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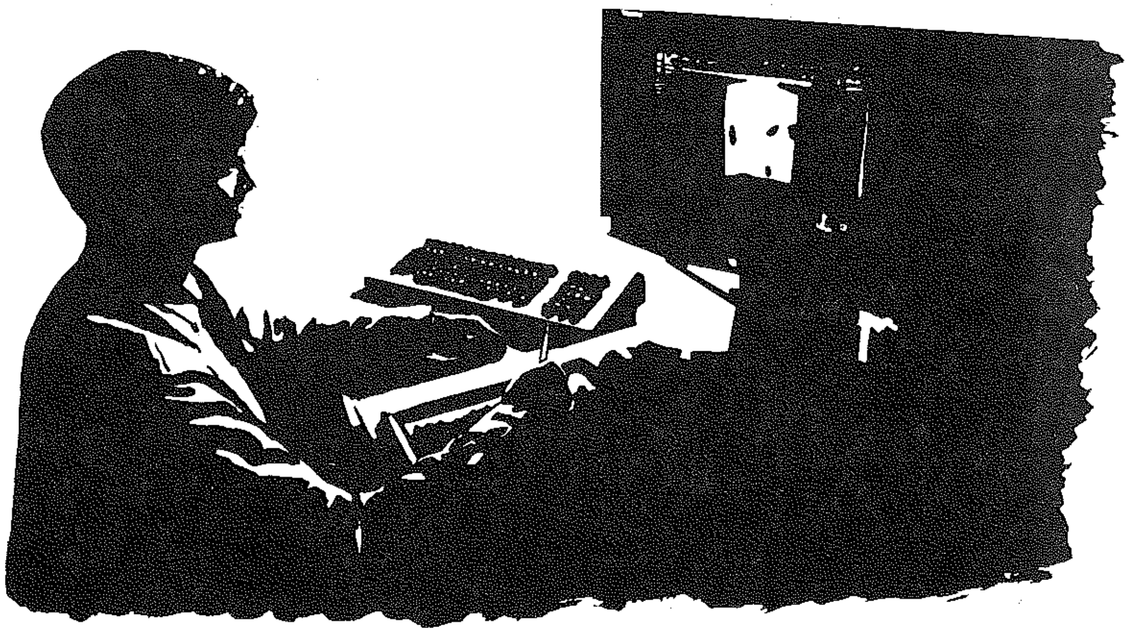

# THEME: Future Programs of Agricultural Education

THE
# AGRICULTURAL EDUCATION
MAGAZINE

December, 1985 Volume 58 Number 6



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Articles and photographs should be submitted to the Editor, Regional Editors, or Special Editors. Items to be considered for publication should be submitted at least 90 days prior to the date of issue intended for the article or photograph. All submissions will be acknowledged by the Editor. No items are returned unless accompanied by a written request. Articles should be typed, double-spaced, and include information about the author(s). Two copies of articles should be submitted. A recent photograph should accompany an article unless one is on file with the Editor.

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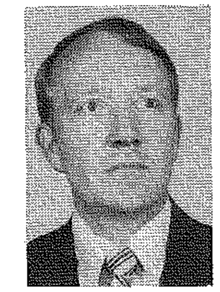
# Ferried on a Tributary



BY LARRY E. MILLER, EDITOR

*(Dr. Miller is a Professor in the Department of Agricultural Education at The Ohio State University.)*

A last editorial must be prepared — the last chance in this forum to share thoughts and concerns, although, I hope, not the last chance to share through this publication. I have asked myself, "what concern is worthy of presentation in this my final issue?" I attempted to step out of the role of a professional in agricultural education and view our efforts collectively in order to identify that concern. My synopsis focused upon the lack of innovativeness in the profession.

### Dispensers or Acceptors of Change

I characterize my concern by labeling the profession as being stoically indifferent to innovation. Surely, this is a strong statement meant to stir thought. The statement is specifically meant to address our willingness to accept change. Agricultural educators are meant to be change agents and assist with technology transfer. We define learning as bringing about a change of behavior, and we religiously plan and evaluate our programs with this process in mind.

Are we as willing to be the recipients of, as we are to be the dispensers of change? I perceive that we are not. We teach students to accept challenges, to dare and to take calculated risks; but we seldom do ourselves.

Change has occurred throughout the profession; however, it typically only occurs when it is a part of mandating legislation. We can go/grow beyond what is prescribed. Perhaps there is too much safety in continually just going on doing what we have been doing. Glances are cast askance at the vocational agriculture teacher that breaks with tradition and does something a bit differently, at the state supervisor who wants to administer in a manner outside the norm, or at the teacher educator who proposes a teaching philosophy other than the way we were taught.

We are afloat as a viable program, but innovation is the motor to the boat and our horsepower is often lacking. We are, more often, the ferry that is tugged from one side of the stream to the other by the legislation. I would even liken our stream to a tributary and not in the flow of the main waterway of education. We are anchored by the ferry lines of legislation to running back-and-forth, year-after-year as the stream continues to flow by us.

Dare we cut the line and trust ourselves in the free-flowing waters of the tributary or the stream and eventually the main waterway? My view does not show that we are willing to break with traditions.

Just consider a few examples. Why do we continue to conduct contests for vocational agriculture students in areas where the knowledge/skill are no longer needed in the occupational area? Secondly, why was "Agriculture in the Classroom" an outgrowth of the USDA and not from the community of agricultural educators? Why are we not at the forefront in delivering adult education in agri-industry?

### Seeking Opportunities

When one considers innovation, the rationalization that those at the helm control the direction comes too easy. We need dynamic, forward-looking leadership, but those handling the oars certainly can help determine direction and speed. Each crew member must participate but I perceive too many dozing below deck.

The vocational legislation even provides for funding of innovative/exemplary/pilot projects. Yet, only 4.9 percent of the projects funded could be identified as being related to agricultural education (Arthur and Budke; 1980a, 1980b). Such a paucity of projects would indicate that we do not seek innovative opportunities when they are provided for us.

Ingenuity often characterizes what we do day-to-day in our programs. Teachers and others develop unique ways of doing many of our duties. We seem, however, unable or unwilling to apply ingenious techniques to our total program.

### The Future

My concern may also involve program definition. The question being "can we conceptualize agricultural education in a broader context which goes beyond vocational education in agriculture?" We are one part of an educational system in agriculture. I maintain that we can help provide service to and educate those not enrolled in vocational agriculture. We should have a role in the broader mission whether it be in the international arena, adult education in production agriculture or agri-industry training, and/or elementary education. I hope this issue which relates to our future helps provide us with some new directions, thoughts and challenges for the future.

### Change of Editors

Being the editor of this publication carries many rewards. I have been privileged to work with numerous outstanding people. I have appreciated the opportunity to serve the profession and hope I have contributed in some way to its betterment.

As Blannie Bowen assumes the duties of Editor, I challenge the members of the profession to read the

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magazine, write articles for it, encourage others to subscribe, and to share your thoughts with the new editor. We are indeed fortunate to have the magazine as a means of sharing knowledge. We need to support it more fully.

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THEME

# Future Programs of Agricultural Education

The future! We often think that if only we knew what the future held in store we would be more capable of adjusting to it. We could begin now adapting vocational-technical education in agriculture!

But we do not know the true nature of the future, and it is likely that we are better off not knowing. There are certain events in our future that we are better off not knowing, such as our own deaths.

Fortunately, we are able to engage in the futuring process. This allows us to not only anticipate the future but also to engage in activities to shape the future. And this may be far better than knowledge of a specific future!

## The Futuring Process

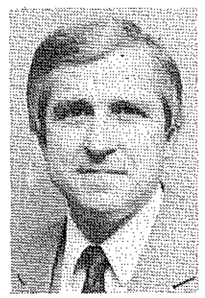
Futuring is far more than long-range planning and forecasting. And this makes it a more complicated process!

Much has been written about the future and futuring in recent years. The World Future Society publishes materials, holds conferences, and involves itself in other activities related to the future. The honored education fraternity of Phi Delta Kappa has been engaged in a futuring activity in the field of education. (See the *Handbook for Conducting Future Studies in Education* published by the Phi Delta Kappa, 1984.) Other futuring efforts could be cited.

The most recent national-level effort to look at the future in agricultural education was a seminar held in Kansas City, Missouri, in July, 1980. Proceedings of the seminar were compiled and distributed nationally. (The proceedings were *Agricultural Education: Shaping the Future.*) No national-level futuring activity for vocational-technical education in agriculture has been held since the 1980 seminar. Certainly, our profession could derive considerable benefit from an immersion in the futuring process.

Futuring takes a broad approach to the future. It is more than long-range planning, which often involves little more than the tentative allocation of anticipated financial support. It is more than forecasting, which is concerned with the probabilities that certain events will occur in the future and is a prerequisite to futuring.

Futuring involves using forecasts but it focuses on a broader picture which provides for alternative futures. We



By Jasper S. Lee, Theme Editor

*(Editor's Note: Dr. Lee is Professor and Chairman of the Department of Agricultural and Extension Education at Mississippi State University, P.O. Drawer AV, Mississippi State, Mississippi 39762.)*

can make decisions about what we want to do or be in the future. Events are interconnected and can be prioritized in the futuring process. The future, at least to some extent, can be designed, shaped, and controlled. (We participate in such a process every time we put part of our income into a savings account or encourage a person to get more education. In these, we are engaging in activities which shape our place in the future.)

Techniques used in futuring are brainstorming (to get an unevaluated list of possible futures); the Delphi technique (to try to get some sort of agreement on likely events among at least a small group of individuals); a futures wheel (provides likely consequences of a trend); cross-impact matrices (identify consequences of events upon other events); and scenarios (written descriptions of the future which rely on the other steps in the futuring process). These techniques in futuring are described in the previously mentioned Phi Delta Kappa *Handbook.*

## The Impact of Legislation

Future programs of vocational-technical education in agriculture are being shaped by a number of trends and actions. Paramount among these are the policies set forth by various governmental divisions and agencies. The most recent consequential action was the passage of the Carl D. Perkins Vocational Education Act. This Federal legislation will likely have considerable impact upon programs in the late 1980s.

The Perkins Act was passed in October, 1984, and contains a number of provisions which will influence the future of vocational-technical education in agriculture. The consequences of the provisions are, to a large extent, up to the profession. How we are involved and respond to



the provisions will have a big impact on our future. Further, it is evident that the authors of the Act wanted vocational education to have a "future orientation." Stress in the Act is on assuring access of all individuals to vocational-technical education and on improving the programs. To maintain programs as they are now is not sufficient, and no funds for maintenance are provided. Even though very little Federal money reaches local programs, this provision is likely to have far-reaching impact. (Perhaps the language in the Act is based on our sometimes behavior of being content with the status quo.)

## Other Sources of Impact

The future of vocational-technical education in agriculture will be shaped by changes in education, agriculture, and society in general. This behooves each of us to stay up-to-date on educational as well as agricultural matters. Further, it behooves us to be aware of the societal changes about us.

Moving into the information age is certainly going to have a big impact. Keeping up-to-date on events in the world around us will require a concerted effort from each individual. Having information is important. As many as 20 percent of the citizens in the United States lack sufficient information to function as viable individuals in the mainstream of economic and social endeavor. This is creating a phenomenon known as "information poverty."

