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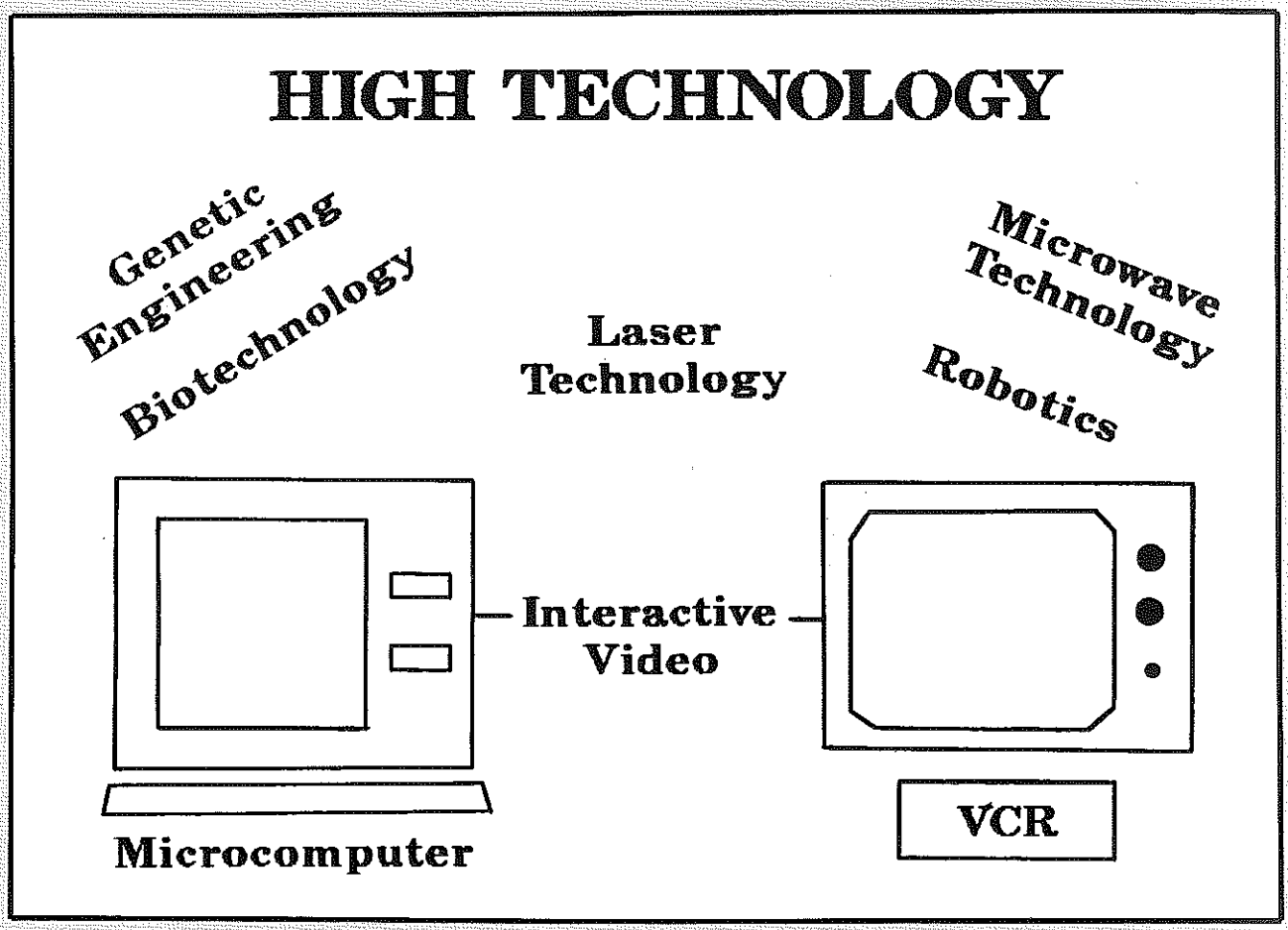


## THEME: Staying Current — High Technology

THE
# AGRICULTURAL EDUCATION
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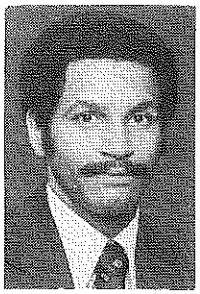
# A Perspective on High Technology



By Blannie E. Bowen, Editor

*(Dr. Bowen is an Associate Professor in the Department of Agricultural Education at The Ohio State University.)*

High technology has supplanted microcomputers as the expression being used by those who follow trends. This issue focuses on high technology because those of us who are users rather than technocrats or whizzes must be at least conversant with this catch-all expression. As one becomes familiar with the subject, your thinking must extend far beyond computers. Agriculture, education, and business are heavily involved with innovations that should not be classified as microcomputer technology. The high tech umbrella includes genetic engineering, embryo transfer, interactive video, laser technology, remote sensing, biotechnology, and a plethora of related expressions.

As a professional in agricultural education, a confusing question arises when one attempts to become literate and up to speed with high technology. Answers about how literate usually become clear only when high technology is used or studied beyond a brief emotional honeymoon period. However, most frequent users say you must be only as good as you have to be, period! Needless to say, there are other schools of thought. However, truly effective agricultural educators should resist most advice that technocrats and neophyte users give. If you lend them your ear, technocrats will convince you that you must keep-up with every innovation, brand, model, etc. To such individuals, a new microcomputer that balances a complicated ration in 2.56 seconds rather than 3.67 must be fondled, caressed, and thoroughly explored. However, most of us do not have time to run to the neighborhood high tech shop to see this new miracle worker or next week's version. Besides, last week's version was priced at only $2,795 and did 10 times more work than was needed.

Needless to say, individuals who follow this gee-whiz advice often times sacrifice agricultural education for high technology. Such individuals might be half literate with technology, but their professional credentials deserve close scrutiny. Are these individuals performing tasks and duties commensurate with being a professional in agricultural education? Is high technology the forest and agricultural education a mere tree? Agricultural educators must be as good as they have to be without sacrificing professional duties and responsibilities.

## Acquiring Competence

Achieving the desired level of high tech competence requires planning and organization. Agricultural educators should follow a systematic model that program planners and evaluators frequently use. Their planning and evaluation model is translated below into a systematic approach to acquiring high tech skills. First, you must realistically assess the high technology skills in your arsenal. In terms of microcomputers, this might relate to how effectively you can use a microcomputer, printer, or modem to run pre-programmed software. The assessment should also measure how effectively you can use word processing, electronic spreadsheets, or database management software.

Second, you should determine the desired level of competence or where you need to be relative to high tech. This is a most difficult part of the planning process. Seeking the advice of competent professionals who have not forsaken agricultural education for high technology appears to be a logical place for input. Again, the advice of technocrats should be carefully weighed for its professional soundness.

Third, you must determine how you will acquire the competence in light of the required sacrifices. Life is full of trade-offs and time spent learning a new form of high technology could be spent doing other professional obligations. Is the new knowledge worth the time invested? If the carefully weighed professional decision is affirmative, then a host of workshops, courses, seminars, and sessions are available to help you acquire the desired knowledge or skills.

Fourth, periodically evaluate where you are with high technology. Because information and space age technology change so rapidly, periodic assessments are indeed warranted. My annual assessment comes at the end of an academic year when I can reflect and do an honest self-appraisal. For example, I maintain and enhance only those microcomputing skills that make me more effective and efficient. My 1985-86 goal was to become proficient in using Apple and IBM compatible microcomputers to teach students how to do word processing, perform calculations with electronic spreadsheets, and use database management software. Over the past five years, my teaching included those three applications and other microcomputer topics, but that teaching was done exclusively with Radio Shack microcomputers. My 1986-87 goal is to become more proficient with computing via telephone, i.e. telecomputing and using computer networks.

## Concluding Comments

Being as good with high technology as the situation warrants has merit because professional obligations continue to mount. The high technology age requires professionals who can manage, sort, and process a variety of information in short periods of time. Those professionals who

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## A Perspective on High Technology

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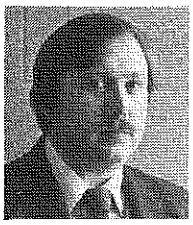
have systematic plans for staying current will reap the benefits that high technology offers. Fred Reneau, the Theme Editor for this issue, is to be congratulated for securing a diverse group of authors to share their thoughts on high technology. All agricultural educators should explore those ideas and then use them in developing a personal plan for staying current with various forms of high technology.

### The Cover

High technology in agricultural education should not be limited to microcomputer technology since it encompasses many other topics that impact upon agriculture, education, and business management. (Drawing courtesy of the Editor).

THEME

# Staying Current With High Technology



By Fred W. Reneau, Theme Editor

*(Dr. Reneau is an Associate Professor and Teacher Educator with the Department of Agricultural Education and Mechanization at Southern Illinois University, Carbondale, Illinois 62901.)*

High technology! Well, what is it? Who needs it? Who has time to learn it? Sometimes it's hard just to maintain the status quo. As teachers, supervisors, and teacher educators in agriculture, all of us have a responsibility to stay abreast of what is happening with agricultural technology.

Production agriculture, on the farm and ranch, is going through some very rough economic times. But we must believe and work toward the idea that 'what goes around, comes around.' Agriculture is headed for better times and there is a future in agriculture.

Future employment opportunities in agriculture and related agricultural industries are projected to be bright. It is estimated that one-third of all scientists and teachers in the United States Department of Agriculture (USDA, November 1985), other government agencies, colleges of agriculture, and agriculture industries will reach retirement age in the next five years. People will be needed in six areas of agriculture: professional and scientists; agri-sales and service; agriculture production and management; administration and finance; manufacturing and processing; and communications and education. Although these needs are beyond the entry level training provided in vocational agriculture, vocational agriculture programs can provide personnel to fill the entry level positions as experienced people move into more professional and technical areas of agriculture.

Innovations in agriculture occur daily. High technology will greatly impact agriculture in the future. A few of the high tech developments in agriculture include: guidance systems on field equipment; bio-genetics in animal production — embryo manipulation; photodynamic "laser" herbicides; mutant pseudomonas syringae — new strains to prevent frost damage; meat treatment — pigmenting myoglobin removal; and food from fixed-bed enzymes.

Innovations and changes in agriculture are many and funds are few. Teachers don't have to know and teach all of the high tech knowledge and skills, but we need to provide students with an awareness of high tech applications being developed and used in agriculture.

