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Computer Use by/and Computer Interface Among Agricultural Economics Institutions

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PROCEEDINGS OF A WORKSHOP HELD
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EUGENE OREGON

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Carl O'Connor

Russell Gum

Co-directors

PREFACE

This is the first in a series of Regional Publications by the Western Computer Consortium. The Consortium is comprised of Western Land Grant Universities and is designed to share computer related information between faculty and staff of the member institutions. As one of its functions, the Consortium assists in bringing together individuals interested in specific areas to learn from others what computer tools are available to assist them in their activities.

While the workshop, whose proceedings are contained herein, was not sponsored by the Consortium, it does represent the type of activity the Consortium will assist with in the future. The purpose of the event was to bring together agricultural economists from land grant institutions and from federal agencies to explore the status and potential of computer use by agricultural economists and of computer interfaces among agricultural economics institutions. Attendees of the workshop had the opportunity to learn from the computer experiences of others how to better utilize computer tools in their own activities.

A major topic of the workshop was policy analysis. Through the efforts of the workshop's organizers and contributors, attendees were made aware of several aspects of policy analysis and how computers affect each aspect. James Zellner discusses the problems and accomplishments of information gathering and dissemination in government. Gum, Martin, and Wear take a look at the appropriate uses of personal computer policy as a tool to explore strengths and weaknesses of different policies, to discover alternative solutions to policy problems, and to negotiate with other policy advocates. Ronald Knutson and James Richardson examine the timeliness of computer facilitated communications among policy analysts and educators to avoid duplication of policy research and education program building. Tom Browning takes a look at the mission of ASCS and the role of information management in meeting agency policy analysis objectives and at computer related developments that enhance ASCS's ability to meet those objectives.

Other timely and certainly useful information is offered by Horner, Nishimoto, and Cothern in their paper. Specifically, they pose a solution to the problem of how to transfer a complex quadratic model of the national agricultural economy from the Washington DC mainframe to a local minicomputer, in this instance a VAX 11/750 located at University of California, Davis.

In addition, Edwin Carpenter presents a comprehensive perspective on the "Microcomputer Age," from the introduction of "dumb" terminals through the projected future in which hardware and software will be so friendly as to be transparent to the user.

The proceedings begin with a paper by Bruce McCarl entitled "Computers and Agricultural Economics Research." In his introduction, McCarl contends that one of the problems facing those concerned with agricultural economics is the overwhelming amount of information that is available regarding computers in contrast to the limited amount of time available to assimilate all the information, the workshops, conferences, newsletters, publications, software and hardware products, etc. Indeed, this problem is one facing not just agricultural economists but everyone in research, teaching, and Extension who is utilizing computers as tools to assist in their activities. As Walter Armbruster explains in his "Opportunities to Pursue," "we need to continue our efforts to incorporate the current and developing computer technologies to make our research, extension, and teaching functions more efficient and continuously better." In order to accomplish that objective, we must be concerned about coordinating efforts across the states and between various federal and state agencies or institutions.

That concern is primary to the following papers, to the series of Regional Publications by the Western Computer Consortium that these papers initiate, and to the objectives of the Consortium itself.

COMPUTERS AND AGRICULTURAL ECONOMICS RESEARCH

by

Bruce A. McCarl*

The rapidly advancing fields of computing and communicating provide the potential for many developments in modern society. Agricultural economics research will be affected. Our research arena will change. There will be many changes in the agricultural sector induced by the influence of computers. Many elements within the agricultural sector have adopted or are considering adopting computers. For example, consider the following developments: there were over a thousand attendees at a recent Purdue workshop on computers for farming; there are many new newsletters on agricultural computing; there are commercial firms providing software and hardware services oriented toward agricultural computing. Further, the recent changes in computing will also effect the research process. The ever diminishing costs of computing coupled with the advent of microcomputers will alter to some extent the way we do agricultural economics research.

Computers will influence agricultural economics research in a number of different ways. For the purposes of this conference, I discuss the influences from two viewpoints. First, I discuss agricultural economics research topics which are arising as the usage of computers within the agricultural sector

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increases. In particular, I deal with the implications for agricultural economics research when participants in the agricultural sector obtain computers and/or computer delivered information. Second, I discuss the computer as a tool for agricultural economics researcher offering comments on both opportunities and cautions for computer use for doing research. Finally, a small discussion is given on enhancing institutional cooperation in computing. A caveat on this manuscript is that it is not extremely tightly drawn together, rather it is written to provide background for a rather diverse presentation.

Background - Computers as a Tool

Before discussing computers and agricultural economics research, it is useful to define the sense in which the word "computers" is used herein. Fundamentally, computers will not be focused on as a piece of electronic hardware. Rather, computers will be examined as devices for the creation of information and the retrieval of data. The computerized information will be viewed as an input to decision making, record keeping, or firm control activities. Thus, rather than discussing computers per se, the topic will be computer usage as it fits into information systems, management-information systems, and decision-support systems. The pneumonic CIDSS, Computerized Information/Decision Support Systems, will be used.

Research Topics

The introduction and development of CIDSS raises issues which are potentially new research topics. A broad, but not mutually exclusive, categorization of these research topics encompasses five subareas: the economics of availability of CIDSS, the design of CIDSS, the aggregate economics of CIDSS, the functional support of CIDSS, and the policy influencing CIDSS.

Economics of CIDSS Availability

Inquiries under this topic deal with the firm level economics of having a computer/information/decision support system available. A number of research questions arise which are pertinent to this topic.

1) What is a decision support system worth? This particular area embodies inquiries on the value of the information that an in-place system creates, or more precisely, the value of system-induced alterations in information available to the firm or agency. There is a need to investigate costs and benefits of the CIDSS within the firm or agency context in order to convince others that computers might be worthwhile. Both case studies and analytic research would need to be examined to address this question.

2) <u>What types of potential computer usages merit support systems?</u> There are an infinite number of potential computer usages within firms and agencies. However, not all usages may be equally appropriate for CIDSS development because of factors such as: recurring and nonrecurring nature of information requirements, the amount of data available, the embodied quantitative and qualitative considerations, the potential usefulness of the computer for analysis, interrelatedness of this area with others, and the economic implications of supplying correct/incorrect information support. This subarea of investigation would examine which usages are appropriate for computerized support, and provide an evaluation method for assessing whether a CIDSS is worthwhile for a particular usage.

3) <u>What is the value of various types of information?</u> Public and private agencies utilize CIDSS to deliver information. Thus, an important inquiry pertinent to the design of systems is: What is the willingness to pay for (or in a public context, value of) the various types of information which could be delivered? Such research would be oriented toward inquiries as to whether a particular piece of information should be delivered via the computer, i.e., whether computerized delivery is worth its cost.

4) <u>What are the scale economies of CIDSS?</u> An observation above indicated that a single system will not be appropriate for the entire spectrum of firm activities, rather multiple CIDSS are likely necessary. However, computers potentially can support many information/decision systems. Thus, an area of inquiry involves the array of usages which should be supported by a

system, and how can these usages be simultaneously supported? Research would involve questions such as: What are the hardware-scale tradeoffs and what is the best phasing of decision support systems development? In addition, the mainframe-microcomputer tradeoff is a relevant question (i.e., when are expanded capabilities economically justified?).

5) <u>What are the implications of decision support systems for firm or agency organization?</u> Computers and their use have created a number of mini-revolutions within industries, firms and agencies. The availability of CIDSS has implications for enterprise organization. For example, new forms of data processing departments, or the elimination of large rooms of people who do manual accounting may result. Data processing departments arose with mainframes and may not be as desirable with micro computers. Thus, an important area of investigation involves the interaction of CIDSS with organizations.

6) <u>How can the adoption of CIDSS be facilitated?</u> Many grand CIDSS schemes have been proposed in the past. Quite a number of these are embodied in Ph.D. theses. However, very few of the systems proposed have been adopted and used. Research could be done on the characteristics of systems which have been developed involving attempts to examine reasons for adoption and/or nonadoption. Ultimately, prescriptions for development strategies would arise.

Economics of the Design of CIDSS

Given that a CIDSS is desirable, information is needed on how a system should be designed. Inquiries into this area fall into five categories.

1) What can be learned from existing systems? Many CIDSS have been put in place, proposed, or are installed. An important research area would involve the examination of existing systems with respect to: what kinds of problems they approach; exactly how they work; what they cost; how they were designed; what alternatives were considered and discarded in their design; what characteristics lead to success and/or failure; what mistakes were made; and what triumphs were realized. Through the systematic study of previous systems, a number of guidelines could be drawn up for new systems.

2) What kinds of tasks are best suited for CIDSS? Again, many things could be done by CIDSS, and other things are best done without. Investigations are necessary on a categorization of the types of decisions which are best suited for systems.

3) How should a new system be configured? CIDSS require considerable design effort. There is opportunity for economic inquiry into "best" methods for design. This would include investigations into software, how it can be acquired, how to develop it, what it costs to develop via different acquisition methods, how to design a system to stimulate adoption, necessary level of human engineering, how the output should look, etc. There are similar concerns relating to hardware in terms of

acquisition and matching capability to requirements. A number of other concerns are also pertinent, such as security, data quality control, interfaces with other CIDSS systems, and interfaces with external data bases.

4) <u>How should one make transition from an existing system to a new system?</u> Given rapidly changing technology it is difficult to know how to keep systems current, how to upgrade and replace, and how to adjust from an old system to a new system. The purpose of studies under this area of inquiry would be to consider the economic aspects involved in these decisions.

5) <u>Who should maintain data and models - micro/mainframe tradeoffs?</u> A major design question which should be examined involves the tradeoffs between microcomputer maintenance of models and data by many, as opposed to mainframe computer maintenance of models and data by few, with access by many.

Aggregate Economics of CIDSS

CIDSS, if widely adopted, would in all likelihood influence agricultural markets and the characteristics of society. Research could be done on examining what has happened, and making projections of what will happen. This would cover a number of areas such as:

1) <u>What will happen to markets?</u> CIDSS such as those which deal with marketing strategies or disseminate market

information could have impacts on competition within markets. They could also have differential impacts across sizes or types of firms. Such research would contribute information on the implications of computers for structure of agriculture and the distribution of firms within a market. Research could also examine the impact of CIDSS on such things as price competition, and price formation.

2) What will happen to the institutions? One hears a lot in the popular press today about individuals working at home utilizing word processers, telecommunications and other technological innovations. Clearly, CIDSS could stimulate large changes in such things as labor practices, banking and credit institutions, and communication institutions. Research would involve inquiries into what has happened, what is happening, and what is likely to happen to institutions. Demands for new services and obsolescence in old types of services could be examined.

3) What is the value of CIDSS to society? A considerable body of economic research has been devoted to the economic effects of technological change. A body of research which can be undertaken involves the distributional impact of CIDSS on firms, markets, consumers, etc., both indicating who initially gains and then indicating how gains may be spread among members of society.

Support of CIDSS -- nuts and bolts

Research under this topic does not necessarily involve a high degree of economic content, rather the efforts involve study of technical management decisions and development/dissemination efforts. There are a number of different lines of research that could be pursued:

1) Review of existing systems. The systems could be examined as discussed above and their structural characteristics examined for factors which improve performance of particular types of systems.

2) Configuration of a system. Here research would be done on the features which lead to successful/unsuccessful systems in terms of software, hardware, and peripheral units, etc. Research could also be done on alternatives for CIDSS organization and the costs and benefits of the different organizational alternatives.

3) Interfaces between systems. There is clearly the potential for multiple levels of CIDSS. For example, the Chicago Board of Trade may make an information system publicly available. In turn, firms may draw on such a system obtaining current market information. Research on this topic would involve questions on the efficiency of various mechanisms for disseminating information and the implications of various information organization schemes.

4) Development of software. Here activities would concentrate on the identification of software which should be developed, the identification of the best development forms and methods (i.e., use a mouse, icons, menus, etc.) and the development of software useful to the clientele groups.

5) Education. The computer is new to many people within the agricultural sector, particularly given the recent trend of falling computer prices. A number of inquiries could be made regarding educational methods, particularly looking at the types of materials, materials presentation, the effectiveness of teaching mechanisms, etc. The question of which groups can most effectively do education (i.e., universities, extension, private industry) is also relevant.

6) Who should deliver what. A large question looms about the appropriate role of extension, private firms, government, cooperatives, individuals, etc. in delivering CIDSS materials. Here inquiries would be done on options and consequences of various delivery schemes.