## This Issue

The authors of the articles in this issue of *The Agricultural Education Magazine* address various areas of vocational-technical education in agriculture and the agricultural industry from their perspective of the future. Some employ the scenario approach; others use a forecasting approach. Regardless, readers should find relevant content for their particular interests in agricultural education.

## The Cover

Students in the classroom of tomorrow may have several devices at their individualized learning stations. Students may be issued their own telecommunications passes in order to receive video images from national databases. Drawing courtesy of Marilyn MacMillan, AAVIM.

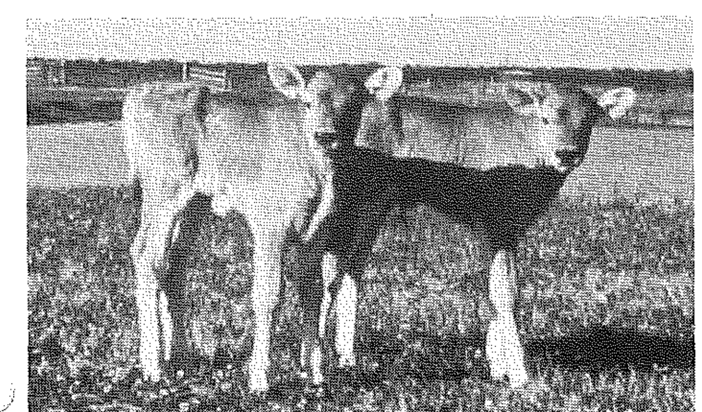
THEME

# Future of Agriculture

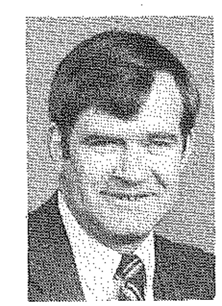
In 1896, William Jennings Bryan said, "Burn down your cities and leave our farms and your cities will spring up again as if by magic, but destroy our farms and grass will grow in the streets of every city in the country." This quote vividly portrays the importance of agriculture to America and the world in which we live. Our nation has prospered for over 200 years. Agriculture has been one of the major reasons for that prosperity.

## Our Heritage

Before we can look to the future, we must understand our past and have an appreciation for the present. History tells us that at the turn of the 19th century, farmers made up over 90 percent of the U.S. labor force. Today, Amer-



**Twin calves produced by splitting one embryo. The calves are genetically identical and were carried by two separate surrogate mothers. (Photograph courtesy of the LSU Animal Science Department.)**



By Danny L. Cheatham

*(Editor's Note: Dr. Cheatham is an Associate Professor in the Department of Agricultural and Extension Education at Mississippi State University, P.O. Drawer AV, Mississippi State, Mississippi 39762.)*

ican farmers make up less than 3.5 percent of the labor force. In 1800, the average value of agriculture exports was $23,000,000 or 75 percent of the total exports. Today, the average value of agriculture exports exceeds 18 billion dollars and accounts for approximately one-fifth of our gross national product (GNP). More than 23 million jobs are generated from agriculture, the nation's largest and most important industry. The American farmer produces enough food to feed 76 people, representing 51 domestic individuals and 25 foreign individuals. We have one of the cheapest food policies in the world. The United States spends less than 16 percent of its disposable income on food while other nations spend anywhere from 20 percent to as high as 60 percent.

How have we prospered? Statistics show the number of people involved in farming has decreased. The number of farms has decreased. The family farm is in jeopardy of becoming extinct. Obviously, the answer is because of research (knowledge and technology) and education. What American farmers have lost in numbers they have made up

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## Future of Agriculture

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for in increased productivity which has come from increased knowledge and technology provided by research and education.

According to Orville Bentley, Assistant Secretary for the Science and Education Administration, USDA "agriculture is a dynamic industry and has been on the high-tech tract for at least three decades." Our record of achievement during the past 50 years is impressive. We have seen mechanization in production agriculture occur, the acceptance of hybrid corn and dwarf wheat, and new chemicals which make it possible for farmers to control insects and diseases and maintain soil fertility.

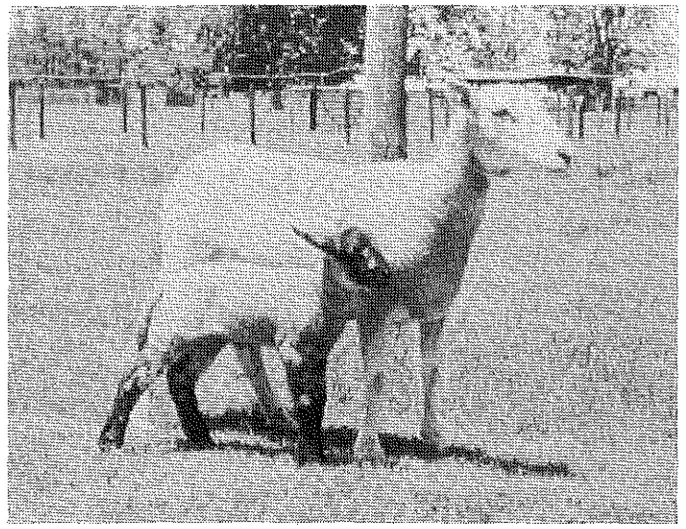
We have seen increased knowledge in the area of animal nutrition and balanced diets which have led to increased productivity. Microcomputer technology has increased the producers' management capability and made more time available for decision making. There are many other areas where changes have occurred resulting from new knowledge and technologies. Yes, our past has been prosperous and has generated sufficient knowledge and technology to meet the changing needs of agriculture.

### Our Future

But what about the future? Can we sustain this growth? Will new knowledge and technology be sufficient to keep American agriculture moving forward and meet the needs of the 21st century? These are questions which are difficult to answer, but based upon our past accomplishments, the answer is yes to all.

Looking down the road to 1990 and beyond involves taking into account uncertainties focusing on technological developments. Producers in America have demonstrated the ability to change and adjust.

Shifting economic conditions, world politics, and government policy will certainly play an important role in determining the future of agriculture. Technology alone cannot make the difference. Let us take a look at some of the exciting possibilities that researchers say may be occurring in the 21st century.



A surrogate mother impregnated by embryo transfer with the lamb she carried through pregnancy. (Photograph courtesy of LSU Animal Science Department.)

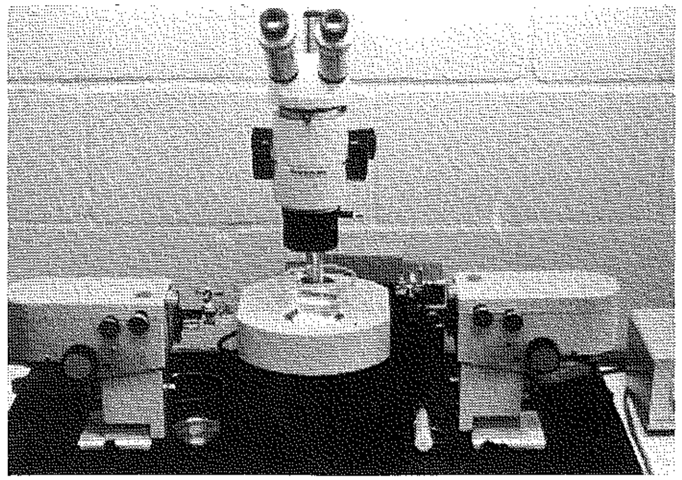
The development of new technology is exciting and probably has never been greater. Biotechnology, including gene transfer, recombinant DNA, and tissue cell culture techniques have tremendous promise and are receiving special attention around the world. Many agricultural biotechnological companies are international in scope. This technology is far reaching and has tremendous potential impact in the agricultural plant and animal area.

### Plant Applications

Some potential areas of impact coming from biotechnology in the plant area include bioregulated selection of desirable traits in plants and higher plant yields through bioregulation and tissue culture technologies. These processes have the potential to reduce the amount of time needed to develop new and/or improved varieties; thus, shortening the amount of research time needed for development. More specifically plant breeding, genetic engineering and plant growth regulators are expected to produce higher yielding crops. The use of recombinant DNA, also referred to as gene splicing, and plant tissue culture are expected to rapidly increase the development of superior plant varieties. This technology increases the likelihood of disease resistant crops and plants which are less susceptible to insects and other pests.

The environment, climate, weather and pests will have less effect on new, more resistant varieties created by biotechnology research efforts. Genetic manipulation of various plants has the potential to improve the rate of photosynthesis; thus, speeding up plant growth rates. Faster growth rates will allow double cropping and production of crops in regions where growing seasons are currently too short or the environment is to hostile for adequate growth. Improved seed treatments or genetic alteration of plants and their seeds may reduce the cost of applying chemicals to field crops; thus, resulting in less dependence on chemical pesticides and fertilizers.

The ability to genetically manipulate the structure of plants can have a far reaching effect. The future holds the promise of nitrogen fixing capabilities which could reduce the need of plants for nutrients from the soil or as supplied by fertilizers; control over ripening of fruits and vegetables; thus, maintaining harvest quality through processing, transporting and marketing; and finally improved quality and nutritive value of small grains for animal and human consumption.



Micro Manipulator-Equipment used in embryo manipulation. (Photograph courtesy of LSU Animal Science Department.)

### Animal Applications

Technological improvements in animal production point to increased growth rates, more efficient use of feed, increased disease resistance, and more offspring per animal through improved reproduction techniques, including embryo transfers. Through animal genetic engineering, we are likely to see a genetic package exhibiting uniform characteristics such as sex, weight, age, genetic background, and feed efficiency characteristics. This technology will allow the producer to develop a specific product for a specific market and improve the coordination of production and marketing and contractual relationships with the processors.

Recombinant DNA technology, along with embryo transfers, has tremendous potential in improving animal health and productivity. The development of vaccines and interferons will likely provide protection against various animal viruses and diseases. Annual milk production for dairy cattle could increase almost four times that of today's average. One genetically superior animal might produce dozens of offspring each year through the process of cloning and twinning; thus, decreasing the per calf cost of maintenance and ensuring a superior quality animal. Altering sex ratios in animal offspring is another promising technique. This process will allow the producer to develop a breeding program that will produce offspring, male or female, as desired.

### Mechanical Applications

Mechanization will be more important in the future. Automated tillage and harvest systems will likely be more expensive and complex but have the potential to increase efficiency. The ability to make automatic height adjustments over uneven terrain will speed harvest time, lengthen the life of equipment and ensure a more complete harvest. Microcomputer technology will allow for automatic adjustments of equipment speed based upon terrain while at the same time monitoring fuel consumption and making appropriate adjustments based upon desired work rate.

The computer, built into the harvest machinery, will handle the ability to measure in the field crop ripeness and moisture content thus allowing a more precise harvest schedule which might enhance crop storability and save energy costs for crop drying. Tractors with on-board computers with a number of different sensors to monitor fuel flow rate, power output, transmission settings, draft and position of the implement being pulled will allow for minimization of fuel consumption and optimization of the work required; thru, creating efficiency.

Today, most all modern equipment has some type of computer or electronic device designed to make the equipment more responsive to the needs of the farmer. However, this equipment has not yet proved its reliability and, thus, has had a negative effect in the mechanization area.