In this issue, Mottaz, Cone, Raymond and Nowels, and Conrads discuss the use of community and industry sources by vocational agriculture teachers in the development of individual awareness of high technologies in agriculture. Kotrlik, Parton, and Borne discuss some of the new developments in agriculture.

Dairy Cattle: Principles, Practices, Problems, Profits, 3rd Edition, By Donald L. Both, Frank N. Dickinson, H. Allen Tucker, Robert D. Appleman. Lea & Febiger, 600 Washington Square, Philadelphia, Pennsylvania 19106-4198, 1985, 473 pp., 173 illus., $39.50.

This book presents the principles, practices, problems and profits of dairy cattle farming. It presents a comprehensive range to topics related to dairy farming including the dairy industry's development and current practices, breeding, nutritional and feeding practices, reproduction and lactation, and herd management. Sections are included on what I consider recent advances in dairying: milking systems, feeding strategies in early lactation, protein metabolism, and use of microcomputers. Overall, this book treats daily herd management in a very complete, current, and technical manner which leads to increased profitability for farmer or student.

Each chapter has a follow up of review questions and references. The text of most chapters begins with a brief history of the topic and concludes with a brief summary of the preceding material.

This textbook is recommended for an advanced high school course in dairying, a 2 year junior college or a 4 year college. It can be used as a reference in the high school or a course text in colleges.

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# Shift Your Gears — To High Technology

By Garry Raymond and K. Elliott Nowels

*(Mr. Raymond is a Master Teacher for the Chicago High School for Agricultural Sciences, 3807 West 11th Street, Chicago, Illinois 60655; and Mr. Nowels is President of Project Clear Window, Inc., an educational communications firm at 333 N. Michigan Ave., #1401, Chicago, Illinois 60601.)*

Every so often it seems that a new "buzz term" sweeps the country in the name of educational progress. Usually the term lies at the center of a larger issue and often educators feel a need to line up "for" or "against" the trees of the term without seeing the forest of the central issue.

The term "high-technology" seems to be such a term and those that may resist keeping up with "high technology" are missing the overall point. That point, quite simply, is making the time-honored effort to **keep agricultural education relevant.**

In the realm of current events, the term "high technology" can be used to herald several basic shifts that seem to be occurring in America and the industry of agriculture. In response to this transition, a few "shifts" may be appropriate on the behalf of agricultural educators.

## Shift Your Image

Agriculture is an applied science — a very advanced science. *The American Heritage Dictionary* defines "technology" as "the application of science, especially in industry or commerce." Yes, that means that what we are doing is already "high technology", if we are staying current with new developments in the industry of agriculture. Concern yourself with maintaining the relevancy of your educational programs and you're concerning yourself with high technology. No mystery about where to go get it or what it looks like. It looks like relevancy of education.

## Publicize Your Image

Once you realize that you're indeed providing relevant, "high technology" educational experiences for the students in the classroom, **try not to keep it a secret.** In the domain of public information, the buzz term can be used to advantage. Touting the "high technology" nature of your programs may be the best way to avoid budget cuts and program elimination.

Remember the old public relations adage: "When you are getting tired of your slogan, your public may be just beginning to hear it."

For some it may be difficult to get out of the idea of stressing farming in agricultural careers, but the fact is that about three out of every four young people we educate will be in a career other than production agriculture. We're all proud of our agricultural youth, but developing an attitude of serving the greater industry of agriculture doesn't mean altering our support of those who come from farm backgrounds. It may mean opening up our support of those that don't.

The real shift here may be in the opening up the "space" in agriculture for those bright young minds that are interested and only need a gentle push toward understanding where they fit in. Overall it may mean a shift in your attitude — too often we think only in terms of "our family of agriculture" instead of realizing that we are also part of mainstream America. Let's be more a part of mainstream America and generate the support we need among those common everyday voters.

So, in answer to the question, "Why have a school for agriculture in the City of Chicago?" We often must ask: **"Why not?"** The industry of agriculture is so large that we had better be active in educating people to offer their talents to the industry wherever we can. We can't hope to fill all the positions available with just those people with "farm backgrounds", consequently, we must make it our business to handle the education of non-farm folks the best way we know how: through vocational agriculture and the FFA.

## Yourself As A Teacher

The shift here is simple — Are we still trying to teach everything ourselves, or are we providing a means through which our students gain knowledge — from whatever source, but through our facilitation? Take a moment and think right now: **The idea is that your students "learn."** And it doesn't matter who they learn from as long as you're there to professionally guide the learning.

Some educators may be paralyzed in providing avenues of "high-tech learning" to their students simply because they feel they don't have that knowledge themselves. They may be paralyzed by the thought "I have to go back to school." It's not true! If you look around, you might find that there are many, many sources for this information — chiefly from those involved in agriculture's private sector.

We must develop close business and industry partnerships. Fortunately, most local vocational agriculture departments already have advisory councils, and this is a logical place to start the ongoing process of staying current. The advisory council offers you the opportunity to go out and find the best possible people from your local

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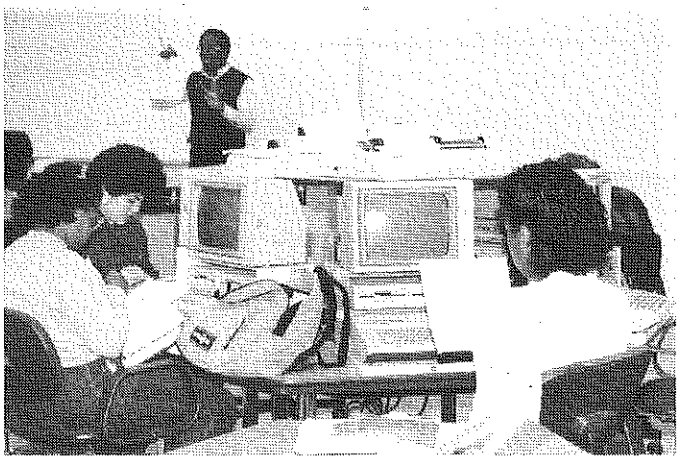
Tom Donovan (far left, President of the Chicago Board of Trade and chairman of the Advisory Council for the Chicago High School for Agricultural Sciences (CHSAS), makes a point during a recent meeting of the group. Listening (left to right) are Dr. Ellen Summerfield, Principal of the high school, George Munoz, Chairman of the Chicago Board of Education and Dr. Manford Byrd, Chicago Superintendent of Schools. (Photo courtesy of Project Clear Window).



Computer science is just one of the many specialized courses offered at the Chicago High School for Agricultural Sciences. An effort to incorporate learning in agriculture is made in each course — whether it is of math, English or science. (Photo courtesy of Project Clear Window).

## Shift Your Gears — To High Technology

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agricultural resource pool and pick their brains about what skills they want the people they employ to have. **Enrolling them in support of your program gives them the feeling of partial ownership that enables them to put a strong arm of advocacy on others in the community that may not yet be your good friends.** This will increase your pool of cooperative work experience possibilities and offer a wide range of potential field trips and guest speakers.

### A Shift To Action

These ideas must be translated to action in the classroom and educational activities in high schools across the country. We cannot wait around for it "to go away." It won't.

**It's crucial, if we are to survive, that we don't talk the issue to death or confuse terms with substance.** We must maintain or reinstitute relevancy. We've got to provide an avenue to gain support and information from agribusiness and industry and translate their ideas into action within our programs. And this takes an **active approach.** In most cases, this kind of support is ready and willing, even anxious, to help in any way the agricultural education professional sees fit. All they require is a clear invitation.

### Summary

If vocational agriculture is to be truly career-oriented, we must look to the "non-traditional" aspects of the industry we serve. A few examples include bio-genetics, telecommunications, aquaculture, hydroponics, engineering, computer analysis, meteorology, service technician, ova transplants and robotics. These examples are "Star Wars" enough to scare even the most open-minded agriculture instructor. But, in most cases, we don't have to teach indepth technical skills. Instead, we need to provide students with an awareness of the changing shape of agriculture and the wherewithal to be fertile ground for an employer's educational efforts.

Certainly, in this arena — the preparation of young people who have common sense, skills in oral and written communication, possession of the work ethic and the spirit of cooperation — the vocational agriculture program and the FFA have few peers. By keeping up to date and maintaining our relevancy, that tradition will certainly continue.

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PRODUCTION ECONOMICS: THEORY WITH APPLICATIONS, By John P. Doll and Frank Orazem, New York: John Wiley and Sons, 1984, Second Edition, 470 pp., $32.95.

Production emphasis is a subject commonly offered in undergraduate programs of agricultural economics. It is an area of economics devoted to the analysis of the use of resources in production processes found within individual firms in agriculture.

This book is designed to bridge the gap between abstract economic theory and its application to real situations in agriculture. It contains 10 chapters and covers the following major areas: introduction to production economics and its relationship to other branches of economics, production and cost functions, allocation of one variable input, production with two or more variable inputs, production of two or more products, economies of size and their implications for farms, the production process through time, introduction to decision theory, linear programming, and farm adjustments in a changing economy.

The authors designed this book for undergraduate students who have had a course such as principles of agricultural economics but no other exposure to microeconomics. It is well written and would be useful as a text for such students. Agricultural teachers at the high school and junior college levels would find the book quite useful as a reference.

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# How To Stay Current With High Technology

By Ted Mottaz

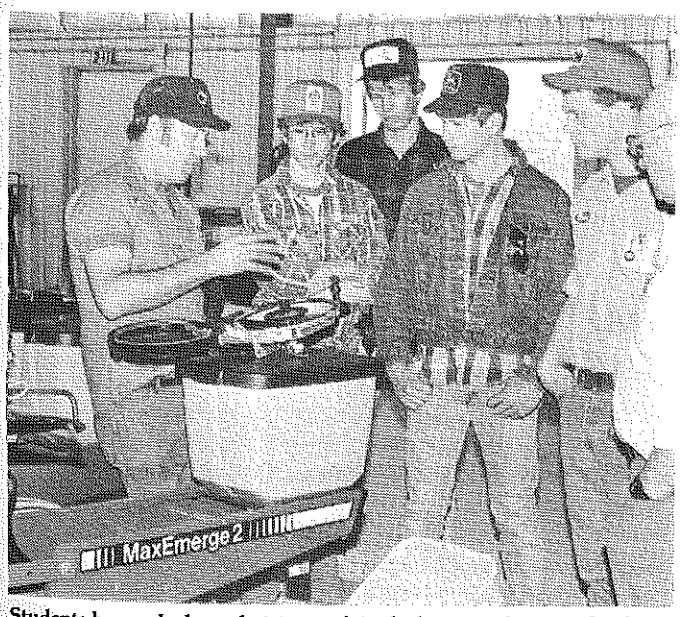
*Mr. Mottaz is Agriculture Coordinator at Carl Sandburg College, Galesburg, Illinois 61401.)*

"Staying current" has always been a theme of good agriculture teachers. However, the problems of staying current seem to have been compounded in the last few years. Exponential increases in new technology have been accompanied by declining farm income and paltry funding for agricultural education. Consequently, there are few other teaching fields today where the changes are so rapid and the margins for economic error so slim. Nevertheless, there are ways to acquaint students with the latest in technology without putting financial stress on your program.

