He then turned his attention to Representative Brown's second point, and repeated that AGNET is now self-funding, although some early "start-up money" had come from the Old West Regional Commission, a consortium of five governors, in 1977. System costs to the users include telephone charges of $20 to $28 per hour, with the computer cost (for a local call) being on the order of $10 per hour. As to savings, Dr. Kendrick reported that in the case of "formulating rations, they are saving $4.00 to $5.00 on every ton:"

> ...that doesn't sound like much until you realize that many of these feed lots, both in Nebraska and California, are feeding 50 tons a day...and that adds up.

And where irrigation scheduling is involved, by timing the water applications more evenly against monitored plant needs, the savings are around $13.00 per acre, "and that is mostly in energy costs which not only saves money but conserves energy." As to whether AGNET represents a "marriage of the university and private industry," he judged that it may be in "a grey area." He stressed that it is not a profit-making organization, and does cover its own costs.

> We have a number of clients that are commercial firms who take the information...a number of other agricultural computing networks are subscribers to AGNET and I think it is not completely immodest to say that they take some of the information off our system and repackage it with their advice and move it out to their clientele.

Pursuing this topic further, Chairman Brown said that he was:

> ...looking forward to the time when we see the next generation of growth in these systems and you are going to be competing with the Canadian system or with the Farm Bureau system ...and where is that going to leave you in this competitive struggle?

He then directed his attention to the role of graphics in such delivery systems by observing that at present:

> ...you are demonstrating a system which is rather unsophisticated in terms of its graphics, which isn't all that important, of course, when you are just delivering straight information, but when it comes to marketing these sophisticated graphics are a very big plus...particularly if you can provide the same data content with more sophisticated graphics and manipulation capability, assuming economic factors are reasonably comparable. You lose out in that competition.

One final point: a non-profit institution such as AGNET "may have difficulty generating the funds to do the planning or the investment...necessary to expand your service."

In replying, Dr. Kendrick noted that "non-profit doesn't mean you sell at absolutely rock-bottom cost." AGNET charges allow for recovery of costs, plus funds for "development, thinking, programming," and some of the revenue derived from the system operations is applied to the "recovery of past programming efforts." The witness offered the opinion that the AGNET system, as it exists at the University of Nebraska, is "comparable to a university press, which is self-supporting and develops technologies and techniques for publishing their specialized type of information.

After expressing pleasure at learning about the acceleration in some of the FAS areas, which had been attributed to "a little pressure from the Subcommittee," the Chairman asked a pair of questions:

> 1. How do you project the future development of the services and the technology that you have described?
> 2. Is that going to continue to expand and develop rapidly or just what is your situation at the current time?

Mr. Cannon, in response, said that the Foreign Agricultural Service is "deeply involved" in "information resource management" activities, as required by the Paperwork Reduction Act of 1980.

> ...we obviously are looking for any possible ways that we can carry out the mission of that particular organization. Electronic dissemination does that now...I am very convinced that we are just touching the beginning of this electronic dissemination process.

AGNET is being used as a "test," he declared, to determine "whether we can reach the user out there and whether he wants this information or not:"

> We are convinced there is a market out there for foreign data. We've never really been sure. I mean, with our paper that we've been publishing for years and years, we just in many cases assumed that that end user wanted that information. With this system that we are testing with AGNET, we can now get some definite feel...all of a sudden we are communicating with each other.

14-795 O - 83 - 15

The final comment by Mr. Cannon embodied his belief that:

> ...along with our telecommunications system that we are developing in conjunction with the State Department of moving data from overseas, the system that FAS has got going now is just exciting as can be and I believe that the foreign agribusiness community is going to be very pleased with it.

The next witness to appear before the Subcommittee on the second day was Roy A. Meek, Manager of the Eastern Lamb Producers Cooperative in Pulaski, Virginia, who was accompanied by Kenneth Neel, Manager of the Electronic Marketing Association. Describing himself as a "dirt farmer...at ease in a pen of cattle or a pen of sheep, but a room full of computers tends to scare me," Mr. Meek opened his testimony by sketching some of the conditions existing at this time in agriculture:

> ...the agriculture industry is experiencing some of the most difficult times since the Great Depression...we have met these problems in the past by increasing our efficiencies of production and increasing our volume of production.
>
> With the decreased emphasis on agriculture research, both at the U. S. and State level, we have had no major technological breakthroughs in production agriculture, hence we have reached a point where the average farmer is unable to improve his efficiency enough to ensure a profit.

Observing that "Increases of production when each unit loses money simply is not good economics," the witness enumerated three key considerations which must be addressed in increasing marketing efficiency:

> 1. Since the computer age gives us the tool to collect and disseminate information about specific segments of our industry, we now have the capability to know as much or more about a given agricultural commodity as do the people with which we trade.

2. In order to be successful marketers, we must know what our supply is, where it is, when it is ready to market, what the cost of production is, and what to expect the production will be in the near future.
3. With this kind of information, we can grow, feed, and breed around potential gluts in the market, and furnish the consumer with a more even flow of food at a more stable price.

Mr. Meek went on to explain that the Eastern Lamb Producers Cooperative was organized ten years ago "because of our lack of work in marketing." At that time Virginia placed 23rd in the United States in prices received for lambs. A cooperative endeavor was undertaken by several groups—USDA, various state departments of agriculture, the American Sheep Producers Council, assorted state and country cooperative extension services, and local lamb producers—which formed what was "probably the first organized effort to sell livestock by electronic means." Initially, the telephone system was used, with a "conference call" arrangement that allowed buyers to bid on the lambs at auction while the stock remained on the farms. The process looked like this:

- The successful buyer then asked for delivery within seven days, which aided him in getting fresh lambs on a day when he needed them most.
- If the price offered was not acceptable, the lambs were still on the farm, undisturbed by the sale, and not adding to the market glut, which was probably the cause of the market decline.
- On the date of delivery of lambs that were sold, representatives of the state department of agriculture were on hand to sort and grade the lambs, thereby ensuring the buyer that the quality of lamb was as advertised.

Within two years, due to its excellent acceptance by the buyers, Virginia moved from 23rd to 1st place when prices were compared; indeed, they sold their lambs for an average of $2.00 per hundred more than the state that was second. (See Appendix 7)

In 1980, through a grant from the USDA Agricultural Marketing Service, the system was "streamlined" to become "the first organization to sell livestock at auction by computer." Calling this a "technological breakthrough," Mr. Meek felt that there is the potential in such a system for improving not only the marketing of livestock, but grain and other agricultural products.

> The computer has made this possible with less cost and certainly more efficiency than the conference telephone call. Its use has grown from the initial 30,000 head of lambs that we sold two years ago to an estimated 200,000 head that will be sold in 1982.

Lambs are now sold in 22 states, using this system, to packers covering "an area from San Angelo, Texas to Toronto, Canada and east." Computer terminals are now being used in plants that have "72 percent of the kill capacity for lambs in the United States."

The Electronic Marketing Association, he averred, has "proven beyond a doubt that this is a system that will work for all commodities." Programs have been developed for selling: feeder pigs, slaughter cattle, feeder cattle, and EMA is "in the process of finalizing the slaughter hog program." Mr. Meek also mentioned that the organization is working toward joint efforts with a National Livestock Producers Association.

> Our board feels at this time that...we can operate on our own behalf without the help of the Government grant. We are certainly appreciative of what it has done in helping get the program on the way...You helped us in coming to that conclusion when you told us there was no more money available, but the goal of the U. S. Department of Agriculture's Agricultural Marketing Service... has been reached. We have a system that will work and it is now time for the industry to take it and move forward.

Mr. Meek shifted the thrust of his testimony to tell about a new information transfer program under development by the Electronic Marketing Association to benefit the sheep industry, so that its members can "make production and marketing decisions that will aid in the industry's growth and enhance the individual member's income." This industry was chosen, he explained, because it is relatively small and "we surely can learn what the make-up" is.

Speaking as a "grassroots" representative who is "one of that group of truly needy when you think of those in which you would like to eradicate ignorance," the witness stated his belief that the Cooperative Extension Service is "the best tool for dissemination of information in the world." Not every farmer is going to have a computer, he said, and added that some do not have telephones as yet. The availability of computer-supported systems will increase the effectiveness of the county extension agent:

> We can expect him to know where to get that information that is asked for...This agent, through the use of state specialists, will be able to ask for information from U. S. specialists.

Furthermore, such a system can be "a tool for sharing,across state lines, ideas so that each of our states will not be spending money on similar projects...let's don't do the same thing with this tremendous system of information and production as we have done in the past with our commodity production." The Extension Service, he declared, "must be considered as the wheel already built and proven which will run more smoothly with the grease produced from this new technology."

Several marketing conferences at which this system will be described in depth are scheduled for the month of August in Salt Lake City, Atlanta, Chicago, and Oklahoma City.

Following this testimony, Chairman Brown asked the witness to say more about the extent of EMA activities, to which the latter responded that after initially handling lamb marketing activities in Virginia, West Virginia and North Carolina, additional states have been added: Tennessee, Kentucky, Ohio, and New York. All of these fall within the purview of the Easter Lamb Producers Cooperative. A similar program exists in the Midwest which was developed by the Equity Livestock Market and is called the "Corn Belt Trans-auction," that also uses the EMA services.

Although the Electronic Marketing Association is at present a non-profit group, Mr. Meek emphasized in response to a question along these lines from the Chairman, it may undergo a transition to a profit-oriented organization in the future. The capital for EMA has been provided by the Lamb Producers group, but USDA supported the development of the computerized system.

Representative Brown spoke of his interest in this type of system sponsorship, and recalled the way in which AGNET functions at a university site, after which he observed that:

> ...your system is a non-profit with a cooperative sponsorship and it seems to me that there are opportunities in the agricultural information field for cooperative organizations, just as you have your farm coops in the lamb business.

The Chairman moved to another related topic, pointing out that:

> You raised the point about how this electronic marketing has improved the market price, and presumably therefore the profitability of the lamb growing operations as a result of that. You have pointed out the great changeability in the markets for agricultural products, which is something that disturbs us in this committee in many areas. The more productive a farmer is and the more he produces, frequently the less he makes as a result of it.

Perhaps through the use of an information dissemination system such as that sponsored by EMA, there would be a way to "smooth out fluctuations in the market just as a result of the better distribution of information:"

> ...so the consumers could be better buyers as a result of better information about the flow of products and could be encouraged, for example, when there is a surplus of lamb, to eat more lamb, and that would help to remove the surplus and stabilize the prices in that fashion.

Mr. Meek replied that such a result "is our goal in working with the National Association of Sheep Producers and in developing an informational system;" discussions between the groups have revealed that:

> ...we really don't know in advance when these...so-called gluts of the market will occur, and lamb is a commodity that we can feed to the market at different times. We can breed around gluts.
> ...if we can gather information from those producers, put into an organization owned by those producers [with] information furnished to them at their cost...they will use it better than they will the present information that we get through free governmental sources.

It is the hope of his organization that a "model" can be developed for use by other segments of the agriculture industry.

Amplification of the testimony on the technology actually employed by Mr. Meek's group was the next request from Chairman Brown. Several salient facts emerged from the witness' response:

- We are operating on leased time...through a INFONET system whereby the packers that have computer terminals can dial into the system at no cost [using]... an 800 line. This system...is international.
- ...we do our business through a computer terminal, which is connected to the large computer...at Beltsville, Maryland.
- We pay for the time that we use...it costs our producers about 25 cents a head to market their lambs ...The only cost to the packer who has the computer terminal is the cost of the computer terminal.

With this system, Mr. Meek told the Subcommittee, "we have become price makers instead of price takers."

> And if the price is not right, we leave the lambs on the farm until the following week or the week after that. It has tended to smooth out the peaks in production.

Asked if the buyer (or "killer") would ever like to look at the lambs being purchased, the witness informed the Chairman that the state grading services in the participating states are of such excellence that it is possible to "sell on reputation."

> ...a buyer will remember forever a load of lambs that does not do well...We have not had any problems with the packers wanting to look at the lambs. In fact, our major buyer for the lamb shearersin Virginia, West Virginia and Kentucky is in Toronto, Canada.

When asked by Chairman Brown if there was more to know about the technology involved, Kenneth Neel of EMA stressed that their time-share-system keeps costs down both in terms of overhead for the central facility and charges for the packers who are using the system terminals. These users, he said, "have made requests for information-type systems [by which]...they could access information using these same little computer terminals," which are very portable and can be used in the home or any location with an electrical outlet.

Mr. Neel returned to the subject of international communications:

> ...the company that we do business with...the INFONET system, has a worldwide communication where buyers in this country could interact with buyers not only within a day's time but within a second's time.

Chairman Brown, in continuing this discussion, maintained that once such a terminal is available, there is virtually no limit to the kind of data bases which can be accessed. "It becomes a matter," he noted, "of understanding the multitude of resources that are available through that terminal." The portability of such terminals offers a number of options:

> Actually, any dirt farmer who has electricity and a telephone line could be educated to use a portable terminal ...hook it in and get the information he wanted, and his local extension agent could help him to understand the uses of it or even make it an opportunity for another business, renting terminals to those who didn't want to buy a terminal.

The final witness before the Subcommittee was Dr. Louis A. Bransford, Vice President for Planning and Development at the Public Service Satellite Consortium (PSSC). After noting that he originally came from a rural village in northern New Mexico, "where we could never grow anything," he described the PSSC as "an international membership organization which was created to encourage and facilitate appropriate use of satellites and other telecommunications technology for public service." Its membership includes more than 110 organizations in the fields of health and medicine, education, public broadcasting, libraries, state telecommunications and religious communications.

During the past seven years, the witness commented, PSSC has been involved:

> ...in a number of rural telecommunications projects, ranging from studies of rural telecommunications needs to actual demonstrations of advanced technology in rural communities. Although the focus of our work in rural communications has been in the Rocky Mount[illegible]s, Appalachia, and Alaska, we choose to define rural [illegible]e broadly.

Illustrative of the first type of endeavor, he said, was a second year of a study on telecommunications requirements in the Pacific Basin, an area which "shares many of the characteristics and needs of sparsely populated areas in the United States."

Dr. Bransford went on to say that his focus would be on "satellites," but asked that his listeners share the view that these constitute a "pipeline that can carry video, audio, and data."

> ...the typical satellite, an RCA satellite or a Western Union satellite, has 24 transponders. A transponder might be the equivalent of a video channel...[and could] provide 1,000 to 1,200 voice lines...or carry from 50 to 60 million bits of data per second.

The PSSC definition of "rural" includes "communities with populations under 2,500 and usually some distance from a population center." Many of the city services in such communities are "limited or nonexistent," he continued, including "medical care, education, economic development, public facilities, a[illegible] enter[illegible]t."

> There is a cause and eff[illegible] rel[illegible] [illegible] shortages and isolation, otherwis[illegible] defined [illegible]le inability to reach and communicate with eac[illegible] [illegible] conveniently, be it video or be it data.

Oftentimes, it is a "hardship for people to get to town or to access information," and impediments include bad roads, inadequate public transportation, and prohibitive costs. Dr. Bransford told of meeting one of the leaders on a Navajo reservation who defined communications as his "Ford pickup, a tank of gas, and 40 miles of bad road."

A "climate of choice" has been engendered by improved communications which can diminish isolation by making information available to those in remote areas. The "fortunate few" in rural America can either move elsewhere or wait for better communications capabilities to come their way. The "rural poor" are less fortunate, and while they may decide to move, "where do they go and what do they do?" "The decade of the seventies witnessed technological advanced in the U. S. which vastly increased productivity in almost every area of human endeavor," Dr. Bransford asserted, and telecommunications technology was no exception.

Rural areas fared less well than urban and suburban entities, but most dwellers do have television, if with "fewer channels and generally speaking...poor quality."

- ...including services from translators and cable, the typical rural household receives only 50 to 60 percent of television signals received by its urban counterparts.
- ...public television is usually what rural communities do not receive.

Cable systems with satellite earth stations have commenced to create "small, ad hoc rural networks" in a few regions. Some short-term demonstrations have shown the potential of advanced telecommunications, but these--often funded by the U. S. government--ended when money was curtailed.

Turning to telephone service for rural America, Dr. Bransford informed his audience that the Bell system--with its 22 operating companies--"currently serves 80 percent of the U. S. population, spread over less than half of the U. S. geography." By comparison, "some 1,200 independent telephone companies serve 20 percent of the population and about two-thirds of the geography." The witness reminded the Subcommittee that with the "imminent changes" affecting AT&T, "those who are now underserved will probably be the last to be served," for:

> As with any new venture, the private sector is reluctant to invest when the rate of return on investment is low or is deemed insufficient.

Striking a more optimistic note, Dr. Bransford said that the "prospects for telecommunications, particularly satellite communications, look promising for rural areas:"

> You inject low power television...direct broadcast satellite service, and satellite-fed cable service, and rural telecommunications makes a quantum leap.

Ample evidence exists, he observed, that "this technology can provide needed services and entertainment far more effectively and efficiently than current methods:"

> In Alaska, for example, it has been demonstrated that in emergency situations paraprofessionals can use telecommunications to obtain guidance from physicians, guidance that would otherwise not be available. One radio physician can consult and direct as many as 50 paraprofessionals, each of whom could oversee separate villages of 100 to 200 people.

Other examples of note, in medically-related areas of endeavor:

- o American College of Radiology, which successfully has demonstrated that X-rays can be transmitted via satellite.
- o University of Colorado has used satellite technology to transmit the data necessary to perform a CAT-scan.

Entertainment programming has made advances "through such services as Home Box Office, ESPN, CNN—Ted Turner's program from Atlanta—and others."

"The challenge to rural areas then is to establish a telecommunications network which is flexible, affordable, and which can adequately reach even the most isolated viewers." Dr. Bransford contended that communications satellites offer "a natural solution to rural telecommunications needs," and unlike land-based communications links (i. e., microwaves and cable) are "distance-insensitive."

> ...it costs no more to transmit a signal from Washington to Los Angeles, plus 100 or 200 other locations that have earth stations, than it does to transmit from Washington to Richmond...and where it is appropriate and economical, satellite services can be combined with cable, microwave, or even the phone to reach almost any audience.

Dr. Bransford's next topic was "direct broadcast satellite service," a technical development that has "stimulated more interest, both within the industry and with the general public."

> There is something exciting about the concept of a tiny antenna, two to three feet in diameter, costing $300 to $500, located perhaps on one's roof, picking up signals directly from a satellite.

He continued his exposition of the DBS role, stating that it:

> ...offers the same potential augmentations of conventional broadcast services as cable, more channels and greater diversity of program material, and not just video.

DBS would find itself "in competition with cable"in some areas, he predicted,saying that "where cable can be installed for $500 or less per home, it wins on every count:

- o the number of channels available
- o the capability for local programming
- o the availability for handling both broadcast and non-broadcast programs

It was the opinion of Dr. Bransford that since it will cost more than $500 to prepare a home for reception, "DBS will be the preferred distribution vehicle in many rural communities."

A new type of earth station—a "one-way, receive-only data communications unit"—then was discussed by this witness, who emphasized that it "will enable users to access any one of several data bases:"

> You activate the system by phone and the information is transmitted via satellite, high speed transmission, directly to the user. It avoids the high cost of transmitting via satellite from the user premises but you have the benefits of high speed, on-line return, at a very modest charge.

Dr. Bransford then quoted the FCC Chairman, Mark Fowler, as claiming that "direct broadcast satellites represent a long-range approach to providing more services to rural areas." The witness maintained that "there may be more regulatory than marketplace barriers to the expansion of DBS in rural areas; however, new technology and the right combination of regulatory controls could ensure that expansion occurs in the near future." It should be noted that the recent FCC ruling regarding DBS activities, as discussed in Chapter II, reinforces the perceptions of Dr. Bransford.

The potential for a "hybrid system"—low power television, DBS, cable, with a satellite connection—has been viewed by many as the best service provider for rural America, he noted, but "there must be a large enough revenue base in such markets to support local programming." He stressed that "lack of local programming capability is probably the major weakness of DBS."

"A key advantage to satellite systems," Dr. Bransford announced, "is that they are flexible:"

> New points can be added to a network by installing an earth station, without regard to the difficulties of distance and terrain which...plague the installation of terrestrial systems...satellite carriers provide more flexible interconnection arrangements to owners of local networks than terrestrial carriers.

After commenting that "for years translators have provided simultaneous retransmission of television signals received from full-power UHF or VHF stations to rural areas," Dr. Bransford talked about a "new breakthrough," low powered television or "LPTV." This is a new, expanded service which will:

> ...allow many television stations to originate their own programs and carry advertising or charge subscription fees.

More than 5,000 applications have been submitted for such services, to be supplied through low powered television stations, which are expected to "stimulate programming delivered by satellite, especially to rural areas." The witness questioned the feasibility of much local programming from a single low powered television station, but professed belief that "regional chains could get enough revenue to support a regional program," which is "where the coop concept would apply."

Dr. Bransford next described other technologies under development, which are worth noting:

> 1. ...bandwidth compression, essentially using less bandwidth to transmit a video signal...motivated by the high cost of video broadcasting and the need to ensure that there is enough transponder capacity to meet the demand in transmission, particularly of video, although it does have applications for audio and data.

ERIC

2. The design and manufacturing of earth stations has followed a path similar to that of computers: smaller packages, lower cost, yet more capacity ...this is a function of the new high powered satellites and the dramatic growth of the industry.
3. The technology of fiberoptics also allows several extensions of services terrestrially which are either very difficult or impossible to accomplish today. Fiberoptics has wide bandwith capacity within a small physical space. It is immune from interference, both electromagnetic and radio. It has low attentuation ...is not affected by the weather...is lightweight ...non-radiating, and it is becoming less costly.

He pursued the latter point with this statement:

> This means that it is technically and economically feasible to bring video services into the home which could not be there before. It will be possible to bring a larger number of TV channels and other interactive services to whole communities as fiberoptics become more readily available.

In spite of the many identifiable advantages and "glowing prospects," Dr. Bransford underscored the fact that a rural telecommunications network has not been established, and gave these reasons:

- [lack of a] demand for a specific set of communications services...sufficient to induce a commercial supplier to offer the proposed combination of services at the right price.
- [lack of] population density...and subscription potential...fewer voices coming from rural America translates into unattractive markets.
- Certain public services are not desired or required because people are not aware that they are available or it has not been feasible to provide such services.

Among the problem areas previously unattended but now capable of being dealt with through the use of space technology: disaster relief, search and rescue, and monitoring of water supplies or forest fires. "Only public demand," the witness emphasized, "will stimulate change" in many of these potential activity areas.

ERIC

"Economic considerations"must be looked at realistically, Dr.Bransford said, and those concerned with the role of telecommunications for rural communities must not become preoccupied with entertainment, improved health and educational service, or access to information, nor ignore two related questions:

1. Would it make a difference if we considered a rural telecommunications network from an economic perspective?
2. Can we defend an economic argument for improving telecommunications in rural America?

In light of the fact that the average size of a farm has decreased in the last decade while the number of farms has increased, it is possible, he stated, that with modern telecommunications:

> ...we can keep smaller farms alive by providing them access to information, as has been well demonstrated, and perhaps help them remain competitive.

Shifting his emphasis to the role of computers on farms, Dr. Bransford agreed with earlier testimony which noted that their presence was "not uncommon," but that "connectivity to relevant software is limited and expensive using existing landlines."

> If we could justify a satellite link, and the average farmer could interface his farm computer to the state extension office, or any one of the agricultural, veterinary or forestry colleges in the United States... the possibility of decreasing the cost of operation or increasing productivity would become evident.

He spoke in passing of his personal experience with the mining industry in New Mexico, which attracted skilled workers "who were able to bring their families because they provided health services, educational programs, and entertainment electronically."