Electronic devices of the future will be more reliable, cost effective, and make a functional contribution to the user. Controlled traffic, automatic guidance, engine draft, and tractive efficiency control are just a few of the areas where likely break-throughs will occur in the agricultural mechanization area.

### Information Applications

Anyone writing about the future of agriculture must mention electronic technology. Communications and information management are key areas for the American farmer. These areas will likely exert a great influence on the farmer of the future.

The margin between profit and loss is razor thin and with the appropriate use of computer technology and access to related knowledge, the farmer can make wise management decisions which will hopefully be sound and correct. We are likely to see producers with microcomputers with decision making software to assist them in making those tough decisions needed to survive in the farming business. The computer will allow for options to be explored prior to making dollar investments.

Agricultural information data bases will become more prevalent. These data bases will provide current information to the farmer for use in decision making. Information relating to weather, marketing, and research related findings, appropriate chemicals for use with different crops, and the list could go on and on, will be at the finger tip of the farmer. It has been said that we are in a knowledge explosion and that knowledge is power. If this be the case, obviously, electronic technology will play an important role in shaping the future of agriculture.

### The Horizon

The changes that are on the horizon are exciting for agriculture. We are embarking upon a new age. To cope with new technologies and anticipated change, we must have an understanding and appreciation for its use in our profession. The more we understand the potential changes of the future, the better we are able to accept the change and assist in teaching and disseminating of the new knowledge and technology which hopefully, will make our world a better place to live.

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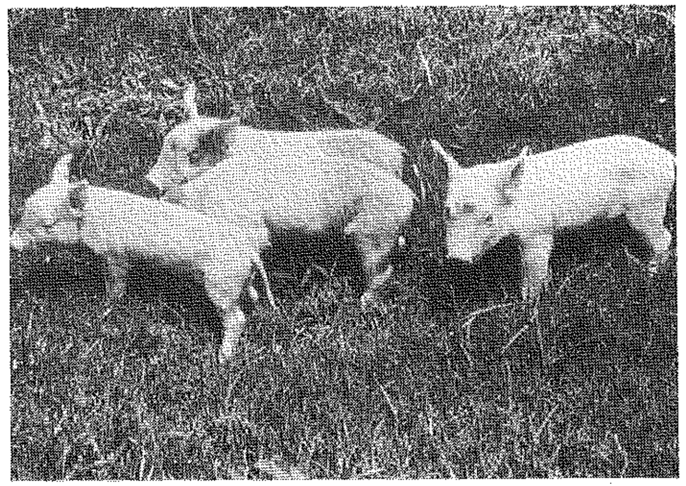

Two sets of identical twin pigs produced by embryo splitting. The litter was carried by a Duroc surrogate mother while carrying a litter of purebred Durocs. (Photograph courtesy of LSU Animal Science Department.)

## Future of Agriculture

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**THEME**

# Program For Century 21: The Bio-Electronic Future


BY CLIFFORD L. NELSON

*(Editor's Note: Dr. Nelson is Professor and Chairman of the Department of Agricultural and Extension Education at The University of Maryland, College Park, Maryland 20742.)*


Agricultural education has survived because of its flexibility and its ability to react to local needs. Reaction from state and national leadership has historically been hampered by legislation insensitive to the times and ignorance (both covert and overt) of local school situations and the current realities of agriculture. Survival in the 21st century cannot be assured with haphazard approaches to development of vocational education in agriculture. The basic question is how do we prepare for the opportunities that will come and not what the opportunities are today.

Federal funds are less likely to be available for vocational agriculture programs at the local level. The relatively expensive nature of a vocational course will cause budget-watching administrators to take a very close look at any such offering. The need for extended contracts (summer employment) to assure comprehensive programs will raise questions. Marketing strategies for vocational agriculture must be modified to meet the changing world around the local school. What are some of the adaptations that vocational agriculture may have to make to survive?

**The University of Maryland computerized least-cost ration-balancing program for dairy cattle is accessed by remote terminal.**

### High School Curriculum

The high school curriculum in the 21st century will have to consider the continuing major agricultural changes. A significant and permanent change will be the increased depth of knowledge that will be required in the biological and physical sciences to understand and deal with daily 21st century agricultural practices. The biotechnology of the 1980's will be the common applied practice in the near future.

This has critical implications for future vocational agriculture course content. Current vocational agriculture is science based. Tomorrow's vocational agriculture will be even more science related. Vocational agriculture must have significant science content to assure credibility of programs with agricultural industry and the public plus the capacity to compete for able students.

The importance of the sciences emphasizes the changes that must be made in the curriculum. A significant change in the levels at which practical skills are taught could be expected. The whys as well as the hows will need to be part of each program. A national curriculum may be suggested in the near future to assure basic scientific, theoretical and applied content in classes. These classes, ultimately, will need to contain community-based subject matter about an agriculture that is closely related to the developing bio and electronic technologies. Techniques being practiced only at universities today will be a required part of the high school vocational agriculture laboratory of the 21st century. Students will have daily access to massive national and international data bases to assist them in problem solving and decision making.

Supervised occupational experience (SOE) will remain an important part of the century 21 curriculum. Student employability will still depend upon the ability to perform tasks in production agriculture and the supporting industries. Teacher supervision, on-the-job or on the farm, is what makes agricultural education unique among high school courses. The combination of teaching both the prospective worker as well as the prospective entrepreneur is also a distinguishing characteristic.

A strong FFA will change to meet the agricultural as well as the student needs of the 21st century but will remain strong in its devotion to developing the personal skills of its members. Traditional contests and awards are likely to change and will evolve to recognize the biotechnical and electronic skills taught in the century 21 program. The ability to speak, conduct a meeting, and to demonstrate other leadership skills will still form the foundation for the FFA program because these skills will always be important. With a reduced proportion of the population expected to be involved in agriculture in century 21, the need for a more effective and articulate leadership is crucial.

### Serving the Adult Community

At the turn of the century, it was possible for a young person to acquire enough knowledge as a youth in high school (later college) to see them through their adult years. By the 1950's, this was no longer possible. The Boeing Company stated in the late 1950's that they would need to retrain employees 5 times during their working life. With the rapid technological growth since that time, this figure has probably doubled. Technological change is taking place at a faster and faster rate. To remain current requires constant study.

History has shown that the most efficient way to disseminate knowledge is through systematic instruction. Vocational agriculture and extension have offered instruction ranging from short meetings to courses that extend up to 3 years. Agricultural industries have also committed significant resources and time to educational programs for their employees and clients.

### New Partnerships

New agreements between vocational agriculture and extension are anticipated. The severe shortage of agriculturally prepared professionals facing the nation in the remainder of the 20th century will dictate the pooling of limited professional and financial resources to meet the needs of the agricultural community.

Funding from the Perkins Vocational Education Act will be difficult to direct to many traditional programs. Extension funding has also suffered reductions at the national level. New ways of utilizing the strengths of existing professionals must be sought so that the needs of the agricultural professionals, producers and those in related agricultural industries can be met.

It is also anticipated that more educational support will be needed for the entrepeneurs in agriculture service and supply industries. This is a clientele group that has not been systematically addressed by the vocational agriculture or extension programs. These agri-businesses must remain viable for a strong total agriculture in century 21.

Vocational agriculture must be willing and able to change with the technology of agriculture. It will require strong efforts from teachers, teacher educators and direction and leadership from the professionals in state and national supervisory positions. A closer relationship with agricultural industry will also be needed for success to occur. Century 21 offers the most exciting era ever for agricultural education if the profession is ready to accept the responsibility for moving into the bio-electronic century.

**BOOK REVIEW**

CAPITAL INVESTMENT ANALYSIS: USING DISCOUNTED CASH FLOWS, by George L. Casler, Bruce L. Anderson, and Richard D. Aplin. New York: John Wiley & Sons, Inc., 1984, Third Edition, 144 pp., $19.95.

This book focuses on capital investment decisions which may involve large sums of money in expenditures for land, equipment, buildings, and other assets. Since these decisions influence the long-run flexibility and earning power of the business, it is imperative that they be based on reliable forecasting and evaluation procedures.

The book contains 14 chapters. The major areas covered include capital investment decisions, commonly used measures of investment worth, time value of money, present value of a future sum of money, evaluating capital investments in terms of cash flows for income taxes, the cost of capital, special problems in projecting cash flows and in analyzing investments, handling uncertainty, handling inflation, acquiring assets with financial lease vs. purchase and loan, and capital rationing.

Two widely used measures of investment worth, the payback and simple rate of return methods, are discussed and it is noted that both suffer from the weakness of failing to reflect the time value of money. The book focuses on two measures of investment worth that do reflect the time value of money: the net present value method and the internal rate of return method. The authors stress that these two approaches, correctly applied, can provide an excellent basis for applying judgment in making capital investment decisions.

This publication is designed as a basic text for courses in advanced farm management or financial management. It would be useful as a reference for agricultural teachers at the high school and junior college levels.

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THEME

# Secondary Programs . . . Looking Ahead

By R. Dale Perritt

*(Editor's Note: Dr. Perritt is an Assistant Professor in the Department of Agriculture at Stephen F. Austin State University, Nacogdoches, Texas 75962.)*

When speaking of the future, we must attempt to bridge the gap between what is and what will be. There is an obvious link between the past and present, but the road from present to future may include many unforeseen detours. It is these detours or events in the future of secondary vocational agriculture that interest us most.

There are a number of methods for predicting events in the future. Some futurists project current trends with the assumption that a given trend will follow a predictable course. Others, with more creative minds, project future events which cannot be realistically supported by current events. Still others attempt to improve their insight by soliciting opinions from authorities and then reach a consensus of what the future holds. Regardless of the procedure, uncertainty remains the one certain aspect about tomorrow.

## The Prologue and Future

Why then do we, as educators, look to the past and present to catch a glimpse of the future? Shakespeare explained it in part in Act II, Scene I of The Tempest when he said, "What's past is prologue". People have attempted to peer into tomorrow for primarily one reason and that is to make tomorrow more productive than today.

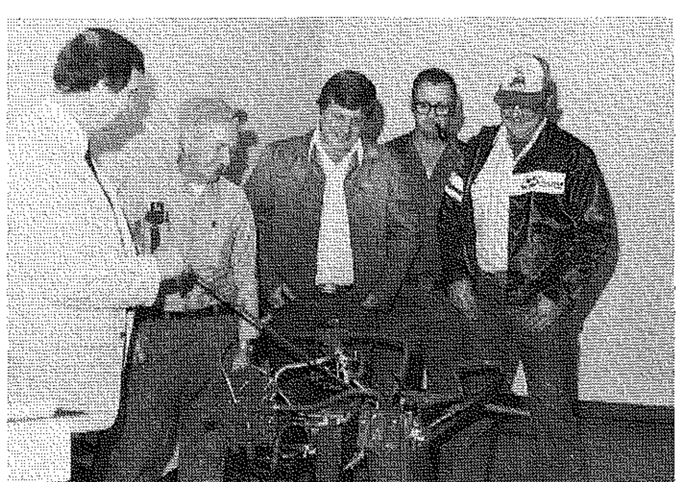
If secondary vocational agriculture programs are to be more productive, we must prepare for what lies ahead. What should we expect of future students? How will curriculum meet student needs? How will the vocational agriculture teacher of tomorrow teach, supervise, and manage the total vocational agriculture program?