## Acquaint Students with the Latest Technology

*The latest in agriculture chemicals.* For the latest in crop chemicals, contact local agribusinesses to reach the district sales representative for the particular products you would like to see. Why bypass the local agribusiness? We don't like to put the local business that often is in a very tight financial position on the spot. The district sales representative has little trouble obtaining even very new, scarce products and can often obtain them for us free or at reduced cost. Also, the district sales representative has immediate access to the company's most recent data and can give an excellent explanation to the class on the theory behind the new chemical as well as its proper usage.

Probably the greatest restriction on actual student application of this new technology is the availability of a land lab. If your institution has no land lab, try working out an agreement with an area producer. Both farmers and chemical companies are more than willing to become involved with an active agriculture program that provides high visibility for the product as well as expert use of the product. To be equitable to all chemical businesses within your district, you might try a comparison plot or annual rotation of featured products.




**Students hear a dealer technician explain the latest in planter technology. (Photo courtesy of Ted Mottaz).**

*The latest laboratory equipment.* The cost of facilities and equipment for extensive laboratory work is usually prohibitive. The instructor has to ask the question, "Do I want my students to be lab technicians or do I want them to be aware of the latest technology that is available to them as producers or agribusiness persons?"

Most of the students at our institution are either interested in the application of laboratory results or are several years away from conducting their own research. Therefore, a basic knowledge of research techniques and their application is our first lab priority. We handle staying current in lab technology by cultivating a good working relationship with laboratories in the area. There are numerous independent soils labs throughout the country and many are interested in demonstrating to students. In our area, we are able to take our plot soil samples to a professional lab. Students analyze the samples through the guidance of the lab technicians and develop a fertility plan like the lab provides its customers. This way, the students begin to understand the basic principles of agricultural research and actual lab procedures as well as their use in agriculture/agribusiness.

In the area of animal science, very few agriculture programs have access to the latest technology in disease detection and techniques. We address this issue by taking our students to inspect an area animal disease laboratory. The purpose of our visit is not really to develop skills in the highly technical area of animal diseases, but to make the students aware of the technological changes in the field and how those changes can affect them in their careers.

*The latest marketing strategies.* One of the most demanding and important components of the agriculture program is the teaching of marketing. We can obtain

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# How To Stay Current With High Technology

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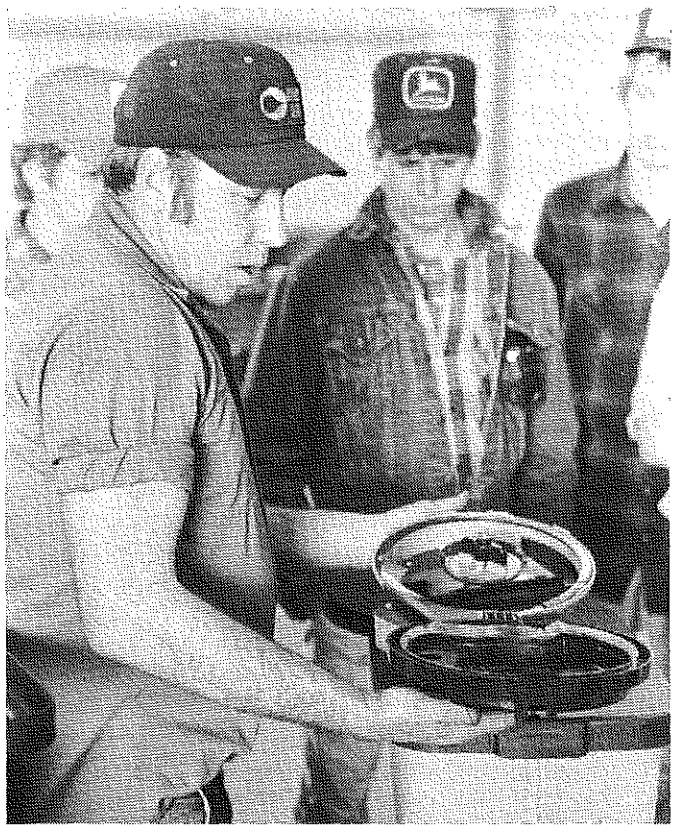
assistance in this complex field by the utilization of the computer and telecommunications networks.

Many agricultural programs have access to a computer. What better way is there to obtain up-to-the-minute marketing information? These services are relatively inexpensive as long as you are working with only price updating, and not a full-blown marketing service. Although the marketing industry is at present rather reluctant to place true, full marketing services in a public institution, we are seeing some softening of their position with the advent of scaled-down programs. And don't forget the local elevators and brokers. They are usually more than willing to assist in whatever way they can.

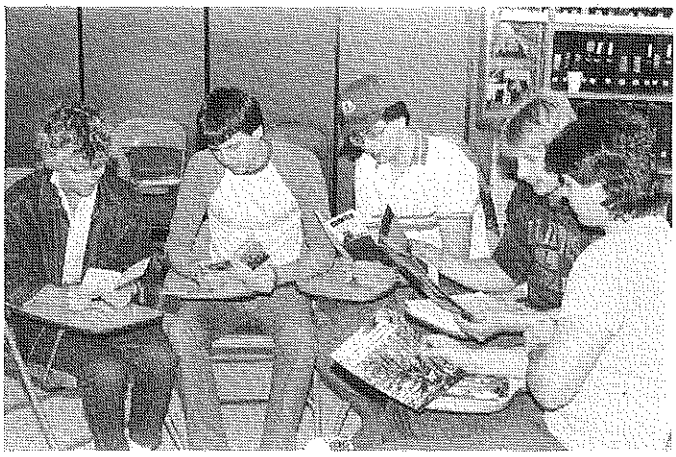
*The latest machinery technology.* There is no way an educational institution can stay current in machinery technology without a good working relationship with area dealers. If your relationship is good, there is no way you can miss out on the newest technology. This relationship can be the most valuable one your program ever had.

Students in our institution have prepared all types of machines for the field either at the college shop or in the dealership. Seeing how a piece of new equipment goes together allows students to better understand field adjustment as well as assembly.

With appropriate publicity, dealers have been very willing to loan us the newest of their line for use on our plot. Field testing the latest machinery gives students a knowledge of both the advantages and the problems of the new models.



**A dealer technican explains planter innovations to a visiting crops class. (Photo courtesy of Ted Mottaz).**



**Students stay current in agricultural chemicals by checking the latest brochures from chemical manufacturers. (Photo courtesy of Ted Mottaz.**

*Maintaining the latest files.* Probably one of the easiest ways to stay current is to develop a filing system of the most current brochures and sales leaflets. I realize that we are not to be commercial, but it is important to stay ahead of our students and it is very possible to discuss current products without endorsing any particular firm. Try to get on mailing lists of "update materials" sent to dealers and users. Fill out reader information cards every time there is an opportunity. Also, this is the age of agriculture shows. Attendance at area shows can show you the latest and also make some very valuable connections to agribusiness.

Glance through your files occasionally to throw away outdated material. One of my most vivid memories is cleaning out a teacher's agricultural machinery file and finding a brochure detailing the adjustment procedure for a horse-drawn plow. Keeping outdated material only makes it difficult to consult the sources you really need.

A time-honored source of current material is the inservice program. Inservice is still a good general reference point, but you may find that you need more specific material. Don't overlook your County Extension agent and the Cooperative Extension Service in your state. There is no better way to stay current at a reasonable cost. Also, don't overlook giving the Service your support. Limited funds are jeopardizing its ability to provide us with current information, and we should remember that we are in this business together.

## Summary

The task of staying current is very difficult, but it is one of the most important things that we can do. One of the driving forces behind my decision to farm personally and to protect our college agricultural plot from encroachment is the concern of staying current. If our students can observe the latest in technology, they will be better prepared for their careers. If they can observe a teacher who is receptive to new ideas and willing to change, they will be a step closer to the adaptability they will need in the year 2000.

THEME

# Food For Thought

By Joe W. Kotrlik, Gaylon Parton and Curtis Borne

*(Dr. Kotrlik is an Associate Professor and Mr. Parton and Mr. Borne are Graduate Assistants in the Department of Agricultural, Extension and International Education at Louisiana State University, Baton Rouge, Louisiana 70803-5422.)*

Teachers of vocational agriculture face an ever increasing technology gap between our program of instruction and the fast-moving technological world around us. High technology innovations occur every day, especially in the animal and crop sciences. Yet, the multitude of demands on the teacher's time often make the task of keeping up technologically difficult if not impossible.

A simple solution does not exist. Students in vocational agriculture programs can't be allowed to fall behind the norms set by technological advancement. As a result, we must all ask ourselves one question: "Is my instruction living up to its technological potential?"

To take an inventory of our knowledge of high technology, let's look at several recent innovations that may be classified as being significant in the field of agriculture. As you read through the examples, assess your state of readiness to be a vocational agriculture teacher in the high technology field of agriculture.

## Photodynamic "Laser" Herbicide

A newly developed highly selective herbicide is on the market. It offers the advantages of being biodegradable, thus, it is not harmful to humans and is also effective at low concentrations. This photodynamic "laser" herbicide is triggered by sunlight and has been called the decade's most dramatic agricultural development.

The main ingredient is delta-aminolevulinic acid (ALA), an amino acid found in the cells of animals and plants. ALA is used by plants to make tetrapyrroles chemicals that form chlorophyll when exposed to sunlight.

In the evening, the herbicide is sprayed on plants, forcing them to accumulate tetrapyrroles at a higher rate than normal. At daybreak, the extra tetrapyrroles cause photochemical reactions that break down cell membranes and drain the plant's fluids within hours.