Policy

Many authors in the popular and/or scientific press have pointed to the computer as being a major force in changing the structure of society. The final area of inquiry, therefore, is that of policy directed toward CIDSS. Government has long played a role in the way technology influences society. There certainly will be cries for increased or decreased government action on certain issues, etc. with the scope of the CIDSS. This leads to a number of various inquiries regarding policy.

1) The role of various entities. Government can influence the role played by many actors within the CIDSS field either directly or indirectly, i.e., through research funding. The main question is: considering social and private welfare, what is the best way of organizing CIDSS's? For example, is it desirable to have many firms independently collecting foreign grain yields or a unified system of information? Inquiries would consider the costs and the direct benefits from the service, along with the distributional consequences across society. Similarly, inquiries could be made on the roles of the government and the private sector in information delivery.

2) The effects on markets. As mentioned above there are a number of possible effects on markets. Things such as the degree of price competition or the competitive position among different types of firms may be altered. Thus, policy questions involve (a) forecasts of the consequences of various developments, and (b) consequences of policies oriented toward CIDSS. This would include evaluation of proposed regulations and/or potential regulations.

3) Rights and duties. A number of economic-legal issues could arise with regard to policy, such as: how the rights to information are allocated; who owns information; if CIDSS are provided; what is the liability in terms of software, hardware,

and faulty information; what are liability issues with respect to security? A considerable economic research effort could be developed on these lines.

Computers as a Tool for Doing Agricultural Economics Research

Now, I turn my attention to computers as a research tool. Discussion under this topic will deal first with opportunities for doing research with a computer (particularly a microcomputer), and second, some cautions to those engaging in research with a computer.

Opportunities for Doing Research with a Computer

Computers have been available to agricultural economists for several decades. Thus, many of their features are well known; i.e., their ability to manipulate numbers, handle data, sort data, retrieve data, perform statistical analyses, run various other programs for data analyses, etc. However, the recent microcomputer revolution has created a number of new opportunities. These arise because of changes in (a) the real cost of computing; (b) private sector investments in microcomputer software development; (c) the size of the market for software facing the developers; and (d) agricultrual economics departments facing large surpluses of paid-up computer equipment (i.e., in our department at Oregon State University, we have in excess of one computer for every three staff members) which as a group, are underutilized. Further, the number of computers is increasing and its percentage of utilization is constant or decreasing. These phenomena jointly lead to a number of significant opportunities which are discussed below.

Redefining the Back of the Envelope. A very famous expression among those who do economics and other kinds of analysis involves the proverbial back of the envelope on which many analyses are done. I believe the advent of microcomputers allows one to redefine this back of the envelope. The use of spreadsheets, particularly when integrated with graphics and drawing programs, allows one to do very quick analyses utilizing the power of spreadsheets, drawing, and graphics packages to communicate them. Further, integration with word processing programs allows such analyses to be merged into writings then rapidly printed or telecommunicated.

Simulation. Simulation (meaning the utilization of a "reality depicting" model), to examine the consequences of various scenarios, has long been a tool of agricultural economists. But this tool is commonly regarded to be expensive. Microcomputers permit new possibilities for Monte Carlo simulation where one, for example, programs a simulation into a machine and lets it run for the weekend. Microcomputers also offer significant opportunities for simulating simple things, using the revised back of the envelop power provided by spreadsheets with graphics output (as will be demonstrated by Gum tomorrow afternoon).

Access to Current Data. Microcomputer technology allows for several exciting sorts of developments for data access and development. A wider degree of data interchange is possible using telecommunications for retrieval and dissemination of data between research institutions. This is certainly an area for interplay between the government and universities. However, micros have implications beyond the simple access of data. Micros also may be used in data collection. One can easily create data collection templates using portable micros. Data then could be entered either directly in the field by the people being questioned, by those doing the questioning, or by clerical assistance shortly after the questioning had been done. Any of these developments would allow different forms of interactive data consistency checks, data completeness checks, and other mechanisms to improve the immediate quality of data. In addition, field recording of data will allow for more rapid analyses. Also, such field checking procedures would allow one to rapidly assess whether an ongoing data collection effort is successful, potentially modifying it to obtain higher quality data.

Keeping Current in the Literature. A problem I face is keeping current. I imagine I am not alone. This is exacerbated by the fact that such journals as AJAE now take between six months and a year to get one review of a manuscript and probably average two years from initial manuscript preparation to publication. I believe microcomputers coupled with stronger national information systems offer great potential for one's ability to remain current with the literature. For example, one could, using microcomputers, access and search literature as stored under the CRIS or Agricola. Also, one might be able to access publications in departments across the country. Further, networks or bulletin boards could be developed among researchers covering particular areas (i.e., such as the activities of a regional research group). There is considerable potential for the retrieval of references for individuals or collectively through group actions where references are stored and retrieved, searching for author's names, intersections of authors' names and titles, journals by particular time periods, or key words. Data base management systems certainly make this a feasible and attractive alternative.

Communicating Research.

The improvements in telecommunications-computer interface capabilities provide the opportunity for enhanced communication of research. Manuscripts may be disseminated rapidly by use of telecommunications, or possibly magnetic media. There is the possibility of current interest bulletin board development where researchers would submit manuscripts, plans, results, etc., on a particular topic to a bulletin board where the information would be retained for access by interested researchers. Similarly, through stronger bibliographic systems (CRIS, Agricola, etc.), one could keep more current tabs on publications and efforts of researchers. Thus, using microcomputers, bulletin boards, and bibliographic systems one could quickly obtain information on current research endeavors and potentially obtain copies of reports.

Cautions on Using Computers on Agricultural Economics Research.

Computers, as long discussed in the literature, allow researchers to execute necessary tasks in a rapid, accurate fashion based on applicable data, allowing the storage of research models and their reuse. One also obtains reductions in data acquisition costs; reductions in document preparation costs --or increases in publication timeliness. Computers also allow enhanced communication with other researchers. However, there are a number of considerations which one needs to recognize when getting involved with computer-supported research which may be negative. These will be stated as a number of observations.

Observation Number 1. From the standpoint of research, one should be careful not to regard data as the output of the research information process. Clientele groups most often have far too much data and far too little information where one has systematically attempted to bring the data together to a particular issue. Researchers must regard our data collection and dissemination systems in the light of how the data will be used, and provide mechanisms with which the data can be summarized and converted into management information. One also must design adequate retrieval systems anticipating the usages of data. In addition, the ability to create volumes of numbers from A computerized systems does not constitute research. One needs to exercise judgment and care when using computerized models.

Observation Number 2. The advent of computers and computerized retrieval systems potentially leads to a research environment in which researchers acquiring models and data through telecommunications will have less knowledge of the original source of data and/or the assumption underlying various models. This can result in research being done which improperly or inadequately deals with the characteristics of models and data.

Observation Number 3. The computer system designed and developed today will probably not meet tomorrow's perceived needs. This in itself is not a sufficient reason for researchers to delay their entry into computing by waiting until tomorrow's "perfect" system is available. When choosing a system, however, one should buy a relatively flexible system that appears to offer current capability along with future expansion potential so that capabilities may be exploited as they become available. Computing equipment is relatively inexpensive and probably will continue to be so.

Observation Number 4. When one is using a computer in research, but the computer is controlled by the data processing department, or by programmers hired by researchers, it is easy for that computer implementation to get out of the researchers control. This leads the researcher into a position where one receives statements which are difficult to evaluate such as, "it is very difficult to enter particular aspects of the research into this computerized analysis, they will need to be neglected." Similarly, it is often difficult to assess whether an implication is proper. Researchers should obtain sufficient technical training to make these judgements themselves.

Observation Number 5. Computers will not support all phases of research and the researcher must be careful to keep asking the question "is it worth it to go through the computerized analysis of this particular problem."

Observation Number 6. One must be careful with computers not to become enamored with hardware but to worry about what the computer can do for you and whether the software is adequate for your purposes. This is particularly true when regarding micro-computers. Further, processing speed is not a large concern: however, one needs to be careful with hardware capability insuring that the tasks one wishes to do will fit into memory and/or be adequately supported by off-line storage systems available on the machine.

Observation Number 7. When one is administrating research, under-utilization of equipment, resistance to computers, or inability to use computers is often encountered. This can only be alleviated by encouraging the researchers to learn computing and by accepting the fact that it will probably take several months in order for the individual to become competent with this tool.

Observation Number 8. The widespread nature of agricultural economics research will lead many to redevelop the wheel (i.e., there probably have been 25 linear programming packages written already and there will probably be another 25 in the next six months). This leads to a need for central interchange among researchers and it also requires verified, well-documented programs distributed in source languages so that they can be adapted to the particular needs of researchers.

Observation Number 9. One needs to be careful to communicate the image that you do not have to be a programmer in order to utilize the computer. Many canned packages are adequate for the analyses that we do in agricultural economics research.

Future Activities

This topic lends to several challenges. First, I believe that an attempt should be made to organize a formal professional dialogue on computers in research. I believe such a dialogue should be coordinated through something like a regional research group and should treat questions on how USDA and the universities could go about making data available to one another, how one might facilitate the interchange of software, how one might revise, if desirable, bibliographic services, etc.

Second, I believe some effort should be made to initiate bulletin boards in various research areas. For example, I go to the Southern research meetings on risk and I think it might be quite valuable to encourage development of a computerized bulletin board as an example of what could be done.

Third, I believe it is important to develop a better current research information dissemination system; perhaps this could be in the form of a computerized journal, as has been proposed in our profession. In addition, the CRIS system could be updated using microcomputer technology for faster reporting and better information retrieval.

Finally, I believe that we need to take administrative steps to encourage microcomputer usage outside of the "technically oriented group." Our colleagues could greatly gain from microcomputers. It would be worthwhile for people such as those here to try to increase demand for computing equipment through dissemination of information on microcomputers in research or other means.

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AGRICULTURAL OUTLOOK DELIVERY: IMPLICATIONS FOR POLICY

by

James A. Zellner*

A necessary condition for efficient markets to prevail is, according to economic theory, full information about the relevant factors affecting the marketplace. Perfect information of course never exists; however many markets in the U.S. economy, particularly agricultural sector markets are characterized by a high degree of information.

Information has many public goods characteristics. Once developed it is difficult to exclude others from information; hence, the classic free-rider problems occur. Also, once developed and released, information can be made available to others at zero or minimal cost; hence, marginal-cost pricing suggests public or cooperative provision of information.

These attributes are surely important reasons that Government has long been involved in the information gathering and dissemination business. Agriculture has a long history of active information gathering and dissemination ranging from market news, to crop reporting, nutritional well-being, and of course commodity supply, demand, and price statistics and analyses.

It is these latter data and analyses we usually think of when we use the term "outlook." But depending on the particular

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clientele we are serving, outlook information can take on many forms and characteristics.

Just who are these clientele and what form of outlook information do they use? Generally we list among our outlook constituents farmers, policymakers in the Administration and in Congress, Extension specialists, agribusiness firms, from input suppliers to processors and final marketers; and for many of our analyses, the general public. Of course there are others who use our information in one form or another, and many find it useful and profitable to "further process" the information, repackage it, re-analyze it, and market it for other users who cannot, or choose not to, use our outlook information in the form we provide it.

The Economic Research Service identified $3.4 million and 93 staff years as devoted to situation and outlook during FY-1983. If we add to that data gathering and policy analysis, not all of which is tied directly to situation and outlook, the figure rises to $9.4 million and 199 staff years and a budget of $45 million.

Let us take a look at who uses ERS outlook information. A word of warning, our data only cover initial users and perhaps because of our new publications policy in ERS, may be biased toward "wholesalers" of information.

Since we instituted a paid subscription policy for publications in FY-1982, ERS has witnessed considerable changes in the make-up of subscription lists to all of its periodicals, including situation and outlook reports. Our information dissemination has always been oriented toward "wholesaling" rather than "retailing" but the subscription policy change now assures that many final users of our information, particularly individual farmers, will receive it through some other publication rather than directly from ERS. The information may be exactly as issued by ERS, or it may be packaged and/or interpreted by the wholesaler in a way to make it more useful to a particular subscriber. A rather unscientific sample of our mailing lists for two situation and outlook publications indicates that unspecified firms and individuals account for 27 percent of our subscribers. Commercial food, milling, chemical, etc., processors account for 30 percent; commodity traders 12 percent; consultants, commercial firm libraries, financial firms, trade association and farm groups, and university libraries account for between 4-6 percent each; and transportation companies, Federal government agencies, foreign countries or firms, and exporters account for about 1 percent each.