### The Student

Students beginning school next year will be considerably different upon entering high school than their counterparts of ten years ago. Computers, with much greater capability than those to which we are accustomed, will be as common as the family television. Fears concerning technological change will likely be less staggering because change will be a lifestyle more acceptable to the future student. Whereas the first computer one faced may have aroused a wish for a return to the days when life was simple, the student of the future will, by nature, be an early adopter of new technology.

If present trends continue and instantaneous change remains a way of life, the student of tomorrow, with all the advantages of a high tech society, may struggle with the traditional values upon which our society has been based. The factors that have developed the alienated adolescent of the 80's will continue unless they are faced in the future educational settings. The family unit, recently defined by the U.S. Census Bureau as "any two people living together" has apparently failed in many cases to supply the needed direction to young people.

The development of the self-actualized student whose value system is grounded in the free enterprise system may then fall more directly on educators, especially vocational educators. Placing more emphasis on the development of the whole student will not be a difficult task for vocational agriculture but merely an outgrowth of our philosophy of meeting individual student needs.



The increased attention of adult education will elevate the status of the teacher within the educational community.

The teaching of specific skills will remain an important aspect of the curriculum.



Finally, the student of the future will be a critical thinker, capable of solving problems by efficiently managing information. The 1980 census revealed that 50 percent of the workplace is involved in information processing. Joseph Duffy, Chancellor of the University of Massachusetts, stated that the economy of the future may depend more on human capital (skill, dexterity, and knowledge) than on physical capital (buildings, machines, and money).

Agriculture in the U.S., which has always been ahead of the game, will likely follow the same mold, especially in the agribusiness sector. A student, then, will enter the vocational agriculture classroom with a greater need for management and interpersonal relationship skills than ever before.

### The Curriculum

Most vocational educators agree that an efficient instructional curriculum must be based on sound learning theory and present skills and concepts common to an occupation. Future secondary vocational agriculture programs will address curriculum development from primarily the same position. However, a concentrated effort will have to be made to teach concepts which are transferable to other jobs. It has been estimated that future workers will, on the average, change jobs eight times during their career. Because of such changes, students may no longer be able to gain one set of skills while in school that will be sufficient for both entry and advancement in a chosen occupation.

The problem of antiquated skills becomes a more pronounced problem as technology advances. It is for this reason that some futurists are opposed to the teaching of job specific skills which may result, in a time-bound curriculum. Many of the generalists in education support a more liberal approach to curriculum with the idea that skills for living will be of much greater importance to the future worker than specific skills.

In reality, the curriculum of the future will most likely be a blend of the two, both specific and general — specific enough to gain entry level skills, yet general enough to allow a shift in job descriptions as chances for advancement occur throughout the life of the worker. To provide this type of atmosphere, curriculum planners must evaluate and revise their programs on a daily basis.

As skills change so must the stated performance in an instructional unit. The inclusion of communication skills and critical thinking skills must also be emphasized to aid in the establishment of an inventory of abilities which will be common to various job descriptions.

If present trends continue, instructional emphasis in vocational agriculture will continue to undergo a constant shift to reflect new technologies. Agricultural mechanics will likely include the addition of electronics related to agriculture as an instructional area. With the ever increasing development of robotics, electronic components, and dedicated computers for monitoring systems, trouble shooting skills congruent to these areas must likewise improve.

Land-use planning and extensive conservation practices will also be stressed in the instructional areas. Problems associated with depleted acquifers and acid rain are only in the formative stages in comparison to what may lie ahead. Students in future agriculture programs will be more concerned with practical applications of genetic engineering, maintenance of the cropland base, and producing more from less than their counterparts of today.

### The Teacher and Teaching Techniques

The role of the teacher of vocational agriculture will likely see some transition in the future. These shifts may be gradual and scarcely noticeable as they occur. However, a longitudinal approach will reveal critical changes in the next twenty years.

Among those changes will be a shift in the traditional classroom design toward one more conducive to individualized instruction. Traditional teaching techniques may seem somewhat boring in comparison to the electronic media that will be available to vocational agriculture students. The teacher will assume the role of resource person and director of learning experiences as a result of the instructional methodology necessary to maximize computer assisted instruction.

Following the lead of the military and industry, teachers may employ the use of more simulation techniques. The use of such techniques usually occur because the "real thing" simply costs too much. Advancing technology in

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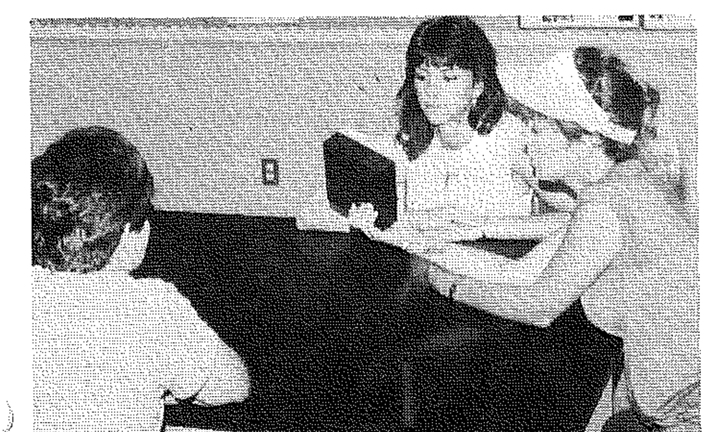
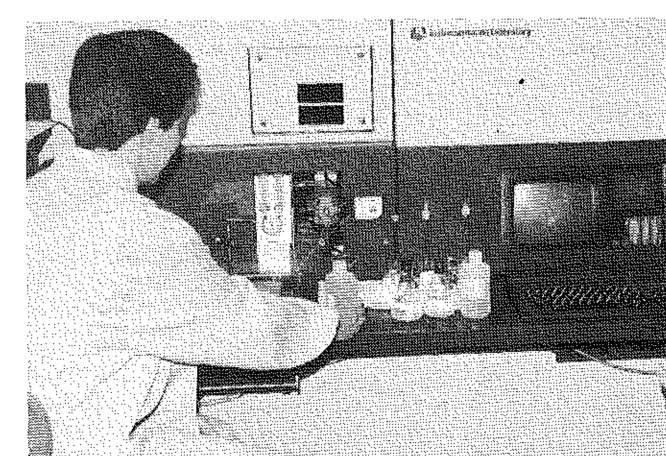


Technological advancements, such as this light weight heat shield from the space shuttle Columbia, will continue to have an impact on farm machines and equipment of the future.



A student observes a soil analysis being run on an Ultrafast Sequential Inductively Coupled Plasma Emissions Spectrometer.

## Secondary Programs . . . Looking Ahead

*(Continued from Page 11)*

machines and equipment needed in the vocational agriculture laboratory may result in expensive equipment which every school may not be able to purchase. The result will be the use of simulators which, like the airplane simulator, may be used with few of the constraints associated with actual flight.

Counseling will also be an important function of successful teachers. They will have to maintain a firm grasp of the insights related to the changing job market in order to advise both the secondary and adult student. Through their counseling techniques, teachers will be an important link in the development of students values related to work, leisure, and family life.

Within this same realm, instructional methodology for the future will place more emphasis on techniques which emphasize the affective domain. The ability of the teacher to maintain positive student attitudes during an era of great instability will spell success for many programs.

Successful teachers will also recognize the need for increased adult education. Placing more emphasis on the adult learner will in turn elevate the status of the agriculture teacher within the educational community. As more adults continue their education, the true worth of the program will be realized by those who truly make a difference.

Finally, professionalism will be the earmark of the future vocational agriculture teacher. This will stem from a greater emphasis on professionalism at teacher training institutions and a closer scrutiny of potential teachers by teacher certification offices. Teachers will be more involved in the political arena primarily to insure quality programs and to promote job security. The increased emphasis on professionalism will, in the end, produce a teacher with a genuine interest in students and the "radiated warmth" desired by all students.

### Summary

Looking ahead to vocational agriculture's future, one must question, will it be "feast or famine"? The current onslought of educational reforms is certainly taking its toll on enrollments, teacher morale, co-curricular activities associated with the FFA, and appropriations necessary for solvent programs. If educational reforms have not yet arrived, be prepared for a struggle. But more importantly, be prepared for the future of vocational agriculture. Things tried by fire will stand the test of time as will vocational agriculture at the secondary level.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THEME

# Technical Education In Agriculture: The Future Is Now

By Arnold Mokma

*(Editor's Note: Dr. Mokma is Assistant Director for Academic Affairs and Associate Professor at The Ohio State University Agricultural Technical Institute, Wooster, Ohio 44691.)*

On a return trip from the Research Lab on the Agricultural Space Station in 2020, I had the opportunity to talk to Chris Agris, Jill Kauman and Jeff Planz.

Mr. Agris produces 5,000 acres of crops. On a typical day during planting and harvesting seasons, he goes to his office about 8:00 a.m. to get the field work started. By pushing a few buttons to start the electronic monitors, he also starts the power units which, in turn, signals the storage module doors to open. Through the use of sensors, the power unit attaches the appropriate tillage tool and planter for the field to be planted that day and proceeds to the field. Nurse tanks on self-powered units go to the appropriate storage areas for supplies: fuel, fertilizer, seed, pesticide, etc. They then go to the field to stand by for refills as needed.

During harvest, the power unit attaches the harvestor with its laser beam cutting head. The nurse units, in planting season, are converted into small grain carriers which bring the crop from the harvest unit to the home office. There they are sent via high speed connectors to the nearby marketing terminal. While they are traveling, Mr. Agris sends an electronic message to the terminal giving instructions on which market to send the grain. While he is reviewing the international grain markets, Mr. Agris also is reviewing the fertilizer and seed markets for next year's crop.

His purpose for visiting the space station was to observe the new crop species and varieties that are being developed through sterilized tissue culture for high yields and pest resistance.

Ms. Kauman described her operation as similar to Mr. Agris but in addition to the 1,000 acres of crops, she has 1,000 dairy cows. She has her herd divided into ten sterilized dairy chambers and has a herd manager in charge of each chamber. The manager maintains the proper environment (heat, ventilation, etc.), sterilizes all the incoming feed and oversees the milking system.

With the advent of biotechnology some forty years ago, Ms. Kauman indicated her herd average now exceeds 40,000 lbs. per cow with the cows milked 200 days per lactation. To improve the profitability, Ms. Kauman has contracted with the Hy-Pro Milk Company to sell high protein milk which is produced through the injection of protein producing enzymes into the cow's udder.

Her purpose for visiting the space station was to learn the latest one gene implantation to continue improving the genetic potential in her herd.

Mr. Planz has a completely different type of operation. He is an ornamental plant breeder. He specializes in producing plants through tissue culture techniques for their fragrance as well as their flowering beauty. Although his company specializes in woody plant, he has a division that works with herbaceous plants and a third division that works with fruiting plants where flavor is a third factor to be emphasized in the cloning process.

He visited the space station to learn about sterilized cellular microculture to gain better yeilds in his cloning chamber. Upon his return, he plans to send his cloning technician to the station for a one week workshop utilizing this new sterilization process.