## Mutant Pseudomonas Syringae

Thousands of acres of crops are ruined each year by frost. The primary cause of that damage is two strains of bacteria, *Pseudomonas syringae* and *Erwinia herbicola*, which have a membrane protein that orients water molecules into an icelike lattice.

Researchers have been able to isolate the gene responsible for the ice-nucleating ability to *Pseudomonas syringae* and have altered it to create strains that cannot catalyze ice formulation. When placed on plants, the mutant bacteria thrived and crowded out the unwanted "wild" ones. The result: no frost damage.

## Pigmenting Myoglobin Removal

For chicken lovers, white is in. The use of pale parts for chicken nuggets and breast patties is mandatory for consumer satisfaction. The problem for the chicken industry is what to do with all those dark meat thighs.

The answer to the need is to remove pigmenting myoglobin by washing and bleaching the thighs. A little bleach in the form of hydrogen peroxide or ascorbic acid is the answer to really whitening the thighs. The process even results in a bonus: The taste is improved to approximately halfway between breast and thigh meat.

## Future Food from Fixed-bed Enzymes

Lip-smacking tastes can be obtained from genetically modified microorganisms or fixed-bed enzymes. These foods are the "real thing." Because they are the real thing, they taste, smell and nourish exactly like the real thing. They match the aroma, flavor, nutrients, and even texture of the natural foods.

These foods are synthetic, but not artificial. Their composition is identical to their natural counterparts. Examples of those already produced and being marketed in Britain are "memic meats" in the form of "veggie burgers" and chunks of "beef" in frozen meat pies.

The Federal Drug Administration is studying a genetically modified bacterium used to produce "calf rennet" which will be used in puddings and cheeses. The microorganisms containing either bacterium, fungi, or yeast will grow on almost any organic substrate. Vegetable starch set up in tanks such as potato dextrose agar can yield a product under a city, in a desert, or anywhere as long as there is energy from the sun.

Fixed-bed enzyme synthesis involves transforming raw natural materials into foods by chemically recreating animal metabolic processes. For example, to make milk, a pulverized semi-liquid, "chewed" slurry of grass can be filtered through an enzyme sequence — the same sequence as encountered in bovine digestion. The end product will emerge as a synthetic milk.

## Embryo Manipulation for Farm Animals

The use of embryo engineering may help redesign animal agriculture. This new biotechnological process which is being perfected by Dr. Robert Godke's laboratory at Louisiana State University is revolutionary to animal breeding.

Embryo microsurgery (micromanipulation) for farm animals is a newly developed technique which involves opening the outer covering (**zona pellucida**) around the

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## Food For Thought

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embryo of an early state embryo (six to eight days after mating) with a finely drawn glass needle or a razor blade. The embryo is then microsurgically dissected into equal parts, as shown in Figures 1 and 2.

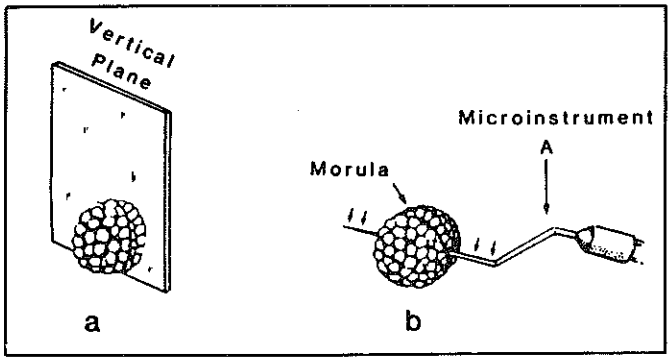


**Figure 1. The embryo is bisected on a vertical plane as shown in 1a. A fine glass microinstrument (needle) is used to bisect the embryo (shown in 1b) while in the holding medium.**

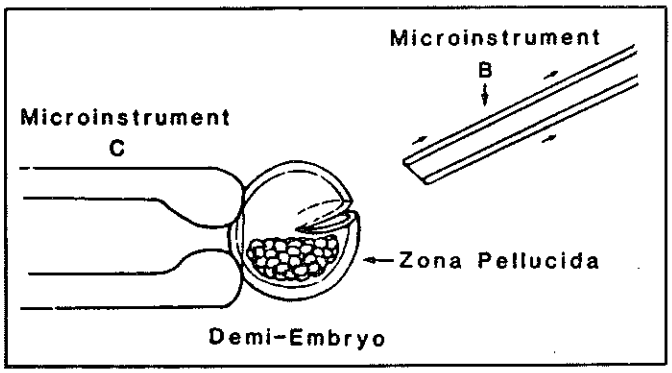


**Figure 2. A half embryo (demi-embryo) is placed in an evacuated zona pellucida with a fine glass blastomere handling micropipette. The zona pellucida is held with a glass suction micropipette.**

This micromanipulation technique can result in monozygotic (genetically identical) twins which will be of the same sex. These "half" embryos (as called demi-embryos) can be further divided to produce triplets or even quadruplet offsprings from the same embryo. This innovative approach to producing genetically identical twins has already been successful in the U.S. in all types of livestock including beef and dairy cattle, sheep, goats, swine, and horses.

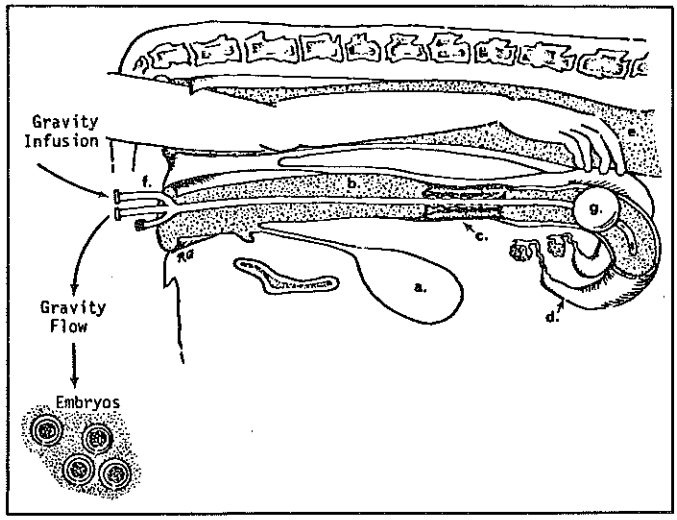


**Figure 3. A gravity flow non-surgical embryo collection system for cattle: (a) bladder, (b) vagina, (c) cervix, (d) uterine horn, (e) rectum, (f) three-way Foley catheter and (g) inflated cuff.**

Embryo micromanipulation is only one of the many advancements unfolding in "high-tech" agriculture. There have been procedures developed in recent years that were keys or stepping stones that have led up to embryo engineering. These included donor superovulation methodology and non-surgical embryo transplant (collection and transfer) techniques that were essential for this process.

Also, the development of the special defined media for holding embryos, the ability to freeze and store embryos for future use, and the perfection of the **in vitro** culture systems have all made important contributions to the recent success of this micromanipulation process. It appears that these new techniques along with micromanipulation are just the beginning of the new era in animal reproduction.

### Conclusion

These few examples of "high-tech" agriculture are ones that do not require extensive research study or equipment to present to a class of future innovators. As vocational agriculture teachers, we can and will have a tremendous hand in the development of future innovations if we decide to become innovative in closing the technology gap that exists between our programs of instruction and "high-tech" agriculture.

*Coming in November . . .*

**Staying Current: Professional Affairs**

# New Agricultural Machinery Technologies... How Does A Teacher Keep Up?

By John A. Conrads

*(Mr. Conrads is a Reliability Manager at John Deere Tractor Works, P.O. Box 3500, Waterloo, Iowa 50704.)*

Mechanized agriculture as we know it today is a rather recent development. Even today many areas of the world are farmed by methods that are thousands of years old. I am reminded of that when I look at the crude plow I brought from my stay in Iran. It consists of a rough natural tree trunk that serves as a beam; it has a vertical wooden member that serves as the standard with a steel tip slipped over it. And then there is a rear handle for the farmer to guide the plow. At the front of the beam is a yoke which then completes the entire implement. Oh yes . . . one thing kind of intrigued me: It does have an adjustment on the joint between the beam and the standard to provide different angles for the ground engaging tip.

Systems on modern agricultural machines have been improved and made more reliable, but they have also become extremely complex . . . often more complex than the do-it-yourself mechanic can master. Therefore, the demand for skilled technicians in farm equipment dealerships is at an all time high despite the recent recession in agricultural machinery business. It continues to be less difficult to hire a qualified engineer than a highly qualified technician. But the progress of agricultural machinery technology has not stopped. In fact, design objectives for future products center on ways to improve consumption and enhance efficiency. Whereas the cost of portable fuel has decreased in recent months, there is no question that operating costs can be significantly lowered with better use of available energy. So additional push will be directed at reducing the amount of fuel used per acre. This will be reflected in new engine technology as well as new technology in transmitting power.

## Untapped Resources

One of the untapped resources for improving efficiency and function is the prudent use of electronics. We are only at the beginning of the influx of electronics in almost every function of modern farm machinery. This is fast becoming one of the new technological plateaus that everybody who is involved in agricultural machinery has to get familiar. At present most of the electronic elements are for monitoring. But before long, electronics will be used in controlling vital functions. Already electronically controlled governors are appearing on diesel engines and before long they will make their entry into the agricultural machinery market. Just when everybody thought they had the diesel engine figured out, here is a new wrinkle that has to be understood. Electronics will also find a wide range of application in guidance systems such as row guidance for planters or harvesting machines such as cotton pickers, forage harvesters, combines, etc. Electronics are already applied in determining ground speed of the tractor through the application of radar. A combination of these technologies will very soon lead to automatically controlled operation. The operator will just dial in the speed in which the machine has to travel and all the shifting and engine control will be taken over by electronic function. Electronically controlled depth control for implements is already a reality.

This is the present and perhaps mid-term outlook. But things don't stop there. Revolutionary things can be envisioned as we look ahead to the end of the 20th Century and perhaps even into the beginning of the 21st Century. Farming will definitely undergo a substantial revolution.

