AN ADMINISTRATIVE PERSPECTIVE ON MICROCOMPUTERS FOR AGRICULTURAL RESEARCH AND EDUCATION

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INTRODUCTION

> The computer is possibly the most significant technological innovation during the 1980's in American agriculture. (ECOP, p.1)

Most of us involved in agricultural research and education are aware of the tremendous aid to our work computers have provided over the past 20 to 25 years. But the innovation to which ECOP refers—the phenomenon of the microcomputer in agriculture—is just now unfolding.

For almost a century, we have developed in this country an impressive and productive network of agricultural teaching, research and extension. During this span of time, many changes have been wrought upon American agriculture; agriculture has evolved as a science. As a consequence, U.S. agriculture feeds our citizens for less than 20 percent of the average family's net income and provides the buffer between starvation and survival for many other people in the world. We have successfully met, harnessed, and even instigated changes for the betterment of mankind. However, this is in retrospect. The issue today is how to best meet yet another change—the evolution and increasing use of the microcomputer in our homes, on our farms, and in our agribusinesses.

This change, as is so often the case, has taken us by sudden force. It is hard to appreciate the fact that this wonder machine was developed and introduced into our society less than 10 years ago. The average agricultural administrator today recognizes this force and something of its awesome potential for American agriculture and for our land grant system of research and education. He or she also typically suffers sudden pangs of discomfort throughout the day (and night, perhaps!) over what to do about all of this. There are now many more questions than there are satisfactory answers relating to the microcomputer and what it can and should mean to us. We view the microcomputer with mixed feelings—it is a potentially powerful tool for managing our homes, offices, and farms, yet it is a stranger whose character and basic nature change rapidly. The microcomputer is so new and complex that making close acquaintance and developing understanding of it is very difficult.

Many of us grew up in an era when the IBM 650 was king and one unit served the entire university. In many respects comparable in capacity and capability to the IBM 650, the microcomputer is rapidly coming to the fingertips of each educator, farmer, and housewife, and in a dazzling array of sizes, shapes, brands, and capabilities. No wonder the typical administrator alternately worships, curses, ignores, questions, lauds, and criticizes the microcomputer before turning the whole issue over to a committee or trusted expert.

ABERRATION OR REVOLUTION?

Among the reservations and concerns of administrators relative to the microcomputer and its use in agriculture has been the question of reality and permanence. Is the microcomputer only a fad, or is it really here to stay and plague us, and to find its place among us as a tool of management? By now, most of the agricultural administrators with whom I've talked and whose views I've read agree that we truly are in the midst of a revolution. Based on these expressed views, on my own limited experience (and very few of us have had much experience in this area), and on mounting evidence in the form of sales and cries for help in using microcomputers, I submit that we must begin yesterday to plan, invest, integrate, and manage our affairs accordingly. Another quote from the recent ECOP report reads:

> For the first time in American, and world, history, *management power* can be put directly on the farm with added productivity and increased efficiency as the significant end results. (p. 1)

Among administrators, the key question, and one with many facets, is how best to go about making this happen most propitiously.

MICROCOMPUTERS IN RELATION TO OUR MAJOR FUNCTIONS

Our major functions—teaching, research, and extension—each share a common set of challenges and concerns, yet they face diverse sets of unique challenges. The revolution is common to each function,

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bringing similar responsibilities, frustrations, and opportunities. We must once again meet sudden change by joining hands. However, teaching, research, and extension each face a somewhat unique set of circumstances concerning the use of microcomputers as reated to their particular functions.

Teaching

A tremendous challenge and opportunity faces our teaching component—that of generating computer literacy in our graduates. Gone are the days when we can justifiably do anything else. And the teaching responsibility also extends to developing computer literacy, or at least an appreciation, among our teaching, research, and extension faculties (yes, administrators are included).This will include decisions regarding courses, new faculty members, hardware, software, and software development skills. How much computer expertise to require of our graduates must also be determined. And how do we equitably reward those faculty members who consult with other faculty or who develop software? This new educational effort calls for changes which we typically regard as evolutionary or long-term, not revolutionary. And yet, in the midst of the microcomputer revolution, some revolutionary changes are warranted.

Research

As with many of our endeavors, research programs share in some of the responsibility of training students to conduct research with the aid of the computer. Making the correct selection of computers and related equipment for use in conducting our research programs is a major challenge. In making the selection, administrative and publications uses must also be considered. Also, especially for research, the question of interfacing with both teaching and extension programs, particularly those concerning computer purchase and usage, poses a special challenge. To what extent do we "stay compatible" or "go it alone?" In what methodological and developmental software research should we be involved, and how do we properly reward those involved in these efforts?

Extension

In addition to considering questions of appropriate equipment and software for maintaining programs, disseminating information, and administering the entire operation, extension bears the major brunt of the uncertainty as to how to best serve the public in using microcomputers. The housewife with her new microcomputer has always been able to call on her friendly home economics extension agent in similar predicaments. Will she again be able to obtain the necessary software to really use the new purchase or perhaps the help to make the initial hardware purchase? This is not likely at present. The same is true for the farmer. In Arkansas, we very often encounter a progressive farmer who has a new microcomputer, but who does not have the knowledge to use it. I believe that this is typical.

Again, the specter of additional training arises. How much additional training should be provided? What is the best way to obtain the training? Who do we train? What gets sacrificed to afford the training? How long can we take to "come up to full speed?"