### A Dream

Is the above scenario "far fetched," "not possible," or "just another ivory tower dream?" Not so, say the experts! All of the components described are utilizing technology available in 1985. Some of the items such as electronic sensors and genetic engineering technologies need to be perfected, but the technology exists in 1985 and it is only a matter of time before the limitations will be corrected.

Terms such as optoelectronics, microchips, crystals, bioreactors, holograms, bioholonics, mycorrhizal infections, optical communications, rapid digital modulation, etc. which are just becoming part of our vocabulary in 1985 will be commonplace in 2020.

The year 2020 was selected because that is when the majority of our postsecondary graduates will retire, assuming the work to age 55. We need to think back an equal number of years (35) and consider what has happened since 1950. The year 2020 is just ahead of us and the pace of change between 1985 and 2020 will be much more rapid that the pace of change between 1950 and 1985.

What are the implications for our technical agriculture programs at the community and technical college level? What changes must occur if technical programs are to remain viable sources of technician employees for the agricultural industry?

### Technical Programs

In the mid-80's, it is easy to become pessimistic about the future as we face another 8-10 years of declining numbers of high school graduates; the public is crying for improved quality with fewer resources; current equipment purchased as programs were developed in the late sixties and early seventies is wearing out but no funds are forthcoming for replacement; and the advent of high technology is increasing the pace of change requiring constant revisions in curriculum. We are truly at the cross roads in technical education. The future will be what we want to make it.

As we face the high technology future in agriculture, we need to consider the impact and use of satellite surveillance of crop and weather conditions, computers and electronic data processing; robotics with microchips and electronic sensors; cloning, recombinant DNA, protoplast fusion and genetic engineering; lasers and fiber optics; natural cell factories for producing pharmaceuticals and health chemicals; and microwave communications all integrated into a vast system of agricultural production, marketing and processing. The equipment of the future will be combinations of mechanical, electrical, electronic, fluid, optical and thermal power applications.

This author is assuming that all the new fangled gadgets will not replace the need for human skill and judgement. However, these gadgets will require a very sophisticated relationship between person and machine that does not exist today. We already are observing one of the changes that must occur in the new relationship. At a recent conference, it was reported that over 50 percent of the electronic components returned under machinery warranties are, in fact, not defective. The mechanic analyzing the machine's performance is not able to adequately troubleshoot the electronic circuits and, therefore, replaces parts in a hit-or-miss, trial and error process, until the machine performs properly.

In the future, we can expect technicians to need an even better understanding of the basic sciences, mathematics, communications and the global society. In addition, they will need better understandings of computer applications, commodity marketing, and quality standards, so their judgement can be used to make better management decisions and/or recommendations and can lead fellow workers in completing various tasks. It is becoming abundantly clear that the emphasis in our postsecondary programs must be on the total individual in preparation for a career of work and study, not just the entry job.

Our technician preparation programs of the future will require a close working relationship between the educators and industy leaders who are serving in an advisory capacity. We need their input on curriculum design and content, we need to be aware of their manpower needs, we need to have access to their equipment and expertise and, in some cases, we need to use their facilities if we are to have quality programs.

It is assumed the individual technicians will need constant updating. Learning will really be a lifelong process. However, much of this learning will be in highly specialized; short-term workshops offered in a variety of settings. It will be a common occurance for people to go to other countries for workshops on the latest techniques for servicing various components of machines or to learn new practices to improve production or market quality of products. Teleconferences with interactive video systems will be another common method of delivering instruction.

### Leadership

The implications for preparing teachers for these technicians are profound. The technical agriculture faculty of the future must be technologically competent but also must

*(Continued on Page 14)*

## Technical Education In Agriculture The Future Is Now

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have the pedagogical skills to deliver quality instruction. What is being done today to help agricultural faculty members at the technical and community colleges to develop programs with the emphasis on the total person? Are teacher educators developing programs to better prepare the technical agriculture faculty at our technical and community colleges?

We need leaders who are willing to accept the challenges and take strategic steps to redirect our efforts toward the future and renew our commitments to prepare technicians for the agricultural industry. Many alarmists view other aspects of our society as "asleep and shortsighted" to the changes occurring around them. Are we content to be Twentieth Century aborigines with an industrial age version of the saber-tooth curriculum? In agriculture, we cannot afford this relaxation of concern.

It is now time to examine our programs and practices at all levels, consider the impacts of megatrend forecasts and technological breakthroughs, and use our imagination and ingenuity to invent what we have never been able to do. We can consider the changes in the future to be a major revolution of today's technology, but by staying up-to-date with the technological change we can have a comfortable evolution into the 21st century. Our goal must be to establish programs that prepare young people for entry level employment and a career of continuous learning and work. The future in agricultural education is really a path of opportunity!

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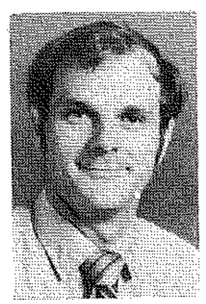
THEME

# Future Young and Adult Farmer Programs




DR. GLENN A. ANDERSON

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Young and adult farmer classes are an important phase of the total agricultural education program. The classes assist farmers and agribusiness people to keep up-to-date in their work and to advance in their chosen vocation. The programs have been successful because agricultural education instructors have been willing and capable of providing relevant educational classes. The continued success of these programs will depend on instructors making additional program changes in the future.

### Changes

The program changes in adult agricultural education will be necessary because of the many technological changes in agriculture. At a forum on agriculture in the future, Weismann (1983:ix) made the following statement concerning future changes in agriculture, "Agriculture change in this century has been swift and complex. It will be more so in the next century. Everyone who grows food will have to factor economics, technology, demographics, and geo-politics, and distribute agricultural products, and those who make agricultural policy."

The quotation contains implications for planning and conducting our future young and adult farmer programs. The programs of the future must be based on instructional activities which will enable the farmers and agribusiness workers to meet the changes in agriculture. As we plan our future programs, we must keep in mind some of the anticipated changes in agriculture.

These changes include a change in the classes of farms, a change in the farm enterprises, a change in the growing sites for producing crops, and a vast change in the agricultural communications system.

Robinson (1983.85) suggested that the agricultural industry of the 21st century will be comprised of two major classes of farms: (1) commercial farms which produce about 95 percent of total output, but account for less than 10% of all farms; and (2) a noncommercial class of farms composed of hobby farms, rural residences, and subsistence farms.

The young farmer educational programs must be planned to provide instruction to both of these groups. The educational programs for these two groups must be as different as the goals of the two groups. One group is concerned with maximizing profit, while the other group is more concerned with avocational education. Both groups need and deserve educational services.



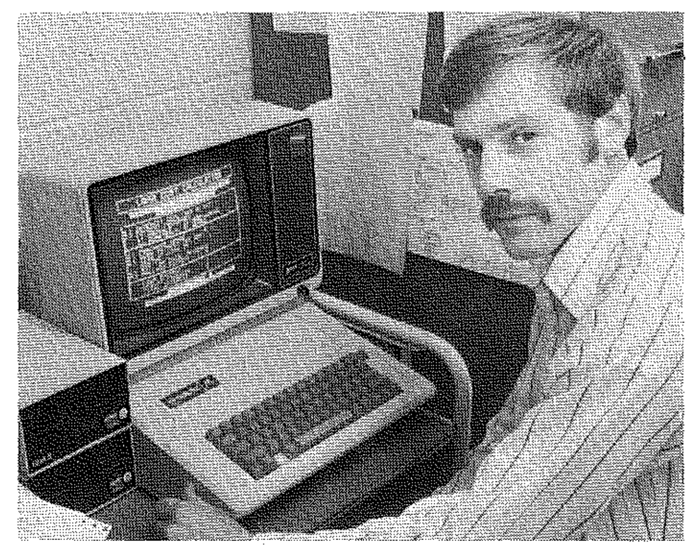
The farm enterprises of the future will undergo many changes from the present. The production per acre will continue to increase. The types of crops grown will change. Farmers in arid lands will grow crops such as jojoba. Farmers will harvest more products from the water. Some of the educational programs of the future may be on topics such as "Producing Sea Weed," "The Production of Food in Space," and "Producing Crops Without Soil".

### Computer Utilization

The future use of computers in the production of agricultural goods and equipment is expected to expand rapidly. Today, computers are used to control and formulate the rations of livestock. Farm records and budgets are kept on computers. The computer of tomorrow will perform much of the work of agriculture. Much of the farm labor will be controlled by computers.

With the increased capabilities of computers, telephone communications, and video systems; the opportunities for young and adult farmer programs are virtually unlimited. Our programs may become international in nature. A young farmer advisor may have members in another state. The use of advanced telecommunications will enable a young farmer to conduct programs around the world. Farmers in third world countries could be members of young farmer associations in this country and benefit from the educational programs.

The sophisticated communications systems will enable young farmers around the world to share their knowledge with other farmers via satellite. Young farmers will unite to create a data base for use by farmers in other countries. The data base will assist farmers to solve management, production, and marketing problems. The young farmer advisor would instruct members in the process of retrieving and analyzing data to make sound decisions.



**Much of the farm work of the future will be controlled through a computer. (Photograph courtesy of Larry Kesterson, "The Daily News Leader," Staunton, Virginia.)**

### Programming

The topics and locations of the young farmer programs may change in the future; however, there are some present day guidelines which will be of value when planning activities for future programs. The items to include in future programs are listed in the Young/Adult Farmer and Rancher Handbook (1980:5). The items include: (1) on-farm instruction, (2) in-depth courses in farm management and technical agriculture, (3) One-shot (special) meetings, (4) farm and agribusiness tours, (5) recreational and social events, and (6) social activities.

Future young farmer programs will consist of taking what has worked for many years and fitting it into new innovations and instructional techniques. Farmers of the future must be better educated to be successful in the new technological era. Young farmer programs of the future must enable our members to remain successful. They must be better at all phases of their work, better at production, better at management, better at finances, and better at marketing. In planning future programs, it is good to remember a few characteristics of our program.

Bender et al, (1972:9) made the following observation about adult education: "Since participation in adult education is essentially voluntary, the agricultural educator is challenged to develop programs that are relevant to today's problems in agriculture and that assist the participants in making important decisions about their enterprises."

Programs of the future must be relevant to the problems of the future. Our programs must offer solutions to those problems. If our programs adjust to meet the technological changes of agriculture in the future, young and adult farmer programs will continue to be a vital part of the future agricultural education.

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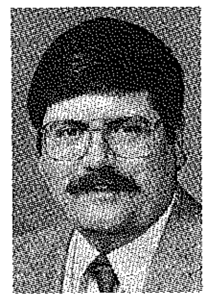
*Coming in January . . .*

**Vocational Agriculture and the Excellence Movement**

THEME

# Instructional Technology: Fantasy or Future Fact



By Richard Hylton

*(Editor's Note: Dr. Hylton is Assistant Director of the American Association for Vocational Instructional Materials, Driftmier Engineering Center, Athens, Georgia 30602.)*

The year is 2010. Imagine the following scene in the vocational agriculture classroom. The classroom we are in is very large. A holding area is available inside the classroom for animals used in experiments and instruction. Indoor gardens and greenhouses are constructed as an integral part of the classroom. The classroom has a kitchen where students prepare their own lunches. Students have their own individual study areas which are soundproof and immune to outside distractions.