## A Look at the Future

It is perhaps interesting to speculate . . . to look at the future . . . to gaze into a crystal ball . . . but it is important to look at the historic perspective and draw conclusions for the future. While doing so we will observe that the future is already here. Agricultural machinery today does not com-

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**Mechanized agriculture is a recent development because many areas of the world use methods that are thousands of years old. (Photo courtesy of J.A. Conrads).**

# New Agricultural Machinery Technologies . . . How Does A Teacher Keep Up?

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pare with the crude machinery of only 50 years ago. It is highly sophisticated and many systems rival the complexity found in modern aircraft. All these systems will need attention and service at some time. The big question is who will service these machines skillfully and expeditiously.

There is no question that modern machinery systems are not going to be serviced by novices or by uneducated and unskilled technicians. That is where the vocational-technical schools and junior colleges come into the picture. What is more important, that is, where does the agricultural teacher enter the picture? It is commonly accepted that many of our technical training efforts lag anywhere from five to 15 years behind the marketplace and the students are trained on machines and systems that are 10-15 years old. This leaves the student bewildered when he or she leaves the classroom and enters the world of work. This, in my estimation, is one of the reasons why vocational training programs have not received the support by the community and potential employers. It is essential that today's students are trained on today's machinery and today's systems. Again no student will be adequately trained on these new systems unless the teacher is also qualified to set the pace in the classroom. The rapid development of agricultural machinery has left some teachers in the wake and they have become unqualified to handle today's needs. Teachers whose training goes back 20 to 30 years and who have not made a conscientious effort to stay up-to-date are probably ineffective in educating our new generation of technicians.

Most schools do not employ a teacher recertification procedure; neither is there any real credible way of appraising the effectiveness of the teacher. On the other hand, a teacher is often at the mercy of the budgets that don't allow the school to procure modern training aids equivalent to machinery systems that are currently on the market and to send the teacher to advanced training courses.

The recipe for success in the classroom is to have systems in place that prepare students effectively for the world of work. Two major strategies have to be followed: (1) The continuous updating and requalifying of teachers; (2) The procurement and continuous updating of training components that are current with new technologies in agricultural machinery.

The first can be achieved by teachers who conscientiously strive to stay in tune with developing technologies and school administrations that vigilantly pursue teacher qualifications by whatever means. This presupposes that the administrations in our vocational schools and junior

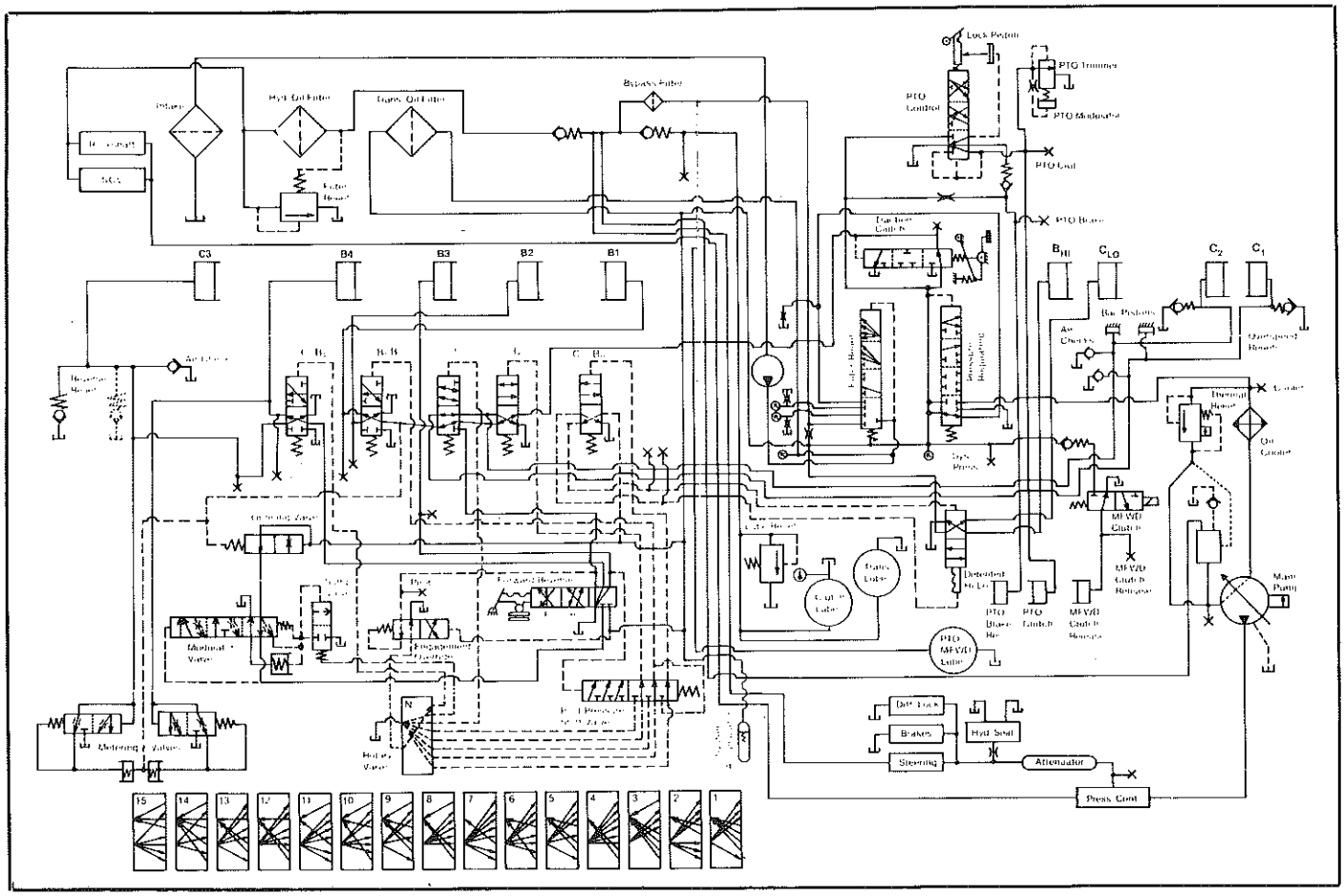



**Figure 1: This circuit diagram depicts the complexity of controlling a modern power shift transmission. (Figure courtesy of J.A. Conrads).**

colleges are totally aware of what is happening. One way to assure this is through local advisory boards that establish what the marketplace needs.

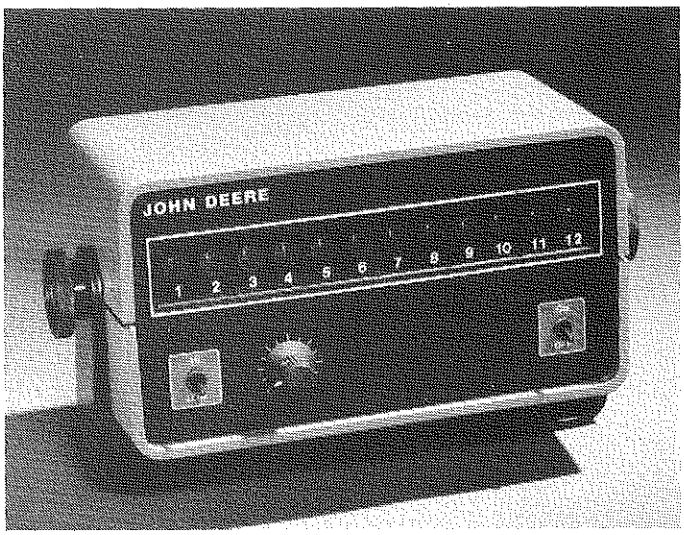
The school administrations must also assure that budgets allow for the purchase of new components. In the end it comes down to funds and teachers as well as school administrators have to be good salespersons to sell their programs to the funding agencies in order to remain credible in the eyes of potential employers. Whereas an orderly and forceful administrative approach is essential for progress, there is no substitute for the individual initiative of teachers.

## Up-to-Date Sources

Here are some suggestions for staying up-to-date. Almost all manufacturers produce excellent operator and service manuals that are available for rather nominal charge from the manufacturers. These are probably some of the very best sources for an insight into modern technology. In addition, some manufacturers allow agricultural teachers to attend their service schools or maintenance sessions where dealers' service people are being taught on the new technology.

Another excellent source of information are local dealers. It would seem that the motivated agricultural teacher would have a working relationship with some local implement dealers and get some firsthand information about new technologies and how to deal with them. Generally, implement dealers welcome the involvement of agricultural teachers because they can readily see their worth to a community in providing a skilled technician pool. Another broad perspective of new agricultural machinery technology can be gained by attending agricultural machinery fairs or a Farm Progress Show where machines are in actual operation.

Also, wouldn't it be a real eye opener to spend half a day on a combine or a tractor? And then, of course, there is the help that comes from the universities and inservice workshops but in the end there is no real substitute for the




**This monitor checks seed drop. Lights will flash and an audible warning sounds when planting rates change significantly. (Photo courtesy of J.A. Conrads).**

teacher being a researcher in his or her own way. None of the knowledge about this new technology will come easy, so it will be up to the individual teacher and his or her zeal to remain up-to-date. Not every approach is right for every teacher. The best way to get the knowledge will have to be decided by the individual teacher as he or she views his or her own capabilities in view of the needs of the marketplace.

One more thought. Today's generation of young people has largely grown up with the computer and they certainly don't see the repair of a simple lawn mower engine as a challenging occupation in the classroom. The higher the level of technology that is being taught, the greater will probably be the interest of the student body. Since it is quite clear that no organization can rise above the quality of its leaders, it is equally true that no substitute can be found for a qualified teacher. The skill level of students

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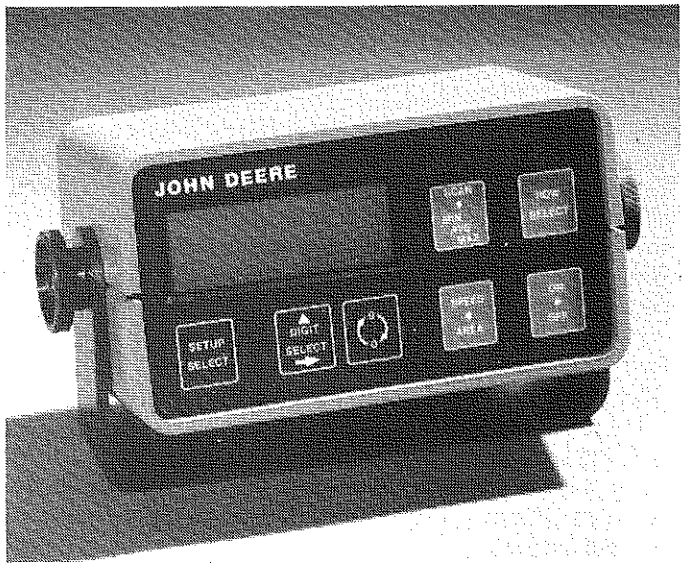
**This row scan monitor quickly displays the average population of each row. (Photo courtest of J.A. Conrads).**




**Multiple information such as planting speed, average population per row, average population of all rows, acres planted per day, and acres planted so far this year can be provided by this monitor. (Photo courtesy of J.A. Conrads).**

## New Agricultural Machinery Technologies . . . How Does A Teacher Keep Up? *(Continued from Page 13)*

will be in direct relationship to the skill level of the teacher.