ERS also provides outlook information electronically, and has since February 1983. Our Outlook and Situation summaries are carried via DIALCOM on the Extension Service's electronic mail system, and the Martin Marietta system. And, the summaries as well as the entire text of outlook and situation reports are carried on AGNET. A user on AGNET may choose to access only the summary or one of perhaps 20-30 subheaded parts of the report, or any of 10-20 tables in the report. AGNET has the capability of providing ERS summaries of what information is used, and how frequently. The so-called "hits" information is rather interesting. Unfortunately, as is often the case, some of the data already have been lost because there was no interested user, but the "hits" information for the first month of AGNET use and the current period are available, and I will summarize some of it for you.

The first month of operation saw the inclusion of seven reports, including Agricultural Outlook, Ag. Exports, and five commodity situation reports--Vegetables, Wheat, Feedgrains, Fats and Oils, Livestock and Poultry. In total, 160 different users made 937 contacts or "hits" during February. The types of hits made were interesting, I think, particularly in light of our perception of who our users are and what they are interested in learning from our reports. About one-third (205 of 666) of the hits on situation reports were for tables. This ranged from 8 percent of the Wheat Situation hits to 54 percent of the Vegetable Situation hits. The five special articles contained in three of these reports attracted only 14 hits, and 8 of those were for the analyses of the 1983 wheat program. Parts of the report which I interpret as having policy information--farm income, program characteristics, etc., garnered 78 (8.3 percent) of the hits in February. The full text of the Departments' PIK Assessment report went into AGNET on April 5, and during April accounted for 847 of the 1,274 hits on the system. During the four months the PIK assessment was on the AGNET system, it accounted for 30 percent of the hits on ERS material. During the first eight months of operation, various issues of Agricultural Outlook accounted for 15 percent of the hits, and traditional commodity situation reports accounted for 29 percent of the hits. If there is any doubt of the importance of world developments to U.S. agriculture and the participants in the Ag. system, the fact that 15 percent of the hits recorded on the system were for export related reports--regional reports, world supply-demand estimates, and agricultural exports--is instructive. The remaining hits in the system were for news releases, ERS abstracts, and inputs-related Outlook and Situation reports.

So what does all of this imply for policy, for users of policy information, and particularly for using systems for policy information like those now in use for Outlook and Situation? It should come as no surprise that policy and outlook are closely intertwined. With an industry such as agriculture, where government is deeply involved in the everyday producer decisionmaking from planting decisions, to acreage reduction program decisions, to CCC and FOR loan decisions one can hardly separate policy from outlook. The outlook, particularly short-term, dictates policy and program decisions, and the longer-term outlook (Baselines) bears heavily on the kinds of policy alternatives that will be considered for legislative purposes.

It works the other way too, of course. Without knowledge, or at least a good intuition of the programs to be in place, it is virtually impossible to accurately analyze the outlook for a commodity. Even the longer-term baseline activities must rest on some general policy assumptions which are consistent with, yet also strongly affect, the supply-demand balance over the baseline period.

It is rather clear from the little data we have on what AGNET subscribers use (access) of our Outlook publications, that policy information is of considerable interest to the users of the system. We have, unfortunately, not been able to recover the particular news release hits by users, but my suspicion is that a considerable number of those were on the news releases that described the 1984 wheat and feedgrain programs.

The implications of, and alternatives for extending electronic information dissemination to policy will depend to a large extent on what we mean by policy information. If by policy information we mean program provisions, particularly specific provisions of a program for the forthcoming crop year, I think we already have the system in place. AGNET carries the news releases of USDA, and in case nobody has noticed, those are the only official sources of program announcements for the 1984 wheat, feedgrain, and cotton programs. There have been no Federal Register notices issued as yet. Also, each ASCS office receives program provisions through the news releases; thus, information is available to farmers locally within a short time after being released in Washington. All that remains is to assure that all of the constituencies requiring that information have the opportunity to access a system which contains it.

Prior to announcing a program for a given crop year, the Department must issue in the Federal Register a proposal requesting public comments on alternatives, and prepare an economic impact statement on the likely effects of the alternatives under consideration. This too is a form of policy information and it is not presently on our systems. Of course, policy information of interest to the agricultural sector which is in the form of proposed rulemakings may come from many sources--EPA, Treasury, Commerce, and others; thus there appears to be a potential for providing this type of information in a timely manner.

If by policy information we are referring to legislative activity, there are several sources of information. The Library of Congress' SCORPIO system provides legislative tracking and some information on the content of particular pieces of legislation. Congressional Quarterly is initiating a similar system in the near future. Whether it will provide a broad range of information is yet unknown.

If we are looking for the kinds of information on legislation that is contained in newsletters, who is backing it, what trade-offs are in the works, how many votes are lined up, etc., we are facing a whole new question of who could provide the service, at what cost, and who might be allowed access to it. Here, we are right up against the kinds of copyright issues we will be discussing in other sessions of this conference.

Finally, what about policy information regarding the longer look--policy issues, policy-related research discoveries, general attitudes and perspectives of important decisionmakers and movers in the policy area? This might include speeches or excerpts from the Secretary of Agriculture, or from testimony of recognized experts before various Congressional committees. The recent Joint Economic Committee (JEC) hearings on the future of agriculture are a good example. If by policy information we mean policy perspectives such as those offered to the JEC, excerpts from (or entire texts of) the testimony of those leaders might be quite useful additions to the material presently available.

Decisions as to what kind of policy material we are interested in placing on such a system will to a large extent dictate where we logically place the responsibility for inputting and maintaining the information we desire. If news releases are what we desire, the Office of Governmental and Public Affairs of USDA may be the responsible party. However, if we are more interested in rulemaking, we must look to ASCS or other agencies promulgating the rules, or even to a value-added service. Investigative reporting of policy developments will probably have to be provided through those who hold the copyrights to the newsletters. Finally, longer-term perspectives which may be included in research or testimony or speeches may be the responsibility of a consortium of interested parties--ERS, the Land Grant Universities, Extension, and the Congressional committees. I am sure we will hear more thoughts on this in tomorrow's discussions of future possibilities.

COMPUTERIZED BATTLEGROUND FOR POLICY

by

Russell Gum, Mike Martin, and Linda Wear[1]

Introduction

The basic purpose of this paper is to evaluate from a practical perspective the evolution of the computerization of the agricultural policy battlefield. Consideration will be given to both the weapons themselves, the tactics involved in their use, and the role of the policy professionals and their institutions operating in a computerized battleground.

Computerization of Policy Analysis

The use of computers in agricultural policy analysis has evolved from limited use by professional analysts as tools for statistical and modeling tasks to extensive use by these analysts as tools for data base management, advanced statistical analysis, and complex modeling tasks.

The analysis of agricultural policy is currently carried out in four major spheres. A principal analytical center is in USDA.

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The Economic Research Service (ERS) is charged with generating analytical communication for use in the policy/appropriations process. The USDA has a relatively large staff, an extensive data base and considerable analytical support. There is growing concern, however, that USDA has become increasingly short term and political in its contribution to the policy dialogue. Moreover, the nature of the policy process has relegated analysis, even within USDA, to ex post commentary.

Major national econometric modeling firms form a second policy analysis sphere. These firms operate large, elaborate computer models whose internal operations are virtually unintelligible to all but a small handful of economic technicians. The models rely completely on the data bases held by each firm. The analytical output of these models must be accepted on faith tempered by their past performance. In this respect, there is a mix of science and religion which surrounds their models.

In any case, the models generally are used to address issues of macroeconomic impact. The sector specific impact of any policy initiative may be lost in the aggregate picture.

The land grant universities (and a few private institutions) also contribute to the dialogue in policy. The very nature of university research, however, leads to long run, ex post analysis of relatively limited usefulness when concerns are short run. Moreover, the analysis is often fragmented in nature as universities focus on issues with regional or commodity specific implications.

Finally, farm organizations provide policy input. This input tends to be anecdotal and advocational in nature.

Most debate on policy and policy analysis has taken the form of guerrilla warfare with hit and run tactics. And most on an ex post basis. Ex ante analysis in general focuses on cost of programs with welfare effects largely ignored.

The advent of personal computers has begun a new era in policy analysis. Now the possibility exists for policy analysis to be done by large numbers of people who may not be trained as policy analysts, but have access to micros and knowledge of software tools such as spreadsheets. The result is that computers have been demoted from policy battleships to infantry weapons and a combination of low cost and friendly software has resulted in the rapid proliferation of these weapons to camps of every stripe. This latest phase of the evolution of computerization of policy analysis will have serious implications for both the traditional policy analysts and their institutions and perhaps more importantly , the policy process itself.

Impact on Policy Process

Given the evolution toward popular use of personal computers for policy analysis, what will be the impact on the policy process. Policy activists/analysts will generate and use personal computer policy analysis [PCPA] in the following ways:[2]

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2. The difference between policy activists and policy analysts has eroded so much that for most cases, the terms can be used interchangably.

1. As a method to lend credibility to their position by invoking the great computer god.

2. As a method to find a problem their preconceived solution fits.

3. As a tool to discredit opposing positions by invocation of the computer.

4. As a method to explore the strengths and weaknesses of the policies they advocate.

5. As a method to explore alternative solutions to policy problems.

6. As a tool to be used in direct negotiation with other policy advocates.

Within the foreseeable future it is likely that the frequency of use of PCPA's will be higher for the uses at the top of the list. If this is true, and we believe it is, serious questions arise about the social usefulness of PCPA adoption by policy analysts/activists. In fact, the use of PCPA may lead to further confusion instead of enlightenment in policy debates.

In order to encourage their appropriate use, policy analysts need to promote development of PCPA's which demonstrate the usefulness of such models as methods to explore alternative solutions (use 5 above) and as tools to be used in negotiations (use 6 above). The following is an example of such an attempt.

A PCPA For Soil Conservation Policy Analysis

A useful system for aiding in the analysis of soil conservation policy can be designed using spreadsheet software currently available on most microcomputer systems.[3] The software design provides a computerized organization sheet for problem analysis where the interrelationships between erosion rates, technological conditions, production levels, and aggregate supply and demand curves can be defined vis-a-vis the rows and columns of the spreadsheet. In a well designed spreadsheet, alternative policy scenarios can be evaluated rapidly by modifying the entries in a few cells. Although level of detail provided by a spreadsheet based CIAS is limited by the capacity of the software package being used, the spreadsheet offers a relatively simple and highly efficient means of introducing the important issues to be addressed in the evaluation of alternative soil conservation policies.

The intent of this analysis is to develop a simple analytical model, which enables the user to evaluate the implications of alternative conservation policies. For this purpose, the soil erosion spreadsheet was designed in the form of a market equilibrium simulation model. The interaction between aggregate supply and demand relationships determine the quantity and price of commodities that are produced and consumed while soil erosion interacts with technological and production relationships to determine aggregate output levels.

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3. The example presented has been run on both an IBM PC using 1.2.3 and the Apple Lisa using Lisa Calc.

The basic structure of the analysis and the parameter default values include:

1. Demand Relationships
   1. Domestic Population Growth = 1% per year
   2. Foreign Population Growth = 1.7% per year
   3. Domestic Price Elasticity = -.2
   4. Foreign Price Elasticity = -.4
   5. Initial Price = $1 per unit
   6. Initial Export Demand Quantity = 36,584 million units
   7. Initial Domestic Demand Quantity = 32,444 million units

2. Supply Relationships
   1. Initial Price = $1 per unit
   2. Initial Supply Quantity = 69.026 million units (cash receipts form marketing total crops 1980.
   3. Technical Progress = 1% per year, if no erosion, otherwise dependent on erosion rate.
   4. Erosion Rate = .1, 1, 10% per year (varied to perform sensitivity analysis).
   5. Participation in Soil Erosion Programs = 0, 25, 50, 75, 100 (varied to evaluate alternative policies).
   6. Supply Elasticity = .2
   7. Acres of nonerosive land = 118 million acres
   8. Acres of potentially erosive land = 235 million acres
   9. Yield reduction due to erosion control = 10%

The technical progress condition reflects both the fact that technology increases yields and the less well-known relationship that technology has much greater impacts on the noneroded land. For example, new genetically superior crops are engineered to produce on good soil and simply won't produce up to their potential on eroded soil. Thus, the extremely important link between the impact technical progress and erosion is modeled in the spreadsheet. The yield penalty for erosion control can be viewed as a measure of the cost of erosion control. The other parameters are rather standard and will not be explained further in this paper.