Also, what is extension's role in providing software for microcomputers? This has to rank as one of the major challenges facing us—the division of labor between the public and private sectors in making software available and in maintaining it for our clientele.

Recent estimates available through ECOP (p. 5) indicate two significant things: (1) some of us are already giving this issue very serious thought, and (2) the cost will be considerable. As much as 5 percent could be added to the state's extension budget (an estimated $54 million annually on a national basis) to add the new computer-based delivery system, which would be limited to technical personnel, and to provide equipment to assist *existing staff* in developing software programs.

COPING BY ADMINISTRATORS

The microcomputer specter has administrators scrambling. There is an aura of anxiety among us. But early signs of responsible coping with the complex issues are beginning to appear. This meeting and the meeting of the Southern Directors of Agricultural Experiment Stations and of Extension Services later this week are evidence of responsible activity. The North Central Directors of Experiment Stations and of Extension Services have developed and adopted a set of administrative policies for computer-based information systems to help each state and institution. The W. K. Kellogg foundation continues to provide financial backing and direction to regions and states through its grants program; the North Central Computer Institute has been established and is immersed in activity designed to help us with hardware, software, and related issues; a feasibility study is underway in the Northeast region and another one is underway in the Western region. Here in the Southern region, emphasis is on use of our regional structure to assist us in coping with these computer-related issues.

Recently, a quick, informal survey of institutions across the country indicated that while more institutions are beginning to work on software questions relating to patents, copyrights, peer review of software programs, and appropriate rewards (promotion and tenure credit) for software development, very few (less than 10 percent) have actually developed and adopted policies in these areas.

As with any other decision-making process, various administrators are handling the microcomputer revolution differently. Very few are sufficiently well versed to personally lead the charge, sort out the relevant from the irrelevant issues, and set policy. Most are dependent to a large extent on faculty and staff for the technical input for day-to-day decisions and for

development of policy regarding hardware, software, and related issues. Special task forces and standing committees also are being used to help structure and guide computer-related decisions.

As I indicated earlier, coping will be expensive; we're talking about big resources in dollars and people. And the revolution has begun at a most difficult time for most of us. Both dollars and people are especially scarce within our land grant system these days. This puts the administrator into an even more severe bind to do all of the things that he or she knows should be done and to do them as quickly as possible. Responsible coping is beginning to occur, but we have a long way to go, and it will involve considerable time, pain, effort, and expense.

SPECIAL CHALLENGES

Finally, there are several dimensions to the administrator's challenge regarding the use of microcomputers in agricultural research and education; thus, perspectives on microcomputer use are multifaceted. A few of the more challenging issues confronting us follow.

Hardware

Technological changes are occurring so rapidly in hardware availability, capability, and cost that it is difficult for an expert, much less an administrator with limited computer knowledge and more than computers to manage, to stay abreast. The two primary challenges are decisions regarding hardware purchases—kinds, amounts, priority uses—and long-term planning and budgeting for adequate equipment. Typically, an institution has technical competence available to judge individual purchase decisions; the crunch comes in managing for overall efficiency across the institution through time.

Software

One thing is clear relative to software: it is and will continue to be a key element in harnessing the microcomputer as effective management power. But the collective task is gigantic, considering both the development and maintenance aspects as well as the numbers of potential clients. Some thought has been devoted to the issue, but the question regarding the division of labor between the public and private sector in developing and maintaining computer software is largely unanswered. In general, many administrators, I believe most administrators, see a very heavy dependence upon the private sector in providing software for microcomputers in homes, on farms, and in agribusiness.

Coordination Within

How can teaching, research, and extension best coordinate efforts to optimize internal and client usage of the microcomputer? Administrators at all levels are, or need to be, facing this issue. Compatibility within agriculture is important with respect to software, reward or professional credit for software development, and hardware to some extent. The internal coordination needs to be provided before much can be accomplished toward coordination across state lines.

Coordination Among States

The north central states appear to be out front in coordinating efforts across state lines. The North Central Computer Institute provides one very significant mechanism for coordination. Perhaps the diversity of approaches to interstate coordination now occurring in the various regions is a plus. Hopefully, one or more viable approaches to coordination can be forged from the activities now underway.

Cost Effectiveness

As with most management situations, cost effectiveness is a challenge to administrators as they cope with the microcomputer revolution. Although the computer industry has provided for a great deal of technical and cost efficiency in computer hardware (a major reason for the revolution), the cost of providing adequate hardware and software and the related faculty expertise within our institutions are still very high. I believe we must depend upon private industry not only to continue making hardware available to agriculture at a reasonable cost but also to effectively provide the major access to software through time. Even so, our institutional role remains significant, expensive, and subject to close scrutiny for cost effectiveness.

SUMMARY

In summary, still another major change is suddenly upon agriculture and the land grant system. Microcomputer usage is a revolution, and it is here to stay. It confronts each component of our trio of functions: teaching, research, and extension. Some challenges are shared among these functions and must be confronted jointly; others are somewhat unique to a given function. Administrators largely have been taken from the blind side, but are showing signs of at least a willingness to cope. Policies must be developed, largely through joint efforts among teaching, research, and extension administrators, to face hardware, software, coordination, and cost effectiveness challenges. The reward could be fantastic, the ushering into agricultural pursuits of yet another force for human betterment—management power.

REFERENCE

Extension Committee on Organization and Policy. "The Computer: Management Power for Modern Agriculture." Purdue University, 1982.