### Summary

My appeal is to all agricultural teachers to assess their capabilities in the light of today's technologies and those technologies that will emerge in the near future and then take those steps that are necessary to close the gap. Certainly much help is available to the ones who probe and apply themselves. Excellent knowledge of present technologies will not only make the teacher more comfortable in his or her role, but it will also result in a well-trained group of young people who are ready to go out to do an expert job on agricultural machinery. In the end, the credit should truly go to the teacher's effort that has gone into preparing young people for the world of work. That's the final exam. I know you will make sure you pass it because I have witnessed your dedication many times.

THEME

# The Need To Keep Up With High-Tech Agriculture

By Robert Cone

*(Mr. Cone is a Vocational Agriculture Teacher at Salem High School, Salem, Illinois 62881.)*

Vocational agriculture instructors keeping up with high technology agriculture! Impossible, you say, especially with preparing for judging contests, Foundation Awards, community service activities, FFA banquet plans, semester tests, ordering supplies, chapter earnings and savings activities, BOAC plans, and I could go on and on. Then there are local, regional, state and national meetings to keep up with funding, policy changes, trends, and other developments.

Most of us have families that deserve our attention. Vocational agriculture instructors' spouses should not be treated as widows or widowers. Our profession should not take away from our family responsibilities.

Planning becomes essential in the life of a vocational agriculture instructor. As an instructor becomes more experienced, he or she will be able to spend less time preparing for the basic units that are a matter of routine. His or her time can now be devoted to professional improvement, individual student needs, more indepth FFA activities, and keeping up with **high technology agriculture.**

Good planning becomes a continual challenge for the beginner as well as the 30 year veteran in teaching vocational agriculture. Plus, there are always those unexpected interruptions such as the Community Development Director needing a list of all the past chapter presidents, Dekalb Winners, and State and American Farmers by a 24 hour deadline for the new Community Information Bulletin or a former student stepping in the agriculture room seeking information on how to caponize a rooster while your Agriculture I class is in session.

When we as vocational agriculture instructors subscribed to the creed that we are teachers of vocational agriculture "by choice and not by chance" we knew we were going to have to work. We knew that it wasn't going to be a 9 to 5 job. We knew that there wasn't any textbook that started on page 1 on September 1st and ended on page 425 on the 1st of June.

Vocational agriculture instructors are a special breed. You can sense this the moment you attend a section meeting, a state committee, a state conference, or a national function. Or, how about the electricity that flows the minute you enter Municipal Auditorium in Kansas City, Missouri, with your registration information for your National FFA Convention delegation? How about the thrill that comes from seeing one of your FFA members walk across the stage receiving the American Farmer Degree? What about the pride that comes when a former student who is now a successful young farmer introducing you to the new veterinarian in the community as "the one guy that helped me get where I am today?" What about the freshman college student calling long distance from her sorority or his fraternity to report a 4.8 grade point average and to thank you for your help and guidance through high school?

Teaching vocational agriculture is truly a profession. We have the responsibility of conducting ourselves in a professional manner and have the responsibility of developing programs that meet the needs of young people who are preparing to live, work, and be leaders in the next century. Our young people deserve the very best educational opportunities that society can provide. It is quite true that vocational agriculture cannot be taught across our nation as it was in the 1950s, 60s, and 70s. Let us be cautious, however, "not to throw the baby out with the bath water." We have made changes before and as professional educators are quite capable of making changes for preparing secondary education students for High Tech Agriculture. There are many solid and fundamental basics that we must keep. I'm referring to those time honored activities in our program that have developed "people skills."

These may be even be more important in High Tech Agriculture.

Any vocational agriculture instructor who has taught for more than five years with any success at all has had to be creative. Creativity is a personality trait that each teacher who enjoys working with students will just naturally acquire. I think vocational agriculture instructors are gifted with a special amount of creativity.

My superintendent said to me, "You can say things and do things with your students that other teachers couldn't get by with." I'm not sure that was a compliment, but I think he was saying that sometimes vocational agriculture instructors are gifted with unique approaches to education that are not in the textbook, but they meet the needs of students. In teaching High Tech Agriculture, creativity can be a valuable personality trait. For example, to illustrate creativity, the next time you are in a group of vocational agriculture instructors, just ask each one how he or she teaches parliamentary procedure. You will find as many ways as there are teachers in the group. There is no one successful technique to teach parliamentary procedure yet students all across our nation are learning leadership skills through vocational education in agriculture by parliamentary procedure units.

The moment we as vocational agriculture instructors were sitting in the university methods classes and were instructed that our curriculum must meet the needs in our community, we knew that we had to be creative. That meant that we were unique from the teacher down the road. That philosophy of agricultural education still exists. The only difference is that we must continually re-evaluate that curriculum and keep up with the times. For example, Wayne Sprick, vocational agriculture instructor at Four Rivers Area Vocational Technical School in Washington, Missouri, who was recently named Vocational Teacher of the Year at the 1985 American Vocational Association Convention in Atlanta, is a prime example of creativity.

When an occupational analysis revealed agribusiness career opportunities rather than production agriculture should be pushed, he made the effort to change his curriculum. Now he teaches agricultural sales and services, management, and horticulture. The school is located close to St. Louis, so many of his students are not from the farm. Therefore, Sprick offers a co-op program in agribusiness to give these students an opportunity to get experience in production agriculture as a help to them in securing non-production jobs in agriculture. This is a perfect example of vocational agriculture ingenuity.

Now there are communities all across our nation just waiting for creative instructors to develop programs like Sprick's. People everywhere are eating food, buying flowers, planting Japanese Yews, raising pets, operating machinery and managing agricultural businesses.

## Keeping Up

When I enrolled as an undergraduate at the University of Illinois in Agricultural Education in the late 1950s, computers were only referred to as giant machines occupying several stories of a big building. Little did I realize that in the 1980s, I would be taking classes from Southern Illinois University with one of those monsters on my desk top. Furthermore, I didn't ever expect it to be necessary to obtain information from my 12 year old son when "SYNTAX ERROR" kept appearing on the screen for my homework assignment. His response was, "Oh Dad, that is just a very common programming error."

**Teachers must demonstrate to students that they can effectively use high technology. (Photo courtesy of Robert Cone).**

Keeping up is not easy. Let me remind you, however, vocational agriculture teachers are a tough breed. We can master the "Syntax Errors" and all the other little "smart aleck" quips that flash on the screen when we make errors on computers. **High Tech** agriculture involves computers. Every high school vocational agriculture student should be equipped with computer literacy.

## Updating "Seasoned" Teachers

Teachers in our area have been most fortunate. Teacher educators at Southern Illinois University were quick to realize the need in training "seasoned" vocational agriculture instructors in computer literacy. They have offered over 10 semester hours of credit in "Microcomputers in Agriculture." As a result, most vocational agriculture departments now have microcomputers and many are offering courses for students in agricultural computing. If we as professional vocational educators meet the needs of students in agriculture and prepare them for the future, computer literacy becomes very basic.

As teachers of vocational agriculture, we also have a tool that has been the "undergirder" of vocational agriculture for 58 years. The FFA is the greatest youth organization in the nation that is uniquely related to activities in the vocational agriculture classroom.

It has been my observation that programs initiated at the national level are very progressive and represent new technologies in agriculture. For example, let's look at the National Agricultural Business Management Contest. One

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## The Need To Keep Up With High-Tech Agriculture

*(Continued from Page 15)*

must realize that only one chapter per state participates. But, that is not the real purpose in the national contest.

The purpose is to set those areas of knowledge and skills forth that are beneficial for students to become acquainted in the world of agricultural business management and not just those competing at the national level. Therefore, one planning a course outline in agricultural business management should consider units in net worth, financial ratios, partial budgeting, cash flow, accelerated cost recovery systems, hedging, and taxation. This could be basic subject matter whether teaching in Washington State or Vermont. Special alterations can be made to your course outline to meet local needs.

Now, what I've said about the National Agricultural Business Management Contest is true of the other areas. Close scrutiny at the national level incorporates the latest agriculture technical data into the national contests. The national staff is to be congratulated on their quality programs at the national level.

The Ag Ed Network is another example of the availability of **high tech** information. The network — a joint effort of FFA and AgriData Resources — is billed as America's first on-line educational network. Hundreds of vocational agriculture classrooms are taking advantage of this **High-Tech** service.

State Associations of Vocational Agriculture Teachers should carefully monitor the **High Tech** advances in their respective states. Local teachers have the professional responsibility to take advantage of "Inservice" workshops to keep up. For example, in Illinois, great effort has been placed on changing our Land Use Management Score Card to allow for the "C" value. The Illinois Soil Conservation Service has calculated maximum C values that can be used for each tillage system and crop rotation. Illinois has been divided into three sections and C values were developed for each, reflecting differences in climatic conditions, planting dates, and cropping systems. The Illinois Association of Vocational Agriculture Teachers spent many hours in workshops training teachers this new philosophy, purpose, procedure, formula, and method of determining "C" value. It is now a part of every Sectional Land Use Contest in Illinois.

Locally, teachers are obligated to meet the needs of their students. The perfect learning situation is when a student asks a question pertaining to his or her SOEP or a unit of study. "How do I plant a Scotch Pine tree? What is the best variety of wheat to plant this fall? Where can I find information on hydroponics?"

We, as vocational educators, experience more "ripe" learning situations than any other educators. We must realize that it is never embarassing to say "I don't know." However, it is not doing the students any favors by not making any attempts to find the answer or not directing them to proper resources.