Dr. Bransford chose, in the next portion of his testimony, to share information about the American Feeder Pig Cooperative tele-

14-795 0 - 83 - 16

auction system. He told how pigs in feed lots—in Minnesota, North Dakota, and Wisconsin—are auctioned via telephone to buyers who convene at elevators and other locations, primarily in the Midwest. The Cooperative asked PSSC to help "examine the requirements and costs to develop a tele-auction but with video capabilities," with an objective of increasing the sale of pigs and expanding the auction nationwide or even internationally. The PSSC response featured the possible use of:

> ...a transportable satellite uplink, [such as] a Winnebago van...[with] an antenna on the roof. You could drive that from feed lot to feed lot and provide auction services live from the lots. Receive-only terminals would be located at elevators, commodity markets, processing plants throughout the country, where interested buyers would convene to bid on the pigs...there seems to be something exciting about being able to see something that you are bidding on. It might also provide an alternative to the grading practice.

The economic implications of such a tele-auction network: "increased sales," plus more jobs due to the operation and maintenance of the uplink and downlink facilities.

Another example of how telecommunications can affect the economy of a community, the Trempealeau County Kellogg Project, was then cited by the witness. In this instance, a teacher in one school can teach students in a number of other schools, and some schools slated for closing remained in operation. Interestingly, this project was featured in congressional hearings on rural telecommunications during the 95th Congress, at which time the initiative taken by the Western Wisconsin Communications Cooperative in gaining Federal support under the Vocational Education Act of 1968 (Public Law 90-576) and the Rural Development Act of 1972 (Public Law 92-419) led to a demonstration project that brought broadband linkage of a two-way nature between eight schools in Trempealeau County.

A cautionary note was sounded by Dr. Bransford at this point in his presentation, when he said that "communications does not guarantee development. It cannot breed instant wealth."

> ...but it does provide a synthesizing tool, a catalyst for change, an opportunity which can brighten the prospects for citizens of rural America.

Three conditions have been enunciated by a FSSC economist who is working on the Pacific Basin project, he said, which must be fulfilled if companies are to locate their facilities in rural U. S. areas:

1. the right kind of transportation must be available;
2. sufficient numbers of people must be available to be employed; and
3. sufficient appropriate communications capability must be available.

Once again Dr. Bransford iterated his core question:

> What then will it take to establish a viable rural telecommunications network to support needs and requirements of rural America, agriculture being but one of the disciplines?

Two important actions must occur, he judged:

- First, people will have to become aware of the potentials of telecommunications and will have to become comfortable with the technology in their everyday lives.
- Secondly, institutions will have to be adjusted, or new ones created, to focus on telecommunications' planning and implementation.

Continuing, Dr. Bransford said that most entertainment and non-entertainment telecommunications services—with the latter including "continuing education-related services"—will have to be conjointly packaged...to attract many rural areas," and "many" means "in the hundreds." The difficulty of assembling a "combination of programs or information as appropriate to rural Appalachia as it is to the northern Rocky Mountains" would be difficult, he admitted.

Another facet of the problem, Dr. Bransford went on, would be the "legalities" of establishing functional linkages between cable companies and the independent telephone companies which serve most rural communities.

> Present regulations prohibit a single owner from controlling both the cable TV franchise and the telephone company in a community. Although waivers are available in communities where competitive provision of telephone and cable television services is not feasible, the FCC's case-by-case approach and waiver criteria may have discouraged new development.

Two vital considerations were propounded by the witness, which constitute the "bottom line" in this area of potential development:

1. Until people have a chance to experience the advantages of telecommunications, they will not be willing to invest money in unknown, complicated equipment.
2. Moreover, until rural America has a taste of the benefits of telecommunications, the demand necessary to attract commercial financing is not likely to be generated. It seems imperative that someone on the outside provide the initial impetus.

Since "stable financial support" is a sine qua non, there have been those who have argued that "government subsidization is necessary to establish the system, but that once the system exists, recurring revenue from operational services would engender a self-supporting enterprise." Dr. Bransford, in support of this position, then indicated that "subsidization, whether in the form of a direct grant or tax advantages, will be necessary to foster new avenues of communications technology for rural America."

In amplification of this stance, he constructed this underpinning of reasoning:

- o First and foremost, a government-supported program could provide the impetus necessary to establish regional planning bodies for rural satellite telecommunications systems. Through this process, comprehensive and coordinated planning could be undertaken to ensure services that are most effective and efficient.
- o Second, direct or indirect government support will be necessary for the acquisition and installation of hardware, either by a private company or a public body.

The witness went on to acknowledge that regardless of the approach that is taken, "proposals for new budget expenditures or tax incentives will be somewhat less than popular during a time of severe budget crises."

Through a historical example, Dr. Bransford then sought to show how government investment in a public service area--in this instance the railroad expansion of the mid-1800s--was repaid with interest, and "through the substantial expansion of the tax base, had realized an enormous gain on it's original investment." Space development offers a similar opportunity at present, he indicated:

> The most conservative estimates range from four to six dollars returned on each dollar invested in space technology. When one includes the many industries initiated by the research and development work carried out during the Apollo program, in particular, estimates jump to $20.00 for each dollar invested.

And to further underscore the investment potential of such technology, Dr. Bransford noted that revenues from communications satellites "already exceed one billion dollars per year and are expected to more than double by 1985, growing by a factor of thirty by the end of the century." In 1982, "the total communications marketplace will exceed

$100 billion," he stated, with a tax base increase potential that is "phenomenal."

With the capability to serve all of America with "the best and brightest of telecommunications delivery systems," the extent to which these are extended to "those who are traditionally last in line will depend on three fundamental factors,"according to Dr. Bransford:

1. government policy that fosters delivery to and for rural areas;
2. the development of appropriate technology to deliver services: and
3. the degree to which rural populations demand services and show that they can pay for them.

Four assumptions were predicated at this juncture regarding the establishment of a rural telecommunications network:

- ...rural markets can be aggregated
- ...needs can be well articulated
- ...demand is sufficient to support various telecommunications systems
- ...satellites, when coupled with complementary technology such as cable or low powered television, can provide transmission service at a modest cost to rural America

The responsibility of government, as set forth in this final portion of Dr. Bransford's testimony, is defined in these words:

> What we await, then, are government programs and policies that will actively promote improved telecommunications services for rural America.
> ...it will be important to foster new efforts, including research and development by appropriate government agencies, as well as letting industry explore the market.
> One obvious danger is that too laissez-faire an attitude on the part of government, under the guise of deregulation, might mean decreased services to rural America. Left completely to marketplace equations, sparsely settled areas will be at a disadvantage.

After commenting that Dr. Bransford had presented a "truly exciting picture of the future of rural America under a fully developed electronic communications set-up," Chairman Brown asked for information about Japanese efforts to develop and market equipment that "would fit into this need for low-cost satellite television communication." Dr. Bransford responded that their advances are in the use of "very small earth stations...predicated on their satellite systems that are high frequency...[in the] 30-20 gigahertz range." The United States, the witness noted, has not funded R & D efforts in this area.

Representative Brown then asked if Dr. Bransford foresaw "any difficulties arising out of the shortage of orbital slot allocations" in the light of a "massive increase" in the numbers of satellites. "There is a parking problem in space," was the reply. Certain facts must be kept in mind, the witness observed:

- At the present time, they tend to locate satellites four degrees apart.
- There is discussion taking place now to locate them [at] either three degrees or two degrees spacing.
- All of the parking slots are asked for [in]...the C-band frequency.
- [In] the higher frequencies there are some still available, but...we share that spectrum with all other countries in this hemisphere.
- ...the FCC in the last year has approved the launch of 20 or 25 and...the construction of 20 or 25 new satellites...some will be replacements...[or]at higher frequencies.

Returning to the earlier commentary by Dr. Bransford about the mining company in New Mexico which attracted employees by providing various benefits, including access to entertainment and educational offerings, via telecommunications, the Chairman asked:

> ...do you see any indications that the development of a fully implemented, sophisticated rural telecommunications capability, which would provide a whole range of data, entertainment, and so forth, would lead to any change in the settlement patterns in this country?
> There is already evidence of some movement away from cities back to rural areas. Do you see this as being influenced by the greater availability of a more adequate rural telecommunications capability?

Noting that there has been "somewhat of an urban flight phenomenon," Dr. Bransford remarked that there would be an "effect on settlement of outlying areas when you know that health, education, and entertainment services are readily available."

One of the problems of developing comprehensive support systems in rural America has been "the lack of local programming capability," Chairman Brown stated, as well as "the lack of ability to aggregate markets for large-scale, more sophisticated kinds of communications services."

> I am reminded of the similar problems that we have had in prior generations, beginning with rural electrification and then rural telephone, in which the Federal Government encouraged and provided assistance in the formation of rural electric coops which went into rural telephones, and some of which, I understand, are now actually going into other forms of services.

"Do you see this as a possible model...for the Federal Government to provide assistance in the expansion of rural telecommunications services...[through a] rural cooperative venture, locally owned and controlled by members of the cooperative and perhaps networked on a regional basis?" Dr. Bransford responded that this "is the only way we are going to justify any type of local programming...It will require some cooperative efforts, and I think the coop concept is the vehicle to bring it about."

With this final exchange, the second session of the formal hearing was concluded, and Chairman Brown notified all participants in the six discussion groups that their findings would be presented at a plenary afternoon session in the Subcommittee chambers.

ERIC

VII. HIGHLIGHTS AND COMMENTARY: TECHNICAL WORKSHOP ON APPLICATIONS OF COMPUTER-BASED INFORMATION SYSTEMS AND SERVICES IN AGRICULTURE, MAY 1982

As an introductory to his statement opening the final session of the combined hearing and technical workshop, the afternoon of May 20, Chairman George E. Brown, Jr. again thanked the more than 100 individuals who had participated in the workshop discussion groups. Indicating that the "gist of the recommendations and findings" would be of much value, he informed the attendees that they would be used:

- ...as a basis for future policy actions involving legislation or other matters [and]
- ...as a form of education for the Congress as to the developments which are taking place in this extremely important area.

Constituting the six discussion groups were persons from the farming community, academe, Federal and State government, associations, the media, and the corporate world, all of whom voluntarily gave of their time and energy to come up with ideas and insights that would be useful to the Subcommittee. The workshop topical areas were categorized thusly:

Group 1 — Private Sector Information Services
Group 2 — Government Information Services: Management and Marketing
Group 3 — Government Information Field Operations
Group 4 — User Requirements
Group 5 — System Implementation: Hardware Installation, Training, Maintenance, Software and Data File Modification
Group 6 — Present and Projected Technology

The initial oral summary presentation was made by Ray Daniels, Vice President for Agriculture at Chase Econometrics, located in Bala Cynwd, Pennsylvania, who served as the leader of Group 1. Accompanying him was the group rapporteur, Gerald J. Sophar of the Field and Special Programs Division at the USDA National Agricultural Library.

Mr. Daniels first spoke of "information as a national resource," and noted that in this decade a great deal of "analysis and planning" would be required on the part of the farming community in order to achieve the desired "productive efficiency." Integral to achieving this should be the selective "application of computer-based information and systems." In approaching its task, the discussion group divided the topic of private sector information systems into five areas:

1. maintenance and collection of primary data
2. data accessibility
3. communications systems...responsibility of public and private sectors
4. computer hardware systems
5. value-added information

Although the focus of Group 1 was on the roles and responsibilities of the private sector, there were many mandatory comments regarding public sector charges and contributions. First, Mr. Daniels reported, the discussion centered on the public sector's "investment" in data, and its continued role as the "original source of information collection and maintenance." Source data derived from the private sector would have its credibility—quality, accuracy, and completeness—questioned. Another problem: "the private sector would tend to want proprietary ownership of original data, thus restricting its availability to other competitors, universities, and government agencies." The public sector entity responsible for collecting such data should, therefore, provide to potential users information under certain guidelines:

- [data]...in computer-readable or at least hard copy form...uniformly formatted and readily accessible.
- ...should not be contracted out to private sources since such contracts reduce the competitive advantage of different private agencies and could increase the cost to public research institutions.
- ...care should be taken not to sole source the data to one private computer company which could force users to pay royalties and other user fees.
- ...make the data available to all parts of the country, to both public and private sectors, using the latest state-of-the-art communications systems.

On the latter point, the discussants realized that there are many areas in rural America where telephone service does not allow the transmission of computerized data, which would indicate a move to satellites or other telecommunications systems. And whereas such systems "should remain in the public domain so they will be accessible to everyone, computer hardware delivery systems...should be purchased by the end user."

"Value-added information," reflecting "human expert interpretation and the repackaging of data," should be a shared responsibility, the group decided. At this point, a cardinal tenet was agreed upon:

> The profit motive will be the primary force determining what the private sector provides to rural America.

The public sector must, however, "develop a consistent set of standards for evaluating what information should be provided...[but not] without determining its value" according to some consistent criteria.

Coupled with that recommendation was the belief that no information be destroyed which could be used for research purposes.

Group 1 then juxtaposed recommendations as to the roles which the two sectors should fulfill in offering various products and services:

- The <u>private sector</u> will thus provide user systems to the rural community only in...those market segments where volume or numbers of users would provide an equitable return on investment.
- The <u>public sector</u> will need to assist in fulfilling the needs of the smaller farmer or other sectors which are not economically feasible for the private sector.

Related to the identified private sector responsibility (above) was the opinion that it should "assist small businesses in developing software programming systems for small farmers."

Next, Mr. Daniels explained, his group has dealt with the "data and information systems requirements of rural America," classifying them in this way:

1. Financial data, such as individual recordkeeping and cost analysis;
2. Enterprise planning [including]...what inputs to use, how much to use;
3. Buying and selling information; and
4. Computerized monitoring of the [farm] production system and equipment...amount of water needed? Are the tractor blades deep enough? Is the hired worker on the job or asleep?

A cluster of questions were articulated within the group which focused on the development of information support systems, and access to the files therein:

- Who owns public-developed systems such as AGNET?
- Could a private company go to the University of Nebraska or other public agencies and obtain these programs and systems?
- Would it be legal for the private sector to buy such public sector programs?

The basic policy issue of what should be the "competitive nature of public institutions in developing and marketing commercial systems" prompted a series of questions from the Group 1 participants:

1. Do such institutions charge full price in their development or are they subsidized?
2. Do local small businesses have the right to use those public institution computers at the same price in order to compete?

In connection with this second point, it was noted that "excluding labor, the largest cost in developing software packages is the computer." If the small entrepreneur cannot use public institution computers, then he may not be able to compete.

Still other questions were raised anent the scope and nature of public institution development and operation of computer-supported services:

- Is it not the responsibility of the public sector, such as USDA, to provide the private sector with the same data in the same readable form, and in the same timely manner, as FAS does for AGNET?
- Should public agencies be allowed to use public funds to enhance private company software systems, data offerings, or user friendly languages without making them available to everyone?
- Does the public sector have the right to provide specific programs on specific micro-computers for farmers without doing it on all micro-computers?

The issue of legal ownership of private programs, data, and software developed in the public and private sectors may also become a "critical constraint to public and private industry investment in the decade ahead," reported Mr. Daniels:

> For example, if I spend $5 million developing a system, do I not have a right to own it? Ownership of computer software is not very clear. Patent laws on computer software are very confusing.

"Data base ownership" is another important issue that was addressed. If a company takes a government-developed data base and places it on the corporate system, perhaps reformatted for use in preparing charts and graphs, does the company now have proprietary ownership?

Another issue discussed within Group 1 concerned the "quality of computer systems:"

> Are we not seeing empty computers offered to farmers which require more programming ability than he has? I ran into that [problem] before I came into private business...at the university I had no programmers. I now require one programmer for every economist. I do not think the farmer can afford that kind of staffing cost to develop his programs.

Mr. Daniels also reflected on the question of whether the computer is being oversold: "I think we need to face reality that microcomputers are not going to do everything...will they get the job done for which they were purchased?"

Group 1 also felt that universities involved in developing and managing information services should "check closely with their law schools," inasmuch as there may be some "maneuvers during the decade ahead with respect to computer systems and data ownership." Yet another area of importance, in the judgment of the discussants, regarded protection of users' personal information. "What type of protection will the company offer a user?"

Two final issues surfaced which merited mention to the Subcommittee:

1. Pricing of public data...How should it be priced if it was developed in the public sector?
2. Efforts should also be made to arrive at common computer languages; also more disclosures as to the complexity of systems offered.

The group rapporteur, Mr. Sophar, reminded the audience that while most of the commentary thus far had been within the "individual farmer" frame of reference, that "almost everything that is stated here also applies to the problems of small communities."

Chairman Brown remarked that "many of the questions you raised here are questions which have been or need to be raised in broader areas of the information field:"

- ...we are grappling with the question of who has the rights to publicly-supported research in many different areas.
- There is the question of the conditions under which it should be licensed if a patent is developed as a result of...publicly-supported research.
- ...right now [there is] the question of whether we should turn over to the private sector some of the information systems that have been developed...the National Technical Information Service, for example.

After listening to these observations and Representative Brown's declaration that "We are rethinking the role of Government in a number of areas of this sort," Mr. Daniels announced that one important issue had not been included in the previous summarization:

> ...as the private sector tries to move in [this area], does it have the right to move toward proprietary ownership? This ownership reduces freedom of information. ...If they do, then we are going to restrict trade... the free flow of information is essential to proper business development in the small computer area.

He went on to say that:

> ...in my business we are traveling throughout the world trying to get proprietary ownership of industry data or specific country's data, so we can develop an edge on the competition.
>
> Once I have the data base on a proprietary basis, my competitior cannot put it in his system. A lot of this is being done. I think that this is a very serious question when you talk about moving the original public data to a sole source private company. That really will become a constraint of trade.

Appearing before the Subcommittee to present the oral summary for Group 2 (Government Information Services: Management and Marketing) were the group leader, Dr. Buel F. Lanpher, Program Leader with the USDA Farm Management Extension Service, and Harold Walker, a Farm Management Extension Specialist at Virginia Polytechnic Institute and State University, the group rapporteur who would explain the findings and recommendations.

Mr. Walker opened his statement by noting that there was a strong feeling within the group—comprised of "approximately 20 people from Federal and State governments, land grant universities, private consultants, and the media"—that "not enough is known about whether electronic technology can be used effectively to serve the small and limited resource farmers and other rural groups." It was the consensus that a study be made:

- ...to determine alternative possibilities of serving this clientele with computerized information systems.
- ...to also consider how each alternative approach would fit into Federal, State, and local programming efforts, whether by the public or private sector.

Optimism was expressed within the group that this technology might be used to "strengthen the already proven paraprofessional type of programs."

It was believed, the spokesman said, that "if funding were not a problem, the mechanisms for using computer technology could be developed" for the identified users. The "need for good software" was delineated early in the discussions, and those involved contended that:

14-795 O - 83 - 17

> Land grant institution personnel need to develop at least prototype or minimal amounts of software that fully and accurately incorporate subject matter for particular decision-making situations. This software should be available to the general public.

Continuing on this theme, the group stated that private firms should be "deeply involved in the direct delivery and servicing of the software to the end user." Farmers need help in making key decisions about the purchase of management and marketing software or requisite hardware, and they can be aided by receiving "objective and unbiased information from the land grant college system."

> Few farmers are capable today of evaluating the pros and cons of what is being offered in this field of new technology. Farmers continue to look to the Cooperative Extension Service for their educational assistance as they have done over the past years as new technology has been introduced.

The matter of educational assistance was one of prime concern to Group 2, which cited a "vast need" for helping farmers learn how to effectively utilize software in making management and marketing decisions.

- This goes far beyond the training needed for the routine procedural and mechanical manipulation of operating computer hardware.
- Most farmers want assistance in determining appropriate and accurate input data that fits into their farm situation.
- They then need substantial educational assistance to interpret the program output and how to implement this plan into their business.
- There usually is a need to change some or many of the coefficients that have been used and rerun the computer program for best results. This provides information on the sensitivity of the output to the coefficient changes.
- This process requires substantial one-on-one types of educational assistance.

Several resources exist which can be utilized to fulfill such activities, Mr. Walker reported: the Cooperative Extension Service, private or coop organizations, farm business management associations, and private consultants.

The discussants then considered a number of special programs or projects which may have to be developed "for those who cannot afford to pay" for the more advanced services. Of particular concern was the quality of telephone service in many rural areas. "Party lines" still exist in many states, especially in rural areas, and these are "unacceptable for data quality needs since there is no method for keeping other party line users from picking up their phones when they desire."

> Such action terminates data transmission, at worst, and results in garbled transmission at best. The "last mile" subscribers on these telephone lines can forget data transmission completely.

Mr. Walker reported that one state represented in Group 2 had 48 percent of its rural telephones in the "unsuitable for data transmission" category. He went on to say that alternative methods of transmission, such as microwave or satellite, are "extremely expensive." To better understand this critical area, it was recommended that:

> ...a feasibility study be conducted to determine how services can be provided to rural America or whether such services could be provided and means of financing such services.

Also, the question was posed: "Is legislation needed to require some minimum level of transmission quality to rural areas?"

The attention of the group then shifted to the roles and responsibilties of the U. S. Department of Agriculture, beginning with an enunciation of its function "to collect and disseminate information on agriculture and rural America." Originally, USDA collected much of such information for internal use, but made it available to States--usually in printed form--upon request. Formats differed between agencies and divisions. With the advent of electronic technology, certain conditions must be recognized:

- ...these data bases were made available to States in the existing formats.
- Recipients face the task of trying to retrieve information from numerous sources within USDA with no consistency of format or method. Some attempts produce less than desirable results.
- USDA staff have been very cooperative in working with individuals in the States who want this information, But in most cases persons wanting the information must be well versed in computers.
- ...in many cases information wanted probably is in different divisions or agencies within USDA and on different computer systems.

Several changes could be made within USDA to alleviate these difficulties said the group through its spokesman:

1. ...the adoption of a common data base management system for all of USDA-type information.
2. ...change the retrieval systems so that they are more user friendly.
3. ...channel all access to USDA information through a central computer that functions as a clearinghouse type of system. Each agency then could continue to use their different computers and their different methods, but users would be relieved of learning the different protocols and different user numbers and accounts that must be established at the present time.
4. ...add the ability to scan USDA information to reduce the need to print large quantities of information that later prove to be not useful for the purpose intended.

Mr. Walker next informed the Subcommittee that Group 2 had "seemed to support the concept of a national computer center to assist in the coordination of computer projects and systems for the land grant college system:"

> The focus of this center should be to develop standards or common procedures for computer activities and systems to facilitate development and training for maximum information transfer among the states.

Also discussed were "the need and desirability of creating several regional computer centers," which the USDA is "now in the process of doing."

Two other recommendations were made by this group, Mr. Walker said in closing:

> 1. ...the establishment of documentation guidelines move forward and that they be adopted on a national basis ...more support should be given to further development and evaluation of this effort.
> 2. A study should be made of the impact of this change in marketing on the traditional marketing structures.

After thanking the group for its four recommendations regarding USDA, which he deemed "extremely pertinent," Chairman Brown averred that he knew Mr. Lett, an earlier witness, was "working assiduously to accomplish some of the recommendations that you have made." During the 20 years of his own cognizance of this field, the Chairman noted, recommendations "have been fairly consistent with regard to the need for better policy management of scientific and technical information. The situation has gotten worse rather than better." He continued, saying that the group recommendations "will be very helpful in helping us to turn the corner and begin to make those improvements." With the passage of the Paperwork Reduction Act and other initiatives, "we are closer...and beginning to see a recognition of the need for common data base management systems, for example."

Mr. Lanpher and Chairman Brown then entered into an exchange about "the time required to get the farmer up to speed and to understand and utilize these programs," as well as "the actual time involved in running through a program after you know what you are doing." The "real cost," Mr. Lanpher declared, resides in such action elements as:

- ...the accurate determination of input data.
- ...the right coefficients to analyse.
- ...[the decision] to rerun.
- ...the "what if" questions.