## Futuristic Programs

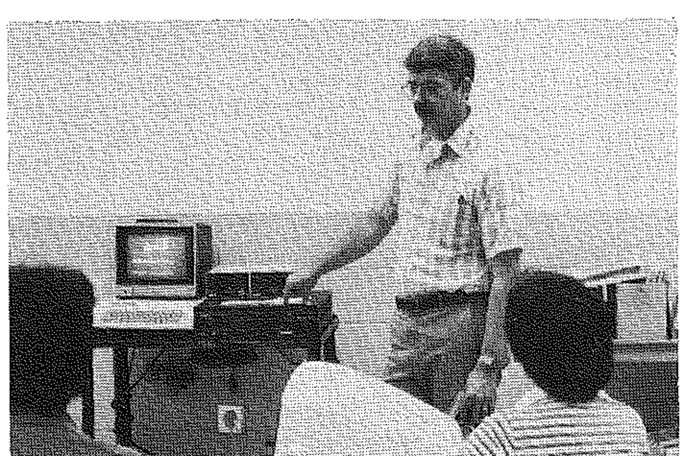
The agriculture students come to class every day with their own computer notebook. The computer notebook is a portable computer available at a price where the school system provides one to every student. The student never waits for computer time. The notebook computer is carried home every night as an after-school learning tool. Students who are ill or on school sponsored trips will never miss class as they can use their computer notebook and video display unit to view and participate in the daily classroom activities. Every student has been assigned their own telecommunications pass. A communications module is available at every individual study center. Every piece of electronic equipment is now connected by microwave, laser, or infrared systems eliminating the need for patchworks of wire.

The students in the class vary in age. Grade levels have been abolished by the U.S. Supreme Court as being discriminatory to individual progress. Students enter and leave class at differing times. Class periods of set lengths of time no longer exist. The central computer in the classroom recognizes and identifies students by voice and can show their present work status at a moments notice.

The student, by voice or thumb print, selects the sequence of learning modules to be shown on their screen. One readout may inform the student: "You have progressed to the unit on plant genetics. You have completed modules 13, 14, 16, and 18. Do you wish to proceed to: Module 17: Lab Experiments? Module 19: Hybrid Subcultures?"

Information for large group instruction is displayed by the instructor on large screen displays. Graphic capabilities will allow the instructor to show detailed parts of larger objects. With zoom and auto-focus capabilities, the smallest of parts can be identified and viewed in a working mode. Networked printer stations will allow hard copies of information to be available on compact disks. The optical storage of digital data on compact disks will be available to every instructor.

The entire contents of the Library of Congress is available in a compact disk bank (about the size of a standard school locker) which is located in one corner of our classroom. Instructors conference with students and parents through video display terminals. Through video cameras, students bring their supervised occupational experience projects to class for review and evaluation by instructors and peers.



Students are instructed on the possible uses of the interactive videodisc system. (Photograph courtesy of Jim Wren, AAVIM.)

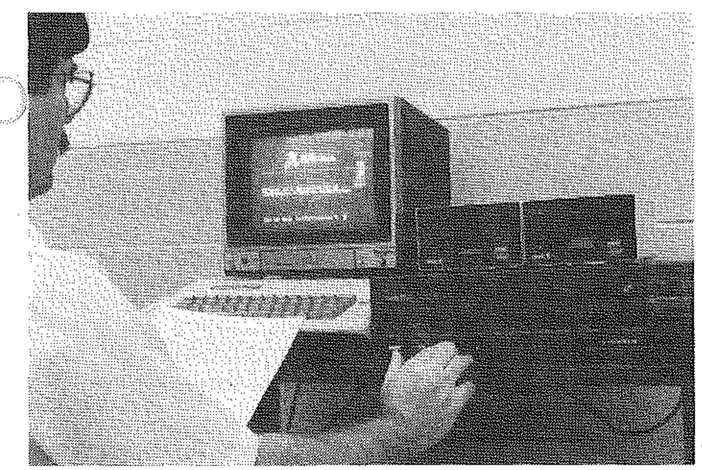
The latest in educational technology includes the interactive videodisc system. (Photograph courtesy of Jim Wren, AAVIM.)



Students sitting at their video terminals can control water and humidity to see the visual effects of each on plant growth and yields. Feed rations are calculated for animals through computer simulations. The animals are observed on the display screen as the effects of the varied rations on growth are shown from 1 to 180 days. Students with graphic tablets simulate the design and construction of energy efficient housing for dairy animals. Food products developed for consumers can be tested for fragrance and taste in learning units designed with taste and smell functions.

Our classroom has several units which aid our instruction. These units are comprised of computers and robots that help us in controlling the environment, communicating with large national data bases, selection of the appropriate learning for each student, maintenance of student profiles, research, and evaluation. Robots assist instructors in maintaining classroom equipment and assist daily in the set-up of displays and experiments. Robots are responsible for maintenance of the learning environment and the procurement of supplies. While it is the responsibility of students to feed and care for the animals and plants, robots assist the instructor in assuring that every task is performed correctly.

The instructors in the classroom are a team. The team is modeled after a family with a father figure (male) and a mother figure (female) who are both teachers. The team is comprised of several other specialists who play an important role in bringing person-to-person life experiences to the classroom. Instructors are aided by a central administrative unit which monitors attendance, controls petty cash and inventories, and makes trip plans and reservations for instructionally related field trips. More time is used in the classroom for instruction than any previous year.



Using an interface device, you can combine the basic function of a videodisc player or VCR, the storage and playback of video images, with the interactive capabilities of a computer, all in one interactive program. (Photograph courtesy of Jim Wren, AAVIM.)

## Impact

We have just completed our tour of the futuristic vocational agriculture classroom. Have you considered the impact of future educational technology on you, your students, your classroom? What new educational technology is available today?

Just as everyone was beginning to feel comfortable with microcomputers being present in schools; a new system, interactive videodiscs arrived on the scene. With the aid of a video interface device you can link your computer to video technology, such as a videodisc or a videocassette recorder, allowing you to manipulate video images with your computer. Using a software program designed to send command instructions to the interface device, you can gain access to any frame on the videotape or videodisc by entering the instructions into your computer keyboard. You can alternate between computer and video images allowing you to integrate video images with your own software programs.

The time span between the introductions of new educational technology continues to decrease. What will the classroom of tomorrow resemble? Can we design and construct classrooms today to meet rapidly changing educational technology?

As we return to the reality of today, we must remind ourselves that our trip was a fantasy. How lucky we are to be a part of this transformation. No, we need not keep up with all the changes but most importantly we must exercise our leadership, insight and professional understanding which will help shape our future educational environment.

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## WANTED: Book Reviewers

One of the services that The Agricultural Education Magazine provides for its readers is the review of publications that address agriculture and agricultural education. The Book Review Editor receives current publications from over 50 publishers in the United States and from some foreign countries.

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THEME

# Expanding Opportunities For Women

Women have always worked in agriculture, but their roles have changed in recent years. Now they are moving into many non-traditional agricultural occupations. They have been at the forefront of sweeping changes in demographic, social and economic patterns. Their horizons have expanded and their career options broadened in the agricultural industry as well as other areas. The future is filled with opportunities for women who are prepared for careers in agriculture.

This article addresses opportunities for women as farm entrepreneurs and in the nonfarm sector, opportunities for vocational education in these changes, and how teachers of vocational-technical education in agriculture can facilitate the changes.

## More Women Farm Owners

While women have always worked on farms, their role as entrepreneurs has increased in recent years. Today, in the United States, about one farm in twenty is either solely or primarily operated by a woman, increasing from less than three percent of all farms in 1950 to approximately five percent in 1985. The total number of farms operated by women exceeds 120,000. This change occurred at a time when the total number of farms was declining rather sharply.

Many women have inherited their farms from husbands or other family members. They love their land, enjoy working it, and, perhaps most importantly, need to earn a living. Livestock, cash grain crops, horses, and other animal specialties are the most common types of farms operated by women. The changing roles of women have made it easier to be a successful female farmer.


By Delene W. Lee and Shirley Haggard

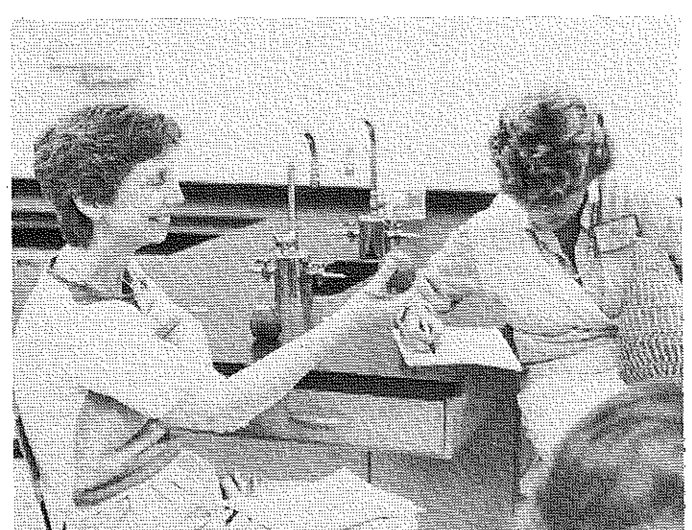
*(Editor's Note: Dr. Lee is Associate Professor of Business and Economics at Mississippi University for Women, Columbus, Mississippi 39701; and Ms. Haggard is Supervisor of the Office of Vocational Equity, Bureau of Vocational-Technical Education, Mississippi State Department of Education, P.O. Box 771, Jackson, Mississippi 39205.)*


## More Women in Non-Farm Agriculture

Participation of women in all areas of the labor force has increased rapidly in recent years as career opportunities have become more readily available. In the past, as women were concentrated in traditionally female fields, their earnings tended to be low and their options for advancement limited. As they are expanding their horizons and moving into non-traditional fields, including agricultural occupations, their earnings' potential has increased as well as opportunities for upward mobility.

More than one-half of all adult women in the United States work outside the home or are seeking work, an increase from one-third since 1950. Many of them are in agricultural occupations. Their earnings still lag, however, in comparison to their male counterparts. According to the Bureau of Labor Statistics, women, as a group averaged, in 1984, $258 per week while men took in $399. This amounted to 61 cents to every male's dollar and is a continuation of an age-old disparity.

Due to affirmative action efforts by agribusinesses, women sometimes begin at salaries higher than men. Any disparity should diminish, however, as women continue to enroll in programs such as vocational-technical education in agriculture and prepare for jobs in agricultural supplies and services, agricultural mechanics, agricultural products, horticulture, and other areas. Good vocational-technical education in agriculture can help females overcome discrimination when they seek employment in non-traditional agricultural occupations.



**Women often return for additional education in preparation for agricultural occupations. These women are studying a disease of tomatoes in a continuing education class. (Photograph by Jasper S. Lee, Mississippi State University.)**

**Women are entering a variety of agricultural occupations, including plant pathology technology. This person is performing laboratory analysis of nematode formations in soybeans. (Photography by Jasper S. Lee, Mississippi State University.)**

## More Opportunities

Over the years, vocational education programs have served about equal numbers of males and females. However, the programs for each have differed markedly. Even though nothing in the federal legislation prevented women from participating in programs for gainful employment, over the years home economics was often the only vocational education for women. In the early part of this century, a greater percentage of women actually participated in programs of agricultural education than in the mid-part of the century.