Results of the SES Simulation

The results of the SES simulation provide useful insights as to the effects of alternative conservation strategies on agricultural market conditions over time. Price and quantity equilibrium levels are significantly influenced by the degree to which soil loss is controlled over the length of the simulation. While the demand relationship was the same for each of the policy solutions evaluated, the availability of supply varied under each alternative. The supply of agricultural products is significantly affected by the number of participating producers; i.e., level of erosion control. Therefore, the availability of agricultural products in the future is very dependent upon the policy action that is implemented over time.

After 100 years, the effects of erosion on total supply are significant. The divergence between available supply in the best case scenario (100% participation) and the worst case scenario

(0% participation) is clearly visible in Figure 1. Here, despite the yield penalty for erosion control, the total supply curve associated with 100% participation is greater than those curves corresponding to the worst case scenario for the various rates of soil loss. For the policy solution corresponding to no erosion, the equilibrium price level is only two and one half times that for the initial period while the equilibrium quantity is approximately 2,100,000 million units. The equilibrium price level associated with an erosion rate of 0.1% in the worst case scenario is nearly eleven times that in the initial period while erosion rates of 1.0% and 10% result in price levels that are approximately seventeen times that in the base period. Equilibrium quantity levels are 130,000 million units and 113,000 million units, respectively.

Policy Evaluation Using Economic Welfare Analysis

Once the market equilibrium values of price and quantity have been calculated for each of the simulation periods, an economic welfare analysis of alternative policy solutions can be accomplished. A large portion of the SES model was devoted to the calculation of the consumer and producer surplus measures corresponding to the market equilibrium for each time period of the analysis. The value of the measures for each alternative policy solution were compared to the values obtained under the best case solution (the base scenario). In this manner, it was ascertained whether producers and consumers became better or

SUPPLY AND DEMAND CURVES

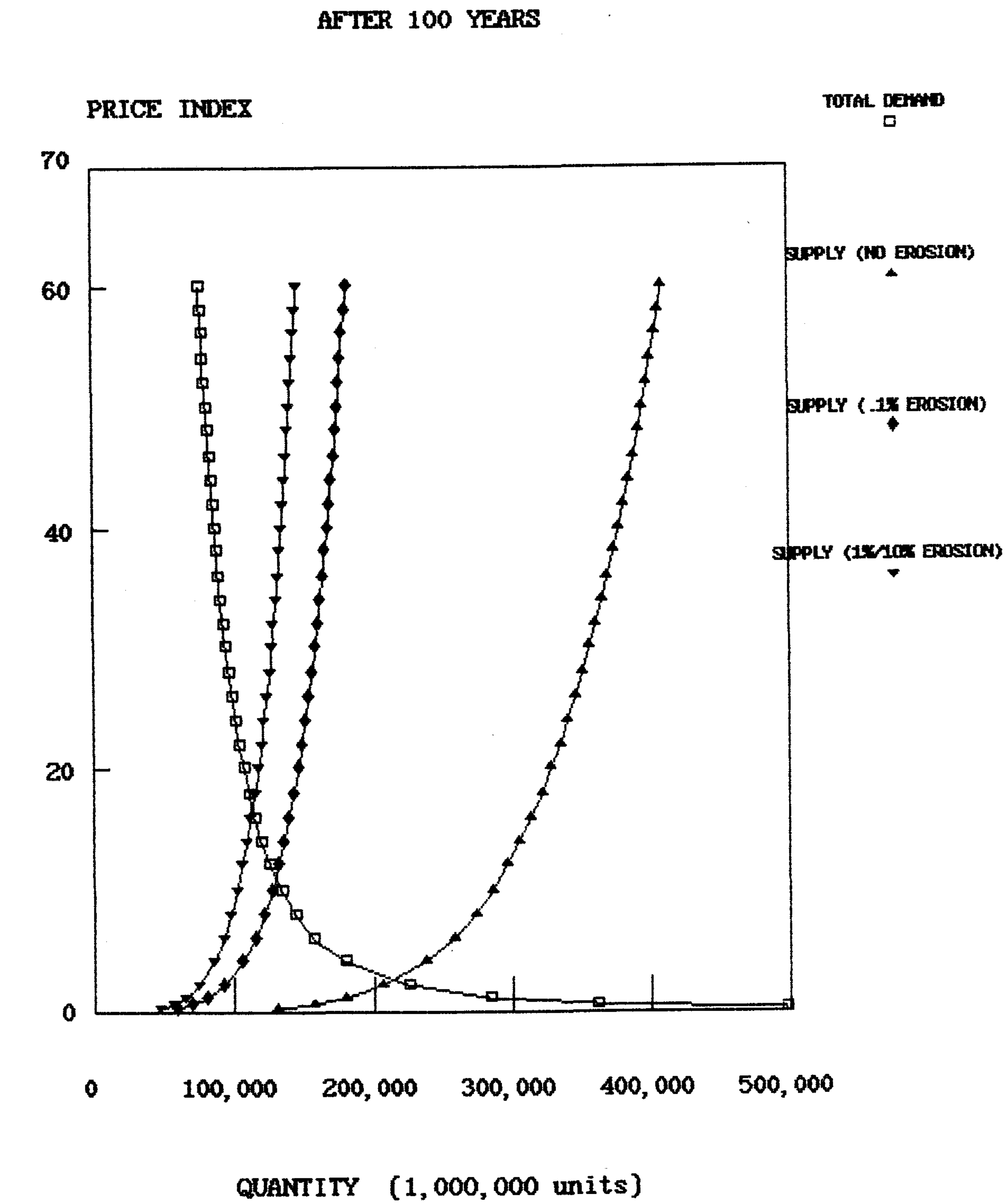

Figure 1. Supply and demand curves after 100 years (1% erosion rate).

worse off as the rate of participation in conservation programs declined.

As indicated previously, the five alternative policy scenarios, including the base solution, were evaluated at three different erosion rates: 1.0%, 10%, and 0.1% per annum. In terms of the welfare analysis, the rate of soil loss affected only the magnitude of the results; it did not influence the trend of the impacts. Therefore, the relative merit of each of the policy solutions will be discussed only for the case where the erosion rate was fixed at 1.0% per year.

As the rate of participation in conservation programs decreases from 100% to 75%, the relative value of the consumer surplus declines over time. This trend is illustrated in Figure 2. Although the consumer surplus measures are approximately the same under each scenario for the first fifty years of the simulation, the relative values diverge significantly after this period. Consumer surplus values for the 75% scenario become increasingly less than those under the best case solution. With the lower participation rate, however, producer welfare increases over time relative to the base scenario. Again, for the first fifty years of the simulation, the measures of producer surplus are approximately the same for both policy schemes. Thereafter producers are significantly better off with the lower rate of participation.

Total social welfare, the sum of producer and consumer surplus, is negatively affected over time. This indicates that the negative impacts of the lower participation rate on consumer welfare outweigh the positive effects on producer welfare. From

WELFARE MEASURES: 75% PARTICIPATION

(Changes in Value of Measure from Base Scenario)

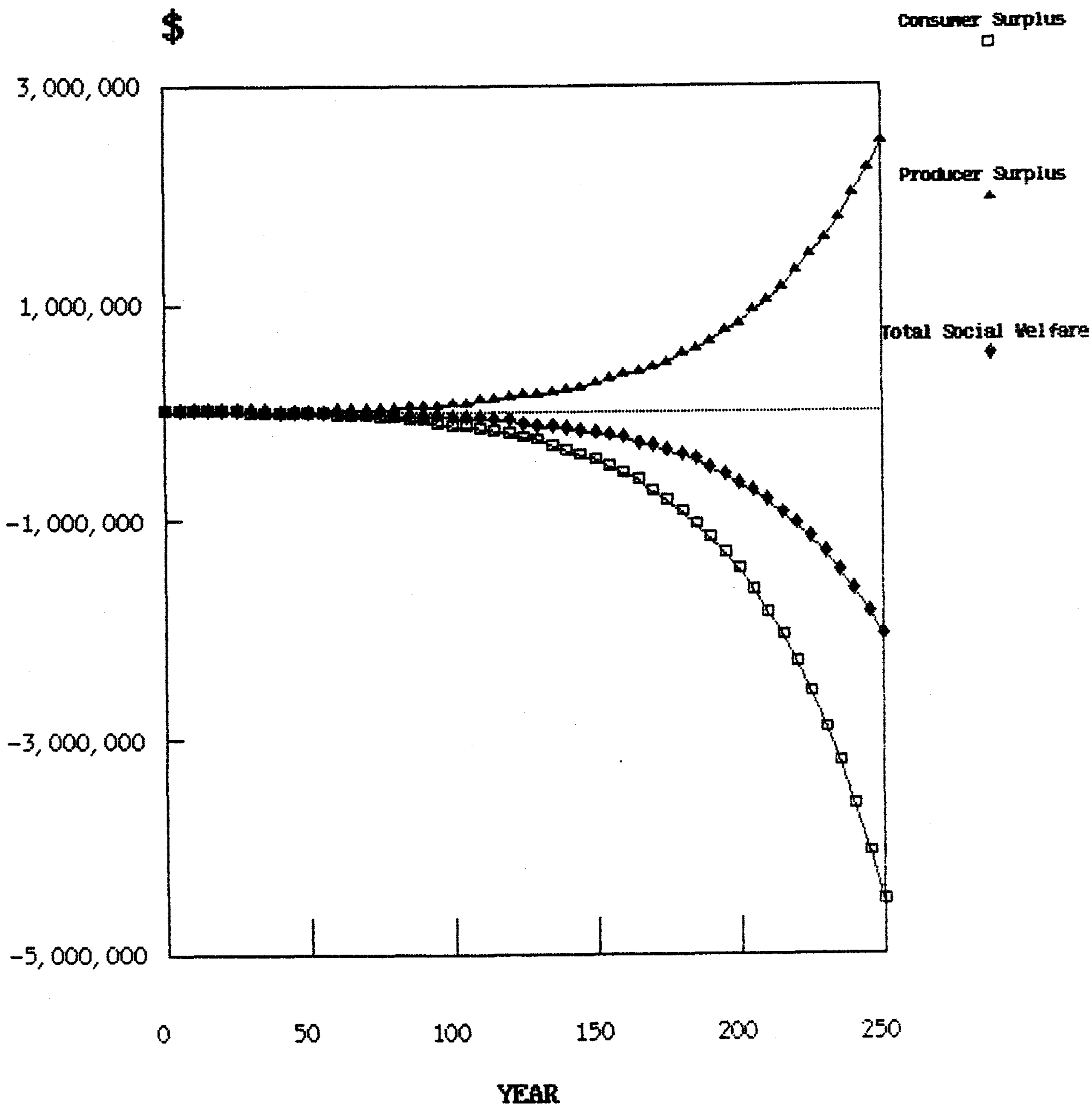

Figure 2. Change in Welfare Measures Over Time Calculated with a 1% Erosion Rate.

the point of view of society as a whole, the policy solution bringing about 100% participation in conservation programs is preferred to the solution where only 75% participation in such programs is achieved. However, producers are clearly better off with the lower rate of conservation activity.

Further, the basic implications of the welfare analysis are the same when the simulations are run using an erosion rate of 10% or 0.1% per year. As would be expected, however, the magnitude of the impacts are greater when an erosion rate of 10% is used and are relatively less when a rate of 0.1% is assumed.

Distribution of Welfare Impacts Among Producer and Consumer Groups

For purposes of policy analysis, it is of critical importance to know the distribution of policy impacts among affected groups. In the SES model, five distinct groups have been identified: (1) domestic consumers, (2) export consumers, (3) farmers who produce on nonerosive acreage, (4) farmers who produce on erosive acreage choose to participate in conservation programs, and (5) farmers who produce on erosive acreage and do not choose to participate in conservation programs. To evaluate the consequences of various conservation policy alternatives on each of these groups, the consumer surplus measures were modified to reflect per capita values while the producer surplus measures were modified to reflect per acre values. The change in the value of these measures relative to the base scenario were calculated and the distribution of policy impacts among the various groups identified. (Note: These measures are calculated using a 1.0% erosion rate.)