They next focused on the need to tailor programs for "the individual farmer situation," as opposed to dealing in averages.

Shifting the discussion to another essential facet, the Chairman asked if there are, among the management and marketing systems, those "geared to the needs of the farm household."

> Here I am talking about the management of menus, for example. This is in helping people to shop and to prepare food more wisely...so that a housewife looking at her budget and availability of food...could be helped to make management decisions.

In response, Mr. Walker said that there are several program on the CMN system which operates out of Virginia Tech which are "oriented to the family...some related to food purchasing [and] the nutritional content of foods." Among the 10 or 15 programs there are also "budgeting programs to help them budget their expenditures to cover food, clothing, and other necessities." Representative Brown acknowledged that "we have a tremendous amount invested in nutrition research," which would seem to be the "kind of information that could be made available in a computerized data base."

In his final comment, Mr. Larpher informed the Subcommittee that there is a USDA publication which"contains about 1,500 programs, computer programs, used in agricultural extension...some of these are home economic programs."

The third discussion group, charged with looking at government information field operations, was represented before the Subcommittee by Dr. James Lyons, Assistant Director of the Agricultural Experiment Station at the University of California at Davis, who served as group leader, and Howard Lehnert, National Program Leader with the USDA Agricultural Weather and Videotex activity, the rapporteur. Observing that there might be a certain redundancy between the presentations of the various groups, but that "you might even find utility in the redundancy," Dr. Lyons opened his oral summary in this way:

> Crop operations, the process of making a knowledgeable decision to optimize crop and livestock production systems and to maintain a viable and competitive agricultural economy is fundamentally dependent on the availability of needed and useful information of many kinds.

Computer-based information services should be viewed as "simply another method, amongst a number of methods, of distributing the needed information," he said.

Dr. Lyons then offered a historical perspective:

> ...the wire service, radio, and television...each assumed a role in changing the form by which information was gathered, developed, and disseminated. With each technological improvement, the then traditional methods were not displaced, but became associated with more defined roles.

It was the consensus within Group 3 that the information required by the manager of a crop or livestock production system can probably be categorized as:

1. ...that which is assessed periodically in a management process from an inventory of historical records, and
2. ...that of a perishable nature which is needed in a timely manner for on-going decisionmaking.

It was explained that the first category "encompasses items that change relatively infrequently, such as available land and soil types, equipment inventories, cropping patterns, pesticide registrations, and so forth." This information is relatively static in nature.

The second category includes information which tends to change rapidly, including such items as marketing and weather data.

There are four essential elements involved with the kind of information services and systems dealt with by Group 3:

1. data collection
2. analysis and information development
3. information dissemination
4. education

Before exploring each of these in greater detail, Dr. Lyons underscored a concept which had been expounded upon in other group presentations:

> Full and complete utilization of a total information resource is a responsibility of both the public and private sectors...the public sector should only be involved in those areas where the private sector does not have the capability or willingness to provide the necessary service for a reasonable fee.
> In areas where they do demonstrate such capabilities and interest, there should be a transfer to the private sector.
> Furthermore, where the public sector has the responsibility for these information services, user fees or cost payment by the direct beneficiary should be considered where feasible.

In amplifying the feeling of the group about data collection, Dr. Lyons indicated that the responsibility for "primary information gathering"--such as weather and marketing—should continue "to reside in the public sector, particularly at the Federal level." The obligation to maintain quality control assurance may be the responsibility of an agency or in some instances, where more cost effective, with time-sharing companies.

The optimum utilization of human resources was discerned to be a vital component wherein analysis and information development were concerned. Although in some cases "the direct collection and dissemination of raw data may be adequate for the purpose of reaching decisions," in most cases such data must be "analyzed, interpreted, and synthesized into information that is of use to the agricultural manager/adviser." The group spokesman gave this example:

> ...there are very few constraints to the collection of weather data, but what is most necessary is the ability to analyze that data in the context of local experience and knowledge of cropping systems and convert it into forecasts that have meaning to the farm manager. To be most effective for on-farm use, analysis requires the interaction of agriculturalists and meteorologists. The public sector has staffed the Federal system in land grant universities with the breadth of expertise to carry out this function.

In considering the information dissemination element, Group 3 agreed that "most of the development of computer-based information systems for agriculture, and subsequently the demonstration of the utility to farmers and consumers, has occurred in the public sector." However, it was pointed out that "the private sector is experimenting with a number of unique systems and in most instances will assume the predominant role in information delivery." It was the group's opinion that as "the commercial feasibility and potential markets become more apparent," some products and services now integral to public systems"will gradually be transferred to the private systems."

Education of the user--whether it be the practicing farmer, professional pest control adviser, or crop consultant--was stressed by the discussants as being a "key element in maximizing the potential of computer-based information systems in agriculture." Instructing the user is seen as a "continual and on-going requirement," one in which the land grant universities and Cooperative Extension Service will play a major role. This process, Dr. Lyons asserted:

> ...not only serves to educate the user, but provides an equally vital role as a feedback mechanism to aid in the development and testing of the data systems and interpretations involved...the problems in the field can be brought to the attention of the scientists and solutions sought.

The concluding section of Dr. Lyons' report to the Subcommittee was comprised of a series of recommendations for its consideration.

> - First, Congress should recognize that availability and use of agriculturally important information is the paramount issue, and the precise route by which this occurs is less important...computer-based information systems are simply another tool.

In some instances, the group felt, use of the advanced systems"may have a short-term effect"on reducing public access to certain kinds of information, "but the challenge is to ameliorate that impact through good planning." Also, utilization of a computer-supported system does not mean that the ultimate user must have a personal terminal, since these systems "can still feed local newspapers, radio, and TV, and can be located in public access locations." Key data from some programs—IPM monitoring, threshold determinations, degree-day systems—can be reduced to "a simple graph on a sheet of paper."

- Secondly, Congress should encourage and subsidize, if necessary, pilot systems to explore new ways of maximizing the benefit of this technology.
  In this process, there should be recognition of the full costs involved and that as some of the more profitable items are transferred to the private sector, the subsidy of the less profitable items will need to continue.

- A third recommendation is that Congress should recognize the need for continued development of micro-computer software to substitute for and/or complement centralized information dissemination services.

The latter type of services, the Group believed, "have limited ability to solve some site-specific, on-farm operating problems" (such as irrigation management). It was noted that micro-computers are increasingly being used for fiscal management, payroll and accounting, as well as process control (e. g., drying operations and irrigation scheduling). It was emphasized that many problems on the farm do not require the resources of a centralized computer system, and that suitable communications support often does not exist for remote dwellers. Another shortcoming is in adequate software to support the micro-computing system. Dr. _ ons then conveyed the underlying feeling of his group that this recommendation "does not preclude encouraging the development of centralized information systems," but they are "<u>not</u> a panacea for all on-farm operating problems."

- [Recommendation four:] Congress should also encourage that departments and agencies develop their own criteria for the proper and timely transfer of computer-based information systems or portions of systems to the private sector.

- [Recommendation five:] Congress should recognize that there are beneficial ways for public systems and private management information vendors to cooperate ...as long as the technology developed remains in the public domain and available to all.

There would be value in a follow-on to such activities as the Greenthumb Project in Kentucky, for through these endeavors much is learned about the assignment of responsibility for maintaining current information on subjects of interest to agriculturalists.

- Finally, [it was recommended that] Congress should consider and encourage a variety of ways of funding these systems, including but not limited to direct user fees, sponsorship of various programs, and public funding.

At the invitation of Chairman Brown, the rapporteur for the group, Mr. Lehnert, reaffirmed that three types of systems are in existence which may serve the farming community:

1. central, main-frame, time-share system
2. videotex system, such as Greenthumb
3. on-farm, farmer-owned unit

Each has its requirements and advantages, and "I do not believe there is going to be one grandiose system...we are going to have to learn to live [with] and feed each of these."

Having received this report, Chairman Brown noted that there is a "vast resource of research data which has been accumulated over maybe 100 years" at various land grant colleges and asked if such data are "as readily available to the user and to the public" as they should be? In reply, Dr. Lyons contended that "we do an excellent job of getting that information out...the key element is the analysis and interpretation of that data...the faculty's ability to interpret large amounts of data into a form that is useful.

> In many cases we do not move fast enough in getting our research brought to a conclusion to suit many segments of agriculture, but this is because I think probably we are conservative by nature. We want to see the data before we are willing to say that a certain event is the best way to go or not.

He concluded by saying that he did not perceive that "there is a tremendous backlog of unused data that has been interpreted and put into a useful form"that is not available for use.

When asked by the Chairman if there were any "weaknesses," Dr. Lyons observed that "there obviously is variability among faculty members. Some of the data that goes out is not as well founded or innovative as it should be." To which Representative Brown responded that:

> ...we can both be looking at the same picture and you can say this is a very good system with no major flaws and I can be looking at it and saying that it is a very good system but it is missing a lot of opportunities.

The group leader for Group 4 (User Requirements), Dr. Russell Youmans, is Director of the Western Rural Development Center at Oregon State University in Corvallis, Oregon. With him, to present the insights and findings of this discussion element, was David Hoyt, the rapporteur, who serves as Leader for Training and Education at the National Agricultural Library. After noting that Group 4 during its deliberations "reconfirmed the importance of several of the issues raised by the staff background paper for this workshop hearing"(see Appendix 15 for a listing of suggested issue parameters), Dr. Youmans identified "the lack of software designed specifically for farmers and ranchers" as a major problem in the application of information technology. Two observations from the discussants merited exposition:

1. ...although the cost of hardware has been reduced tremendously, and although the ease of the use of that hardware has increased, the cost of software development has not changed. The current generation of software continues to reflect the tremendous amount of detailed, expensive, time-consuming activity...[whose] cost must be recognized by potential users and producers of that software.
2. ...potential users of computer technology start from the wrong starting point all too frequently, much like our tendency to kick automobile tires.

He went on to say that "rather than buying the hardware and then looking for an application," potential users need to answer these questions in this sequence:

- What do I want to do with this particular technology?
- What software will accomplish these tasks in an effective manner for me?
- What hardware will operate this particular software?

In its scrutiny of ways to create a technology-supported "rural users system," Group 4 identified and discussed a number of concerns, starting with a consideration of "supporting interconnect systems--telephone, cable, or satellite--[which] must be developed and maintained." It was recognized that hardware and software "retail vendors and service facilitators," as well as requisite education resources, may not be readily available in much of rural America.

Another realization centered on the fact that "uses other than farm and ranch uses are required in the rural communities to reach a scale to justify private and public investment:"

> This broad development of computer use in rural areas will strengthen the farm/ranch ability to use the technology and, more importantly, will point up the need for adoption of computer technology as a management information tool for

ERIC

rural households, local government, small businesses, and the non-farm professionals.

Dr. Youmans alluded to similar thoughts in Dr. Wilde's testimony, and also mentioned correspondence from Daniel Carter of Texas Instruments, a member of this working group, to the Chairman which elaborated on "this broader challenge to building an affordable and workable system for rural users."

A third concern was focused--particularly by private firm representatives within Group 4--on the need for "market potential research" for technology which could influence"investments in producing hardware and software for rural uses." Corollary to this thrust was a need to gain "a rough idea of the ability of farmers and ranchers to pay for this technology." This research, the group spokesman reported, was viewed as "probably best a public sector activity." Continuing, Dr. Youmans indicated that it is known that "individual operations and firms are collecting information at the present time,"and Mr. Datt's earlier testimony regarding the AFBF monitoring of its activities and discussion with system participants was cited as an example of this. Among the considerations identified by Group 4:

- ...private groups may be very reluctant to share information generated at their own cost.
- ...broader research across pilot projects...the independent innovators would start the process of estimating costs and benefits and of describing the early path use of this new management tool.
- This research would be largely economic in nature, but should include several other groups looking at broader computer applications--on farms and ranches, for household management, for education, and other applications that may come in that rural farm/ ranch environment.

"Our work group struggled considerably with the public and private sector partnership," Dr. Youmans explained. The private sector was seen as the provider of hardware and "likely will be the base provider of the linkage system, interconnecting the hardware." Uncertainty arose when the discussion turned to software preparation and delivery:

> ...the software industry definitely would be a private/public mix...agricultural cooperatives have been mentioned earlier...as a point for innovation...[with] potential for delivering software to farms and ranches. But the total number of users is small, and when one considers the diversity of agriculture and that diversity's demand upon software, there may currently be too few commercial providers that have the operating knowledge to handle specific farm/ranch applications.

The Group felt that the Land Grant institutions and USDA "have much to share with users and private providers, but the tie to the commercial vendors of software is not clear at the present time." Two questions were posed at this point:

- ...should publicly-developed programs be copyrighted and protected, or should they be left in the public domain?
- ...what responsibilities do the public entities have in monitoring the use of the software they develop?

Although "many of the early adopters of farm and ranch computer uses currently are writing their own programs," this is not seen as a likely long-range solution. One possibility, it was felt, might involve cooperative efforts between the Extension Service groups within the land-Grant system and software development firms, especially in furnishing an expanded outreach capability to the farming community. The discussants emphasized that:

> ...it is important for Extension Services in the universities to develop computer capabilities to act as an effective third party for farm and ranch users to recheck the ultimate application of computer software.

Next on the agenda of Group 4 was its anticipation that there are "several major educational challenges" which will involve groups from both sectors of society:

- ...we see a need for education on the question: What are the possible uses of computer technology for farmers and ranchers?
- We see continued public and private sector involvement in computer applications due to the small scale at which the application can be made in rural areas.
- A first-exposure education program could be largely a private activity for firms with specifically designed introductory programs...[but] the public sector may have to handle some rural applications because of problems of scale.
- The advanced work on applications, including programming for individual analysis activities, may well call for service on a fee basis—either by public or private sector [groups].

The matter of where and to what degree the public or private sector entities should become involved clearly was difficult to cope with, as reflected in one example reviewed by the discussants:

> ...in the Midwest where corn and soybeans are produced, there are enough similarities across operating units that applications can be effectively handled in the private sector.
>
> However, when we come to the areas with diverse agriculture—where the products may be radishes, rhubarb, and rutabagas—the public sector may need to fill the educational role.

Dr. Youmans then told the Subcommittee that his group had become aware of a "new actor...coming on the scene," one that has "been developing in recent years and will find a role to play with farmers and ranchers." Known as "information brokers," they can often "help the farm user gain access to specific information from major data sources." He continued on this topic, saying that "what is sorely

14-795 O - 83 - 18

needed is the analytical interpretation of raw data to reduce the information-overload frequency associated with large data bases." An analogous situation may be the one described by Dr. Wilde in his exposition on the information specialist in the rural library. To underscore this condition, Dr. Youmans quoted Kenneth Boulding who has said that "Education is the selective loss of information." It will be the challenge to the successful information broker to "help the ultimate user find adequate information for his decision, hence avoiding the overload."

During the deliberations of Group 4, a number of "general concerns" had emerged, to be mentioned by its spokesman in order "to encourage further consideration by the Subcommittee or others:"

- o First, we would encourage the collection and evaluation of fugitive software in the public and private sectors. It could then be made available to a broader range of people in rural areas.
- o Second, the current incompatibility problem for both software and hardware reduces the spread of successful use of programs.
- o Third, we recommend copyright or pricing policies to facilitate a spread in the development of effective software for farmers and ranchers.
- o Fourth, there is a concern for security as the system enters the American rural home.

Dr. Youmans then reported that the group would like to suggest "a framework for developing a broad rural computer-use system on a scale appropriate for farmers and ranchers, and other rural users." Figure 21 depicts the matrix of parameters identified and discussed. It was the consensus of the group that "all of the users will be making all these uses over time." Furthermore, such a framework might be used in establishing "priorities for investment of private and public time and money."

FIGURE 21

Rural Users and Uses of Computer Capabilities

USERS	Farm/ranch	Household	Local government	Small business	Professional
USES					
Stand alone					
Analytical					
Word processing					
Control/monitoring					
Interconnect					
Time sharing					
Data base					
Communication a. routine b. sporadic					
Transaction					

The interactions evidenced through the use of such a framework can be useful in many ways, and sometimes rather interesting conflicts become apparent.

> As an example, a rural businessman may not be interested in local consumers having transactions capability—i.e., the ability of purchasing from regional or national businesses—though he may very much desire that same capability as he looks at jobbers and wholesalers in distant points.

Dr. Youmans closed his commentary by setting forth four questions which his group had felt fell within the general framework matrix, and "apply to nearly all users and all uses:"

1. What is the pragmatic rural need for computers? What are the costs and benefits of computer use for farms and ranches and for other rural users?
2. What is the ability of the distribution system to support any large rural interconnection system?
3. Is there the ability to provide service for software and hardware in rural areas, with an understanding of the rural farm/ranch applications?
4. Is there an educational system to develop the potential of this technology from start to maturity?

Mr. Hoyt, the group rapporteur, then offered a "brief profile" of what he termed "universal user requirements" which must be kept in mind:

> o The first is awareness, or what I would like to call information literacy...it does very little good for all these systems and services to exist unless people know of them. Many people are still woefully informationally illiterate. With the television, the telephone, and the terminal, <u>it is now possible to turn the most isolated home into an international information center</u>.
> o In a pluralistic society, it seems that is in our best interest to have and maintain multipurpose and multi-source systems which can serve a variety of user needs.
> o Training...not all systems are simple, and with some systems, no matter how user-friendly the software, the subjects will remain complex...[and] will require intermediaries to serve as assistants. Training can come through cooperative ventures between the Federal, State, and local librarians, Extension agents, information vendors, and brokers.
> o Resources...many of the systems discussed and demonstrated...are considerably expensive to use...can cost more than the average American can afford...access to these systems will require financial security.

Chairman Brown expressed interest in hearing Dr. Youmans comment further about "research being needed on market potential," and whether support for such undertakings should come from the public sector.

> That is not a universally accepted view...market potential research should be publicly supported, although I happen to agree with the thrust of that...NTIA, for example, has let some small contracts within the last couple of years to certain organizations like the Public Service Satellite Consortium to attempt to analyze and aggregate markets.

He then asked if Dr. Youmans was"talking about short-term markets or longer term markets." In response, the spokesman for Group 4 declared that:

> If this technology bears any potential significance to farm and ranch management—of the magnitude of commercial

> fertilizers or hybrid corn, as some people believe—then I think some basic research is important, taking a look at productivity of this type of an investment. <u>This management tool affects the bundle of resources that American agriculture has to work with--the same bundle as labor, capital, and land</u>.

Presently, "at the innovation level, we can begin to establish a prospective," Dr. Youmans said, so that it will be possible to obtain a "long-run look at where this technology is going to fit in American agriculture."

The final point made by Representative Brown in exchanging ideas with this presenter was around the issue of whether utilization of information might "lessen the utilization of other resources," and he mentioned the case of "IPM" where "you are cutting into a lot of chemical markets when you advocate the more intelligent use of IPM, based upon information about infestation, time of application, and that sort of thing. <u>What increases one market may decrease another market</u>." And after Dr. Youmans observed that "There are problems no matter which side of that market you stand on. There is opportunity on the other side,"the Chairman confirmed that "if we keep in mind that the basic consideration is the welfare of the user and the producer...it works out all right in the long run."

The function of Group 5 was to deal with the critical area of "System Implementation: Hardware Installation, Training, Maintenance, Software and Data File Modification." Serving as spokesman was the group leader, Dr. John M. Brazzel, an organizational consultant based in Washington, D. C., accompanied by the rapporteur, Mark Nestle, Deputy Director of the Planning and Analysis Staff for the USDA Farmers Home Administration.

Dr. Brazzel began his report from the group by describing "three assumptions about the current and future developments in information systems in agriculture:"

> 1. ...dealt from the point of view of the rancher and farmer with the kinds of information systems--the hardware, software, and data bases--that would be available in the near future.

In this connection, Group 5 "did have a sense that there is a trend toward the use of interactive microprocessor-based systems and away from completely one-way systems."

> 2. ...the development in implementation of computer-based information systems in agriculture is in its infancy.
> Now is the time to encourage innovation and adaptation. It is time to encourage diversity as opposed to trying to focus in on one best or two best kinds of systems...also a time in which assistance is very much needed to assist beginning users.
> 3. ...many of the issues and questions facing us today are system start-up questions. If we were able to look ahead with some certainty ten or 15 years... the issues and questions would be very different... because we will see a new generation of farmers and ranchers beginning to enter the field who are more comfortable with computer technology.

The concern of the group regarding this latter point, he commented, stemmed from the threat posed by "the kinds of cuts we are seeing in education and the potential effects of those cuts." The discussants also expected that in the future "computer-based interactive systems will be coupled with information processing and storage capabilities," thus creating an "infrastructure" capable of serving the full spectrum of users:

- o ranchers and farmers
- o bankers
- o newspapers, radio, and television
- o libraries
- o Cooperative Extension Service agents

o colleges and universities
o retail and agricultural supply outlets
o farm organizations
o local and State governments

Nine issue areas, with accompanying recommendations, comprised the focus of Group 3 discussions. The first of these dealt with the "bewildering array of hardware, software, and data bases from different sources" confronting the potential rural purchaser of information systems. The "maze of alternatives" can best be sifted through with outside help:

o formation of computer clubs
o development of training and education opportunities
o development of a brochure that describes current information about alternative systems, their prices and sources...certainly something that the USDA can provide [or]...that State cooperative extension services might be interested in pursuing.

Education and training opportunities constitute a second major issue area, and the group felt that such offerings should come from the "staffs of organizations that traditionally assist the farming and ranching community," including experts from universities, cooperative extension services, and farm organizations.

A third issue involves "a very strong need now to look at ways to reduce line costs of...interactive systems requiring on-line transmission" of data. Possibilities identified by the group:

o decentralization of systems
o designing systems to minimize on-line time
o use of new or improved cables, satellites, or other technologies to reduce costs

Standardization of equipment, software, and data bases was the essence of the fourth issue area. Dr. Brazzel reported that his group "had a strong feeling and substantial agreement"that:

> ...point for equipment, software, and data base suppliers really face two choices. They either have to standardize or they have to make provision for easy adaptation of software and data bases to alternative types of equipment.

One action option discussed at length was the desirability of establishing a "software and data base clearinghouse" that would furnish "information and critiques about available programs and data bases and assistance." Although there was agreement that "the formation or development" of one or more clearinghouses "ought to be encouraged by the Congress and the USDA," there was no conclusion whether these should be at the national, regional, or State level. The group did not want, however, a system that would be "dominated by the Federal Government."

The fifth issue dealt with piracy of programs, with emphasis on "providing compensation for those who write programs." It was believed that such an issue "cannot be avoided."

Dr. Brazzel then embarked on a relatively lengthy discussion of the sixth issue area, which was broadly concerned with data bases. Among the several key points which he enunciated:

- ...there is adequate data available from current sources.
- ...need to provide for a linkage of Government data bases in ways that make them easily accessible to farmers and ranchers...Michigan State is beginning to do this [through the COMNET system]...Congress and the USDA should encourage these kinds of efforts.
- ...need for indexing of available data bases and the development of abstracts describing data bases... their sources and the sources of assistance in using them.
- ...real time data is fitted to local situation...still a problem...data that are available now are often not as timely as they might be and they are often not tailored specifically to the local situations.
- ...the kinds of problem-solving that we are doing and

the kinds of data that we are using end up being simulations of what is going on, on the farm, rather than an analysis of the actual farm situation.

- Weather information is often for multi-county areas and often updated only once or twice a day.
- ...a very volatile area...the issue of data provided to individual farmers and ranchers about their operations and about production, prices that they get, income, energy and fertilizer use, impact of disease, weather, soil moisture, erosion...<u>One can anticipate considerable reluctance on the part of farmers and ranchers to provide this kind of information</u>...provision would need to be made for confidentiality and perhaps oversight by the providers of the information and feedback for their use.