World War II was a major factor in demonstrating that women could perform in non-traditional job areas. The door was opened, never to completely close, although most women did retreat to the home when the war ended. Major emphasis after the war was upon training for acceptable female occupations, such as telephone switchboard work, cosmetology, and clerical positions.

Significant developments occurred in the 1960's to encourage women to participate in vocational agriculture and other non-traditional programs. The term "sex equity" came into use, and new efforts began to emerge asking for equal access to all labor markets. The FFA also accepted females into the organization in 1969 after considerable debate. (It is ironic that the student organization actually held back the participation of females!)

A national report on women in vocational education was published in the early 1970's showing that most programs were dominated by one sex. Course materials reinforced the stereotyping of females. Teaching practices discriminated against females. Recent research indicates that some of this discrimination continues, as was found by Henderson (1983) when female students enrolled in horticulture were found to be on-task less than male students — their teachers demanded less of them.

The 1976 amendments to the Vocational Education Act of 1963 encouraged equal access and provided funds for a sex equity coordinator in each state. The Carl D. Perkins Vocational Education Act of 1984 further encourages equal access by identifying funds to eliminate sex bias in vocational education and providing programs for single parents and homemakers.

Some states are making considerable progress in encouraging female enrollment in vocational agriculture. In Maryland, female enrollment has increased from 25 percent in 1974 to over 30 percent in 1984 (Mayor, 1985). Nationally, female enrollment has increased from about 9 percent in 1975 to 11 percent in 1984 (Ibid). Females have been active in the FFA, too. In California, FFA membership is 39 percent female and the females hold 45 percent of the FFA chapter offices (Leising and Emo, 1984). In Mississippi, females comprise 46 percent of chapter officers. Similar trends exist in other states.

## What Teachers Can Do

Teachers are important in shaping the quality and substance of vocational-technical education in agriculture programs. How they respond to the needs of different students influences how well the students may be able to achieve in non-traditional roles. Teachers hold the key to increased enrollment and successful participation by female students.

Successful teachers work at eliminating obstacles to the development of competencies that female students need to enter agricultural occupations. A few suggestions are:

- have positive attitudes toward female enrollment
- work at overcoming peer, family, and employer bias
- use materials/instructional aids that do not stereotype or discriminate
- expect high quality performance from all students
- actively market programs to female as well as male students
- observe language on a daily basis (Is it sex biased?)
- develop SOE programs in work situations that follow acceptable equity practices
- enroll students who can benefit from the instruction (Do not use high pressure recruiting just to gain female enrollment.)
- have female members on your advisory council

## Overcoming Obstacles

The agricultural industry has many career opportunities for good paying, satisfying employment. These opportunities are for both males and females. The challenge, and the opportunity is to overcome the obstacles that hinder female enrollment and progress through the vocational-technical education in agriculture program. Teachers are the key to providing an environment in which all students can realize their potential and develop the competencies needed for a successful career in the agricultural industry.

### References


Henderson, J.L. "Time-on-Task Behavior in Selected Vocational Horticulture Laboratories," Ed.D. Dissertation, Mississippi State University, 1983.

Leising, J.L., and Emo, K. "Gender Equity: California Future Farmers of America." Staff study, University of California, 1984.

Mayor, Marie; Vocational Equity Specialist, Maryland State Department of Education, Baltimore, Maryland.

ARTICLE

# A Social Science Mission For Agricultural Education

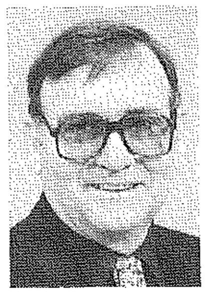
The agricultural education units in New England have the capacity to help carry out the social science mission of the colleges of agriculture in which they are located, according to the deans of those colleges. But, the deans of the agriculture colleges are less willing to recognize that agricultural education units have the same capacity when the unit is located in a college of education.

The deans were responding to an initiative started by the New England teacher educators in agriculture at the 1984 New England Vocational Agriculture Teachers Conference. A committee consisting of Dr. W.H. Annis (NH), Dr. G.R. Fuller (VT), and Dr. A.S. Mannebach (CT) drafted a proposed "Statement of Purposes" for agricultural education units in New England. After soliciting comments from all teacher educators in agriculture in New England, a final draft of the statement was mailed to the Deans of New England colleges of agriculture. The committee was invited to attend the September 1984 meeting of the New England deans to discuss the proposed statement of purposes.

After a lengthy discussion, the deans reached a consensus that Dean Robert O. Sinclair of the University of Vermont would poll the deans for additional comments. Then Dean Sinclair, working with Dr. Fuller, would rewrite the statement to more accurately reflect the position of the administrators of New England's colleges of agriculture. The statement was revised and subsequently accepted by the deans at their December, 1984 meeting.

## The Statement

The accepted "Statement of Purposes" manifests the New England teacher educators' belief that college administrators, faculty, and others need to understand that agricultural education units can contribute to the total social science mission of colleges of agriculture and should not be managed solely as public school



By Gerald R. Fuller and William Annis

*(Editor's Note: Dr. Fuller is Professor and Chairman of the Department of Vocational Education and Technology, University of Vermont, Burlington, Vermont 05405; and Dr. Annis is Professor and Chairman, Department of Occupational Education, University of New Hampshire, Durham, New Hampshire 03824.)*

teacher certification and inservice education units. The teacher educators based their belief upon a set of key assumptions which included (1) Colleges of agriculture have a responsibility for assuring there is sufficient human resource capital to meet the demands for scientific expertise in agriculture at all levels; (2) Colleges of agriculture should assure that all citizens of our Nation are knowledgeable about the importance of agriculture to the economy, society and their personal life; (3) The mission of colleges of agriculture includes the development of student abilities in both technical-scientific knowledge and skills, and in social science knowledge and skills (such as communications, personal value setting, problem solving, interpersonal relations, and leadership; (4) Colleges of agriculture have a responsibility for providing leadership, or cooperating with other colleges in the development of policies regarding agricultural education; (5) Vocational agriculture education in schools should be integrated with general education as part of a comprehensive high school education; and (6) Colleges of agriculture should assure that all teachers of agricultural subjects are adequately prepared and receive continuous upgrading.

In their "Statement of Purposes", the deans specified that: "Agricultural education units in New England colleges have a capacity to assist Colleges of Agriculture carry out the social science component of the mission of those colleges. Utilizing this capacity will assure that those colleges of agriculture with agricultural education faculty (a) take a lead in public school policy development regarding agricultural education at the elementary, secondary, and post-secondary levels, (b) insure that graduates are adequately prepared to pursue careers in the broad fields of agriculture and possess the skills and knowledge to become innovators and entrepreneurs, and (c) prepare a pool of graduates to meet the scientific expertise needs of domestic and/or foreign agriculture."

The "Statement of Purpose" goes on to say that deans of colleges of agriculture view agricultural education units as having the capacity to help the colleges assure students (a) have an understanding of our American agricultural heritage (including the Land Grant tradition), (b) know the National and Regional current status of agriculture as well as the trends and plans, and (c) are aware of career opportunities in agriculture. Agricultural Education units can help; (a) develop educational experiences to assist students achieve some of the social science goals of the college through the development of process skills (including innovation skills and entrepreneurial skills) which are important for pursuing a career in agriculture, (b) provide leadership in the development of public educational policy to assure that human capital needs in agriculture are met, (c) provide teacher education programs which prepare teachers to teach agricultural subjects either in the United States or developing nations, (d) provide leadership in the identification and recruitment of qualified students for the colleges, and (e) provide leadership in the development of research expertise in the areas of educational policy and process as they relate to human capital development for agriculture in this country and abroad.

The deans state that college students should view agricultural education units as helping to (a) develop process skills, (b) select and prepare for advancement in agricultural careers, (c) prepare to teach agricultural subjects in pubic schools, and (d) obtain knowledge of and practice ways in which the quality of personal life can be enhanced through agriculture.

The deans believe secondary school personnel should view agricultural education units as helping to (a) provide information to assist in shaping public educational policy which will privide the human capital needed to meet the demand for scientific expertise in agriculture, (b) prepare teachers to teach agricultural subjects, (c) provide opportunities for college students and faculty to work with expert teachers of agricultural subjects, and (d) provide effective inservice education for employed teachers of agricultural subjects.

Secondary students should, according to the deans, view agricultural education units as helping to (a) provide a linkage between the colleges of agriculture and the public school, (b) provide opportunities to prepare to teach agricultural subjects in schools, (c) provide opportunities to become involved in educational experiences in college to explore and prepare for a variety of career fields in agriculture, and (d) provide opportunities to associate with others having similar interests, with similar or diverse backgrounds, in the exciting experiences of college life.

## Conclusions

The authors believe deans of colleges of agriculture are willing to maintain viable agricultural education units in their colleges. Courses and services offered by agricultural education units must become requirements or recommended electives in the curricula of other departments in the colleges. One way this can be accomplished is for agricultural education units to serve all students in colleges of agriculture by contributing to the social science mission of those colleges.

Courses and support services will need to be developed which apply the knowledge and theories of agricultural education to settings other than vocational agriculture. For example, courses such as Agricultural Communications, Rural Adult Leadership, Adult Learning Theory, Supervised Occupational Experience, Orientation to the Land Grant College, and College Teaching might be among those commonly found being offered by agricultural education units. Opportunities for cooperation with Rural Sociologists need to be explored. Interdisciplinary courses and research may offer exciting new opportunities for Agricultural Education faculty and students.

The new courses and services will need to generate the necessary student credit hours and outside income which, when combined with the standard teacher certification courses, assures agricultural education units of continued support by deans of colleges of agriculture. All this must be accomplished while still maintaining an appropriate balance with the long standing teacher preparation and inservice education roles of agricultural education units.

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ARTICLE

# Agricultural Mechanics Facilities — Impressive or Repressive

What is the condition of your vocational agriculture mechanics laboratory? Is the lab safe or unsafe? Is it adequate or inadequate? Is the agricultural mechanics laboratory a positive or negative environment for student learning?

There is no doubt that the instructor in a vocational agriculture program is the key to the program's success. However, the type and quality of agricultural mechanics facility available to the instructor may, to a large extent, determine long-term program results. Lee (1980) emphasized that our agricultural facilities should reflect the present and future instruction taking place. Innovative teachers have been able to use community resources when school agricultural mechanics facilities have been lacking.

By Jack L. Rudolph and Edgar P. Yoder

*(Editor's Note: Mr. Rudolph is a Graduate Assistant and Dr. Yoder is an Associate Professor in the Department of Agricultural and Extension Education, Pennsylvania State University, University Park, Pennsylvania 16802.)*

Right or wrong, our vocational agriculture programs are judged by their physical appearance and any reason is a good reason to cut programs when budgets get tight. We must make changes and improvements before we are backed into a corner.