The relative effects of alternative policy solutions among domestic and export consumers are identified in Table 1. Although each consumer becomes increasingly worse off as the rate of participation in conservation programs declines, the relative magnitude of these impacts differs considerably. In terms of per capita measures, domestic consumers are significantly more adversely affected by increasing erosion levels than are export consumers. Even under the worst case scenario, the per capita well-being of the export population is diminished by only a few dollars relative to the base scenario during the first one hundred years of the simulation. The results of the SES simulation would seem to indicate that per capita, domestic consumer well-being may be a relatively more important policy consideration than the need to avoid adverse affects on the export consumer.

The distribution of alternative policy impacts on the three producer groups are identified in Table 2. Recall that in the base scenario, all those farmers producing on erosive acreage are assumed to participate in conservation programs. As the rate of program participation declines under each of the policy alternatives, the producer surplus per acre (PS/A) for nonparticipants indicates the net change in the value of the PS/A currently being realized by those not in conservation programs relative to what could be achieved if all producers participated in such programs. Similarly, the PS/A for participants indicates

TABLE 1. Per Capita Welfare Impacts Among Consumer Groups ($1,000,000). *

TIME	DOMESTIC 75%	EXPORT 75%	DOMESTIC 50%	EXPORT 50%
0	5.231	0.298	10.227	0.601
5	2.770	0.148	5.475	0.309
10	0.149	-0.007	0.299	0.001
15	-2.632	-0.167	-5.319	-0.321
20	-5.577	-0.332	-11.393	-0.659
25	-8.690	-0.501	-17.942	-1.013
30	-11.972	-0.674	-24.980	-1.381
35	-15.426	-0.852	-32.522	-1.764
40	-19.054	-1.033	-40.582	-2.162
45	-22.860	-1.218	-49.175	-2.574
50	-26.846	-1.407	-58.313	-3.000
55	-31.015	-1.600	-68.010	-3.440
60	-35.369	-1.795	-78.276	-3.893
65	-39.913	-1.995	-89.125	-4.359
70	-44.649	-2.197	-100.568	-4.839
75	-49.581	-2.402	-112.616	-5.330
80	-54.712	-2.611	-125.281	-5.834
85	-60.048	-2.822	-138.573	-6.349
90	-65.594	-3.037	-152.505	-6.875
95	-71.353	-3.254	-167.089	-7.413
100	-77.332	-3.474	-182.337	-7.961
250	-416.435	-11.981	-1077.688	-29.733

TIME	DOMESTIC 25%	EXPORT 25%	DOMESTIC 0%	EXPORT 0%
0	15.003	0.892	19.571	1.172
5	8.118	0.466	10.702	0.621
10	0.448	0.010	0.597	0.019
15	-8.061	-0.478	-10.862	-0.638
20	-17.462	-0.999	-23.800	-1.351
25	-27.809	-1.553	-38.348	-2.124
30	-39.154	-2.141	-54.645	-2.960
35	-51.552	-2.763	-72.836	-3.862
40	-65.056	-3.420	-93.071	-4.831
45	-79.719	-4.112	-115.504	-5.872
50	-95.592	-4.839	-140.297	-6.985
55	-112.726	-5.601	-167.612	-8.174
60	-131.169	-6.399	-197.615	-9.441
65	-150.969	-7.231	-230.474	-10.786
70	-172.171	-8.098	-266.357	-12.212
75	-194.819	-8.999	-305.431	-13.720
80	-218.955	-9.934	-347.861	-15.311
85	-244.619	-10.901	-393.812	-16.986
90	-271.349	-11.902	-443.442	-18.745
95	-300.681	-12.934	-496.905	-20.588
100	-331.152	-13.997	-554.351	-22.514
250	-2249.808	-58.638	-4737.857	-113.453

* Percentage value in column heading indicates participation rate.

TABLE 2. Per Acre Welfare Impacts Among Producer Groups ($1,000,000).*

TIME	NO EROSION 75%	PARTICIPATE 75%	DON'T PARTICIPATE 75%	NO EROSION 50%	PARTICIPATE 50%	DON'T PARTICIPATE 50%
0	-7.543	-6.789	10.789	-14.648	-13.183	3.684
5	-4.260	-3.834	15.874	-8.391	-7.552	11.744
10	-0.245	-0.221	21.651	-0.490	-0.441	21.406
15	4.606	4.145	28.164	9.336	8.403	32.873
20	10.411	9.370	35.455	21.405	19.265	46.364
25	17.303	15.572	43.562	36.076	32.469	62.109
30	25.427	22.884	52.518	53.754	48.379	80.357
35	34.947	31.452	62.345	74.896	67.406	101.364
40	46.046	41.441	73.058	100.014	90.013	125.400
45	58.925	53.032	84.658	129.685	116.716	152.742
50	73.811	66.429	97.131	164.553	148.098	183.677
55	90.953	81.858	110.445	205.339	184.806	218.492
60	110.631	99.568	124.545	252.849	227.564	257.476
65	133.155	119.839	139.351	307.980	277.182	300.917
70	158.868	142.981	154.750	371.733	334.560	349.094
75	188.155	169.339	170.594	445.223	400.701	407.273
80	221.441	199.296	186.692	529.691	476.722	460.703
85	259.199	233.279	202.805	626.516	563.864	524.610
90	301.956	271.760	218.635	737.233	663.509	594.188
95	350.297	315.267	233.818	863.547	777.192	669.589
100	404.874	364.387	247.914	1007.354	906.619	750.920
250	15,053.813	13,548.432	-12,090.398	42,467.606	38,220.845	-1,797.834

TIME	NO EROSION 25%	PARTICIPATE 25%	DON'T PARTICIPATE 25%	NO EROSION 0%	DON'T PARTICIPATE 0%
0	-21.347	-19.212	-3.015	-27.669	-9.338
5	-12.400	-11.160	7.737	-16.291	3.849
10	-0.734	-0.661	21.162	-0.978	20.919
15	14.196	12.777	37.712	19.190	42.684
20	33.026	29.723	57.894	45.320	70.092
25	56.488	50.839	82.275	78.728	104.247
30	85.428	76.885	111.485	120.984	146.428
35	120.821	108.738	146.220	173.943	198.106
40	163.780	147.402	187.244	239.797	260.969
45	215.581	194.023	235.390	321.125	336.943
50	277.673	249.906	291.564	420.944	428.209
55	351.704	316.533	356.743	542.779	537.228
60	439.538	395.584	431.974	690.726	666.759
65	543.281	488.953	518.373	869.531	819.880
70	665.306	598.775	617.123	1,084.672	1,000.001
75	808.279	727.451	729.471	1,342.449	1,210.884
80	975.192	877.673	856.720	1,650.083	1,456.646
85	1,169.395	1,052.456	1,000.225	2,015.821	1,741.775
90	1,394.632	1,255.169	1,161.385	2,449.051	2,071.127
95	1,655.084	1,489.576	1,341.638	2,960.428	2,449.930
100	1,955.410	1,759.869	1,542.444	3,562.004	2,883.777
250	100,106.925	90,096.233	19,842.965	253,669.046	77,498.174

* Percentage value in column heading indicates participation rate.

the net change in the PS/A being realized relative to what could be achieved if all farmers employed conservation strategies.

Although producers, as a whole, are better off under increasing levels of erosion, the distribution of the impacts varies among the three producer groups. Under each of the four policy alternative for which relative measures were calculated those producers choosing not to implement conservation strategies are, at least in the earl stages of the simulation, better off than those producers who do employ such strategies and those farmers producing on non-erosive acreage. However, as the effects of erosion on productive capabilities begins to take its toll, the relative advantage of the nonparticipating producers begins to decline. Under the policy solutions corresponding 75% participation, 50% participation, and 25% participation, the gains of the nonparticipants relative to the participants diminish after approximately 75 years. Thereafter, the participating producers are relatively better off and it becomes apparent that the implementation of conservation strategies pays off. The magnitude of these advantages increases as the rate of participation declines. It is interesting to note that of the three producing groups, those farmers without erosion problems gain relatively more by higher levels of soil loss on the erosive land.

Usefulness of SES

The ability to understand trade-offs among alternative policy solutions is a critical component of the policymaking process. Informed decisions regarding policy impacts among affected groups must be made in order to determine the relative merit of a proposed solution. A well-designed information and analysis system that allows the decisionmaker to critically evaluate relevant policy alternatives can provide an effective tool for policy development. A computerized information system enables the decisionmaker to highlight important policy parameters in an efficient and analytical manner so that the impacts resulting from changes in these variables under alternatives can be evaluated.

The above PCPA graphically demonstrates the usefulness of this type of analysis to display trade-offs and to display the results of the interaction of supply and demand forces. It is clear that this analytical tool, which can be very simply applied with a microcomputer, is potentially quite powerful. Depending on the purpose and skill of the user, it can contribute clarity and focus to the policy debate or it can contribute confusion and delay.

Concluding Comments

One can foresee at least two scenarios from the PCPA revolution. The first might be best called the "Pollyanna view" which runs as follows. The wide availability of this new capacity will lead to a more sharply focused, economically literature dialogue on policy. As a consequence, the policy process will be elevated above the mire of political and emotional wrangling. Under this scenario, policy analysis, both ex ante and ex post, would reflect the application and understanding of welfare theory and competent cost-benefit analysis.

The alternative scenario reflects the cynical view of the policy process. That is, policy analysis and the debate over programs will degenerate further into a sort of "Beirut style" guerrilla warfare. Analysis, re-analysis, counter-analysis, and un-analysis by fractionale policy combatants will lead to process paralysis.

In either case, one outcome seems increasingly clear. The rise of PCPA will irreversibly alter the role of USDA, land grant universities, and the major consulting-modeling firms. It appears likely that, in the future, the analytical role of these institutions will decline and they will become "munitions suppliers" for smaller assault squads. Data collection and software development will become their principle functions as the centralized analytical system is replaced by cadres of mobile attack units.

COMMUNICATION OF POLICY ISSUES VIA COMPUTERS: A PROPOSAL

by

Ronald D. Knutson and James W. Richardson

One of the keys to overall improvement in our ability to both analyze and educate on policy issues, options, and consequences is improvement in our ability as economists to communicate with one another. The personal computer, utilizing existing communications systems such as DIALCOM offers a new possibility for communication by policy economists.

The purpose of this paper is to discuss a concept of computer facilitated communication among policy analysts and educators. Computer facilitated communication is particularly useful in policy, due to the requirements for timeliness; the widespread interest in policy issues; and the relative scarcity of qualified policy analysts, analytical models, and educators. With the possibility of even more limited resources in the future, there is no point in needlessly duplicating our policy research and education program building at each land grant university.

Background

The idea for a computerized communication system for policy issues was initially conceived in the Southern Extension Public

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Affairs Committee after observing a demonstration of the DIALCOM system. This system is part of the Cooperative Systems Mail Network developed and used by the Federal Extension Service to electronically communicate with Extension Service Directors in each state. By specifying individuals' identification numbers, papers, notes, and data can be left for a particular person in his or her mailbox. This type of dial-up communication network for policy economists would greatly encourage policy researchers and educators in different states to work jointly on research and education manuscripts.

In addition to transmission of outlook information over COIN, the system makes available on a daily basis news releases and related information, as well as the largely policy-oriented memorandum titled Ag AM. Subsequent discussion by the Southern Public Affairs Committee led to the exploration of additional information that could be transmitted over the DIALCOM system. Since most of those involved in the discussion were primarily Extension-oriented, the discussion focused on possibilities such as putting Jim Webster's Food and Fiber Letter on the system; providing timely coverage of farm policy developments in Congress; and transmitting pertinent papers from hearings, such as agricultural policy related papers presented before the Joint Economic Committee. Possibilities for communicating among policy economists were also discussed. For example, the implications of a new or modified policy proposal on peanuts might be analyzed at the Texas A&M Policy center and then transmitted immediately to policy educators and analysts in other peanut producing states, as well as to Congressmen and Senators having peanut industry constituents. A second example is the transmission of new policy education packages, including overhead transparency formats, over the system.

The possibilities fostered sufficient discussion and interest within the Southern Extension Public Affairs Committee to request that the Federal Extension Service investigate the possibilities. In addition, communications were initiated with other regional Extension policy committees to foster nationwide discussion of the possibilities. Subsequently, at the National Public Policy Conference, a committee was appointed composed of Fred Wood, Phil Favero, Charles Gratto, Keith Scearce, Warren Trock, and Jim Zellner to further develop the concept, investigate its feasibility, and to the extent feasible, proceed with implementation. The work of that committee is just beginning.