Software, "the farmers' biggest problem," was the focus of the seventh issue area. And, as Dr. Brazzel emphasized:

> It is the area where attention needs to be given... where profit potential is great for private vendors entering the agricultural applications of information technologies.

Group 5, after discussing various alternatives, suggested that one feasible path of action was the creation of:

> ...regional or State clearinghouses or publishing houses for programs...that would provide access, quality assurance, program documentation, and assistance in the use of programs.

Establishing viable <u>marketing and advertising channels</u> was identified by Dr. Brazzel as the eighth issue area. It was acknowledged that since the "application of computer-based information systems to agriculture is...in its infancy...normal channels of marketing and advertising hardware, software, and data bases have not developed." Opportunities exist for "beneficial cooperation among private vendors" --universities, extension services, farm organizations--in opening up such channels and helping make potential users aware of alternative systems' capabilities and prices. It often is difficult to assess start-up costs, for many of the systems now in existence are still in a "pilot" stage.

> Most of them have zero or low user fees. Information systems will take a number of years to become self-supporting...I do not think we know for sure what to expect in this area.
> We do know that start-up costs are very high, so that sponsoring organizations must have substantial resources to subsidize the operation of a system during its infancy.
> This will have the effect of restricting the entry of organizations into the field and...the diversity of hardware, software, and data base systems available.

It was recommended by Group 5, in this connection:

> ...that Congress encourage the conduct of a study...of the whole financial side of information system applications in agriculture, along with the implications for public and private sector roles and responsibilities.
> Included in this study...ought to be a hard-headed look at the economics of information systems now and in the near future, especially from the point of view of the farmer and rancher.
> If we are going to move into the area in the near future, subsidy is needed.

The ninth and final issue submitted by this group concerned "technical and people sides of implementation." Dr. Brazzel told of the development of "technically perfect cutting-edge information systems that nobody uses," which is probably due to the "failure to involve the relevant people in organizations during the design, development, and implementation phases." It is a combination of key participants—system designers, those who provide maintenance, as well as the actual users—who "determine whether a system is going to be successful or unsuccessful, and whether it is going to be used or not."

> Our group agreed about the importance of including all relevant people in organizations...[including] designers and providers of hardware, software, and data bases, potential users, and groups who might be impacted by the systems.

Noting that the present "hearing and workshop are an excellent example of the benefits of providing forums that bring system designers and providers together," Dr. Brazzel conveyed the recommendation from the group that:

> ...the Congress, USDA, and others encourage the convening of similar forums, organized regionally and in the States...[and] that special efforts be made in these future forums to involve farmers and ranchers with experience and interest in computer-based information systems.

And with one last recommendation related to this issue area, the spokesman for Group 5 ended his summarization:

> ...the Congress should encourage a needs assessment study focused on farmers' and ranchers' needs in the area of computer-based information systems as well as the kind of financial resources that are needed for farmers and ranchers to participate in these systems.

A personal observation by Mr. Nestle, the group rapporteur, reflected other comments heard during the course of the two days of sessions:

> I came to this workshop and hearings thinking I was relatively aware of what was going on in developments in this area. I found out that I had an awful lot to learn and I did learn a lot here.
> What it makes me think about is the farmer, the rancher, the small businessman in the rural area. I have relatively high exposure to what is going on and the technical aspects. He does not.

Clarification of two earlier, and perhaps conflicting, statements by Dr. Brazzel was asked for by the Chairman:

> ...early in your statement you pointed to the fact that we were in the very early stages of this information revolution and we need to foster innovation and resist premature standardization.
> ...later on you cited the example of the two farmers with incompatible hardware and the need to do something about it which implies either standardization or more adaptable software.

The reply brought forth the admission that "there is some conflict, but there also is a source or suggestion about directions we really need to go in." The point being made demanded a hard choice: "either standardize or come up with ways to make programs and data bases adaptable to existing and diverse systems." In the opinion of Dr. Brazzel, the latter course of action will be chosen, and it may be that "equipment producers will also find it advantageous to look at any kinds of trends that are developing in data bases and programming and adapt."

The summarization of findings and recommendations for Group 6, charged with scrutinizing "Present and Projected Technology," was presented by Dr. David L. Holder, the group leader, who is Program Leader for Livestock and Meat Marketing with the USDA Extension Service. During the oral presentation he was accompanied by Jerry Paulsen, a Systems Analyst with the USDA Extension Service. Serving as the group rapporteur during the workshop sessions was Dr. Fred Weingarten, Program manager for Communications and Information Technology with the Office of Technology Assessment.

Establishing as his context "the consideration of users and their needs as they relate to new technology," Dr. Holder underscored the fact that "Often we talk about technology by itself, but we need to remember for what purpose this technology is being developed." Chairman Brown interjected that this point had arisen several times, and merited repetition because "in a broader sense it is the question that we need to ask ourselves about all technology. Does it meet a real need in the broader user community which in the broadest sense is the whole human society?"

Dr. Holder continued, mentioning several salient discussion areas which had occupied his group:

- ...a number of spin-off benefits from developing various technologies...computer technology for agriculture is one.
- ....nsidered hardware technologies and the trends that are developing.
- ...tried to pay some attention to the trade-offs between costs and benefits that were offered by these different technologies.
- ...considered software compatibility.
- ...considered the whole area of transferring this type of technology to the agricultural community for the well-being of producers and agri-businesses.
- ...identified a numbers of users and their needs.

In amplification of this t point, the spokesman noted that "even a single user has a varie f needs...Even on his single farm, he is apt to want to utilize a number of different computer technologies." Time could be spent profitably, he added, "doing a little more research into what the needs of the various groups are and how they can best be met by these technologies."

Group 6 identified a number of information services, ranging across several application areas, which were considered noteworthy:

- ...need for quick access to perishable information which must be continuously updated.
- ...new computer technologies can also meet the need for archival information.
- ...need for accounting, financial, and problem-solving services.
- ..production automation on the farm and within agri-businesses, such as the use of computer-controlled robots in crop and livestock production and in processing.
- ...farmers seem to be more interested in automatic word processing and those kinds of things which heretofore were not even considered.
- ...computer technology in teaching and instruction.

It is importance that there be an awareness about "the various complimentary relationships among technologies," he told the Subcommittee. Included among the technologies discussed by his group were micro- and mini-computers, videodiscs, microforms (including microfiche), and robotics.

A series of trends surfaced during the exchanges within Group 6, and good consensus was arrived at on the following:

> 1. ...systems will continue to become more user friendly...not necessary for a user to have a whole new area of expertise just to use the technology.
> 2. ...greater variety of technologies and services will be available to the agricultural user.
> 3. ...electronic storage costs will continue to drop.
> 4. ...communications costs will probably decline but at a slower rate, and may, at times, even increase.
> 5. ...per unit processing costs will continue to drop, although the total cost of electronic technology will probably rise as people begin to use it more thoroughly in their operation.
> 6. ...data input costs are likely to drop due to technical advances in such things as readers, sensors, and other types of automatic inputting devices which do not require an individual to gather data and input it manually.
> 7. ...foresee information networks increasingly being linked together and...an intermarriage of different technologies, such as linking up microcomputer with videodiscs or microforms.

Although he expressed doubt that much new could be added regarding comments about government policy issues, Dr. Holder did iterate that the area of <u>standards</u> was "particularly important to new technology" and that the group "saw a real need here to move cautiously."

> Technology is evolving very rapidly. The first phase of a technology, and even the second to come on the scene, is not always the best. We do not want to be making our standards based on that initial entry or even others down the road.

He continued, pointing out that "we need to consider the benefits and the costs. The benefits of perhaps improved compatibility from having some standardization must be weighed against the cost of stifling progress that standardization imposed." Furthermore, the Group believed that:

> ...there is a need for certain agreed upon conventions that can be used more or less voluntarily, but leave room for others to be innovative and to adopt other conventions.

Another major issue centered on the "terms of Government and private cooperation." The Group 6 participants recognized that there are "subject matter and technical expertise residing in both camps:"

> We need to be able to have policies that are going to allow that to be exploited and to encourage both sides to work together.

In illustration, Dr. Holder noted that "there are some traditional education and information gathering roles that typically have been done by public agencies that could now be done by private enterprise utilizing the efficiencies of computer technology." As roles change--perhaps those of the Extension Service and other public agencies--there will have to be further discussion "as to where we can best put our resources and how we can encourage private enterprise to enter into this area." It was the belief of Group 6 that Government definitely has a role in research and development, and include in the latter category "new applications for technology that have come from the space program and other sources of technology."

In response to Chairman Brown's invitation to augment these findings, Mr. Paulsen offered two observations:

> 1. We have been talking about an on-rushing flood of technology with which rural people are faced...we

> have to remember that some of those people...will not have the resources or the ability to take advantage of this...directly and they are still going to have to depend upon somebody else to deliver the information and the other resources that are available through this technology to them.

In many instances, he declared, these people will not have direct access to the technology.

> 2. ...it has been said that the technology is a tool which will be used by people. We must continually strive to make that tool better and to make it easier for the individual to use rather than to expect people who are out there faced with all of this technology to spend more and more time in learning how to use it.

Chairman Brown then embarked on a brief discussion of the "speed with which this technological revolution is taking place:"

> The question has been raised about whether the next generation of farmers and ranchers is going to be computer literate...we probably underestimate the speed with which computer literacy may be developing.

He went on to inform the audience that within the past year, tax legislation—P. L. 97-34, the Economic Recovery Act—was passed that allowed deductions to groups contributing "scientific equipment" to universities that made it "extremely attractive for computer firms." The Chairman told of hearing "stories about Apple Computer Company wanting to donate several thousand computers to local schools. If Apple is doing it, Tandy cannot be far behind."*

> The real impact is on what this would do in familiarizing a generation of students at probably the elementary or high school level...[regarding] personal computers and how to utilize them.

He noted that even in Congress it is astounding at what speed word processors have taken over in offices.

In a change of subject, the Chairman asked Dr. Hilder whether the Agricultural Extension Service had "specialists in information systems" and, if not, "[illegible] in [illegible] and [illegible] in acquiring the expertise to operate these." In elaboration of this final point:

> We have specialists in beef, dairy, and all sorts of of things like that. Do we have either a basic training program to make all Extension agents familiar with computer-based information systems or do we have specialists [illegible] provide that assistance to those people who might need that kind of help?

Dr. Hilder, in reply, asserted that "there are very few specialists in information technology out in the country. Most of them have used this technology in their respective disciplines."

> For example, a number of our farm management people have [illegible] as a great tool for improving farm management [illegible]. We use it a lot in marketing. The [illegible] alone. It needs to be [illegible] into [illegible] discipline.

The topic of "robotics" was the next focus of the Chairman, who described a recent visit to a poultry farm in his district "which was the most automated meat production I have ever seen in my life:"

> There were 250,000 chickens confined in one operation on a rather small plot with an automated feeding system, an automated watering system, an automated heating and cooling system, an automated egg transfer and packing system, so that practically all that was necessary was to deliver the inputs and take the outputs.
> It was all operated by three people...Probably two out of those three people could be replaced by robots before very long. Is that the wave of the future?

"You can let your mind wander down that road," Dr. Hilder responded, "and apply the idea to crop production, preparing land, planting, and so with various kinds of livestock." There is the question of "how we are going to make the social adjustments necessary to

14-795 O - 83 - 19

[illegible] [illegible] an [illegible] dairy farm where:

> ...they were milking cows around the clock, [illegible] just marched them in, attached the automatic [illegible] equipment, produced the automated milk, and the [illegible] would march out.

In announcing the conclusion of the two-day hearing and workshop, [illegible] Brown [illegible] the reminder that the [illegible] objective [illegible] was:

> ...to take cognizance of probably the most rapidly developing technology in the world and in the United States in particular and to take a look at its application to a sector of our economy which we pride ourselves as being in the forefront of technological development and research.

There is "need to review," he contended, "the questions of whether [illegible] and our economy [illegible] taking the steps necessary to maintain a competitive posture in terms of productivity and capability for innovation in order to meet the needs of a very competitive world economy." Two premises then were voiced:

> 1. We do not necessarily assume that agriculture is lagging in the utilization of new information systems and new information technology.
> 2. ...we think it is helpful and constructive to review this situation as part of our general responsibility of oversight of agriculture in the United States and to help to ensure that the necessary policy steps are being taken to maintain our leadership in the world.

Continuing, the Chairman told his listeners that his Subcommittee is "looking at the general problems of research and development in agriculture, at technology transfer as represented by our excellent Agricultural Extension Service,...[and] other kinds of general over-

[illegible]." [illegible] the Sub-committee [illegible] ana-lysis [illegible] of the [illegible] the Members of Congress, and [illegible] of a wider [illegible]."

> [illegible] effort. [illegible] formal report, [illegible] part of our effort to help keep the [illegible] within [illegible] informed [illegible] which may occur.

[illegible] "very [illegible] study of the applications of in-formation [illegible] in a number of different aspects of our so-ciety that are [illegible] by the Office of Technology Assess-ment." [illegible] International Information [illegible], [illegible] listed in Ap-pendix A.

In closing, Chairman Brown judged that "these hearings have been very productive" and expressed his "very deep thanks to all of you who participated."

List of Attendees for Hearing/Workshop on Information Technology in Agriculture, May 19-20, 1982

Name	Title and Organization	Address
Dr. Ralph J. Adkins	University of Maryland	Rm 1216 Symons Hall College Park, MD 20742
Prudence Adler	Office of Technology Assessment	CIT Program, Wash. DC, 20510
Ar[illegible]	[illegible], Scientific and Technical [illegible], Department of Energy	R[illegible] [illegible]045 [illegible] Independence Ave. SW Washington, [illegible]
Neil Baird	Vice President, Marketing Infomart	164 Merton Street Toronto, Ontario, Canada M4S 3A8
Mary [illegible] Ball	Government Specialist Mississippi State University	Cooperative Extension Service P.O. Box 5406 Mississippi State, MS 39762
J[illegible] Batt[illegible]	Michigan State University Agriculture Extension Station	
[illegible] Bay	Director of Information U.S. Department of Agriculture/ES	Room 3128, South Bldg. Washington, DC 20250
James B. Bell	Extension Economist, Virginia Polytechnic Inst. & State Univ.	Dept. of Agric. Economics Blacksburg, VA 24061
Dr. [illegible] Bender	University of Maryland	Agric. Experiment Station Symons Hall College Park, MD 20742
J[illegible] Berry	Acting Chief, Statistical Policy, Office of Information & Regulatory Affairs, Office of Management & Budget	3001 NEOB, 726 Jackson Place, NW, Washington, DC 20503
M.F. B[illegible]rnell		
* W Louis Bransford	Vice Pres., Planning & Development Public Service Satellite Consortium	Suite 907, 1660 L Street NW Washington, DC 20036

[illegible]

* GL	Mike Brazzel	Organizational Consultant	1727 Massachusetts Ave. NW #307 Washington, DC 20036
	Louis J. Brocato	U.S. Department of Agriculture	National Agricultural Library, Room 013, Science and Education, Beltsville, MD 20705
	Dr. Henry M. Brooks	Administrator, 1890 Extension Program, Univ. of Maryland-Eastern Shore	P.O. Box 1082 Princess Anne, MD 21853
	June E. Brown	Database Coordinator Source Telecomputing Corporation	1616 Anderson Road McLean, VA 22102
	Wallace Brown	Director, Div. of Rural Development S.C. Governor's Office	303 Edgar Brown Bldg. 1205 Pendleton Street Columbia, SC 29201
	Betty Buchanan	[illegible] Specialist Rural Electrification Adm. U.S. Department of Agriculture	14th St. & Independence Ave. SW, Rm 2913, South Bldg. Wash. DC 20250
	Robert L. Burgener	Consultant	13013 Narada Street Rockville, MD 20853
W	[illegible]	Asst. Administrator U.S. Department of Agriculture/FAS	International Agricultural Statistics, Rm. 5063 South Bldg., Wash. DC 20250
	R. Andrew [illegible]	Marketing Program Specialist Control Data Corporation	Business Inf. Services 8100 34th Avenue South Mailing Address/Box 0 Minneapolis, MN 55440
	Dan Carter	Manager, Advanced Business Planning-Info. Production	P.O. Box 1444-Mail Station 78[illegible], Houston, TX 77001
	Terril Clegg	Associate Administrator, U.S. Department of Agriculture/ES	Rm 3-04, Administration Bldg., 14th & Independence Ave. SW, Wash. DC 20250
*	W. Clents	Farm Futures	
	Barbara L. Cliff	Extension Agent for 4H & Youth Univ. of Maryland	Box 216, White Plains, MD 20695
	George F. Cross	U.S. Department of Agriculture Soil Conservation Service	P.O. Box 2890 Washington, DC 20013
	David Crow	U.S. Department of Agriculture	GPA, Room [illegible], Administration Bldg, Washington, DC 20250

* [illegible]

	Dr. J.A. Cunningham	System Sociates	11501 Georgia Ave. Silver Spring, MD 20902
GL	Raymond Daniel	Vice Pres., Agriculture Chase Econometrics	555 City Line Ave. Bala Cynwyd, PA 19004
	Marshall L. Dantzler	Inf. Resource Management Staff U.S. Department of Agriculture	Office of the Secretary Room 227W Wash. DC 20250
W	John C. Datt	Secretary & Administrator American Farm Bureau Fed.	600 Maryland Ave. SW Washington, DC 20024
	Dr. Elwyn E. Deal	Asst. Dir. & Assoc. Dean Univ. of Maryland Cooperative Extension Service	1215 Symons Hall College Park, MD 20742
	Ken Dean 447-3641	U.S. Department of Agriculture	
	Vincent De Santi	U.S. General Accounting Office	Rm 3826, 441 G St. NW Washington, DC 20548
	Jim Dinwiddie	Director, ADP Policy & Planning Staff, U.S. Dept. of Agriculture/ ASCS	P.O. Box 2415 Washington, DC 20013
	Gerald A. Doeksen	Ext. Economist, Oklahoma State University	513 Agriculture Hall Stillwater, OK 74074
	Philip L. Dopkowski	U.S. Department of Agriculture/CRIS	National Agricultural Library Building, 5th Floor Beltsville, MD 20705
	Charles Dove	Science Bibliographer Library Services	Congressional Research Service, Library of Congress 20540
	Elizabeth Downey	Downey & Small Associates Inc.	4605 Sleaford Road Bethesda, MD 20014
	Lorraine D. Eden	Radio Shack-Tandy Corp.	11027 Lee Highway Fairfax, VA 22030
	Robert Elkin	Director of Planning Minneapolis Star & Tribune Co.	Minneapolis, MN 55488
	James E. Epperson	University of Georgia	
	Stephen W. Esswein	Computer Services Corporation	
	Dr. Richard A. Farley	Acting Director, U.S. Dept. of Agriculture/NAL	10301 Baltimore Blvd. Beltsville, MD 20705

Bill Gahr	Assoc. Dir. for Food Policy General Accounting Office	Room 6826, 441 G St. NW Washington, DC 20548
John S. Galinski		
Dr. Pradeep Ganguly	Agriculture & Resource Economics Univ. of Maryland	2108 Symons Hall College Park, MD 20742
Donald Gill	Extension Animal Nutritionist Oklahoma State Univ.	004 Animal Husbandry Stillwater, OK 74078
Dr. George Greaser	Extension & Farm Mgt. Specialist Colorado State Univ.	Fort Collins, Colorado 80521
Bernard Green	U.S. Department of Agriculture/AMS	Room 492, GHI Building 500 12th Street, SW Washington, DC 20250
Richard Griffin	Asst. Exec. Dir., Special Libraries Association	235 Park Ave. South New York, NY 10003
Thomas F. Hady	Dep. Dir., Econ. Dev. Div. U.S. Department of Agriculture	GHI, Rm 460, 500 12th St. SW, Econ. Res. Ser. Washington, DC 20250
Dr. George F.W. Haenlien	Extension, Dairy Specialist Univ. of Delaware	Dept. of Animal Science Newark, Delaware 19711
John Hall	Ext. Agent, Ag.icultural Science	203 Calvert Street Chestertown, MD 21620
Dr. M.C. Harding Sr.	Administrator, 1890 Extension Program Virginia State University	Box 540, Petersburg, VA 23803
Dr. Peggy D. Hart	U.S. Department of Agriculture/OSEC	Office of the Secretary Washington, DC 20250
W Richard C. Haycock	Associate Dean, Utah State Univ.	College of Humanities, Arts & Social Sciences, UMC7, Logan, Utah 84322
John Helmuth	Chief Economist, Committee on Small Business	Rm 2361 Rayburn
Dennis R. Henderson	Dept. of Agric. Econ. & Rural Sociology, The Ohio State Univ.	2120 Fyffe Road Columbus, Ohio 43210
Madeline M. Henderson	Consultant	5021 Alta Vista Road Bethesda, MD 20014

	Alison Hess	Food & Renewable Resources Program Life Sciences Div., Office of Technology Assessment	[illegible] Pennsylvania Ave., SE [illegible]ton, DC 20510
	David Hess	SEMIS, Univ. of Maryland	[illegible] Hall, College Park, MD 20742
	Darrell D. Hipes	National Livestock Producers Association	
GL	David L. Holder	Program Leader, Livestock & Meat Marketing, Extension Services U.S. Department of Agriculture	Room 5509, South Agriculture, Washington, DC 20250
	Paul L. Holm		
* R	David Hoyt	Leader for Training and Education U.S. Department of Agriculture	National Agricultural Library, Room 408, Beltsville, MD 20705
	Jon E. Irby	Program Leader 4-H, ES U.S. Department of Agriculture	Room 5035, South Building Washington, DC 20250
	Neal Joe John 447-3641	U.S. Department of Agriculture	
	Richard Johnson	IBM, SMD	
	Carol Jones	Vice President for Communications Cooperative League of the USA	1828 L Street, NW Washington, DC [illegible]
	Mary Gardiner Jones	Vice President-Consumer Affairs Western Union	1828 L Street, NW Washington, DC 20546
	Sarah T. Kadec	Special Assistant to Deputy Director U.S. Department of Agriculture	Administration Management 6505 Belcrest Road, Room 543, Federal Building Hyattsville, MD 20782
W	Dr. Jim Kendrick	Prof. of Agricultural Economics University of Nebraska	[illegible] Hall [illegible]553-0922
	[illegible]ia Khintley	Doanes Agriculture Report	[illegible]ter Road 63144
	Keith Klindworth	U.S. Department of Agriculture/OT	Room 1405, Audit Bldg. Washington, DC 20250
	Robert Landau	President, International Development Center	3514 Plyers Mill Road Kensington, MD 20795

* R - Rapporteur

CL	Buel F. Lanpher	Program Leader, Farm Managem[illegible]t Extension Service, U.S. Department of Agriculture	Room 55[illegible]3, South Agriculture Building, Washington, DC [illegible]0250
	Fa[illegible] [illegible]ehman	Humphrey Institute/Univ. of Minnesota	9[illegible] S [illegible] [illegible]nces [illegible] South [illegible], MN 55455
	[illegible] Lehnert	National Program Leader, Agric[illegible] Weather and Videotext, U.S. Departm[illegible] of Agriculture	[illegible]n, DC 20250
W	Ray Lett	Executive Assistant to the Secretary Office of the Secretary, U.S. Dept. of Agriculture	Washington, DC 20250
	Charles Little	U.S. Department of Agriculture	
	Joel W. Lucas	President, Agricultural Computer Systems	2346 S. Lynhurst Dr. Suite L 603, Indianapolis, Indiana 46241
CL	Dr. James Lyons	Assistant Director, University of California, Davis	IPM Implementation Group Davis, Calif. 95616
	Donald A. Marchand	Associate Director, University of South Carolina	Bureau of Governmental Research and Service Columbia, SC 29208
	Dr. Frank S. Martin	Michigan State University COMNET/MIS	College of Agriculture 221 Agriculture Hall East Lansing, Michigan 48824
	Gilbert Mathis	Sen. Walter Huddleston's Staff	2121 Dirksen, Washington, DC 20510
	[illegible]rcia Matthews	U.S. Department of Agriculture/ASCS	Room 3709, South Agriculture Bldg., Washington, DC 20250
W	Ernie Matthias, Jr.	Inf. Resource Management, Office of the Secretary, U.S. Dept. of Agric.	Room 235W Washington. DC 20250
W	Roy Meek	Manager, Eastern Lamb Producers Association	Pulaski Livestock Market Box 370, Dublin, VA 24084
	Craig F[illegible]	Radio Shack/Tandy	11027 Lee Highway Fairfax, VA 22030
	John C. Mikias Jr.	U.S. Department of Agriculture, AMS	
	Allen Moore	U.S. Department of Agriculture/CRIS	National Agricultural Library Bldg. 5th Floor Beltsville, MD 20705