## Planned Improvements

The largest and most costly teaching area in the vocational agriculture pro-

*(Continued on Page 22)*

# Agricultural Mechanics Facilities — Impressive or Repressive

*(Continued from Page 21)*

gram is the agricultural mechanics laboratory. Minimum recommendations for this facility are a must if the educational impact on students is positive.

After making allowances for tables and stationary equipment, a minimum of 1500-2000 square feet of open space is needed in the laboratory. The large agricultural equipment of today dictates a need for larger overhead doors. A minimum height of 14 feet and a minimum width of 17 feet is recommended.

The amount of light in the facility can affect student safety and student work attitudes. Safety will be greatly affected by the light quality in the laboratory. If a facility is poorly lighted, the room appears to be depressing and not conducive to learning. The color of the walls and the condition of the paint on the walls will affect the amount of illumination in the work area.

Exhaust systems are a high priority for facilities. The health of the teacher and students can be greatly impaired without the proper removal of toxic gas fumes.

Tool storage cabinets located in the agricultural mechanics laboratory and organized by subject matter area are highly recommended. Identification of the shelves with labels or tool silhouettes will help the instructor and student to account for each tool after each class period with minimal effort.

Storage of supplies can make or break the effectiveness of facility organization. Providing 300-400 square feet for supply storage, with a minimum length of 22 feet to accommodate metal stock in 20-foot lengths, is recommended. Overhead storage is an excellent way to minimize floor space for storage and should not be overlooked.

The need for quality facilities is very important during this period of tight budgets and declining enrollments. If we ignore this opportunity to give our facilities a face lift, we may soon find ourselves out of a job.

## Observation Checklist

The following list was developed and used for a study of vocational agriculture mechanics facilities in Nebraska. This list should serve as an indicator of conditions and a guide for possible improvement. It is hoped that school administrators, vocational agriculture teachers and advisory councils will make use of this instrument. The items can comprise a checklist for assessing the adequacy of facilities.

### Safety Area

One instructor in the department holds a current Red Cross first-aid card or its equivalent.
- 1 - No instructor holds a first-aid card
- 3 - (1) instructor holds a first aid card
- 5 - More than (1) instructor holds a first-aid card

Laboratory stationary power equipment is color coded to ASAE safety standards.
- 1 - No color coding on stationary power equipment
- 3 - Stationary power equipment color coded to ASAE standards
- 5 - Stationary power equipment color coded to ASAE standards plus other such items as hand tools or work benches

The departmental office is located so as to provide supervision of laboratory activities.
- 1 - No window in office overlooking the laboratory
- 3 - A window in office overlooking the laboratory
- 5 - A window in office that allows for full view of the entire laboratory working area

Instruction in safety is provided in advance of any laboratory work.
- 1 - No safety instruction provided
- 3 - Safety instruction provided
- 5 - Safety tests on file

Ground Fault Circuit Interrupter (GFCI) outlets for use of electric power equipment outdoors.
- 1 - No GFCI
- 3 - (1) GFCI
- 5 - More than (1) GFCI

Safety zones located for maximum efficiency.
- 1 - No safety zones
- 3 - Safety zones around stationary power equipment
- 5 - Safety zones located around satisfactory equipment plus other such safety zones as around work benches or anvil

Non-skid material is used effectively.
- 1 - No non-skid material inside safety zones
- 3 - Non-skid material used in safety zones around stationary power equipment
- 5 - Non-skid material used on safety zones around stationary power equipment plus other such safety zones as around work benches or anvil

Fire alarm breaker switch located in the laboratory.
- 1 - No fire alarm breaker switch in laboratory
- 3 - (1) fire alarm breaker switch in laboratory
- 5 - (2) fire alarm breaker switches in laboratory

A first-aid kit located in the department.
- 1 - No first-aid kit
- 3 - A first-aid kit in the department
- 5 - A first-aid kit in the laboratory in plain view

Fire extinguishers are well marked and in easily accessible locations.
- 1 - No fire extinguisher in the laboratory
- 3 - (2) fire extinguishers in the laboratory
- 5 - (3) or more fire extinguishers in the laboratory

### Budget

An annual school board approved budget that considers: A) equipment and material purchases and replacement; B) consumable supplies.
- 1 - Not considered by the board as line items
- 3 - Annual budget line items
- 5 - Annual budget line items plus given yearly increase due to inflation

### Drainage, Exhaust and Dust Collection Systems

Laboratory sump type floor drain should be 12 square feet.
- 1 - Drain is less than 12 square feet
- 3 - Drain is 12 square feet
- 5 - Drain is more than 12 square feet

Exhaust system is used for removal of welding fumes in the laboratory.
- 1 - No exhaust system present
- 3 - An exhaust system in use
- 5 - An engineered hooded or ducted system in use

A dust collection system is used in the laboratory.
- 1 - No dust collection system
- 3 - A dust collection system is in use
- 5 - A dust collection system with inlets at each stationary power tool

### Electrical and Compressed Air Systems

Laboratory lighting for work areas is 80 foot candles.
- 1 - Less than 80 foot candles
- 3 - 80 foot candles
- 5 - More than 80 foot candles

The laboratory has at least 4 compressed air outlets.
- 1 - Less than 4 outlets
- 3 - 4 outlets
- 5 - More than 4 outlets

The laboratory has electric overhead bus ways.
- 1 - Extension cords used to operate stationary power tools
- 3 - Bus ways used to supply electricity
- 5 - All stationary power equipment is wired directly to source

For all of the below minimum standards:
- 1 - Less than the number indicated
- 3 - The number indicated
- 5 - More than the number indicated

### Laboratory Area

Laboratory size is at least 3200 square feet.
Laboratory space per student is 150 square feet.
Laboratory open floor space is 1700 square feet.
Laboratory width to length rations is 1:1.5-2.
Laboratory ceiling height is 17 feet.
Laboratory width is 40 feet.
Laboratory overhead door width is 17 feet.
Laboratory overhead door height is 14 feet.
Laboratory has 2 service doors.
Laboratory work bench lengths do total 100 feet.
Laboratory tool storage area is 140 square feet.

### Student Numbers

Laboratory class size is limited to no more than 20 students.
- 1 - More than 20 students
- 3 - 20 students
- 5 - Less than 20 students

### Housekeeping Area

There is laboratory storage provided for students' coveralls and glasses.
- 1 - No storage provided
- 3 - Storage provide in laboratory
- 5 - Lockable lockers provided for storage of coveralls and glasses.

There is adequate storage for brooms and other cleaning equipment.
- 1 - No storage for brooms and cleaning equipment
- 3 - A storage rack or locker is provided
- 5 - Cleaning equipment and brooms stored throughout the laboratory to provide ease of access and save time

Laboratory tools and equipment are organized to provide for ease of use and daily inventory.
- 1 - No organization to tool storage
- 3 - Tools and equipment are organized and stored for easy use
- 5 - Tools and equipment are organized and stored for easy use plus the tools are color coded or number coded to cabinets

Laboratory floor is well maintained.
- 1 - No evidence of floor maintenance program
- 3 - The floor is clean and there is little or no signs of abuse
- 5 - The floor is clean and there is little or no signs of abuse plus the floor has been sealed

Laboratory supplies are stored in a systematic and safe manner.
- 1 - No consumable supply storage
- 3 - Supplies are stored in a systematic and safe manner
- 5 - Supplies are stored in a systematic and safe manner plus an inventory is used and supplies are kept in lockable storage

There are maintenance and service records of electrical power equipment on file in the departmental office.
- 1 - No records kept
- 3 - 50% of all equipment has records
- 5 - All of the equipment has records

The laboratory is maintained in an orderly, safe, and attractive condition.
- 1 - The floor and tables are dirty, the laboratory is cluttered and the equipment abused
- 3 - The equipment is in good repair, the floor and tables are clean and the laboratory is uncluttered
- 5 - The equipment is in good repair, the floor and tables are clean and the laboratory is uncluttered plus the walls are nicely painted, ASAE color coding is used and the laboratory is organized.

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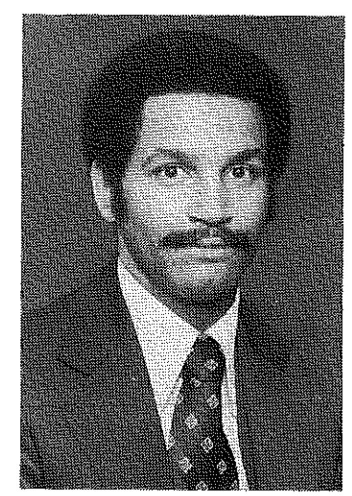

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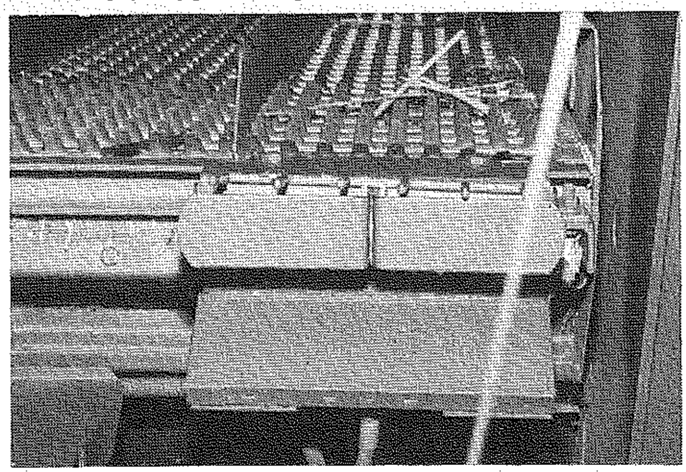
# Stories in Pictures

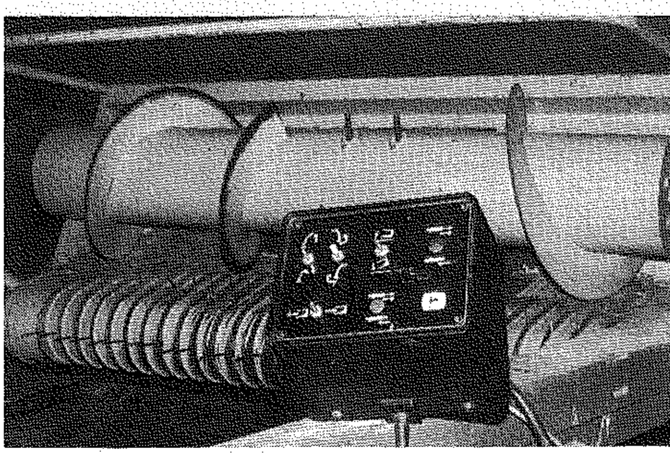
Agricultural technicians will be expected to use computers in analyzing data for management decisions.

Technicians in the twenty-first century will be propagating plants using a sterilized tissue culture process.

Technicians operating agricultural equipment must be alert for warnings from electronic monitors. In the future, electronic sensors and "agrobotics" will replace the operator.



Some of the mechanical units of today's machines will be replaced by electronic modules. An example is the mechanical shaker in a combine which will be replaced with an ultrasonic separator.



Machines which today have some electronic monitors will be equipped with electronic sensors in the future.

Getting information about new technology often uses the proven method of field days.

(Photographs by Jasper S. Lee, Mississippi State University and Arnold Mokma, The Ohio State University.)