Prerequisites and possible roadblocks to implementation were pointed out in the initial discussions of the Southern Public Affairs Committee:

- In addition to the usual cost and hardware access issues, the main roadblocks appeared to involve questions of gaining access to the electronic mail network, which is now reserved exclusively for the Extension Service Director in most states.

- A second roadblock requires additional resources. For the proposed system to be successful, added resources would be required in Washington to collect, coordinate, and compile information in the form needed for distribution over the system. This is not a minor problem. Timeliness requires that information be placed on the system as soon as possible. This will undoubtedly require hiring one or two new people to collect needed information.

- If the system is to realize its full potential, policy researchers will need to have access to it on an equal basis with Extension staff. That could create turf and equitable funding questions.
- The commitment of the Federal Extension service to the public policy information needs of the states has been less than satisfactory over at least the past five years.

Other obstacles will undoubtedly be encountered before the proposed system is operational. However, such potential obstacles should not prevent development of a computer facilitated communication system for policy information. The possibilities for such a system are explored in the remainder of this paper.

The Proposal

Our proposal is broader than that of the Southern Extension Public Affairs Committee in that it is designed to encompass both the research and extension policy communication needs and possibilities. Since it is our position that a good policy extension program is based on a good policy research program and vice-versa, no attempt is made here to divide the research and extension components of such a communication system. The crucial components of the system are as follows:

- Operationally the system must have the capability for two-way communication among all participants. That is, policy economists in each state must have the capability to provide input as well as to receive output.

- A key aspect of the system involves the willingness of USDA (ERS and/or ES) to provide needed information on a timely basis and in the detail required for economic analyses. Without the staff commitment to accomplish this, the system will not realize its full potential. This may well be the most difficult aspect for the system to accomplish. Gathering information on policy is not a particularly rewarding job for an agricultural economics professional. However, the job requires that the person understand the issues well enough to determine their importance to research and extension, well enough to determine their importance to research and extension personnel, as well as understand what information is needed (including the required degree of detail), and how to communicate effectively in writing. A policy trained (M.S.) research or extension associate may be the best person to handle the job.

- Certain types of information would be routinely communicated over the system. Included would be such vital documents as:

  --Domestic and international policy announcements by USDA and the Administration. These would be provided in sufficient detail so policy educators and researchers would know more than the press when they begin their analyses.

  --Major farm policy bills introduced in the Congress would be provided soon after they are introduced with updates on the bills as subcommittee and committee markups occur. In addition, information on bills related to soil and water conservation, food safety, trade, transportation, and tax policy changes would be provided over the system.

  --Policy proposals that are of major significance would be provided even before they reach the bill stage. For example, considerable information was apparently available on the Foley/Dole 1984 wheat program modification proposal before it was introduced. Many questions arose regarding this proposal and each policy economist contacted had to scout out answers individually. This duplication of effort would not be necessary if the system was functioning properly.

  --Newsletters, such as Webster's Food and Fiber Letter, would be placed on the system as they become available. Although Webster's letter is available on Friday afternoon, we do not receive it in the mail until

Tuesday. Frequently, we will receive calls on Monday morning regarding an issue raised in the Webster letter that we did not even know existed or certainly did not know its details. Most policy analysts and researchers do not have access to this letter because of its cost ($295 annually). With limited access assured, it should be possible to negotiate a considerable lower average cost with Webster for the rights to put the Food and Fiber Letter on the system.

- Two-way communication among the states and the main office in Washington, D.C. would facilitate communication among policy researchers and educators in all 50 States. Some of the types of communication that would be possible with the proposed system are:
  - --Monthly updates of research efforts could be sent over the system to coordinate the efforts of regional research groups, such as NC-169.
  - --Inquiries by researchers and educators could be made of their colleagues in all 50 states regarding data, regional and national policy issues, and the names of policymakers involved in particular policy issues, to name a few.
  - --Follow-up information on policy issues could be requested of the Washington staff by researchers and educators in the 50 states. This line of communication may also serve to inform Washington policymakers and analytical staff of new policy issues, proposals and

research results to which they might/should turn their attention.

--Preliminary and final research results on policy issues could be shared over the proposed system. The obvious benefits here would be that we could now get research results to producers and other policy interest groups in all 50 states early enough for them to affect policy changes. Research results could be reported either in a rough issue/result format or in a polished extension format ready for release.

--Worksheets for evaluating participation in farm programs could be distributed to all 50 states in one day rather than a week or two. Spreadsheet information (computer program) for evaluating alternative farm program options could be shared over the computerized communication network. This would significantly reduce the duplication of efforts by policy educators in each state developing their own spreadsheets and worksheets for policy evaluation.

--Overhead transparency formats could be shared over the communication network to further reduce duplication of efforts. Case study materials for policy education could be shared via the network. Where the information can not be shared directly, announcements can be made as to the availability of these materials.

--Announcements of regional policy educator workshops and other broad based research and extension programs in public policy, can be made over the network. This would not replace a widespread mail out of registration material for a workshop.

- If it is not possible to integrate this proposal into the current DIALCOM system, a private sector dial-up mail box like The Source and AGRI-STAR for policy economists should be investigated.

- An outgrowth of the proposed communication system is the development of formal ties between policy educators and on-line data services, e.g., AGRI-STAR and The Source. The proposed system would overcome the major problem of contracting with an on-line system at this time; namely, the lack of a dependable source of high quality policy information.

Our list of communication uses from the proposed computerized communication network is far from exhaustive; but, it serves to demonstrate the potential benefits from the system.

COMPUTERIZATION OF ASCS: POTENTIAL FOR POLICY ANALYSIS

by

Tom Browning*

The purpose of this paper is to discuss "Computerization of ASCS: Potential for Policy Analysis." I will briefly discuss this issue in three parts. First, I will define the mission of ASCS and the role of information management in meeting agency policy analysis objectives. Second, I will present a brief description of several important computer-related developments that will allow ASCS to better meet these objectives. Third, I will briefly describe some important, current, and proposed analytical efforts whose existence is greatly facilitated by improvements in the automation of agency data processing.

ASCS Mission and Information Needs

ASCS is responsible for operating, monitoring, and designing a diverse set of programs affecting farmers, the agricultural community, and society at large. The most significant of this group is the commodity programs which, through nonrecourse loans, direct purchases, land diversion and deficiency payments, and production adjustment activities, help to stabilize the incomes and prices received by farmers. Another series of programs

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provides cost-share assistance to farm and forestland owners for the purpose of maintaining and improving the quality of our soil and water resources. Examples include ACP, FIP, RCWP, and Water Bank. The final group includes the disaster assistance programs--Emergency Conservation Program (ECP), Emergency Feed Program (EFP), Livestock Feed Program (LFP), and commodity program disaster assistance in areas not covered by Federal Crop Insurance.

In addition to maintaining accurate and detailed records on program operation, the agency is also responsible for evaluating progress toward meeting program objectives, assessing the effectiveness and efficiency of current and proposed programs in meeting these objectives (or different objectives), and assessing the consequences of changing program provisions on farm production, prices, farm income, program outlays, erosion levels, water quality, and other relevant factors. Consequently, our information needs are extremely broad, ranging from field-by-field assessments of the cost and effectiveness of a single conservation practice to the terms and conditions of multi-billion dollar borrowings by the Commodity Credit Corporation.

Significant Computer Developments

Through its operation of a wide array of farm-related programs, ASCS accumulates and stores a vast amount of information relating to the physical and financial structure of the farm sector and its reaction to Government programs and policies.

Unfortunately, the amount of information is so vast and the composition is so varied, that it has often been difficult to mobilize these data in timely and cost-effective fashion for use in program and policy analysis. However, several recent computer-related developments appear to offer the opportunity to use this wealth of information to expand ASCS's ability to assemble and organize the data to monitor current operations and evaluate existing and proposed programs and policies.

The most significant development is the initiation of an agency-wide information resources management (IRM) plan to maximize the effectiveness of collection, storage, and use of ASCS data. This plan links a summary of the occurrences at counters of ASCS county offices to the desk of the Washington-based policy analyst. It also includes data input from other Federal agencies, FAS and FCIC, for example.

The basic part of the IRM plan is to place computers in each state office and each of the over 2,800 county offices. These computers will allow the county offices to efficiently store, process, and retrieve basic producer records (e.g., farm and field location and size, crop acreage, land use, farm type, crop yields, payments, loans, storage facilities), crop conditions, program participation, and other program and office information. With additional software, these computers can also assist individual farmers in selecting among program options and aid the county committees in making decisions involving local program operations and producer requests.

Program-related activity occurring at the county office can then be summarized on a weekly basis and transmitted to the state office. After further summarization for use at the State office program, information is then forwarded to Washington, D.C. Detailed accounting information is sent to the central Kansas City computer facility for further processing, storage, and analysis.

At the other end of the system are the Washington-based ASCS program managers and analysts who, through the agency's computer facility and data base, will have direct access to accounting information in Kansas City and the summary program and administrative data. This information can be assembled and analyzed with planned software packages. The results of these analyses can then be quickly transmitted to policy makers for use in policy decisions.

The second important element in the IRM system is the joint ASCS/FAS computer facility located in Washington, D.C. This facility and some of the attendant software are a basic part of the central ASCS IRM system. When completed, it will also allow ASCS and FAS to share, on-line, a common data base which includes international production and price information, export information, and domestic production and program data.

Another important computer development has been the acquisition of microprocessors (PC's) for our analytical staff. These PC's serve as "super calculators" and important research tools, particularly during the evaluation of program options and budgeting exercises. The PC's allow agency analysts to consider a broader range of options and perform a more complete analysis for fast turnaround requests to high level policy makers because of the quick and reliable means of storing and manipulating commodity budget accounts and other critical data independently and through access to main frame computers, such as the joint ASCS/FAS facility or the Washington Computer Center.

There is also great potential for improving commodity and conservation program analysis with the incorporation of small but more sophisticated economic models that are becoming available for microprocessors. The use of such models should permit a more complete, detailed, consistent, and timely analysis of alternative economic and program scenarios.

Current or Proposed Analyses

ASCS has several important current or proposed analytical activities whose existence is at least partially related to the "computerization" occurring. For want of a better method, I will generally categorize these applications according to whether their primary application is toward the commodity-related or the conservation-related programs that ASCS operates.

Commodity. In addition to the more timely availability of basic county level data and the broader use of microprocessors, a new tool for the evaluation of crop conditions and land use is satellite remote sensing. Remote sensing is a computer-intensive process for interpreting current and actual crop conditions from satellite images. If needed, these assessments could be available on a bi-weekly basis for early detection of land use and cropping pattern changes, as well as weather, disease, or disaster-induced changes in crop production. Such information would be extremely useful in assessing the need for changes in program provisions or incentives.

For several years FAS has used remote sensing to assess crop production conditions in other parts of the world. During this past year, ASCS has begun to monitor crop conditions in the U.S. Development of a really effective system is several years in the future; however, we have begun to develop the personnel and the data base to make remote sensing an effective and useful analytical tool. The field-by-field, farm-by-farm, and county-by-county information which ASCS monitors is an idea base for providing "ground truth" confirmation of satellite image interpretations of crop conditions. These "ground truths" can be used to establish and sharpen interpretations for foreign as well as domestic crops.

Conservation. The most important data processing related development for the analysis of conservation programs is creation of the Conservation Reporting and Evaluation System (CRES). CRES collects information in every farm county on general farm and operator characteristics; characteristics of the field or conservation technical unit; a description of existing applied best management practices and their cost; and the consequent efforts of installation of the practices on soil erosion, water conservation, forage and wood production, and animal waste management. This information is currently being used to evaluate

SCS projects (PL-566, RAMP, CTA evaluation), the regular and special ASCS program, i.e.,:

ACP targeting

ACP variable cost-share

ACP special project counties

ACP evaluation of practices

Rural Clean Water Projects (RCWP)

Conserving Use Acreage Analysis

Utilization of the CRES system in conjunction with the updated NRI data and the complete automation of the county offices will allow county, state, and national policy makers to target conservation cost-share funds to the most critical areas using the most effective practices. Also, when such data are used in conjunction with commodity program participation data and farm budget information, it will be possible to analyze the effect of various program alternatives (e.g., cross compliance, conservation bonuses) and program incentives (e.g., cost-share rates, diversion payments, acreage retirement requirements, assistance limits) on both commodity and conservation programs.