Let's not overlook valuable sources at the local level for **High Tech** information. I just learned locally at an Agronomy Day meeting that we now have a herbicide that is to be applied in amounts as little as one-half ounce per acre. A farmer can buy enough for 10 acres and carry it home in his or her pocket (that is, after paying $300 for it).

Vocational agriculture instructors can learn much from former students. This is the value of Young Farmer programs and active Alumni chapters. Informal interaction with these groups becomes a natural environment for keeping up. I have found on numerous occasions that I have been able to give current information to students just from conversations with former graduates concerning hedging, reading soil tests, crop varieties, garden varieties, and I could go on and on.

### Summary

The vocational agriculture instructor doesn't make plans that he or she is going to become prepared for **High Tech** Agriculture starting the first thing Monday morning. Keeping up simply becomes a way of life. It becomes a matter of using the resources that are there for all of us and incorporating the information into our classrooms.

Vocational agriculture instructors must keep up. It has always been a profession of staying up with current changes. For the person who wants to identify with the dynamics of agriculture and has a faith born not of words but of deeds, teaching vocational agriculture is an exciting and rewarding profession.

As we prepare the leaders of tomorrow, our students deserve the very best that we can give them today. A good education is no doubt a good place to begin. We, as professional educators, are obligated to stay in touch with the new **High Tech** and the world agriculture situation.

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FUNDAMENTALS OF SOIL SCIENCE, By Henry D. Foth, Somerset, New Jersey, John Wiley and Sons, Inc., 1984, 7th Edition, 435 pp., $32.95.

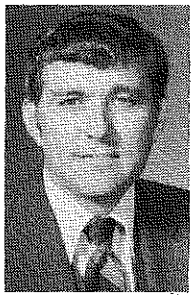
This wide ranging text covers a broad spectrum of soil science with more up-to-date figures, graphs, and pictures than expected for the seventh edition. The original works dating to 1958 surprised this reviewer. The chapters cover their subjects in twenty pages or less except chapters 2 and 10, which take nearly 40 pages and are lengthy compared to the others. The preface identifies the necessity for long discussions needed to clarify difficult concepts, the only real criticism of this text.

It covers soil physical properties, soil water, and water management, soil ecology, organic matter, mineralogy, chemistry, soil genesis, soil survey, classification, geography, fertilizers and their uses, plant composition, animal health, soil erosion, soil erosion control and a new chapter on world population — food-land problems.

This text is directed at the college level. Certainly, a beginning soils student could be well grounded for in-depth and further study by using this text at the junior college or university level. Some advanced high school courses could use this text as a reference and high school teachers may well benefit, as this reviewer has, by using chapters for indepth and background information.

Lee D. West
Mt. Pulaski High School
Mt. Pulaski, IL

# High Teachnology



By Gary E. Moore

*Dr. Moore is Professor in the Department of Agricultural, Extension and International Education at Louisiana State University, Baton Rouge, Louisiana 70803.)*

No! There is not a typographical error in the title. This article is about high teachnology. With the current and future technological advances in agriculture and the cry of educational reformers for change in our schools, it is imperative that vocational agriculture teachers become high teachnology teachers. What is high teachnology? Let me explain.

There are five characteristics of a high teachnology vocational agriculture teacher. These characteristics are:

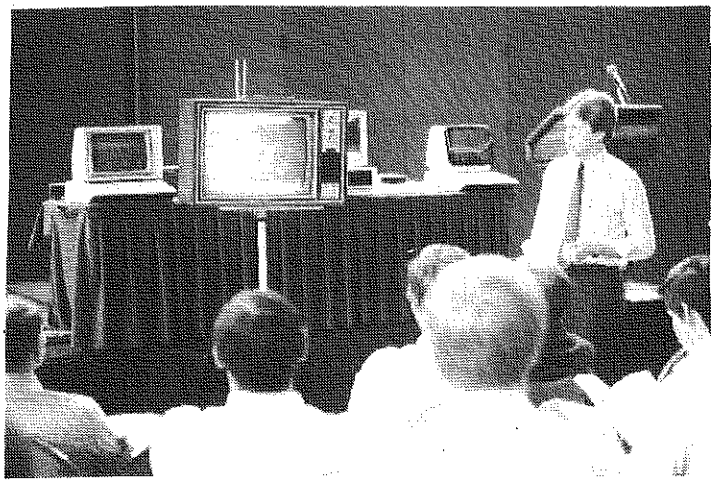
1. Emphasis on teaching students how to find information and solve problems.
2. Use of high technology equipment in teaching.
3. Teaching current and futuristic technological content.
4. Teaching about agriculture from a global perspective.
5. Exhibiting high quality teaching skills.

Let's examine each of these characteristics.

## Finding Information and Problem Solving

What should students know after sitting in an agricultural class for a year? Should they know a lot of facts and figures or should they know how to find information and solve problems? As I think back to my days in high school agriculture, I can remember some of the facts I was taught that are still the same today. A cow still has an udder, there are still monoecious plants, and an insect still has six legs. However, many of the **facts** I was taught such as how much milk an average cow gives, how plants can be reproduced, and how to control insects are no longer true. In agriculture, we must do more than just teach facts. We must teach our students where to find information.

Civilization has experienced several ages such as the stone age, the bronze age, the industrial age, etc. We are now in the information age. Over 5,000 new scientific articles are written every **day.** In the book *Megatrends*, it was predicted that scientific knowledge would double every 20 months. It is next to impossible to keep up with the "facts." They change.



**An AgriData representative explains that network to vocational agriculture teachers attending the LSU Computing Conference and Trade Show. (Photo courtesy of Gary E. Moore).**

A high teachnology teacher will teach where to find current agricultural information and how to use the information to solve problems. We should teach students how to find the facts and I'm not talking about how to use the school library. Most current agricultural facts are found in on-line data banks which are accessible only by computer. We need to teach our students how to access and use these data banks.

Two of the more important information sources for agriculture are Agricola and AgriData. Agricola is operated by the National Agricultural Library and contains current journal articles on agricultural topics, state and federal agricultural research and U.N. agricultural research. It can be accessed through several commercial computerized information vendors such as BRS and Dialog.

AgriData is an extensive telecommunications network designed to provide agriculturalists with up-to-the-minute information about agriculture and the events that impact on agriculture. Various types of information such as daily market prices, weather, market analysis, market advisories, and agricultural and world news can be accessed through AgriData.

In the high teachnology classroom, emphasis is placed on problem solving. Students are taught the steps involved in solving problems with major emphasis being devoted to procedures for gathering and analyzing information. A high teachnology teacher teaches more than just facts.

## High Technology in Teaching

A second characteristic of a high teachnology teacher is that he or she uses high technology in the teaching-learning process. There are several reasons why high technology is used. The first is because some high technology approaches to teaching result in greater student learning than some traditional approaches. A second reason is that teachers who use high technology are providing a desirable

*(Continued on Page 18)*

## High Teachnology

*(Continued from Page 17)*

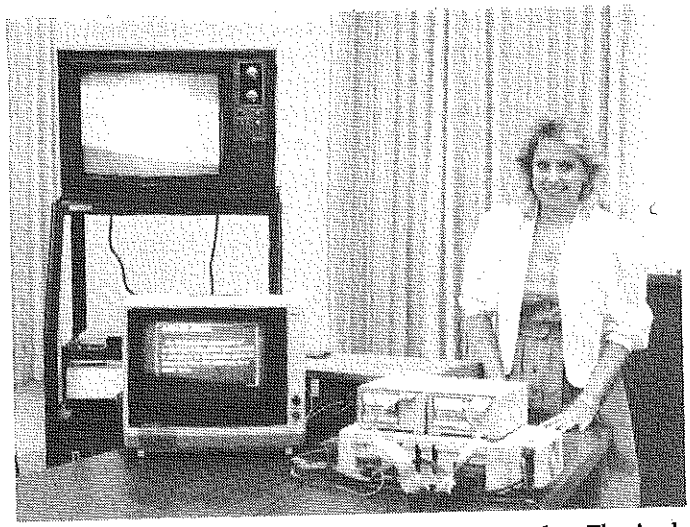
role model for students. The third reason for using high technology is because students will be using the high technology equipment in their future occupations.

Several high technology approaches to teaching enhance learning. There are some computer programs such as "Injured Engine" which are excellent in teaching certain concepts which are difficult to teach using traditional procedures. Simulations and experiments can be realistically conducted on a computer.

A new high technology approach to teaching and learning is called interactive video. This technique combines a computer and a videotape or laser disk player. The computer is programmed to present questions and information to students and controls the videotape player. The videotape machine is used to supplement the computer information by presenting visuals or problem situations. Based upon the student response to questions, the computer directs different segments of videotape to be shown. A teacher with imagination could develop a variety of branching situations which would show the results of decisions made by each student in a class. A student could be presented with a problem situation and would be asked to choose from four or more possible solutions. After choosing a solution, the student would see the consequences of his or her decision on the videotape. The student would have the opportunity to make additional decisions which are based on earlier decisions. In each instance, the results of the decisions can be seen visually. High technology can enhance the teaching-learning process.

Cyberphobia is the fear people have toward computers and other forms of high technology. Many parents, employers, and even some students have cyberphobia. A vocational agriculture teacher who uses high technology in teaching is providing a positive role model for the student.

Today a tractor has $100 worth of microprocessors and electronic sensing equipment. By 1990, it is projected that a typical tractor will have $1,400 worth of microprocessors



**A graduate student at LSU learns about interactive video. The Apple microcomputer in front of the student is programmed to present information both on the computer monitor and on the videotape monitor. (Photo courtesy of Gary E. Moore).**

**Louisiana vocational agriculture teachers learning how to access current agricultural information with the assistance of the National FFA Computers in Agriculture coordinator. (Photo courtesy of Gary E. Moore).**

and computerized controls. We can also expect to see an exponential increase in the use of high technology equipment in other phases of agriculture. If we are doing the job we should be doing in preparing our students for careers in agriculture, we will be teaching them how to use high technology equipment such as computerized diagnostic engine equipment, remote sensing devices, and computers.

Teaching students how to use high technology equipment such as computers means more than teaching them how to play games. I've been in several vocational agriculture departments where students use computers only to print out large banners such as "Jim Loves Sue" instead of using them to solve agricultural problems. A high teachnology teacher will teach students how to use high technology equipment to solve problems in agriculture.