ERIC

	Jimmy D. Murphy	Deputy Assistant Administrator International Agricultural Statistics U.S. Department of Agriculture	Foreign Agriculture Service, Room 5083-S, Washington, DC 20250
	Albert Nance	Texas Instruments	
	Joseph W. Needham	Ohio State Univ.	
	Kenneth S. Neel	General Manager, Eastern Marketing Association, Inc.	P.O. Box 722, Christiansburg, VA 24073
R	Mark H. Nestle	Deputy Director of Planning & Analysis Staff/Farmers Home Admin. U.S. Department of Agriculture	South Building, 12th & Independence Ave., Washington, DC 20250
	Clifford Nelson	Agriculture & Resource Economics University of Maryland	Symons Hall, College Park, MD 20742
	Donald Nelson	Program Leader, Community and Public Affairs, U.S. Dept. of Agriculture	Extension Service, Washington, DC 20250
	Edward M. Nissen	Systems Coordinator, Univ. of Calif., Davis Coop. Ext.	IPM Implementation Group Davis, California 95616
	Granville Ott	Texas Instruments	
	Gerald L. Paulsen	Systems Analyst, Extension Service U.S. Department of Agriculture	Room 500, NAL Beltsville, MD 20705
	James. L. Pearson	Director, MRD, Agricultural Marketing Service, U.S. Department of Agriculture	Room 0608, South Building Washington, DC 20250
W	Charles A. Phillips	Sr. Vice Pres. for U.S. Operations Radio Shack, Tandy Corporation	1600 One Tandy Center Ft. Worth, Texas 76102
	Mike Phillips	Office of Technology Assessment	
	Beverly Powell	AgriData Resources	205 West Highland Ave. Milwaukee, Wisconsin 53203
	Dr John Ragland	Assistant to the Extension Director University of Kentucky	Dept. of Agriculture F327 Agricultural Science Bldg. North, Lexington, KY 40546
	Richard Rankin	Deputy Director, SEA Management Staff, U.S. Dept. of Agriculture	Room 358A, Administration Building, Washington, DC 20250

	Paul Rodgers	Electronic Marketing Association, Inc.	P.O. Box 722, Christiansburg, Virginia 24073
	Vince Sardella	Operations Research Specialist National Telecommunications Inf. Administration	Office of Poli... Dept. of Co... Street & ... NW, Room ... DC
	Dr. Lee F. Schrader	Dept. of Agricultural Economics Purdue University	West Lafayette, IN 47907
	Gerald Schrage,	U.S. Department of Agriculture/REA	Room 1347, South Agriculture Bldg., Wash. DC 20250
W	Harold A. Scott	Director, Videotext Service Tandy Corporation	11027 Lee Highway Fairfax, VA 22030
	Dr. Charles P. Smith	Deputy, Office of Planning and Evaluation	Executive Office of the President, Room 200 Exec. Offic' Bldg., Washington, D^ ^0500
	Gary Smith	Coop. Ext. Service, Agricultural Engineering, Univ. of Maryland	1127 Shriver Laboratory College Park, MD 20742
	Dr. Richard Snyder	Extension Biometereologist Univ. of Calif., Davis	225 Veihmeyer Hall Davis, CA 95616
R	Gerald J. Sophar	Field & Special Programs Div. National Agricultural Library U.S. Dept. of Agriculture	Room 111, Beltsville, MD 20705
	Richard Sparks	U.S. Department of Agriculture/CRIS	5th Floor, National Agric. Library Bldg., Beltsville, MD 20705
	Thomas L. Sporleder	Dept. of Agricultural Economics Texas A & M University	College Station, TX 77843
W	Ronald Stegall	Sr. Vice Pres. of Computer Services Radio Shack, Tandy Corporation	1600 One Tandy Center Ft. Worth, Texas 76102
	Blaine Stockton	U.S. Dept. of Agriculture/REA	Room 3347, South Agric. Bldg., Wash. DC 20250
	John M. Strawhorn	Consultant	
	Alfred L. Stark	Univ. of Nebraska, AGNET	105 Miller Hall Lincoln, Nebraska 68583-0713
	Jeff Taylor	Consultant	
	Dr. Patricia Tengel	Home Economics Dept. Univ. of Maryland	1210 Symons Hall College Park, MD 20742

	Leon E. Thompson	Director, Information Services Iowa Extension Service Iowa State University	103 Morrill Hall Ames, Iowa 50011
	Dr. Tom Thompson	Univ. of Nebraska, ACNLT	Dept. of Agricultural Engineering, 212 Ag Engineering, Chase Hall Lincoln, Ne 68583-0726
	Charlotte Travieso	Coordinator/PDEMS/ES U.S. Department of Agriculture	1300 Wilson Blvd. Suite 101, Arlington, VA 22209
	Joe Trumbauer	Extension Agent, Univ. of Maryland Coop. Ext. Service	Rt. 1 Box 442 Princess Anne, MD 21853
	Gary R. Vacin	Professor, Extension Education Kansas Extension Service	Kansas State University Manhattan, Kansas 66506
	Bernard Vavrek	Director, Center for the Study of Rural Librarianship, Clarion State College	836 Wood Street Clarion, PA 16214
	Hal Wallach	General Accounting Office	441 G St. NW, Rm 5848 Wash. DC 20548
	Lynn T. Warmin	Univ. of Maryland, Coop. Ext. Ser.	33 Courtland Street Bel Air, MD 21014
	Samuel T. Waters	U.S. Department of Agriculture/NAL	Room 100, Beltsville, MD 20705
	Samuel W. Webster	Texas Instruments	
R	Fred Weingarten	Program Manager, OTA	Communications & Inf. Technology, 600 Penn. Ave. SE, Wash. DC 20510
	John H. Wells	Maryland Cooperative Ext. Service Univ. of Maryland	1216 Symons Hall College Park, MD 20742
	Kendra Wells	Extension Agent, Coop. Ext. Serv. Univ. of Maryland	600 S. Frederick Avenue Gaithersburg, MD 20877
	Don West	Program Analyst, Extension Service U.S. Department of Agriculture	Science and Education 1300 Wilson Blvd. Arlington, VA 22209
	R.O. Wheeler	President, WINROCK International Livestock Res. & Training Center	Morrilton, Arkansas 72110
	Dr. Glenn R. Wilde	Asst. Dean for Extension Utah State University	College of Arts, Humanities and Science, HASS07 Logan, Utah 84322

Roxanne Williams	U.S. Department of Agriculture	OF/Room 403W, Administration Bldg., Wash. DC 20250
John T. Wooten	U.S. Department of Agriculture	Federal Bldg. Room 448 6505 Belcrest Road Hyattsville, MD 20782
Russ Youmans	Director, Western Rural Development Center, Oregon State University	Corvallis, OR 97331

Attendees from Canada

Andre Bachand	M.P. Canada
Lorne Bonnell	M.P. Canada
Mel Gass	M.P. Canada
Gary Gurbin	M.P. Canada
Stan Hovdebo	M.P. Canada
Normand Lapointe	M.P. Canada
Laverne Lewycky	M.P. Canada
Hope Meyers	Center for Legislative Exchange Canada
Charles Mayer	M.P. Canada
S. Beauchamp Niquet	M.P. Canada
John Thompson	Alberta, Canada, M.L.A.
Michel Veillette	M.P. Canada

APPENDIX 2

Workshop Participants for the Combined Hearing and Workshop on
Applications of Computer-based Information Systems and Services
in Agriculture

(May 19-20, 1982)

Group 1 - Private Sector Information Services
Group Leader: Ray Daniels
Vice President, Agriculture
Chase Econometrics

Rapporteur: Gerry Sophar
Field and Special
Programs Div.
USDA/NAL

Participants

Andrew A. Aines
Scientist
Department of Energy

F. Dean Baldwin
Economist
Ohio State University

Barbara Clark
Extension Agent 4-H
University of Maryland

Joe Coffey
Planning
Southern States Cooperative

John Datt
Sect. Dir. of Washington Office
American Farm Bur.

Dan Davis
President
Commodity Exchan[illegible] Co.

James E. [illegible]erson
Econo[illegible]
Univ[illegible] of Georgia

Bill [illegible]ahr
Associate Director-Food
U.S. General Accounting Office

Richard Griffin
Assistant Executive Director
Special Libraries Association

Peggy Hart
Information Resource Management
U.S. Department of Agriculture

Carol Henderson
Deputy Director
American Library Association
(Washington office)

Darrell D. Hipes
Exec. Vice President
National Livestock Producers Assoc.

Mary Gardiner Jones
Consumer Interest Research
Institute
Washington, D.C.

Karen Lehman
Humphrey Ins[illegible]
Univer[illegible]

[illegible]
Agriculture Computer Systems
Indianapolis

Joseph Needham
Research Assistant
Ohio State University

Beverly Powell
Planning Director
AgriData Resources, Inc.

Thomas L. Sporleder
Economist
Texas A & M University

Thomas G. Tate
Program Analyst
Extension Service
U.S. Department of Agriculture

Hal Wallach
Principal Statistician
General Accounting Office

R.O. Wheeler
President
Winrock International

Glenn Wilde
Assistant Dean for Extension
Utah State University

Group 2 - Government Information Services: Management and Marketing

Group Leader: Buel F. Lanpher
Program Leader, Farm
Management Extension
Service, USDA

Rapporteur: Harold W. Walker
Farm Management
Extension Specialist
VPI and State Univ.

Participants

Wallace Brown
Division of Rural Development & Special
Economic Assistance
Office of the Governor S.C.

Jerry Clampet
Secretary, Crop Reporting Board
Statistical Reporting Service
U.S. Department of Agriculture

Warren Clark
AgriData Resources, Inc.

Vincent De Santi
Group Director, Information
Resources Management
U.S. General Accounting Office

Pradeep Ganguly
University of Maryland

George Greaser
Extension and Farm Management Specialist
Colorado State University

Thomas F. Hady
ERS-EDD
U.S. Department of Agriculture

Milton C. Harding
Extension Administrator
Virginia State University

Madeline M. Henderson
Consultant

Donald A. Marchand
Associate Director
Bureau of Government Research
and Service
University of S. Carolina

Kenneth S. Neel
General Manager
Electronic Marketing Association,
Inc.

Edward M. Nissen
Information Systems Coordinator
University of Calif., Coop. Extension

James L. Pearson
Director, Market Research &
Development Division
Agri Marketing Service
U.S. Department of Agriculture

Vince Sardella
Operations Research Specialist
NTIA/Department of Commerce

Linda Schotsch
Farm Journal

Lee Schrader
Department of Agriculture Economics
Purdue University

Gary L. Vain
Extension Editor
Kansas State University

Group 3 - Government Information Field Operations
Group Leader: James Lyons
Assistant Director
University of California at Davis

Rapporteur: Howard Lehnert
National Program Leader
Agricultural Weather and Videotext, USDA

Participants

Frank Boyle
Manager - System and Telecommunications
U.S. Department of Agriculture

Jim Dinwiddie
Director, ADP Planning
U.S. Department of Agriculture/ASCS

Charles Dove
Science Bibliographer
Congressional Research Service

Sara Kadec
Special Assistant to Director
U.S. Department of Agriculture/SEMS

Charles Little
U.S. Department of Agriculture

John Ragland
Assistant to Ext. Director
University of Kentucky
Agriculture College

Richard Snyder
Extension Biometereologist
University of California, Davis

Roxanne Williams
Information Management
U.S. Department of Agriculture

Group 4 - User Requirements
Group Leader: Russell Youmans
Director, Western Rural Development Center
Oregon State University

Rapporteur: David Hoyt
Leader for Training and Education
USDA/NAL

Mary Ball
Government Specialist
Mississippi Cooperative Extension Service
Mississippi State University

Henry Brooks
1890 Administrator
Cooperative Extension Service
University of Maryland

Jane E. Brown
Manager, Db Providers
Source Telecomputing Corporation

14-795 O - 83 - 20

Daniel H. Carter
Manager, Advanced Business Planning
Texas Instruments

George Cross
Rural Development Specialist, SCS
U.S. Department of Agriculture

Marshall Dantzler
Special Assistant
IRM Staff
U.S. Department of Agriculture

Gerald Doeksen
Extension Economist
Oklahoma Cooperative Extension Service

Elizabeth Downey
Analyst
Downey & Small Association Inc.

Bob Elkin
Minneapolis Star and Tribune

R.A. Farley
Director, NAL
U.S. Department of Agriculture

Richard Haycock
Associate Dean
Utah State University

Dennis Henderson
Professor
Ohio State University

Alison Hess
Research/Analyst
Office of Technology Assessment

Karen Lehman
Community Program Specialist
University of Minnesota

Craig R. Metz
Videotext Representative
Tandy Corporation

Pete Murphy
Vice President
Dynamac

Harold Scott
Director, Videotext Service
Tandy Corporation

Pat Tengel
Family Resources Management
Specialist
University of Maryland
Extension Service

Jean E. Thompson
Extension Editor
Cooperative Extension
Iowa State University

Bernard Vavrek
Director, Center for the Study
of Rural Librarianship
Clarion State University

Samuel W. Webster, Jr.
Marketing Manager
Texas Instruments

Group 5 - System Implementation: Hardware Installation, Training, Maintenance, Software and Data File Modiciation

Group Leader: John M. Brazzel
Organizational Consultant

Rapporteur: Mark Nestle
Deputy Director,
Planning & Analysis
USDA/FHA

Participants

J.A. Cunningham
Systems Societies
Silver Spring, Maryland

John E. Hall
Extension Agent - Agricultural Science
Chestertown, Maryland

David Hess
SEMIS
University of Maryland

Paul Holm
U.S. Department of Agriculture

Jon E. Irby
U.S. Department of Agriculture

Frank E. Martin
College of Agriculture
Michigan State University

Granville Ott
Texas Instruments
Lubbock, Texas

Paul Rodgers
EMA, Inc.
Christiansburg, Virginia

Gary L. Smith
Agricultural Engineering
University of Maryland

Joe Trumbauer
Extension Agent- Agricultural Science
Princess Anne, Maryland

Lynn T. Warman
Extension Agent - Agricultural Science
Bel Air, Maryland

Group 6 - Present and Projected Technology

Group Leader: David L. Holder
Program Leader, Livestock
& Meat Marketing Extension
Services, USDA

Reapporteur: Fred Weingarten
Program Manager,
Communications and
Information Technology
Program

Participants

Jon Bartholz
Michigan State University

James B. Bell
Extension Economist
Virginia Polytechnic Institute
and State University

R. Andrew Carlson
Control Data Corporation

Curt Fritz
President
DIDS Co.

Richard Johnson
IBM Corporation

Robert Landau
President
International Development Center
SIA

Roy Meek
Manager, Eastern Lamb Producers
Association
Electronic Marketing Association

Gerald D. Paulsen
Extension Service

Gerald Schrage
REA
U.S. Department of Agriculture

Tom Thompson
University of Nebraska
AGNET

Charlotte B. Travieso
Coordinator of Program Development Evaluation
and Management System, ES
U.S. Department of Agriculture

John T. Wooten
S&E
U.S. Department of Agriculture

APPENDIX 3

Glossary of Terms

The purpose of this glossary is to provide useful, succinct definitions of selected terms which concern information technology. The majority of these definitions originally appeared in The First Book of Information Science. 1/

Agribusiness
A combination of the producing operations of a farm, the manufacture and distribution of farm equipment and supplies, and the processing, storage, and distribution of farm commodities.

Algorithm
A prescribed set of well-defined rules or processes for the solution of a problem in a finite number of steps.

ASCII
(American Standard Code for Information Interchange) A data coding standard for alphanumeric information.

Audiovisual materials
A collective noun (not the name of a field), referring to a collection of materials and devices which are displayed by visual projection and/or sound reproduction; sometimes used (albeit incorrectly) to designate a field of study.

Binary
1. The number representation system with a base of two. 2. A characteristic or property involving a selection, choice or condition in which there are only two possibilities.

Bit
A contraction of the term binary digit; it is the smallest unit used to represent information in a binary system.

Buffer
A temporary storage device used to compensate for a difference in the speed of data flow or the occurrence of events when data are being moved from one device to another.

"Bug"
A mistake in the design of a routine or a computer, or a malfunction.

Cable television
The reception of long distance television programs retransmitted to local TV sets over underground coaxial cables.

Character recognition
The technique of reading, identifying, and encoding a printed character by optical means.

1/ Becker, Joseph, The First Book of Information Science. Oak Ridge, Tennessee, USERDA-Technical Information Center, 1973. 90 p.

"Chip" (or integrated circuit)
A miniaturized electrical (or electronic) circuit assembly with certain of its components reduced to microscopic size. Such a device may be smaller than a thumbnail yet house the equivalent of hundreds of transistors, etc. The term "integrated" is used because the device's components are inseparable and formed on (or within) a continuous material. Integrated circuits have allowed the development of varying degrees of miniaturization in virtually all electronic audio and visual devices. Sometimes called a "chip."

Communications
Electrical systems that can send and receive information messages.

Communications satellite
An earth-orbiting device capable of relaying communication signals over long distances.

Computer
An electronic machine capable of processing numbers and letters of the alphabet for many different purposes.

Computer-assisted instruction (CAI)
The use of a computer system to present an instructional program to an individual student and interpret his response. CAI requires the use of an on-line computer terminal and should be distinguished from computer-managed instruction.

Computer graphics
Digital creation of information displays.

Computer-managed instruction (CMI)
The use of the computer to help the teacher manage the educational process by assessing the student, suggesting a course of instruction, and monitoring his progress. To be distinguised from computer-assisted instruction.

Computer network
See Network

Computer-output microfilm
The transfer of information from a computer to microfilm through an intermediate photographic device.

Computer program
A sequence of instructions that causes a computer to complete a desired task.

Core storage
A form of magnetic storage that permits high-speed access to information within the computer.

Data banks
Large accumulated files of information in machine readable form for subsequent access by users via a computer.

<u>Decoder</u>
In videotex systems, a device attached to a terminal unit which accepts the digital data, stores one or more pages in a buffer memory, and displays pages on the screen as directed by the user. The decoder may be integrated within the terminal unit or be a stand-alone device.

<u>Digitizer</u>
A device which converts an analog measurement into digital form.

<u>Direct broadcast satellite</u>
A radiocommunication service in which signals from earth are retransmitted by high power, geostationary satellites for direct reception by small, rooftop earth terminals.

<u>Disk storage</u>
A method of storing information in code, magnetically, in quickly accessible segments on flat, rotating disks.

<u>Downlink</u>
A unidirectional transmission path from a communication satellite to an earth terminal.

<u>Drum storage</u>
A method of storing information in code, magnetically, on the surface of a rotating cylinder.

<u>Earth station</u>
A radio station located on the surface of earth which serves as a satellite receiver and forms part of a space communications system. Such a station comprises one or more earth terminals.

<u>Earth terminal</u>
An antenna together with one or more transmitters, receivers and other ancillary apparatus at an earth station; such an assembly is often loosely described as an antenna.

<u>Econometric model</u>
A representation of an economic system or problem in mathematical form, with equations used to simulate the behavior of the system or problem, under varying conditions. The model is intended to show cause-effect relationships that, by inference, can be used to predict economic conditions.

<u>Electronic blackboard</u>
A device which converts chalk strokes into electronic signals that can be transmitted to one or more remote locations and reproduced on a television monitor.

<u>Electronic mail</u>
See Electronic Message System

Electronic message system (EMS)
Sometimes called electronic message services--a generic term used to describe computer-based message systems--electronic mail, for example.

Electronic printing
The coupling of information stored on a magnetic tape with high-speed photocomposition machines that automatically set type for printing.

Electronic trading system
A remote access system of trading that utilizes electronic equipment to bring together a number of buyers and sellers simultaneously to make transactions. Such a system creates a large central market in place of many small, local markets without requiring all buyers, sellers and products to be at a single location. The auction can be conducted over conference telephone call, teletype, or by computer terminals. (Also called "electronic auctioning system" and "electronic marketing system.")

Facsimile
The optical scanning of a page of printed or graphic information, its transmission over communication lines, and its faithful reproduction at a distant receiving location.

Fibre optics
Glass fibers which are used to carry optical impulses.

Floppy disk
A magnetic disk with a soft, flexible backing. Also called flexible disk. See also magnetic disk.

Hardware
Mechanical and electronic equipment combined with software to create an electronic information processing center.

Information explosion
The exponential increase in the growth and diversification of all forms of information.

Information networks
The interconnection of a geographically dispersed group of libraries and information centers, through telecommunications, for the purpose of sharing their total information resources among more people.

Information science
The study of how man creates, uses, and communicates information in all forms.

Information system
A formal method by which information can be found, delivered, and used by those who need it.

Input
The process of entering information into a computer and especially into its memory.

Intelligent computer terminal
A terminal which can be used as a stand-alone computer for local processing and storage in addition to providing time-shared access to remote computers.

Interactive communication system
A two-way communication system which involves a dialogue between the user and the system -- the user "tells" the computer what information to send or what transaction to make. In some applications of the interactive feature, the computer asks the questions.

Laser
A tightly packed, narrow beam of light formed by the emission of high-energy molecules.

Libraries
Places where information of all kinds is stored, systematically organized, and made available for use on request.

Library automation
Application of computers and other technology to library operations and services.

Library science
The study of the way libraries select, acquire, catalog, circulate, and make available books and other information.

Low-power television
A single-channel video broadcasting service designed to reach a small geographic area.

Machine language
A code used directly to operate a computer.

Machine readable
Information in a form such as punched holes or magnetic codes that can be processed directly by computers and other machines.

Machine translation
The use of computer programs to translate one language into another.

Magnetic disk
A ferrous oxide platter used for storing information in a way that makes it directly accessible for computer processing.

Magnetic tape
A long strip of mylar plastic coated with ferrous oxide on which binary information may be stored, read, or erased.

Memory
An automated device that stores information for later recall.

Microfiche
A sheet of film that stores images of a reduced size in a grid pattern.

Microfilm
Photographic film used for recording graphic information in a reduced size.

Microcomputer
The term "microcomputer," which was first used to denote a subclass of minicomputers dedicated to single tasks and seldom if ever reprogrammed, has become a distinct category. Microcomputers are sometimes called "single chip LSI processors," "component processors," or "pico-computers," with no one term fully accepted. They are used as "stand alone" systems to provide added capabilities to standard computing installations and to enhance logical functions for noncomputer products, e.g., specialized television display, including videodisc. See also minicomputer.

Micrographics
The use of miniature photography to condense, store, and retrieve graphic information.

Microsecond
One millionth of a second.

Microwave
A broadband communications system that uses ultrahigh frequency radio signals to transmit data, telephone communications, and television signals.

Millisecond
One thousandth of a second.

Minicomputer
A small, powerful, usually rugged and comparatively inexpensive, general purpose computer. They are often subgrouped as mini-, midi, and maxi-computers according to the amount of storage they have (usually given in bytes), the number and kind of peripherals they use, and the price range. Minicomputers (all subgroups) usually have a more limited set of instructions than do larger computers. Instead of a fixed control section in the central processor, many minicomputers have programmable microprocessors which can be programmed for different applications. See also microcomputer.