MODEL TRANSFERS AMONG MAINFRAME MICROS AND MINIS: IMPLICATIONS FOR THE FUTURE

by

Gerald L. Horner, Jerry T. Nishimoto, and James H. Cothern*

Introduction

The introduction of the microcomputer has allowed researchers to write papers more easily, prepare complex tables using spreadsheet programs, formulate data bases and to perform some analytical tasks that before could only be done on jointly used computers. These functions are well documented and are used generally by many agricultural economists. Another useful, and not well-documented, task of the microcomputer is facilitating communications and transferring files between computing devices.

This paper will discuss the procedures used to transfer a complex quadratic model of the national agricultural economy from the Washington, D.C. Computer Center (WCC) mainframe (IBM 370) to a VAX 11/750 minicomputer located at University of California, Davis. A section on using a word processor with transferring files between incompatible microcomputers is a related topic and alternative remedies for those problems will also be presented.

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The last section contains a description of the Ethernet computer linking system and the related hardware being installed in the Department of Agricultural Economics at UCD and how it might be operated will be offered as one possible means of connecting micros with an office mainframe or minicomputer.

Typical Problems Encountered in Transferring Computer Programs

In May of this year, the Economic Research Service decided to analyze the effect of significant changes in the export demand for agricultural commodities on irrigated agricultural production, and ground and surface water supplies as part of a larger study called the World Food Study. The model chosen for this task was the United States Mathematical Programming (USMP) model that existed on the WCC. The USMP model is a spatial and market equilibrium model designed for general purpose economic and policy analysis of the U.S. agricultural sector. Land and labor supply functions were specified in the model for 10 regions in the U.S. However, irrigated and dryland agricultural production techniques were not delineated in the model and irrigation water was not included as a regionally supplied resource. The problem was to:

- Transfer the model to The Department of Agricultural Economics at UC Davis.

- Modify the structure of the model to include regionally delineated water supply functions.

- Incorporate dryland and irrigated production activities in the model for each crop in regions where significant irrigated acreage existed.

- Perform 5 export demand and 10 resource cost scenario analysis.

- Write a report by October 1, 1983.

The lack of mainframe compatibility dictates the transfer of programs and data files by tapes which is difficult because of the high degree of programming knowledge and experience needed to write and read a transferred tape. Specific information is needed on character codes, track size, bits per inch, parity and label. Tape drives also present problems. They are usually not compatible between systems and the possibility exits that the tape will be damaged in the reading tape drive making it impossible to complete the transfer task.

Bob House, the ERS economist in charge of the USMP, initially suggested using a micro to download the USMP files from the WCC, but the number and length of the files, and the lack of a high speed modem, suggested that the model might be best transferred through tapes. This task took one month and could have been accomplished faster, even with a 300 baud modem. Since the initial installation, however, numerous files containing subroutines and data sets have been transferred from the WCC to the VAX.

Transferring the USMP Program from the WCC System to VAX

Files were read from the WCC and written to the VAX 11/750 using a Kaypro 10 microcomputer, the Crosstalk(R)[1] communication package and an acoustic 300 baud modem. The Kaypro 10 is an 8 bit microprocessor with 64 kilobytes of RAM, 10 megabytes of hard disk storage, and one floppy disk drive. The hard disk is very useful when transferring files larger than the capacity of the 390 K floppy disk.

Crosstalk is a data communications system designed to use with the CP/M operating system and allows the microcomputer to become a "smart terminal". Command options are available to adjust the sending and receiving procedures of the microcomputer to be compatible with the mainframe or minicomputer. The "data capture" feature of Crosstalk allows information to be read from other computers and captured in RAM, and, when the RAM is full, automatically written to a disk. This function was performed satisfactorily with the Crosstalk command options set to the default values.

Crosstalk also reads files from the microcomputer's disk and sends them to the remote computer but for this task the Crosstalk command set must be tailored to match the host computer. The VAX 11/750 received data files with short line lengths using the

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1. Data Communications Software System for CP/M, Microstuf, Inc., 1845 The Exchange, Suite 205, Atlanta, Georgia 30339

Crosstalk default command settings but it would not receive text files without dropping letters. This problem was solved by setting the WAit command to 05 (one half second). This allows time for the VAX to send a prompt to the micro after a line has been received. To speed the transmission, the FLow command should be set to the line mode which transmits a line at a time rather than the default character mode that sends one character at a time.

Writing files to the WCC required a half duplex setting because the IBM 370 mainframe does not echo the typed characters that are sent. The WCC system also sends a 5 character prompt at the start of each line. The WAit command must be set to 05 and for speed of transmission the FLow command line mode should be selected. The SCreen command was also used when writing files to the WCC. This command instructs Crosstalk not to send line feeds added by CP/M at the end of each line of text when performing a REad command because the IBM did not know what to do with the line feed.

Even at the 300 baud rate, transferring large files is clearly superior to using tapes but a 1200 baud modem would reduce transfer costs significantly.

Using Word Processors on a Mailbox System

USDA has an operational "mail box" system and the Natural Resource Economics Division of ERS is a subscriber. The communication system is the Comet(C)[2] package that was developed for receiving, preparing, editing, sending, filing, and retrieving messages. The system is maintained on a DEC RSX1144 located at the WCC. Sending messages can be a time consuming process if each character is typed into the terminal while on line. Connect time can be reduced by writing the message on a word processor and transmitting the file on to Comet. This also allows longer documents, such as this paper, to be sent quickly and accurately at the sender's and reader's convenience.

The transmission was accomplished by setting the WAit command to one half second and selecting the line mode for the REad command. The SCreen command also needed to be on if the message was going to be single spaced. Using a 1200 baud modem, this paper, including Perfect Writer(TM)[3] commands was send to Washington D.C. from Davis, California in less than 4 minutes.

Transferring Files Between Incompatible Microcomputers

Since very little floppy disk drive compatibility exists between manufactures, three options to transfer files between micros may be considered. They are:

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2. COmputer MEssage Transmission, Computer Corporation of America, Communication Technology Division, 575 Technology Square, Cambridge, MA 02139

3. Perfect Software, Inc., 1400 Shattuck Avenue, Berkeley, California 94709

1. Use a program, such as Uniform(C)[4] that will read and write in various disk formats. The problem with this is that not all disk formats are included in the program.

2. Directly wire the micros though the RS 232 ports. This may work for micros of the same brand but protocol incompatibilities between other micros prevent the reading or writing of files. The computer must also be in close proximity.

3. Use a communication program, such as Crosstalk, solves the location problem but the micros need to have the same operating system.

4. Use an intermediate mainframe or minicomputer to avoid having to specify the unknown protocols and to overcome the indifferent operating systems of the two micros.

One advantage of the last option is being able to transfer command files using a program called PIPIO[5]. PIPIO is a modification to the standard PIP (Peripheral Interchange Program) that comes with CP/M. This modification implements special programs called " Unload" and "Load". The Unload program reads the command file and converts it to hexdecimal code, which

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4. Micro Solutions Inc., 125 South 4th Street, Dekalb, Illinois, 60115

5. Fisher, Steven, "PIP Data Between Computers", Microsystems, July, 1983 occur within a short period of time. At least with a diversity of micro brands, pressure to replace the machines will

be more evenly spaced.

is easily transmitted between machines, and the Load program converts a hexdecimal file back to a command file.

The last option also eliminates the need for an agency or department to purchase a single brand of microcomputer. With the ability to freely transfer information between micros, micros can be purchased on the basis of matching personal preference and needs with machine capabilities rather than making choices based on machine compatibility alone.

Purchasing one type of machine also presents the problem of having the machines becoming obsolete at the same time, which may occur within a short period of time. At lease with a diversity of micro brands, pressure to replace the machines will be more evenly spaced.

Networking within the Office

Making the best use of an 'expensive piece of computer hardware requires hardware that gives access to the computing equipment. A number of alternatives are available such as the networking system being installed in the Department of Agricultural Economics at Davis.

The need for a local area network (LAN) evolved from the desire to improve user access to the department's computer system (VAX 11/750). As the users became more familiar with the system, they expressed the desire to have faster response from the computer than the 30 characters per second (cps) that their telephones and acoustic couplers would allow. The problem involved finding a way to allow up to 30 users to be connected to the computer at a higher transmission speed of 120 cps or, ideally, 960 cps.

Conventional solutions to the problem were to:

1. Buy 1200 baud modems for 30 users for a total cost of $15,000 to $21,000. Although this does offer a higher transmission rate it still requires the dedicated use of a telephone line.
2. Buy statistical multiplexors. This would also cost between $15,000 and $20,000 but this does offer a higher transmission rate. One disadvantage is that the multiplexors require dedicated lines to the computer.

The disadvantages of conventional solutions to communication problems are that the transmission speeds are less than ideal and the hardware does not usually allow for the expansion of future growth.

The Ethernet system consists of a family of computers, a coaxial cable, and software to handle the routing of information. The hardware for the system is a minicomputer dedicated towards communication with the VAX by means of the coaxial cable. The minicomputer will have 36 lines available for terminals, printers, and personal computers. The minicomputer will also have the capability performing simple tasks like word processing locally. The software for the system is being developed to conform to standards which will allow for the sharing of resources such as programs and data files. The advantages to this system are:

1. Computers of any size can be added to the cable when they are needed.
2. Users can share printers and disk storage devices.
3. Users will have high transmission rates.
4. The cost of $26,000 is low relative to the benefits.

Conclusions

The advantages of using microcomputers by agricultural economists are numerous. Having the independence from mainframes that frequently become overloaded reduces the frustration level and improves productivity. Having the ability to quickly interact with other computers of all sizes improves communications and promotes closer working relationships with colleagues. Departments and agencies should explore the opportunities created by installing networking facilities.

OBSERVATIONS ON THE EVOLUTION OF MICROCOMPUTER USE IN AN ACADEMIC SETTING

by

Edwin H. Carpenter*

Introduction

Perhaps it is true that the microprocessor has allowed more change to occur in a shorter period of time than any other invention known to mankind. What is probably equally true is that microprocessors, those little electronic chips that go together to make all sorts of computers and other sophisticated electronic devices, will allow (or force) even more change to occur at a faster pace than can possibly be imagined. The observations to be made in this presentation on the evolution of microcomputer use will reflect some of this technological change. And, no doubt, future change will render some of the observations useless, but they will be made anyway. Along with observations on the technical aspects of the evolution, it is inescapable that observations will be made about social and institutional changes as well, for they may be the more difficult to deal with over the long haul.

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Dumb Terminals and Word Processors

In the beginning, which was only a few years ago, a great deal of attention was being paid to the expensive--and then thought amazing--"dumb" terminals connected by telephone to mainframe computers, an innovation that allowed the user to instruct the mainframe from a remote location and dispense with the use of computer cards. Also on the scene were word processors, electronic marvels that were beginning to see widespread use and increasing acceptance even though they were very expensive and required a specially trained operator, the combined cost of which made it necessary to utilize them full-time in a word processing capacity in order to make them economically justifiable. Their high price tags made them virtually unaffordable by many academic departments, but their presence in some departments meant exposure to others and they, along with "dumb" terminals, helped to set the stage for the microcomputer that has since arrived.

High Expectations

As it turns out, the stage (the academic department in question) would have been better visualized as a seven-ring circus with all seven rings full of activity at the same time. Like in a circus, expectations were high, but unlike in a circus, none of the acts had ever been rehearsed; in fact they had never even been conceptualized. Manufacturers of microcomputer hardware and software, and to some extent retail vendors, were all busy making great claims for their respective products. The departmental (ring) leaders, known also as the professors of "high tech," believed that if a microcomputer could do nothing more than be used as a "dumb" terminal and a word processor, then it would certainly be worth the price. They also felt that microcomputers could do a lot more, so much so that several departmental staff positions could eventually be eliminated. "Surely," they thought, "it would only be a matter of a few months until all faculty and staff would have microcomputers sitting in front of them." Not only would each individual have his/her own machine, each machine would be a different brand and have different capabilities. After all, how else could an institution of higher learning serve its diverse clients throughout the state, as well as prepare its students for many different jobs, except to have at least one of each kind of equipment, and of course, one each of all the relevant software packages?

With such power at everyone's fingertips, the day-to-day routine matters of academic life would be streamlined if not revolutionized. Teachers would be able to have their students doing instantaneous "what-if" analysis for different management problems. Researchers would be able to do all their data entry and analysis independent of the mainframe. Theoreticians could repair to their armchairs and gaze endlessly at the reflection of their navels in the computer monitor as they entered their theoretical breakthroughs into the word processor. Departmental financial and administrative matters would be instantly available on request; for, after all, in the fast-approaching information age only those administrators who process large quantities of information rapidly and accurately would survive. And, of course, secretaries would all be word processors as well as data managers for their respective professors.