Main frame
The portion of the computer which performs the calculations and decisions.

ERIC

Modem
A device which functions as an interface between digital user equipment and the telephone network by conver ‑ analog telephone signals into digital form.

Network
1. In general, a system of interconnected points, agencies, organizations, or institutions which can distribute or interchange resources, energy, or information. 2. For broadcasting, a group of radio or television broadcasting stations connected by relays or coaxial cable so that all stations may broadcast a single program, originated at one point, simultaneously. 3. For information, a system of interconnected or related data banks or information sources from which data can be accessed (and sometimes stored) from a number of points; usually using electronic means. 4. For computers, two or more interconnected computers that perform local processing as well as transmit messages to one another and/or to a central computer for updating information and/or processing inquiries. 5. For libraries/learning resources centers, a formal organization among libraries and learning resources centers for cooperation and sharing resources usually with a hierarchial structure and subgroups.

On-line
The connection of a distant user terminal to a central computer through a continuing communication hook-up.

Optical character recognition (OCR)

The ability of a machine to scan a printed letter of the alphabet and discern which one it is.

Personal computer
See Microcomputer

Picture phone
A new device that permits you to see the person you are calling when making a telephone call.

PLATO (Programmed Logic for Automatic Teaching Operation)
A computer-based education system developed by Control Data Corporation.

Programming language
A special language supplied by a computer manufacturer for writing programs that cause the computer to function according to a programer's instructions.

Programmed learning
A method of self-instruction achieved by a series of carefully designed items, which require responses from the learner and then provide information as to the accuracy of the response.

Punched card
A stiff paper card of exact dimensions into which holes are punched to represent information. Subsequently, the information can be sensed and processed by mechanical, electrical, or optical machines.

Punched paper tape
A narrow strip of paper into which holes are punched to represent information for subsequent processing by machines.

Random Access
A technique for storing and retrieving data which does not require a strict sequential storage of the data nor a sequential search of an entire file to find a specific record. A record can be addressed and accessed directly at its location in the file.

Real time
The technique of computing while a process takes place so that results can be used to guide operation of the process.

RS232-C
An Electronic Industries Association communications standard which allows for interface between data terminal equipment and data communication equipment employing serial binary data exchange.

Selective dissemination of information (SDI)
Computer selection and distribution of information to specific individuals based on their prestated subject interests.

Semiconductor chip
1. A solid or liquid electronic conductor, with resistivity between that of metals and that of insulators, in which the electrical charge carrier concentration increases with increasing temperature over some temperature range. Over most of the practical temperature range, the resistance has a negative temperature coefficient. Certain semiconductors possess two types of carriers: negative electrons and positive holes. The charge carriers are usually electrons, but there also may be some ionic conductivity. 2. An electronic device, the main functioning parts of which are made from semiconductor materials.

Software
1. The collection of man-written solutions and specific instructions needed to solve problems with a computer. 2. All documents needed to guide the operation of a computer, e.g., manuals, programs, flowcharts, etc.

Telecommunications
A term pertaining to the communication by electric or electronic means and/or the transmission of signals over long distances, such as by telegraph, radio, or television. Telecommunications in a broader sense includes not only the technical aspects of transmission but also such aspects as the development of messages and programs and studies of audiences.

Teletel
A videotex service offered by the French PTT (Postal, Telephone, and Telegraph) using the Antiope technology, a system incorporating both teletext and videotext technologies.

Teletext
A one-way home information system in which textual and graphic material is transmitted to a user's TV as part of the television broadcast signal or over cable TV systems.

Television
A method of broadcasting information so that people see and hear it at the same time.

Telidon
An integrated teletext/videotext technology developed by Canada's Department of Communications.

Terminal
A remote communications hookup to a computer that may be used for either input or output.

Time-sharing
Use of a central computer by many individuals in different locations at the same time.

Transponder
A receiver-transmitter combination inside a satellite that retransmits the received signal greatly amplified at a different frequency. The transponder receives information from an earth station's transmitting antenna (uplink) and retransmits exactly the same information on the downlink to one or more earth station receivers.

Two-Way Cable
Cable installations in which two wires are used, one carrying signals from the transmission center, the other taking signals from the television set.

Uplink
A unidirectional transmission path from an earth terminal to a communication satellite.

ERIC

Videodisc

A disc, usually plastic, on which are recorded video and/or audio signals for television use. A videodisc requires a videoplayer compatible with the videodisc.

Videotex

A generic term encompassing the concepts of teletext and videotext. In general, videotex refers to home information systems designed for the widespread dissemination of textual and graphic material between centralized or distributed data bases and low-cost, remote user terminals, under selective control of the recipient.

Videotext

A two-way home information system in which the user is generally linked to the data base by telephone line. Since the system is fully interactive, users may send messages or perform transactions in addition to retrieving information for display on modified home television sets or computer terminals.

ERIC Full Text Provided by ERIC

APPENDIX 4

Selected References

Government Publications

Chartrand, Robert L. and A. Barry Carr. Computer-based information systems and services for rural America. Washington, Congressional Research Service, 1982. 20 p.

Evans, James F. Impact of communications technology on productivity of land: a paper commissioned by the Office of Technology Assessment. Springfield, Virginia, NTIS, 1982. 50 p.

Schlei, Barbara .ndeman. Electronic trading of agricultural products: a paper delivered July 8, 1980, Commonwealth Club, San Francisco. Washington, U.S. Agricultural Marketing Service, 1981. 22 p.

U.S Congress. Office of Technology Assessment. Communications and rural America. Washington, U.S. Govt. Print. Off., 1978. 49 p.
At head of title: 95th Cong., 1st sess. Committee print.
Printed for the use of the Senate Committee on Commerce, Science, and Transportation.

----- Computer-based national information systems: technology and public policy issues. Washington, U.S. Govt. Print. Off., 1981. 166 p.

U.S. Congress. Senate. Committee on Commerce, Science and Transportation. Subcomittee on Communications. Washington, U.S. Govt. Print. Off , 1981. 131 p.
At head of title: Hearings, 97th Congress, 1st session.
"Rural Communications" Hearing held June 22, 1981.

U.S. Department of Agriculture. Agricultural Marketing Service and Economics, Statistics and Cooperatives Service. The feasibility of electronic marketing for the wholesale meat trade. Washington, U.S. Dept. of Ag., 1979, 39 p.

U.S. Department of Agriculture. Office of Governmental and Public Affairs. Report on U.S. Department of Agriculture electronic information exchange and dissemination. Washington, U.S. Dept. of Ag., 1982, 15 p.

U.S. General Accounting Office. Food and agriculture models for policy analysis; report by Community and Economic Development Division -- Food Staff. [Washington] 1977. 64 p.
"CED-77-87, July 13, 1977"

----- Developing state automated information systems to support Federal assistance programs: problems and opportunities; report by the Comptroller General of the United States. [Washington] 1978. 71 p.
"FGMSD-78-31, May 26, 1978"

----- Agricultural weather information is not effectively communicated to users; report by the Comptroller General of the United States. [Washington] 1979. 32 p.
"CED-79-110, August 7, 1979"

----- Department of Agriculture needs leadership in managing its information resources; report by the Comptroller General of the United States. [Washington] 1981. 92 p.
"CED-81-116, June 19, 1981"

U.S. Office of Telecommunications Policy. Interagency committee report on rural communications. [Washington] 1977. 1 v. (various pagings)

Books and Reports

Abt Associates. National community facilities assessment study: pilot phase: final report. Cambridge, Mass., 1980. 53 p.
A study for the Farmers Home Administration, U.S.D.A., contract no. 53-0000-6-23.

Case, Donald and others. Stanford evaluation of the Green Thumb Box, experimental videotext project for agricultural extension information delivery in Shelby and Todd counties, Kentucky; final report. Stanford, Calif., Institute for Communications Research, Stanford University, 1981. 207 p.
"USDA contract no. 53-3K06-1-63"

Electronic Marketing of Agricultural Commodities, Winnipeg, Nov. 2-4 1981. Proceedings. Winnipeg, Manitoba, Canada, Agriculture Canada, Marketing and Economics Branch, 1981. 200 p.

National Symposium on Electronic Marketing of Agricultural Commodities, Dallas, 1980. Proceedings. College Station, Texas, Texas Agricultural Experiment Station, 1980. 154 p.
"MP-1463"

Ross, Peggy J. and Ted L. Napier. Patterns of communication in a rural population. Wooster, Ohio Agricultural Research and Development Center, 1978. 16 p. (Ohio Agricultural Research and Development Center, Research bulletin 1095)

Sporleder, Thomas L. and Kathleen A. Mahoney. Allocative efficiency in electronic marketing for feeder cattle. College Station, Texas, Texas A & M University, 1982. 12 p. (Texas Agricultural Experiment Station, Technical article)

Strain, J. Robert and Sherry Fieser. Updated inventory of agricultural computer programs available for Extension use. Gainesville, Florida, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of Florida [in cooperation with Federal Extension Service, U.S.D.A.], 1982. 186 p.

Strain, J. Robert. Survey of availability of micro and mini computer software: report of the Joint Personal Computer Task Force. Gainesville, Florida, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of Florida, 1980. 39 p. (Institute of Food and Agricultural Sciences. Staff paper 165)

Warner, Paul D. An evaluation of a computer-based videotext information delivery system for farmers: the Green Thumb project; executive summary. Lexington, University of Kentucky, 1982. 32 p.

Periodical Articles

Brown, G. C. Microprocessor-based information management system for an integrated pest management program. Bulletin of the Entomological Society of America, v. 28, June 1982: 135-137.

Brown, G. C. and others. Data base management systems in IPM programs. Environmental entomology, v. 9, Oct. 15, 1980: 475-482.

Burns, Joseph M. Electronic trading in futures markets. Financial analysts journal, v. 38, Jan.-Feb. 1982: 33-41.

Cady, Steve. The high-stakes world of horse breeding. New York times magazine, July 19, 1981: 12-18, 20, 22, 42-43.

Copeland, Ken. "Slide-show" selling gets fresh stockers to Midwest. Farm journal beef extra, April 1981: 2,9.

Diesslin H. G. The computer--extension's delivery system of the future. American journal of agricultural economics, v. 63, Dec. 1981: 863-867.

D'Antonio, Michael. Clearinghouse for egg trades proves success. Washington Post, Sept. 5, 1978: D7.

Harsh, Stephen B. The developing technology of computerized information systems. American journal of agricultural economics, v. 60, Dec. 1978: 908-914.

Hills, Alex, and M. Granger Morgan. Telecommunications in Alaskan villages. Science, v. 211, Jan. 16, 1981: 241-248.

Infanger, Craig L., Lynn W. Robbins, and David L. Debertin. Interfacing research and extension in information delivery systems. American journal of agricultural economics. v. 60, Dec. 1978: 915-922.

Just like the good old days. Telephony, v. 197, Aug. 6, 1979: 19, 22-23.

Linton, Daniel. Marketing cattle board auction style. Extension review, spring 1982: 20-21.

14-795 O - 83 - 21

Menz, Kenneth M. and John W. Longworth. An integrated approach to farm management education. American journal of agricultural economics, v. 58, Aug. 1976: 551-556.

Ragland, John D. Project Green Thumb pilot: information harvest for farmers. Telephony, v. 200, May 11, 1981: 20-24.

Reynolds, Bruce J. TELCOT: a case study of electronic marketing. Agricultural history, v. 56, Jan. 1982: 83-98.

Rubinstein, Ellis. Technology and society. IEEE spectrum, v. 16, Jan. 1979: 81-85

Sarette, M. and others. SCAMP--a computer-based information delivery system for cooperative extension. New York food and life sciences bulletin, no. 90, 1981: 1-8.

Schotsch, Linda. CATTLEX. Farm journal beef extra, Feb. 1981: 1-2,5.

Schotsch, Linda. Your computer options; a Farm Journal report. Farm journal, v. 106, Feb. 1982: 9-13.

Schultz, Theodore W. Knowledge is power in agriculture. Challenge, v. 24, Sept.-Oct. 1981: 4-12.

Shapiro, Robert M., and Pamela Hardt. The impact of computer technology--a case study: the dairy industry. Computers and people, v. 25, Mar. 1976: 8-13.

Stevenson, Carol R. Communications satellites. Communications, Sept. 1981: 58-63.

Sutherland, Stu, and Eldon Fredericks. Computer mailboxes for extension. Extension review, v. 52, fall 1981: 24-26.

Sutherland, Stu. Computer uses in pest management. Extension review, v. 53, spring 1982: 8-11.

Symposium on commodity futures regulation. Hofstra law review, v. 6, fall 1977: 1-201.

Walker, Harold W. Interfacing research and extension information delivery systems: discussion. American journal of agricultural economics, v. 60, Dec. 1978: 921-922.

Wired for water. Farm chemicals, v. 144, Dec. 1981: 56, 58-59.

General Reports on Information Policy and Technology

American Telephone & Telegraph. Corporate Planning Emerging Issues Group. Information and society. Basking Ridge, New Jersey, AT&T, 1981. 52 p.

Congressional Research Service. Information and telecommunications: an overview of issues, technologies, and applications. July 1981. 138 p.
Issued as a Committee Print. U.S. Congress. House. Committee on Science and Technology, Subcommittee on Science, Research and Technology. 97th Congress, 1st session.

Domestic Council Committee on the Right of Privacy. National information policy; report to the President of the United States. Washington, National Commission on Libraries and Information Science, 1976. 233 p.

Horton, Forest Woody, Ed. Understanding U.S. information policy. Washington, The Information Industry Association, 1982. 133 p.

Little, Arthur D. Inc. Into the information age. A report prepared for the National Science Foundation. Chicago, American Library Association, 1978. 134 p.

National Commission on Libraries and Information Science. The White House conference on library and information services, 1979. . The final report. Washington, National Commission on Libraries and Information Science, 1980. 101 p.

----- Public sector/private sector interaction in providing information services. Washington, National Commission on Libraries and Information Science, 1982. 88 p.

U.S. Congress. Office of Technology Assessment. Computer-based national information systems; technology and public policy issues. Washington, U.S. Govt. Print. Off., 1981. 166 p.

U.S. Department of Commerce. National Telecommunications and Information Administration. Issues in public information policy. Washington, U.S. Govt. Print. Off., 1981. 101 p.

ERIC

APPENDIX 5

Acronyms for Organizations, Systems and Terms

AACSys	- American Agricultural Communications System
AFBF	- American Farm Bureau Federation
AGNET	- Agricultural Network
AGRICOLA	- Agricultural On-Line Access
AMS	- Agricultural Marketing Service
ANSER	- Agricultural Network Serving Extension and Research
ASCII	- American Standard Code for Information Interchange
CANSIM	- Canadian Socio-Economic Information Management System
CATS	- Computer-Assisted Trading System
CATTLEX	- Cattle Exchange
CDC	- Control Data Corporation
CMN	- Computerized Management Network
COMNET	- Communications Network
CPU	- Central Processing Unit
CRIS	- Current Research Information System
DATANETWORK	- Time-sharing computer network (of Honeywell Inc.)
DBS	- Direct Broadcast Satellite
DIALCOM	- Electronic mail service (of DIALCOM Inc.)
DIALOG	- On-line information retrieval service (of Dialog Information Services Inc., a subsidiary of Lockheed Corp.)
DISK	- Development Information System for Kentucky
ECI	- Egg Clearinghouse, Inc.
EMA	- Electronic Marketing Association
ESTEL	- Extension Service Telecommunication System
FACTS	- Fast Agricultural Communications Terminal System
FANI	- Food, Agriculture and Nutrition Inventory
FAO	- Food and Agriculture Organization (of the United Nations)
FAPRS	- Federal Assistance Program Retrieval System
FAS	- Foreign Agricultural Service
FCC	- Federal Communications Commission
FTS	- Federal Telecommunications System (of General Services Administration)
HAMS	- Hog Accelerated Marketing System
IBP	- Iowa Beef Processors, Inc.
IPM	- Integrated Pest Management
LPTV	- Low-Power Television
NARS	- Narrative Accomplishment Reporting System
PBS	- Public Broadcasting Service
P.E.T.S.	- Public Egg Trading System
PFA	- Professional Farmers of America, Inc.
PLATO	- Programmed Logic for Automatic Teaching Operation
SCAMP	- System for Computer-Aided Management of Pests
SCORPIO	- Subject-Content-Oriented-Retriever for Processing Information On-Line
STATSCAN	- Statistics Canada

ERIC

TELEX	- Automatic Teletypewriter Exchange Service (of Western Union)
TELENET	- Data communications network (of Telenet Communications Corp., a subsidiary of General Telephone & Electronics Corp.)
TTY	- Teletypewriter
TYMNET	- Data communications network (of Tymnet Inc., a subsidiary of Tymshare, Inc.)
TYMSHARE	- Time-sharing computer network (of Tymshare, Inc.)
USDA	- U.S. Department of Agriculture
WATS	- Wide Area Telephone Service (American Telephone & Telegraph contract billing system)

ERIC

APPENDIX 6

AGNET (Agricultural Network)

The University of Nebraska's AGNET (Agricultural Network) was developed by James Kendrick, a professor of agricultural economics, in collaboration with a professor of agricultural engineering, Thomas C. Thompson, in 1975. Initiated as a Nebraska project with funding from the State legislature, the system was designed not only to provide current market and price information, but also to assist Extension agents in offering enhanced educational and management services to farmers and ranchers. In 1977, the Old West Regional Commission expanded the funding for AGNET to include five other states in the region--today, the system is accessed by subscribers in more than 40 states.

AGNET serves as a decision-making tool by providing assistance in problem solving of agricultural management questions; additionally, the system offers access to a database for information on market conditions and trends. Emphasis has been placed on generating more than 200 programs to support farmers in analyzing a variety agricultural operations. In general, the programs have been developed by groups of specialists at the University of Nebraska and other Land-Grant universities on the basis of their field experiences and knowledge of current research findings. Indicative of the wide range of agricultural areas covered by AGNET are the following samples:

Livestock production:

-- predict growth, costs, returns for cattle on feed (see Figure _.).

-- tabulate costs of pasturing calves on grass

-- formulate least cost livestock diets

Crop production:

-- determine fertilizer recommendations

-- calculate cost per acre to produce a crop

-- apply irrigation water at the optimum time and rate

-- compare costs and returns of irrigated vs. non-irrigated land

Grain handling:

-- calculate grain storage costs over periods of time

-- determine capacity and performance of grain drying systems

Marketing and finance:

-- read expert on "what happened" in the market, "why it happened," and "what might happen next"

-- consider beef and swine marketing recommendations

-- consider income tax alternatives and their effect on your operation

-- determine the maximum bid you can afford for a tract of farmland

Home economics:

-- analyze your daily diet

-- estimate home heating and cooling costs and determine areas of heat loss

-- analyze your family budget

Electronic mail and conferencing:

-- establish quick, two-way communication

-- retrieve old mail (massages kept for 14 days)

-- check to see which receivers have read your messages

-- participate in computer conferencing on a variety of subjects. 1/

In March 1982, the Foreign Agricultural Service of USDA began supplying AGNET with daily agricultural trade leads received by Agricultural Attaches from foreign importers. (See Figure 23).By using AGNET, subscribers can receive and act upon this information within hours rather than the days it would have taken with the

---

1/ University of Nebraska. Institute of Agriculture and Natural Resources. AGNET Fact Sheet (brochure). Lincoln, Nebraska.

mail system. Last year, these leads resulted in export sales of $170 million. Since the success of any trade lead depends upon the speed with which it is fed to interested exporters for their response, it is anticipated that this volume will increase as U.S. suppliers take advantage of this feature. 2/ AGNET also provides summaries of USDA crop and livestock reports that are featured on the Department's electronic mail network.

In addition to the cost of a portable computer terminal, most users spend about $10 per hour for computer use. This cost is based on a charge for CPU time plus a charge for being connected to the computer. Any regular telephone line can be used to access AGNET, although long-distance charges may cost two to three times the amount spent for computer time.

2/ Lett, Raymond. Testimony during hearings on Applications of Computer-Based Information Systems and Services in Agriculture. U.S. Congress. House. Committee on Agriculture. Subcommittee on Department Operations, Research and Foreign Agriculture. Hearings, 97th Cong., 2d Sess., May 19, 1982.

```
Do you want to calculate Costs, Returns, or Performance Only?
.y

Enter the Non-Feed Costs (excluding interest) in Dollars per head per day.
e Zero (or blank carriage return) will default to $0.22/head/day.
..23

Enter:

Initial     Market      Report          Feeder         Interest
Weight      Weight    Interval(wks)    Cost($/cwt)       Rate
.700 1050 4 57.75 16.75
```

```
                    Current    ---Gain---                                     Cost/lb Gain(Cents)
           Ave.     Feedlot   This     Average  Average Dry   Average         This     To Date
Date       Temp     Weight    Period   Todate   Feed Intake   Efficiency      Periods
 4 28      47.0     756.22    2.01     2.01     16.27         8.11            62.45    62.45
 5 26      60.6     841.59    3.05     2.53     17.60         5.77            43.32    50.92
 6 23      64.2     926.79    3.04     2.70     18.88         6.20            45.57    48.91
 7 21      74.1    1005.53    2.81     2.73     19.12         6.80            49.75    49.13
 8  7      77.3    1052.66    2.77     2.73     19.81         7.14            51.73    49.47

                 Total                 352.66   2349.78
               Average                   2.73     18.22         6.66

$ Note - Generally when this column exceeds Selling price, it is time to sell.
Consider that heavier weights may change the selling price due to change in
Grade and/or weight classification.
```

```
Feedlot
Costs        per head   per lb
------------------------------
Feed          120.54    0.3418 @  5.130 $ per dry cwt
Non-feed       29.67    0.0841 @  0.230 $ per day
Interest       24.26    0.0688 @ 16.750 % per yr
Total         174.48    0.4947
```

```
Enter:

  Est.Sale      Commission Fee    Vet,Med, and       Transportation
Price($/cwt)    & Yardage($/hd)  Death Loss($/hd)    Charges($/cwt)
'68 d'4.75 .55

Summary:
Feeder Cost                                      = $ 57.75/cwt
Sale Price                                       = $ 68.00/cwt
Cost of gain (pay weight to pay weight)          =   49.47 cents/lb

Projected Return = $ 126.54 per head

Sale Price  65.00  66.00  67.00   68.00   69.00  70.00  71.00
--------------------------------------------------------------
Returns
per head    94.97 105.49 116.02  126.54  137.07 147.60 158.13
per pound   0.090  0.100  0.110   0.120   0.130  0.140  0.150

To Break Even you must market cattle at $ 55.98
or you must buy Feeders at no more than $ 75.83
```

FIGURE 22 --AGNET Beef Performance Simulator 3/

```
       U.S. Department of Agriculture -- Foreign Agricultural Service
          Trade Opportunity Referral System -- Foreign Trade Leads

Concerning  RICE - MILLED, LONG GRAIN    .      08/24  TORS/SIC Number: 20441000
Issued From ECUADOR                           U.S.D.A. Ref Num: 1753-820823-331A0001
   Wheat, rice (Ecuador). Wants FOB price quotes on (A) white wheat, 200,000
   mt, minimum. Protein 9.5%, FFX moisture content 13.5%, and (B) rice,
   200,000 mt, long grain, No. 2, 4% broken. Bank ref: National Bank of
   Washington, 4340 Conn. Ave., Washington, D.C. CONTACT: W. D. Morrow,
   Prenas 220 & 10 De August, Edificio Bivenco Tercer, Piso of. 205, Quito,
   Ecuador. TELEX: 2270 IETEL-ED. Phone: 551-432. Pls. quote in English.
   (EB-1347-1348)
```

FIGURE 23-- Foreign Agricultural Service trade lead. 4/

4/ University of Nebraska. Sample printout from AGNET system (provided by Dr. James Kendrick, Professor of Agricultural Engineering). Lincoln, Nebraska, August 1982.

APPENDIX 7

EMA (Electronic Marketing Association)

The early electronic auction systems for U.S. agricultural products began with trading conducted over conference telephone call· the 1960's--the first "tele-auction" sold slaughter hogs from Virginia to me.. packers in Virginia and nearby States. 1/ Since then, electronic trading has expanded to include more sophisticated computerized systems which can handle a higher volume of trading as well as bookkeeping functions. An example of this type of system is the Electronic Marketing Association, Inc. of Christiansburg. Va. which held its first computerized auction for livestock in 1980. This system is the offspring of an earlier electronic marketing project for cattle and lambs funded by USDA, Virginia Polytechnic Institute and State University, and the Virginia Department of Agriculture and Consumer Services. Although the slaughter cow marketing program was not successful, project participants determined that the costs of a remote-access timesharing system for buying and selling livestock were the same or below the costs of communicating by conference calls. In March 1980, members of the advisory group for the Virginia project--including livestock producers, livestock marketing operators, and representatives of livestock marketing agencies--formed a non-stock corporation currently known as the Electronic Marketing Association, Inc. 2/ At present, EMA is providing computer auction services not only to the Eastern Lamb Producers Association of Virginia, but also to two other lamb marketing cooperatives headquartered in Wisconsin and Indiana.

1/ U.S. Department of Agriculture. Agricultural Marketing S... Th. Feasibility of Electronic Marketing for the Wholesale Meat Trade. AMS-5.., May 1979. Washington, 1979. p. 24

2/ Neel, Kenneth S. A Computerized Livestock Auction System. Paper presented at the Electronic Marketing of Agricultural Commodities Seminar, Winnipeg, Manitoba, Canada, November 2-4, 1981. (Conference sponsored by Agriculture Canada, Ottowa, Ontario).

Through a telephone hookup to computer terminals in any location, buyers and sellers are brought together at a specific time to determine the price, on a competitive basis, of the animals being offered for sale. The EMA system permits prospective buyers to obtain written descriptions on the lambs several hours before sale time. During the auction itself, the computer drops the asking price until a bid is received, then continues from that point. At the end of a sale, a high bidder receives a summary of his purchases plus a summary of the entire sale; all bidding is strictly confidential. For organizations who do not have enough volume to justify sales on a computer, there is a telephone system which permits buyers to bid on livestock via conference call. This phone system also enables buyers who do not have a terminal to participate in computer. Additionally, it serves as a backup system in case of computer failure.

Analysis of data from sales through the EMA computerized auction system has revealed a positive impact on livestock prices. Access to more buyers across the United States and Canada has enhanced the auction process which typically features more aggressive, competitive bidding. Buyers have also realized several advantages by using the EMA system. Travel costs associated with auctions and visiting producers are eliminated since buyers can access a sale from any location through a portable terminal. Each buyer receives a printed copy of the show list before the sale as well as a summary of what he purchased immediately following the sale, including prices paid and total cost. In general, this computerized auction system offers an efficient trading system for both buyers and sellers and can be operated at a low cost per sale or per unit.

APPENDIX 8

Green Thumb

Green Thumb, the experimental videotext project tested by the Kentucky Cooperative Extension Service and the University of Kentucky College of Agriculture, was conceived in 1977 as a means of providing farmers with real-time weather, marketing and agricultural information. As a result of efforts by Senator Walter Huddleston (D-Ky.), the Department of Agriculture provided $200,000 and the National Weather Service $100,000 for a pilot project involving two counties in Kentucky. After a technical committee determined hardware specifications, bids for the equipment were taken. Motorola won the contract for the user terminals or "Green Thumb Boxes", while Western Union provided the two county host computers; the Computer Division of Tandy Corporation later joined with Motorola in manufacturing user terminals. Two hundred farmers from Todd and Shelby Counties were chosen for the experiment which began operation in March 1980.

Each of the 200 participants received a Green Thumb Box, a low-cost data terminal which was connected to the farmer's home television set and telephone line and was used for entering and receiving information from the county computers. Once the requested information had been received and stored in the Green Thumb Box memory, the telephone was automatically disconnected. The "dump and disconnect" feature was a distinct improvement over fully interactive systems which incurred higher costs due to longer connect times and limited the number of users that could be serviced.

Although the staff of the county Extension offices could enter local information, such as home economic features or 4-H club activities, a large percentage of the information came from the State computer at the University of Kentucky. Data on weather, futures prices, market conditions, pest management, and agricultural economics were provided by the Chicago Board of Trade, the National Weather Service, USDA Agricultural Marketing Service, and State Extension specialists. From a "menu" of information items, project participants selectively retrieved specific "frames" of data that they desired. Ninety percent of the market and about one-half of the weather information was updated automatically; crop and livestock futures updates were scheduled every 15 minute, but generally occurred every 30 minutes due to State computer overload, while weather updates ranged from an hourly to a daily basis. 1/

At the end of the Green Thumb experiment in July 1981, the Stanford University Institute for Communication Research studied the acceptance of the videotext project by the farmers and its impact on their agricultural operations. Researchers affiliated with the University of Kentucky College of Agriculture assessed the organizational structure and technical aspects of the project.

Records stored in the State computer revealed that project participants requested information on market and weather conditions 86 percent of the time, while information on agricultural production, home, and community topics comprised less than 14 percent of retrievals. (See Figure 24). Users generally called the Green Thumb system an average 10 times per month, requesting four items of information per call. Farmer characteristics made little difference in how frequently the system was accessed. (Todd County is dominated by large grain crops farms, while agriculture in Shelby County centers around smaller dairy, livestock, grain and tobacco farms). Thus, future participation in agricultural videotext systems need not be limited to either large-scale or

----

1/ Ragland, John D. Project Green Thumb Pilot: Information Harvest for Farmers. Telephony, v. 200, May 11, 1981. p. 21.

innovative farmers; however. Green Thumb was offered as a free service, and future use of similar systems may vary among large and small farms depending upon cost. 2/

Although users found the overall Green Thumb system to be workable, about half of the farmers experienced technical problems and two-thirds reported inadequate updating of information. These difficulties may have prompted farmers to rank three conventional sources of marketing data--newspapers, radio and buyers--as more important to them than Green Thumb. About half of the farmers indicated that Green Thumb information had saved them money and/or time in their agricultural operations. On the average, users stated that they would be willing to pay about $8.70 per month for a reliable Green Thumb-type service, and about $18 per month for expanded interactive services such as farm business analyses. However, these figures are lower than actual costs of videotext or interactive computing services now operating on a profit-making or cost-recovery basis. 3/

Even though the Green Thumb experiment was successful in many respects, the Stanford evaluation concludes with several recommendations for improvements in future agricultural videotext systems. First, hardware reliability and dependable

---

2/ Bennett, Claude F., and others. The Kentucky Green Thumb Experimental Project: Some Major Findings and Recommendations from University of Kentucky and Stanford University Evaluations. U.S. Department of Agriculture (mimeographed report), 1982. Washington, 1982. p. 1-2.

3/ Case, Donald, and others. Stanford Evaluation of the Green Thumb Box Experimental Videotext Project for Agricultural Extension Information Delivery in Shelby and Todd Counties, Kentucky: Executive Summary. Stanford, California. Institute for Communication Research, Stanford University, 1981. p. 9-10.

updating of the two most frequently-used categories of information, weather and commodity markets, are essential. Second, unless Cooperative Extension staff supply the system with unique data and analyses, users will continue to narrow their attention to the kinds of information which generally duplicates the services of commercial media. Additionally, future videotext systems should be capable of performing farm business computations related to agricultural operations--farmers indicated a willingness to pay almost twice as much per month for such services compared to basic Green Thumb service. The Stanford evaluation further suggests testing of alternative videotext technologies, particularly systems that utilize cable, microwaves, or satellites for transmission. 4/

4/ Case, Stanford Evaluation of the Green Thumb Box Experimental Videotext Project, p. 13-14.

	Shelby	Todd	Total
Market			
1. Commodity futures prices	20.5%	50.8%	40.1%
2. Market interpretation	6.4%	8.4%	7.5%
3. Regional livestock and grain prices	5.9%	3.4%	4.3%
4. Specialists information	2.8%	1.6%	2.1%
5. Agricultural Marketing Service*	2.8%	.8%	1.5%
	38.4%	65.0%	55.5%
Weather			
1. Forecasts	24.3%	16.7%	18.9%
2. Maps (radar and surface)	11.8%	7.2%	9.0%
3. Agricultural weather advisories	3.3%	1.3%	2.2%
4. Severe weather forecasts	.7%	.3%	.5%
	40.1%	25.5%	30.6%
Agricultural Production			
1. Plant Diseases	2.1%	.5%	1.0%
2. Horticulture	1.3%	.4%	.7%
3. Entomology	1.1%	.4%	.6%
4. Agronomy	1.0%	.4%	.6%
5. Agricultural Engineering	.5%	.3%	.4%
6. Animal Science	.6%	.2%	.4%
7. Forestry	.0%	.0%	.0%
	6.6%	2.2%	3.7%
County Information			
1. County News	7.0%	2.4%	4.0%
Home Economics			
1. Home Economics	2.7%	1.7%	2.1%
Community Information			
1. Resource Development	.4%	.3%	.3%
2. Rural Sociology	1.1%	.4%	.6%
	1.5%	.7%	.9%
Youth Information			
1. 4-H	.4%	.5%	.5%
2. World of Work	.4%	.3%	.4%
	.8%	.8%	.9%
Other			
1. Menu Listing	3.0%	1.6%	2.0%

*Only operated for six months.

FIGURE 24 -- Most requested categories of information in Green Thumb Experiment. 5/

5/ Warner, Paul D., and Frank Clearfield. An Evaluation of a Computer-Based Videotext Information Delivery System For Farmers: The Green Thumb Project. Lexington, Kentucky, University of Kentucky, Department of Sociology and Cooperative Extension Service, 1982. p. V-8.

APPENDIX 9

Iowa Beef Processors Satellite Communications System

In an innovative approach to wide-area mobile communications, the Iowa Beef Processors, Inc. (IBP) recently installed a satellite voice communications system which links the company's headquarters in Dakota City, Nebraska to mobile radio units in all parts of Kansas. The system evolved from a need for instantaneous, reliable communications with the company's field cattle buyers due to the nature of the cattle market, where prices are subject to rapid change.

Before the conversion to satellite communications, the IBP had utilized a system of direct radio contact with field buyers through the company's microwave and VHF radio system. As the system began to deteriorate from weather and age--it had been installed in 1962--a decision was made to upgrade the operation. In 1981, the entire VHF system was replaced with new equipment from General Electric Co., and base stations were located in climate-controlled equipment shelters; scramblers were also included to ensure privacy of voice transmissions. A satellite control system was chosen for long-range communications with IBP headquarters; the other two options, rebuilding the microwave system and construction of dedicated telephone circuits, were considered too costly. 1/

The current system, a network of 14 "single-channel per carrier" earth stations talking through a channel assignment on Western Union's Westar III communications satellite, is designed to work in concert with the local distribution capability of short-range VHF radio. The fixed earth stations are colocated with a business-band VHF base radio stations, each of which has an antenna located at the top of a 300-foot tower. These base stations are located throughout Kansas

----

1/ Stevenson, Carl R. Communications Satellites. Communications, v. 18, September 1981. p. 59-60.

to offer reliable communications with mobile units for distances of up to 35-40 miles from the antenna. For long-range interconnection to the control stations at IBP headquarters and two processing plants, the VHF base stations are interfaced with the satellite earth stations. Additionally, there is a transportable earth station that is available for temporary operations in the event of equipment failure or for use during construction of new sites.

The earth stations were designed, packaged, and installed by Dalsat, Inc. of Plano, Texas. At present, the Iowa Beef Processors is monitoring the performance of the satellite network in Kansas to determine the feasibility of establishing similar communications links to buyers located in Minnesota, South Dakota, Nebraska, and Iowa. Possible future uses of the satellite system by IBP include video teleconferencing and high-speed data transmission.

APPENDIX 10

FAPRS (Federal Assistance Program Retrieval System)

During the past 10 years, the growth of Federal domestic assistance programs has been phenomenal. For example, the number of Federal grant authorizations increased from 160 in 1962 to over 650 in 1971 1/--by the end of 1961, the Catalog of Federal Domestic Assistance contained some 1,200 entries. However, until 1978, many local governments, particularly those in rural areas, lacked the financial and staff resources needed to track the nature and availability of Federal assistance programs. Representative Jack Brooks, Chairman of the Subcommittee on Legislation and National Security of the House Committee on Government Operations highlighted this problem of information inequity during 1977 hearings:

> It is virtually impossible--at least without an enormous expenditure of time and effort--for local officials to find out what programs are available to help their communities and how they go about getting the money for them. Larger cities keep people here in Washington . . . but thousands of smaller communities can't afford to do that, and so they may be losing out on funds that they have just as much right to as the big cities. 2/

The legislation, popularly known as the Federal Program Information Act, was passed later that year in an effort to ensure that all communities would have an equal opportunity to identify and receive Federal assistance.

This Act (P.L. 95-220) transferred the Federal Assistance Program Retrieval System (FAPRS) from the U.S. Department of Agriculture to the Office of Management and Budget with a mandate that the data retrieval system be improved using

----

1/ U.S. Congress. House. Committee on Government Operations. Subcommittee on Legislation and National Security. The Federal Program Information Act. Report to Accompany H.R. 6257. House Report No. 95-341, 95th Cong., 1st Sess. Washington, U.S. Govt. Print. Off., 1977. p.2.

2/ U.S. Congress. House. Committee on Government Operations. Subcommittee on Legislation and National Security. The Federal Program Information Act. Hearings, 95th Cong., 1st Sess., April 28, 1977. Washington, U.S. Govt. Print. Off., 1977. p. 9.

the USDA efforts as a model. Additionally, the Office of Management and Budget was instructed to continue publishing the Catalog of Federal Domestic Assistance. Both the Catalog and the computer retrieval system contain the same information, including: a description of each program; a listing of eligibility requirements, formulas governing fund distribution and use restrictions; and a summary of financial information and application requirements. However, FAPRS enables users to identify and obtain information on Federal assistance programs much more quickly than would be possible with comparable manual searching of the Catalog. When conducting a FAPRS search, the individual supplies data on the name and population of the city or town for which the search is being conducted, the county and State in which it is located, the type of applicants, and the specific need of the community. The system then matches the characteristics of a community and its needs with the characteristics of Federal assistance programs. The requestor can continue the computer search by viewing the complete program description called up from the system or by going directly to the printed Catalog for further information, once the program number has been retrieved. Information in FAPRS is generally updated every six months.

Originally developed by USDA for use by the Department's Rural Development Service, the FAPRS service is currently offered in 45 State Cooperative Extension offices. Today, 30 percent of all FAPRS requests are made through State Extension agents--most offices charge an average $3 to $5 for processing a single request to recover some of the costs. Access to FAPRS is available through two time-sharing vendors, General Electric Information Services Company (GEISCO) and The Service Bureau Company (SBC). The magnetic tapes produced by the Office of Management and Budget are also sold by the National Technical Information Service (NTIS).

APPENDIX 11 1/

Public Law 96-511 (Paperwork Reduction Act of 1980)

Paperwork Reduction Act of 1980 - Establishes, within the Office of Management and Budget (OMB), the Office of Information and Regulatory Affairs (OIRA). Requires the Director of OMB to appoint an Administrator as head of OIRA. Makes the Director responsible for any functions delegated to such Administrator. Requires the Director to develop and implement Federal information policies and standards including policies concerning: (1) the reduction of the Government paperwork burden on the public; (2) records management activities; and (3) the privacy of records pertaining to individuals; and (4) the review of information collection requests.

Sets forth functions of the Director with respect to Federal information collection and management in the following categories: (1) general information policy functions; (2) information collection requests clearance and other paperwork control functions; (3) statistical policy and coordination functions; (4) records management functions; (5) privacy of information functions; and (6) automatic data processing and telecommunications functions not including intelligence, cryptologic, or military activities.

Requires each Federal agency to submit to the Director a copy of any proposed rule which specifically requires an information collection requests. Allows the Director 60 days to file public comments on such request. Directs each agency to publish with the final rule its responses to such comments. Requires the Director to make publicly available a justification of any decision to disapprove such a request. Precludes the Director from disapproving any such request if the Director received notice of the proposed rule and failed to file comments within the specified period.

Requires the Director, upon enactment of this Act, to set a goal to reduce the Government paperwork burden by 15 percent by October 1, 1982, and by an additional 10 percent during the subsequent year. Requires the Director, within one year after enactment of this Act: (1) to establish requirements and assign responsibility for agency and Government-wide audits of all major information systems except systems used for criminal investigations or intelligence or cryptologic activities; (2) to establish the Federal Information Locator System; (3) to develop a schedule for eliminating any duplication of information collection requests by the Government; (4) to develop a proposal for collecting data profiles of agency information holdings which are not included in the Federal Information Locator System; and (5) to identify initiatives which may reduce by ten percent the Federal paperwork burden associated with Federal grant programs. Directs the Director, within two years after this Act is enacted: (1) to establish a system for integrating informative management practices with the information policies of this Act; (2) to identify initiatives to improve productivity in Federal operations using information processing technology; (3) to develop a program to enforce Federal information processing standards and to revitalize the standards development program; (4) to complete action on recommendations of the Commission on Federal Paperwork; (5) in consultation with the Administrator of General Services, to develop a five-year plan for meeting the automatic data processing and telecommunication needs of the Government; and (6) to submit to the President and Congress legislative proposals to remove inconsistencies in laws involving privacy, confidentiality and disclosure of information.

Requires each agency: (1) to carry out information management activities in an efficient, economical manner; (2) to designate a senior official or officials to carry out agency responsibilities under this Act including the acquisition of automatic data processing equipment and services; (3) to inventory its major information systems and review, periodically, its management activities; (4) to ensure that its systems do not overlap each other or duplicate systems of other agencies, (5) to develop procedures for assessing the paperwork burden of its collection activities; and (6) to ensure that each information collection request submitted to nine or fewer persons contains a notice that it is not subject to the provisions of this Act.

1/U.S. Library of Congress. Congressional Research Service. Digest of Public General Bills and Resolutions: Final Issue. 96th Congress, 2d Session (Part 1, 1980). Washington, U.S. Govt. Print. Off., 1981. p. 278.

Requires an agency, before collecting any information, to: (1) eliminate reporting requirements which seek information which is available through another Government source; (2) minimize compliance burden on respondents; (3) plan the tabulation of the information in a manner which maximizes its usefulness to other agencies; (4) obtain the Director's approval of such collection; and (5) obtain a control number for each information collective request.

Requires the Director to notify the public of a decision to approve or disapprove any collection request within 60 days of receiving it. Provides for a 30-day extension of such period. Declares that the Director's approval may be inferred if the Director fails to notify the agency of a decision within the required period. Authorizes an agency to conduct the collection of information which has been disapproved by the Director if a majority of agency members vote to override such disapproval. Prohibits the Director from approving a collection request for a period exceeding three years.

Permits the Director to delegate partial or total authority to evaluate the information collection requests of an agency to the official designated by that agency to perform information management functions.

Specifies conditions under which an agency head may request the Director to authorize the agency to collect information for a period of 90 days without complying with provisions of this Act.

Allows the Director, when considering whether a proposed information collection request is necessary for agency operations, to provide an opportunity for the agency and other interested persons to submit or present comments.

Authorizes the Director: (1) to designate a single collection agency for two or more agencies; and (2) to direct the disclosure of confidential information from one agency to another under specified conditions.

Establishes, within OIRA, a Federal Information Locator System composed of a director of information resources, a data element dictionary, and an information referral service. States that the System shall serve as the authoritative register of all information requests. Requires the Director: (1) to design an index for the System; (2) to require each agency to submit for inclusion in the System a data profile of each information request of that agency; (3) to compare proposed information requests with existing requests through the System; and (4) to ensure that no actual data, excluding descriptive data which is necessary to locate information or identify duplicative data, is included in the System.

Declares that no person shall be subject to any penalty for failing to provide information to an agency if the information collection request was made after December 31, 1981, and does not display a control number or a statement that such request is not subject to this Act.

Requires the Director: (1) to review the information management activities of each agency at least once every three years; (2) to report the findings to the agency and specified committees of Congress; (3) to keep Congress fully informed of major activities under this Act; and (4) to submit to the President of the Senate and the Speaker of the House an annual report on such activities. Specifies the contents of such report.

Sets forth exceptions to the authority and applicability of this Act. Declares that nothing in this Act affects the substantive authority of any Federal agency to enforce civil rights laws.

Grants the Comptroller General access to all records of OIRA.

Authorizes appropriations to carry out the provisions of this Act.

Requires the Administrator of General Services: (1) to include in an annual report to Congress and the Director estimates of the costs to the Government resulting from the failure of agencies to implement the Administrator's recommendations resulting from records management studies; and (2) to assist the Administrator of OIRA in conducting studies and developing standards relating to records retention requirements of Federal agencies.

Directs the President and the Director to delegate specified Federal information functions to the Administrator of OIRA.

Amends the General Education Provisions Act to direct the Secretary of Education to coordinate the information collection activities of all Federal agencies if the respondents are primarily educational institutions or if the purpose of such an activity is to request information to formulate education policies. States that such information collection activities shall be subject to this Act.

ERIC

APPENDIX 12

INDAX

INDAX, the home information system of Cox Cable Communications, Inc. has been undergoing field tests in the San Diego area since May 1981. Based on the experience of this pilot program, INDAX is currently being offered on a commercial basis to Cox Cable subscribers in Omaha, Nebraska. Two alternatives for information delivery via cable are available: one-way (teletext), and two-way (videotext). Subscribers to the service must purchase a decoder to convert the incoming digital signals into a video display format, in addition to a key-pad to select frames of information. 1/

With the teletext services offered by INDAX, users can retrieve information on news, weather, and financial data--the two-way service enables users to perform financial transactions and shop from home. Thus, subscribers may pay bills, transfer funds, review account balances, and order merchandise from retailers. Through an agreement with The Reader's Digest Association, INDAX subscribers can access THE SOURCE videotext system which features national and international news as well as the "Commodity News Service" which reports on daily price activities for 22 commodities. The information providers participating in the INDAX service include local retailers and financial institutions; additionally, the Omaha World Herald offers local news, listings of community events, and educational offerings. Special pay-per-view entertainment services, such as major sports events and movies, are also available. The current charge to Cox Cable subscribers for INDAX services ranges from six to ten dollars per month.

1/ Ellis, Michael L., and others. INDAX: An Operational Interactive Cable Television and Home Information System. Paper presented by Michael L Ellis and others (of Cox Cable Communications, Inc.) at COMPCON 1982 Conference, Feb. 24-26, 1982, San Francisco.

APPENDIX 13

FCC Press Release on Interim Rules for DBS

Report No. 17047 ACTION IN DOCKET CASE June 23, 1982

INTERIM RULES ADOPTED FOR LICENSING AND OPERATION OF DIRECT BROADCAST SATELLITES
(GEN. DOCKET NO. 80-603)

The Commission has adopted rules for licensing and operation of direct broadcast satellites (DBS), prior to and conditioned on the outcome of the 1983 Regional Administrative Radio Conference (RARC).

(The 1983 RARC, to convene in Geneva in July 1983, will plan the orbit and associated frequencies for direct broadcast satellites in the Western Hemisphere. Therefore the FCC must await the outcome of the RARC before it can make specific frequency allocations for DBS.)

The Commission's action clears the way for the Commissi n to act on nine pending applications by private companies to provide DBS service -- a radiocommunication service in which signals from earth are retransmitted by high power, geostationary satellites for direct reception by small, inexpensive earth terminals.