But the list of expectations did not end there; there was still the matter of getting the user and the microcomputer together. Certainly there would be little or no problem hooking various hardware components together. An eight-inch or five-and-a-quarter-inch floppy with its resident programs would work in any drive on any machine so long as it was the correct diameter, right? Advertisements about microcomputer hardware and software did not state otherwise and, besides, microcomputers were presumed "smart"; so the big remaining problem was to make sure the hardware looked nice sitting on the table. No low-status brands were allowed and no obviously cobbled together systems would be tolerated. Furthermore, since funds were tight, the equipment would be versatile and reliable. No more "dumb" terminals would be purchased when--for the same price--you could buy a fully equipped microcomputer, and no more dedicated word processor systems would be acquired since the initial capital outlay was the equivalent of eight microcomputers and the annual contract was equal to an additional machine.

Given these expectations about the hardware and software end of the enterprise of getting the user and the equipment together, it followed that the user would be expected to willingly do whatever was necessary to take full advantage of this amazing new technology that promised to simplify everyone's life and make us all more productive. With these expectations in mind (they were only slightly exaggerated) the microcomputers would be made available to the user.

The "High Tech" Professors Go Shopping

What Should Be Purchased?

Way back then (those few short years ago) the companies making hardware were limited mainly to Radio Shack, Apple, and Commodore, a small number to choose from compared to today, nevertheless causing uncertainty about what to purchase for the self-designated professors of the "high tech." The equipment finally purchased was potentially able, so the vendor said, to word process and produce letter quality print, be used as a "dumb" and "smart" terminal when connected to a mainframe, and do stand-alone computing, either from prepackaged programs or from programs written by the user. Word processing, it turned out, worked pretty much as expected after the requisite hours of learning were spent. Stand-alone computing also came along nicely, but only after the microcomputer's disk operating system was indelibly etched in the user's memory. Use as a "dumb" terminal became possible only after several aborted attempts were made to produce the correct set of linkages for the cable that connected the microcomputer to the modem that was in turn used to connect to the mainframe, but then only after the microcomputer software had its "switches" set so it could "talk" or "handshake" with the mainframe. "Smart" terminal use came about after days of reprogramming (rigging) a prepackaged piece of software that the vendor truly believed would work just as it came from its official looking cellophane package. Two years later, after many instances of characters being lost or garbled in transmission to the mainframe, the communications package could still communicate reliably with the mainframe on only those occasions when the mainframe was not too busy to "listen." These minor tribulations seemed not to bother the professors of "high tech" to any great degree, for they were off on a great new adventure. Another piece of hardware was purchased from the same company, the new improved model (of course), and it required users to learn a slightly different set of instructions for its operation. Oh well, no doubt this was the last major operating system instruction change that would have to be learned, so it was overlooked as another minor inconvenience, an inconvenience that was of about the same magnitude as having to repeatedly take apart and clean the connector on the main circuit board of the first microcomputer that was purchased.

Then it happened; along came a portable microcomputer with more memory than previous machines, an operating system that appeared destined to become the industry standard, and software packages for word processing, spreadsheets, BASIC programming and more. All of that in one bundle cost less money than was paid for one of the previously purchased hardware units, and it was PORTABLE!

At last, there was a truly versatile machine at a price for tight budgets, but there was no budget for capital expenditures at that time; so two of these potentially marvelous devices were lease-purchased, and the professors of "high tech" turned another corner on the adventure trail.

<u>User Burden Strikes!</u>

No doubt, that new operating system on the new machine would be the absolute last one ever to have to be learned since it was to become the industry standard. In spite of those hopes, the task of learning it became rather tedious due to less-than-well-written, not to mention inaccurate, documentation. Operating system errors occurred frequently and unpredictably, the small screen monitor caused eye strain, and static electricity produced from walking on carpeting would erase the contents of memory and thereby destroy any work that was in progress. Professors of "high tech" can endure just so much before even they recognise that they are victims of USER BURDEN, the malady that was fast becoming the Achilles' heel of the microcomputer world. User burden was recognized by the industry and adroitly couched in a more positive framework as "becoming more USER FRIENDLY," a phraseology that at least provided the user with some hope that things might become easier.

User burden comes in many forms and strengths and may keep a potential user from ever trying a microcomputer, or it may not surface until sometime after a user has become familar with microcomputers. One example of a particularly heinous form of user burden comes from the fear that a disk will crash or memory will "freeze" and all the work will be lost. A milder form of user burden is the inconvenience caused by having to do the floppy shuffle when all the information won't fit on one diskette. User burden, however, did not deter the professors of "high tech," for they felt confident that their initial expectations were still valid and that the industry's efforts to make equipment and software user friendly would ultimately allow their expectations to become reality.

More Purchases

So, out went the professors of "high tech" to purchase more hardware: a three-station machine and terminals for word processing, two more portables for research, then later five more portables for teaching, a plotter, dot matrix printers, letter quality printers, modems, and those ubiquitous connecting cables. Much of the hardware came bundled with software, but all along the way additional software was acquired. A large room was set up to house the data and word processing unit, a systems analyst/programmer was employed along with a data entry clerk (both of whom were primarily mainframe users), and a couple of capable students were employed as temporary technical helpers.

They say supply creates its own demand, and sure enough some of the faculty, staff and graduate students ventured into all sorts of microcomputer uses. With each user came a unique set of expectations and needs, and a full complement of user burdens, all of which needed immediate attention. "Why won't this printer work with that portable?" "Can't this software be used on that machine, they both use the same operating system?" "The picture won't come on the screen, what's wrong?" "The disk with three hours work on it crashed, what can be done?" And on and on it went! All of a sudden it seemed that the professors of "high tech" were up to their proverbial posteriors not in alligators, but in users and their burdens.

Management Burden Strikes

Virtually every moment the professors of "high tech" were in the office, they were engaged in one capacity or another with microcomputer hardware, software, or its users. They spent hours running install programs so that software packages would execute correctly on the various pieces of hardware. They applied their limited technical expertise to evaluating what was malfunctioning when a system went down. On the way to and from work they were picking up or delivering equipment, both new and broken, to the computer vendors' stores, as well as keeping up with what was newly available. The professors of "high tech" found themselves actively engaged in an enterprise that was far afield from their professional expertise and thereby wondering how their futures would be affected. Was it all worth it?

Expectations Realized

The answer was a qualified "Yes." Finally, some of their expectations were beginning to be realized. First and foremost, the professors of "high tech" were beginning to understand what microcomputers and people were likely to be able to accomplish together, mainly those tasks that have to be done on a frequent basis. Seventy-five percent of the secretaries were word processing with reasonable ease, with new secretaries able to come up to speed quickly, since everyone was using the same word processor software and therefore able to get support from the secretaries that already knew the software. Students were, in fact, doing instantaneous "what if" analysis during their computer lab sessions. Researchers were doing stand-alone analysis on the microcomputers while using them as "smart" terminals for data input to the mainframe and "dumb" terminals for executing analysis on the mainframe. Additional expectations are in various stages of being realized, such as most faculty doing their manuscripts, a task that as yet carries a lot of burden relative to a pad of paper, a pencil and a secretary that will type while correcting grammar, punctuation and spelling.

Down the Road

The professors of "high tech" see, to the extent the crystal ball's haze will allow, several factors that will impact user burden and thereby management burden. The user is expecting reduced burden, and therefore a market exists for things like software that allow one microcomputer to read and write diskettes in another microcomputer's format, a development that provides flexibility among different types of hardware. Integrated software packages provide the user with many diverse functions while requiring the user to learn only one set of commands. Hard disks, ram disks, print spoolers, and faster processing speeds help reduce user burden. Machinery is generally becoming more powerful, and thereby capable as well as versatile, while prices are dropping. This means that any one piece of equipment will be able to perform more diverse functions better. Ultimately, by adding to the mix the use of artifical intelligence, it is suspected that users will be only vaguely aware, if not unaware, that microcomputers are being used to help them perform their various tasks. When the day comes that the hardware and software are so friendly as to be burdenless and therefore transparent to the user, then perhaps all the expectations of the professors of "high tech," however naive they were initially, will be realized.

OPPORTUNITIES TO PURSUE

by

Walter J. Armbruster*

A number of observations come to mind from the discussions over the past two days. Some have to do with cooperation across regions or throughout the U.S., while others may be applicable to individual states or agencies as well.

What is Needed?

There is a need to carefully assess equipment needs, data base requirements, and particularly--in fact probably first--the objectives of the entire computer system. Research, extension, and teaching responsibilities must be considered in making these determinations. We need to be concerned about coordinating these assessment efforts across states and between various federal and state agencies or institutions. The regional computer institutes are attempting to do that across states within a region. USDA seems to be doing that within its own house. How can these assessments be coordinated between USDA (and other Federal agencies) and the states?

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Who Should Be Involved?

ERS, CSRS, and Federal Extension Service need to be involved in interfacing activities, along with agricultural economists representing research, extension, and teaching in each region.

We heard that ASCS is developing some software to allow farmers to evaluate their potential participation in various programs. This could be competitive with extension education efforts. But it may provide a real opportunity for state extension personnel to work with ASCS to use ASCS data in education programs. There is need to think about uniform formats and input requirements to make it work throughout the U.S. And there is opportunity to integrate policy research results into the evaluation approaches.

To better integrate the extension, research, and agency efforts designed to serve the agricultural community, leadership should come from the agricultural economists engaged in policy research, extension programs, and agency analytical and advisory roles. These people can help design programs that may be much better than if the coordination is left by default to the administrators or designated representatives who may or may not be economists.

How Can Such Coordination Be Organized?

One method of coordinating would be to work through AAEA as a professional body. That mechanism may avoid problems related to more complex administrative approaches but would be the most loose knit.

Another coordinating mechanism is a regional research project, but it may be difficult to design the objectives to adequately incorporate extension and teaching concerns. In addition, budget problems may preclude approval of a new regional project. Even though provisions are made for participation outside the region, the need to involve states from throughout the U.S. complicates administering a regional project.

Perhaps the most manageable coordinating mechanism would be for interested federal agencies to take the initiative, working with the established regional computer centers to bring in researchers, extension workers, and teachers. Farm Foundationmay be able to facilitate this approach and perhaps Kellogg would also be interested.

Regardless of the structure used, the initiative will have to come from a few interested individuals willing to put together a proposal or series of proposals, facilitate communication, or organize periodic conferences.

What Format for Exchanges or Coordination?

We need to think about maximizing use of computer technologies to carry out the coordination and exchanges needed. For example, the proposal discussed by Ron Knutson for exchange of extension policy analyses and educational programming appears to have much merit in timeliness, cost effectiveness, and drawing on the best persons and resources.

If one of the existing communications systems can be utilized, a guiding committee may be necessary in addition to the source commitment needed at the federal level. The National Public Policy Education Committee has established a committee, but it may need to be supplemented with research members or a parallel committee--maybe organized under AAEA auspices--rather than counting on that committee to coordinate with researchers. As Russ Gum said, standards may be needed to evaluate various policy efforts.

Areas other than policy also need to utilize the electronic communications potential, but individual initiative such as that taken by Ron Knutson and Jim Richardson on policy would need to be taken. Leadership in fact is going to be the critical element in where things go in research, extension, and teaching related to computers in agriculture and agricultural economics.

What Should Be the Objectives of Coordination?

I think the stated objectives of the North Central Computer Institute capture in broad terms what objectives are important as we look at where to go in computer use and interface among agricultural economists. We need to explore innovative and feasible methods to pursue the objectives of:

1. Joint software development and sharing.
2. Research on computers and sharing the results.
3. Database development, with particular emphasis on compatibility and usefulness for many purposes.
4. Computer education.
5. Information exchange.

Achieving these objectives will not be easy. Much coordination, leadership, cooperation, and hard work remain before we achieve the goal of improving our capability to serve our clientele--be they farmers, rural residents, agribusiness firms, public policymakers, or students. We need to continue our efforts to incorporate the current and developing computer technologies to make our research, extension, and teaching functions more efficient and continuously better.

The Oregon State University Extension Service provides education and information based on timely research to help Oregonians solve problems and develop skills related to youth, family, community, farm, forest, energy, and marine resources.

Extension's agriculture program provides education, training, and technical assistance to people with agriculturally related needs and interests. Major program emphases include food and fiber production, business management, marketing and processing, and resource use and conservation.

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