Those applicants are: Satellite Television Corporation (STC); CBS, Inc.; Direct Broadcast Satellite Corporation; Focus Broadcast Satellite Company; Graphic Scanning Corporation; RCA American Communicatiocs, Inc.; United States Satellite Broadcasting Company; Video Satellite Systems, Inc. and The Western Union Telegraph Company.

Briefly, the Commission:

-- Allocated 500 MHz of spectrum in the 12 GHz band for downlinks and 500 MHz of spectrum in the 17 GHz band for uplinks;

-- Set license terms for interim DBS systems at five years;

-- Adopted a flexible regulatory approach which will avoid delay in the introduction of DBS and will allow DBS operators to determine the characteristics of the service and the Commission to impose regulatory classifications depending on the nature of the operations;

-- Refrained from imposing restrictions on ownership of DBS systems or control of DBS channels; and

-- Declined to impose technical standards beyond those required by international agreements.

14-795 O - 83 - 22

In adopting a flexible regulatory approach, the FCC said delay in introduction of DBS service would be avoided and provision of the services most valued by the public would be encouraged by allowing operators to experiment to find the most desirable service offerings.

DBS operators will be permitted to determine the characteristics of their systems, the FCC said, adding that it would classify such systems depending on the nature of the operations. It said the relevant statutory requirements would apply to DBS licensees operating as either common carriers or broadcasters. Customers of common carriers would not be classified as broadcasters.

The Commission said the experience in this interim period would be helpful in learning whether satellite operators find it most feasible to operate as broadcasters, common carriers, private radio operators or some combination or variant of these classifications. The Commission could then use this experience in deciding on permanent rules.

In deciding not to restrict the ownership of DBS systems or control of DBS channels, the FCC said sufficient competition should exist among DBS systems and between DBS and other sources of video programing to prevent abuses.

However, if concentration of control appeared to be a problem in particular locations, it would consider those localities on a case-by-case basis.

While noting that common carrier DBS operators would, of course, be subject to access requirements under the Communications Act, the Commission said it would impose no access requirements on DBS licensees operating in the broadcast mode since requiring them to relinquish control over programing services might impede their ability to market their service. It noted that in a competitive marketplace licensees will probably have ample economic incentives to offer services that are most desired and needed by the public.

The Commission imposed no technical standards beyond those required by international agreement and set no further technical restrictions on the characteristics of the systems or the services offered. It said imposing technical standards on the basis of current technology would stifle the further development of DBS and that by not specifying compatibility standards, it would allow DBS operators the freedom to offer new services in response to advances in technology or changes in viewers' tastes. DBS operators will be permitted to offer either high definition or conventional television signals but not required to offer either.

The licensing and procedural rules for DBS require applicants to conform to international guidelines. In most circumstances the regulatory policies in force at the time of authorization to construct a satellite would remain in force for that satellite throughout its operating lifetime. Those granted authorizations would be required to proceed with diligence, beginning construction or completing contracting for construction within one year of issuance of a construction permit (CP) and beginning operation within six years of grant of the CP, unless otherwise determined by the Commission.

In deciding to grant interim DBS applications, the FCC noted that the benefits of DBS include service to remote areas; additional channels of service throughout the country; programing better suited to viewers' tastes; innovative service such as high-definition television, stereophonic sound, teletext and dual-language sound tracks, and nonentertainment services such as educational programing, medical data, etc.

The Commission began consideration of domestic policies for a DBS service with a notice of inquiry released October 29, 1980. On December 17 of that year the Commission received an application from Satellite Television Corporation, a subsidiary of the Communications Satellite Corporation, requesting authority to construct a DBS system.

On June 1, 1981, the FCC released a policy statement and rulemaking notice setting forth proposed policies and rules for the authorization of interim DBS systems. At the same time it accepted STC's application for filing and established a cutoff period for the submission of applications to be considered in conjunction with STC's. Thirteen additional applications were received, and of these, seven were accepted for filing, one was accepted in part and five were rejected as incomplete and unacceptable for filing. Petitions for reconsideration of this decision were rejected.

Some parties commenting on the rulemaking notice opposed the authorization of DBS systems on the ground that they would divert audiences from conventional broadcasters, would reduce their revenues and, consequently, would reduce the quality or availability of programing from the local broadcasting systems.

The Commission said it had no way to predict the effect of several DBS systems, or DBS systems in conjunction with cable and other sources of programing, on broadcasting. It said, however, that the services DBS could provide were likely to prove extremely valuable to the viewer and in the absence of evidence of an adverse effect, it should not foreclose the possibility of providing such services solely on the basis of speculation concerning harm to existing broadcasters.

It said allocating 500 MHz to DBS maximizes the number of channels that could be received by a single home antenna, which minimizes the cost per channel to the viewer and increases competition by reducing entry barriers for later entrants.

The Commission said it would continue to license terrestrial users in the 12.2-12.7 GHz band until the issuance of a report and order allocating alternative Fixed Service (FS) frequency bands. Five years from that date terrestrial licensees will be allowed to operate in the 12.2-12.7 GHz band only if they do not cause interference to operating DBS systems.

APPENDIX 14

Selected Canadian Programs

Compared to Federal efforts in the United States, the Canadian government has generally displayed a greater willingness to embrace new information and communications technologies in offering support to the farm community. This opinion was recently acknowledged in a speech by James L. Pearson of USDA's Agricultural Marketing Service:

> Electronic marketing is almost synonymous with Canada. We, in the United States, recognize you as having been the leader in the application of electronic techniques particularly with respect to the teletype trading system. 1/

In addition to providing assistance in the area of electronic marketing of agricultural commodities, the government, through the Communications Research Center of the Canadian Department of Communications, was largely responsible for developing the TELIDON videotext technology. Today, TELIDON is being offered on a commercial basis in Manitoba through an agricultural videotext project called "Grassroots." In the area of economic and social statistics, the government's statistical agency offers on-line access to its comprehensive collection of data through the CANSIM database. The following descriptions give brief overviews of CANSIM and the Grassroots project, as well as summaries of several electronic marketing systems for hogs.

1/ Pearson, James L. Issues, Wrap-Up, and Product Merchandising. Speech presented at the Electronic Marketing of Agricultural Commodities Seminar, Winnipeg, Manitoba, Canada, November 2-4, 1981. (Conference sponsored by Agriculture Canada, Ottawa, Ontario).

<u>CANSIM</u> (Canadian Socio-Economic Information Management System)

Statistics Canada (STATSCAN), Canada's national statistical agency, is responsible for collecting and disseminating data on the social and economic conditions of the country. In addition to providing much of the information free or at a minimum cost in published form, the agency also offers on-line access to the data through the CANSIM computerized database. The data available from CANSIM are of two types: the time-series module which shows changes over a period of time and is viewed as a general-purpose data bank; and, the cross-classified module which shows the interrelationships between a number of social conditions and is designed to meet the specific needs of analysts and researchers. CANSIM currently contains some 30,000 time series which are updated daily; the information covers a broad range of subjects such as agriculture and food, manufacturing, external trade, health and welfare, and population. In the agricultural statistics program, information is gathered from a quinquennial census of agriculture together with more frequent estimates on acreage, yield, and production. Also included are estimates of livestock and poultry inventories on farms and an integrated set of farm income and expenditure accounts.

The CANSIM "Main Base" is maintained at a commercial computer service bureau. From this Main Base, STATSCAN has developed a CANSIM "Mini Base" which includes 25,000 of the most widely-used time series. The Mini Base is available through 12 secondary distributors in the private sector. These distributors are generally computer service bureaus that have agreed to [illegible] CANSIM data according to STATSCAN guidelines and which offer a variety of software packages and [illegible] services.

Manitoba Grassroots

The Manitoba Grassroots program, Canada's first commercial videotext service, is a joint endeavor of the Manitoba Telephone System and Infomart, the nation's largest electronic publishing firm. Based on TELIDON videotext technology developed by the Canadian Department of Communications, the Grassroots service evolved from the experiences of the "Project Ida" field trial. This early videotext program involved 100 homes in South Headingley, Manitoba; the participants were connected to the computer center by two-way cable. Project Ida was later expanded to the Elie-St. Eustache area to test videotext transmission via optical fiber.

Designed to provide timely information services to the agricultural community, the Grassroots system began operating in September 1981. Farmers can access a variety of up-to-date agricultural information such as weather, market conditions, crop and livestock reports, and futures prices; additionally, several daily and weekly farm newsletters are available as well as general news from the Broadcast News wire service. For assistance in financial and agricultural management, the Grassroots service offers problem-solving programs that cover all types of farming. In recent montns, Infomart has added consumer information, travel and sports schedules, health and home economics suggestions, and entertainment listing to the database in order to attract a broader audience.

All Grassroots information is stored in the computer at the Infomart TELIDON Center in Winnipeg. Infomart develops the videotext pages from data supplied by a variety of information providers such as the Winnipeg Commodity Exchange, the Chicago Board of Trade, the Chicago Mercantile Exchange, and Agriculture Canada. The Manitoba Telephone System provides the network for telephone connections from users to the computer center along with the TELIDON videotext equipment for hookup to the user's telephone and television. To avoid excessive long-distance costs, the telephone company decided upon a uniform rate of five cents per minute from any location in Manitoba. The rental cost for videotext equipment is $47.50 per month on a two-year basis and $59.00 per month on a one-year basis; in addition, there is a one-time charge of $75.00 for installation. The Grassroots service currently has over 400 subscribers.

ERIC

Electronic Marketing of Hogs in Ontario

With a mandate provided by provincial legislation, the Ontario Pork Producers Marketing Board (OPPMB) has the authority to market all hogs sold in Ontario. The current teletype auction system, first installed in 1961, was adopted by the Board in response to the producers' need for an impartial mechanism for determining whether or not the market was glutted and where the demand was greatest. The teletype system connects 45 marketing yards in Ontario with eight purchasing offices of major packing plants; additionally, the OPPMB office is hooked into the system so that the Board's staff members can bid on behalf of some 20 smaller processors who may wish to participate in the auction. The bidding begins when a lot of pigs is offered at a starting point about 50 cents* higher than the sales force believes it will bring. The price is dropped five cents every three seconds until the buyer hits a button which stops the bidding. When the price descends to a certain predetermined level, the machine prints a "no sale" and the lot is again offered for sale at the same price level; if the lot fails to sell a second time, the bidding opens at a lower price level. At the end of the day, a sales report is distributed to all participating parties.

By supplying a means of competitive bidding on all hogs, equal treatment is accorded to both processors and producers. The teletype auction system not only facilitates rapid and efficient sales, but also provides a complete and accurate record of all transactions. The program's success becomes clearly evident when comparing Ontario prices with other markets--between 1971 and 1980, the average weighted price for Ontario hogs was consistently above those obtained in Winnipeg, Manitoba, Edmonton, Alberta, and Omaha in the United States. 2/

2/ Bluhm, R. Jerry. Electronic Marketing of Hogs in Ontario. Paper presented at the Electronic Marketing of Agricultural Commodities Seminar, Winnipeg, Manitoba, Canada, November 2-4, 1981. (Conference sponsored by Agriculture Canada, Ottawa, Ontario).

*Prices mentioned in descriptions of Canadian systems are in Canadian currency.

Electronic Marketing of Hogs in Manitoba

After 12 years of operating a teletype auction system based on the Ontario model, the Manitoba Hog Producers Marketing Board (MHPMB) decided to implement the "Dutch clock" auction method in 1977. The switch was prompted by the reduced number of buyers in the system (Manitoba generally produces more hogs than can be consumed locally) and the subsequent decline in prices. The auction takes place at the Winnipeg office of the MHPMB where a sales room has been designed with buying desks wired to the large wall-mounted clock. Once buyers have received a description of a lot of hogs offered for sale at a specific starting price, the clock is activated to display a series of five-cent price drops. When a buyer depresses a bid button, the clock stops and the sale is confirmed; the electronic circuitry is designed to eliminate any possibility of tie bids. A sales clerk keeps records of the sales on individual packer contract forms.

The Manitoba Dutch clock auction method of marketing hogs has become an effective substitute for the teletype trading system. The Manitoba Board serves some 3,500 to 4,000 hog producers and recently reported sales of $120 million per year. By maintaining a greater degree of competition among a smaller number of buyers, the Dutch clock auction has made the "price-discovery" process more equitable. 3/

3/ Munro, W. B. Electronic Marketing of Hogs in Manitoba. Paper presented at the Electronic Marketing of Agricultural Commodities Seminar, Winnipeg, Manitoba, Canada, November 2-4, 1981. (Conference sponsored by Agriculture Canada, Ottawa, Ontario).

Electronic Marketing of Hogs in Alberta

Not all of the electronic marketing endeavors in Canada have been successful. The Alberta Pork Producers Marketing Board (APPMB) was established in 1969 with a statutory mandate to market all hogs in that province. In response to producers' complaints that markets were being manipulated by large buyers--less than 10 pe· · of the market pigs were being sold at public auction--a teletype auction system was installed in 1969.

During the first few years of operation, the system benefited producers by bringing more buyers into the bidding process and reducing delivery costs; buyers also profited from lower assembly costs. However, in a departure from the original design of the system, the APPMB established a series of regional assembly yards which significantly improved the system of assembling hogs and in turn reduced transportation and handling costs. This change weakened the effectiveness of and the need for the teletype auction system. The advantages of electronic trading were further diluted when the number of buyers participating in the teletype auction decreased.

By 1979, the Alberta board decided to discontinue the teletype auction since the system had become ineffective in boosting prices. A. W. Anderson of the University of Alberta concluded that the electronic marketing system would not have survived as long as it did without the strength of provincial legislation to support it. 4/ The improvements in the assemblage of hogs and the decrease in the number of buyers were direct determinants in the decision to terminate the teletype system.

4/ Anderson, A. W. Electronic Marketing of Hogs in Alberta. Paper presented at the Electronic Marketing of Agricultural Commodities Seminar, Winnipeg, Manitoba, Canada, November 2-4, 1981. (Conference sponsored by Agriculture Canada, Ottawa, Ontario).

ERIC

APPENDIX 15

Suggested Workshop Issue Parameters 1/

Working within the context of the preceding commentary, the six workshop discussion groups are being asked to engage in more detailed exploration of their respective focal areas. The ensuing report from each group should include a succinct identification of issues and goals, any reflections on the impact of technology (where appropriate), commentary on such matters as public-private sector roles and responsibilities, and recommendations for possible initiatives by Congress, other governmental groups, or the private sector. Some of the key questions to be considered are listed below.

1. GROUP I - Private Sector Information Services

- Will the charges imposed by private sector information providers constitute a barrier for use by the small farmer?
- Can private sector information vendors provide "original information of the requisite accuracy, completeness, and timeliness, or must they rely (at least in part) on governmental groups?
- Does the range of information required by the farmer and rancher exceed the capacity of existing private sector providers, and if so, what kind of "networking" arrangement is feasible to fulfill such needs?
- To what extent do rural information users require "value added" information which has involved human expert interpretation and repackaging?
- Under what circumstances should there be formal private-public sector collaboration in the provision of information services?
- Will private sector information entrepreneurs strive to develop and offer "user friendly" systems which can optimize ready use by a wide variety of persons in the rural community?
- What provisions for user "feedback" are projected by private sector information providers, so that responsiveness to changing needs can be facilitated?

2. GROUP II - Government Information Services: Management and Marketing

- How can information system design minimize the requirement for hardware acquisition by the user? Are systems being designed which give a particular hardware vendor a captive market?
- Are there formal procedures to insure that system capacity is being used to provide the highest quality analytic routines and the most valuable information, or is this determined by "who gets there first"?
- Is user feedback used effectively to weed items from the data base and to determine priorities for additions to the system?

1/U.S. Library of Congress. Congressional Research Service. Computer-Based Information Systems and Services for Rural America. A pamphlet produced by Robert L. Chartrand and A. Barry Carr for Hearings held by the Subcommittee on Department Operations. Research and Foreign Agriculture of the House Committee on Agriculture, May 19-20, 1982. p. 7-10.

ERIC

- What arrangements are needed to minimize duplicative system development efforts among the various State systems and to make State systems compatible with each other?

- What knowledge and skills are necessary to design a statewide computer-based information system? Do traditional Extension organizations possess individuals with these capabilities?

- How does a computer-based information system compare in cost effectiveness with traditional Extension information delivery systems? For the institution? For the user?

- Are rural communication networks of adequate quality to assure access for all potential users of a statewide computer-based information system?

- Will computer-based information systems replace traditional supply channels for certain types of farm inputs or traditional marketing channels for certain farm commodities? What are the implications of this for the farm sector, the input sector, and the marketing sector?

3. GROUP III - Government Information Services: Crop Operations

- Does the existence of a publicly supported information and management system discourage the development of innovative private sector systems?

- Are there beneficial ways for public systems and private management information vendors to cooperate in serving the same market without giving someone an unfair competitive advantage?

- Is there justification for a user fee in public systems or should access be free?

- Should access to publicly financed systems be open to all or should access be controlled to prevent misuse of the information?

- Does the information provided in the system require professional interpretation before it can be used? Who should provide this interpretation?

- What liability is incurred by the information provider for the effects of the recommendations or information provided through the system?

- Will computer-based information systems replace traditional Extension delivery systems for certain types of information in a way that reduces access to certain segments to the public? How will limited resource clients be served?

ERIC

4. GROUP IV - User Requirements

- In what ways can user requirements for various information support systems — interactive, straight data delivery, modeling, calculation — be ascertained initially?

- Can information entrepreneurs, either governmental or private sector, hold meetings which will serve to orient and educate potential system users regarding the benefits and limitations of computer-supported information systems?

- Should those providing advanced information services develop mechanisms which can quickly monitor changing user requirements?

- Has thought been given to distinguishing the types of products and services required in order to meet various categories of user needs for information?

- Have users of projected systems, in declaring their information requirements, fully understood the cost-performance tradeoffs?

- Should preliminary surveys of community information needs, as perceived by various potential user groups, be undertaken, since oftentimes there is great variance between what is thought to be needed and that which is actually significant?

- Could sample "profiles" of needs be created, during a "pilot" system test period, in order to guide both the information providers and the subsequent user community toward the most responsive service?

5. GROUP V - System Implementation: Hardware Installation, Training, Maintenance, Software and Data File Modification

- What options can be offered potential on-line system users in the way of hardware and software?

- Will there be a quick response, through telephone consultation or site visit, by a system engineer when service is curtailed?

- Can customer awareness of enhancements to the system be ensured both by displayed notices (on the terminal) and through printed releases?

- Are user "brush up" sessions planned, either through on-line instruction sessions or by special seminars held in community centers which allow group sharing of problems?

- How can user requirements for additional data bases best be ascertained and met by information providers?

- Should newly offered data files, especially those with crossover points to existing on-line files, receive special treatment in terms of user awareness and acceptance?

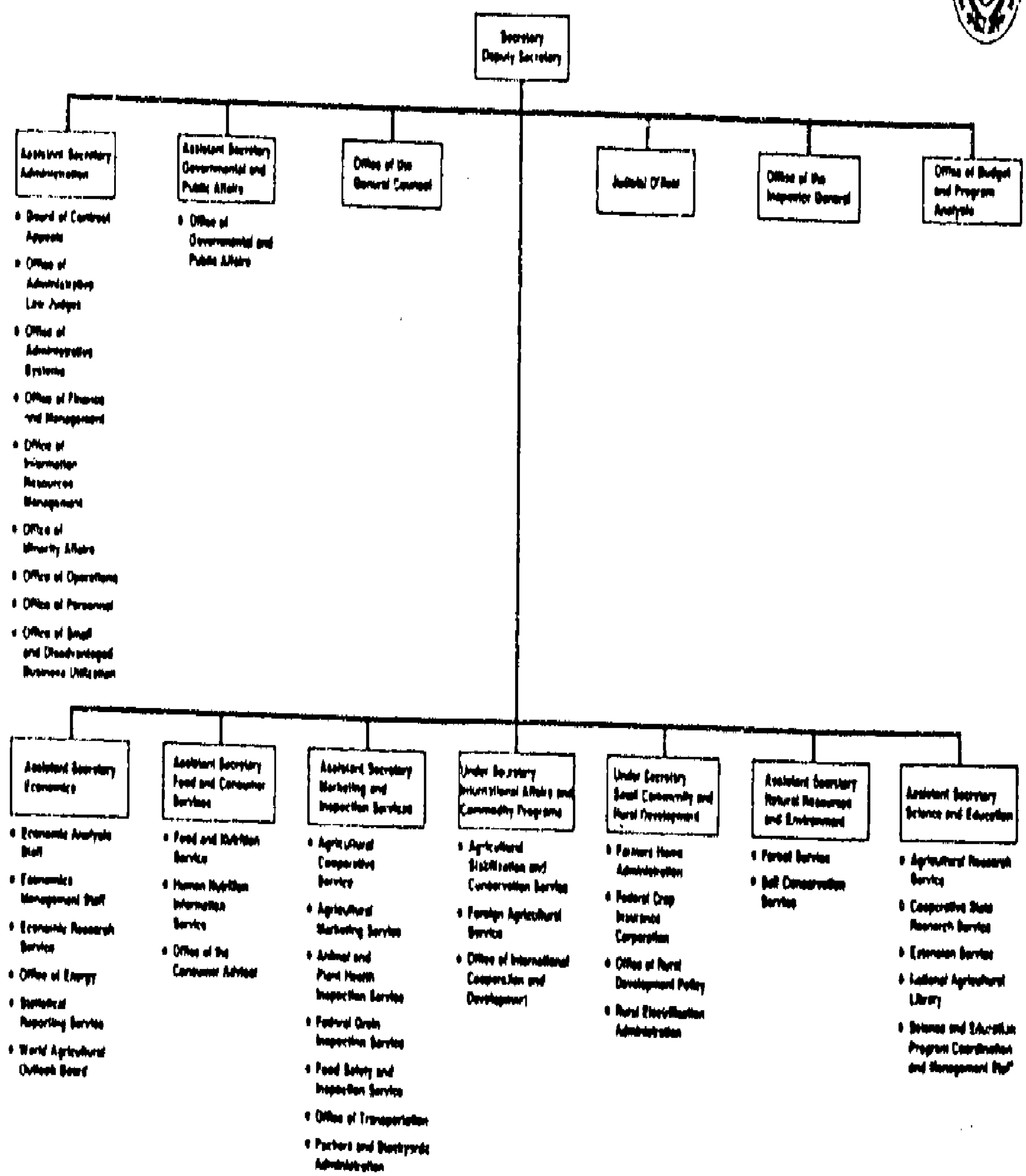
- Is there a necessity to have a "local" system support person on call during the early phases of offering an operational service?

6. GROUP VI - Present and Projected Technology

- Has experience on several "pilot" projects proven that selected information can be disseminated on a cost-effective basis to those in remote areas?
- Is there known continuing research and development in information technology which holds promise of special benefit for rural users?
- Should farmer-servicing organizations (associations, etc.) consider conducting colloquia and demonstrations to further enlighten potential users living in non-urban areas?
- Is a review of existing government-sponsored information services, including those featuring the use of computers and telecommunications, warranted at this time?
- Should the standardization of information systems, in order to facilitate networking between a number of separate services, be considered by the government or some private sector group?
- Is there sufficient system utilization data, based upon systematically conducted surveys, to determine cost-performance alternatives for customers in the farming community?
- Are there user-identified areas where information not currently available should be considered for on-line creation and accessibility?

APPENDIX 16 1/

United States Department of Agriculture



June 1, 1982

1/ U.S. Department of Agriculture. Office of Governmental and Public Affairs.

INDEX

A

* Page references to Representative George E. Brown Jr., and House Committee on Agriculture Subcommittee on Department Operations, Research and Foreign Agriculture have not been listed due to frequency of usage.

14-795 0 - 83 - 23

ERIC

Page

D

Page

F

G

M

N

ERIC Full Text Provided by ERIC

S

U