### Current and Future Technological Content

Several years ago a teacher in Alabama confessed to how he made an"A" in student teaching. Every time the university supervisor would come for a visit, the student teacher, with the confidence of the supervising teacher, would fire up the forge and do forge work. The university supervisor was rather old and enjoyed the forge work because it brought back fond memories of his high school teaching days.

How many vocational agriculture teachers today are teaching memories? A high teachnology teacher will update his or her curriculum and teach the latest technical developments in agriculture. This requires effort. Some of the current technical content which should be taught in vocational agriculture includes embryo transplanting, embryo splitting, embryo freezing, plant tissue culture, automated materials handling, biological insect control, genetic engineering, computerized dairy production, robotics, remote sensing and control, and using computerized forage equipment.

### A Global Perspective

For decades Americans have believed, and rightfully so, that they were the breadbasket of the world. This has been true but is changing. America no longer simply ships surplus agricultural products overseas. Several provinces in

China average higher corn yields than Iowa. India is exporting rice. A number of countries have higher wheat yields than does America. The other nations of the world have made great strides in agriculture during the past few decades.

Today, agricultural developments in Brazil, China, Mexico, Australia and Russia have nearly the same impact if not more on agriculture in your local region than does agricultural developments in Wisconsin or Texas. No longer can we study agriculture from only a regional or national perspective. A high teachnology teacher will teach about food production from a global perspective.

## High Quality Teaching Skills

Educational researchers have identified five traits which are characteristic of effective teachers. High teachnology teachers are enthusiastic, teach with clarity, are task-oriented, use variability, and provide students with the opportunity to learn criterion material.

Research has shown that students learn more when the instructor is enthusiastic. Even though agriculture has been through some hard times, there is still much to be enthusiastic about. High teachnology instructors are enthusiastic.

Students learn more and better when the instructor teaches with clarity. This means the teaching is clear. Characteristics of clear teaching include step-by-step directions, feedback being provided to students, material being taught in an orderly, sequential manner, and good communications techniques being used.

Students are at school to learn. The teacher is there to teach. The teaching-learning process should be the highest priority. Teachers who approach teaching with this task-oriented or business-like approach are more effective.

High teachnology teachers use a variety of teaching methods, materials, and learning activities. No matter how exciting or good a particular teaching procedure may be, it gets old if it is the only method used.

Have you ever had a teacher who played "learning hide and seek." You had to work diligently to figure out what it was you were supposed to learn. Effective teachers don't do this. They let the students know exactly what should be learned. High teachnology teachers let students in on the secret of what it is they are supposed to learn and then evaluate students on what was to be learned.

## Summary

High teachnology vocational agriculture teachers emphasize problem solving based on current information, use high technology equipment, teach about current technological developments, present a global view of agriculture, and exhibit high quality teaching behaviors.

The English poet, Alexander Pope, said:

> Be not the first by whom the new is tried
> Nor yet the last to lay the old aside.

The agricultural education profession already has a number of high teachnology teachers. You will not be the first. The question is, "Will you be the last?"

# BOOK REVIEWS

FUNDAMENTALS OF PLANT GENETICS AND BREEDING, By James R. Welsh, Published By John Wiley and Sons, Somerset, NJ, 1981, 272 pp., $23.95.

An in-depth text for the college level, it can lead the student to the diverse works and personal experiences from which the author must have drawn this very good text. This book provides a comprehensive and interesting experience in the academics of plant breeding. It may have some concepts difficult to understand at the high school level. The frequent references to other works require the use of college or university library facilities.

The chapters cover Mendelian genetics, chromosomes, genes, chromosome numbers, plant reproduction, natural genetic variation, variability in biological systems, breeding objectives, program design, and management, bulk breeding, pedigree breeding, backcross breeding, recurrent selection and synthetic varieties, hybrid breeding, hybrid production systems, mutation breeding, chromosome breeding, breeding with tissue culture, release, and marketing. All chapters are subcaptioned so specific information can be found within the chapters very easily. All chapters are relatively short and concise with discussion questions and problems relative to the chapter. Each chapter has a brief and personalized summary, some relating personal experiences of the author.

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DESIGN OF AGRICULTURAL MACHINERY, by Gary Krutz, Lester Thompson and Paul Claar. New York: John Wiley & Sons, Inc., 1984, 472 pp., $39.50.

This book contains chapters on Philosophy of Design, Materials and Manufacturing Economics, Statistical Tolerance Design, Sizing and Using Stress, Fatigue and Impact Loading, Joining Parts Together, Finite-Element Analysis, Power Transmissions, Linkages on Farm Machinery, and Hydraulic Power Systems. There are 33 useful items included in the Appendix ranging from Common Cross-Sectional Properties to Clevis Pins to a Spring Data Chart. A three page index is also included.

This book on agricultural machinery design is intended for college level students in agricultural engineering and for practicing design engineers.

DESIGN OF AGRICULTURAL MACHINERY is a modern textbook/reference that focuses exclusively on the design of agricultural equipment. It is a comprehensive book on engineering design of agricultural machinery, emphasizing mobile equipment with off the highway applications. A Solutions Manual is listed as being available from the publisher.

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ARTICLE

# Animal Science Update Programs — The Role of Teacher Educators

By Ed Osborne, Jim Flowers and Hobart L. Harmon

*(Dr. Osborne is an Associate Professor, Mr. Flowers is a graduate student, and Dr. Harmon is a Visiting Assistant Professor in the Division of Agricultural Education at the University of Illinois, Champaign, Illinois 61820.)*

Instruction in animal science is an important part of vocational education in agriculture. Animal science instruction is found in traditional production agriculture programs as well as in specialized programs. Regardless of the type of program offered, units in animal science should give students the knowledge and hands-on skills necessary for further study or employment in animal agriculture.

Recent research suggests, however, that many vocational agriculture teachers have never performed many of the skills that students must learn for success in livestock production (Flowers, 1985; Osborne, 1982). Consequently, teachers tend to use classroom discussion as the primary teaching method for animal science instruction. Relatively few teachers use methods which involve demonstrations on live animals or give students the opportunity to learn hands-on skills. As teachers develop confidence in their ability to perform the skills, they tend to use more instructional methods that provide hands-on experiences for their students.

Many vocational agriculture teachers have little first-hand experience with new technologies which are becoming commonplace in today's agriculture. Teachers must not only have the opportunity to develop skills used today, but they also must be able to update their skills as changes occur in animal agriculture. Only by keeping abreast of the latest technologies and practices in animal science can teachers serve as "change agents" in their local communities.

## Tomorrow's Skills

What knowledge and skills will be required of persons who desire to work in the many different animal science occupations? Agricultural teachers recognize that yesterday's skills will yield few rewards for tomorrow's students. Keeping up-to-date in an industry that is changing as rapidly as animal agriculture will be a major task for even the most dedicated and conscientious teachers.

Over 90 percent of all scientists who have ever lived are alive today. The knowledge base in all science disciplines is accelerating at an astronomical rate. The "information age" is upon us and scientists are developing ways to create technologies which promise to revolutionize our society and especially animal agriculture.

The authors of *Agriculture 2000: A Look at the Future* (Battelle Memorial Institute, 1983) and *Agriculture in the Twenty-First Century* (Rosenblum, 1983) provide a futuristic forecast of agriculture. Artificial insemination, embryo transfer, cloning, recombinant DNA, protoplast fusion, genetic engineering, exogenous growth hormones, and numerous biochemical substances are examples of present and future technologies in animal science. Scientists predict that animal breeders soon will be able to select for a "genetic package" in animals. Characteristics such as sex, weight, genetic background, and feed efficiency will be determined by human design rather than "nature taking its course." Computers, electronics, and other technologies will enable more efficient management of animal nutrition, animal health, and the processing and marketing of animal products.

Certainly, students in preservice agricultural education programs should receive practical experience involving current technology in animal agriculture. This aspect of staying current in technical agriculture presents a challenge to agricultural education. An even greater challenge, due to the larger number of teachers involved, is to provide opportunities for practicing vocational agriculture teachers to update their knowledge and skills in animal science. In order to meet this challenge, teacher educators must take a leadership role in developing a variety of programs for delivering technical updates to vocational agriculture teachers in their states.

## How Teacher Educators Can Help

The enormous challenge of keeping teachers current in the knowledge, skills, and recommended practices in animal science falls upon the shoulders of many professionals. Although the technical content of update activities should be delivered by specialists in the respective areas, teacher educators must play an active role in initiating and orchestrating update efforts. Technical specialists are usually more than willing to offer update opportunities for teachers, but they often act upon the request of various groups representing teachers of agriculture.

History has shown that teachers are eager to participate in update activities that are especially designed to fit their needs and interests. The role of teacher educators in each of these is primarily one of organization and administration of update efforts. The actual methods used to update teachers in any given state or region will depend upon the financial, physical, and professional resources available. Following is a brief description of several possible avenues by which technical update activities may be provided.

## Summer Courses

The University of Illinois has had considerable success in recent years with updating teachers through graduate

course work in summer sessions. Courses have dealt with both professional (teaching methodology) and technical skill update in the areas of animal science, crop production, and agricultural mechanics. The professional component (approximately 50 percent) of each course has been taught by a faculty member in agricultural education. This person also has developed the framework for the technical agriculture components of the course and has secured assistance from various faculty members in the College of Agriculture. The actual content of these technical update sessions was determined by the needs and interests of the students enrolled and discussions between the teacher educator and the animal science faculty members.

These technical sessions included discussion of principles and new practices, research results and implications, and demonstration and student practice of specific manipulative skills important in livestock production. The success of an update effort such as this will be dependent in part upon the teachers' desire and need for graduate credit, their willingness to pay tuition costs and devote the time required by a formal course, and their proximity to campus or other course locations. Teacher educators can increase the use of summer courses for technical update in the animal sciences by securing research projects that defray tuition and other costs to participants. Examples of this practice are widespread in other disciplines, particularly special education. With the costs of university course work continuing to climb, teacher educators can provide a significant service activity to teachers by keeping them current through tuition paid summer courses.

## Teleconferencing

Communications technology advancements are slowly making innovative delivery of instruction more available and affordable. Both audio-visual and audio only teleconferencing can be an exciting and effective means of updating teachers in the animal sciences. The University of Illinois College of Agriculture has an excellent audio communication network called TeleNet, which is linked with the Cooperative Extension Service offices in each county throughout the state.

Semester long courses, as well as brief update sessions lasting only a few hours, can be effectively delivered through the TeleNet system. The impact of update efforts using some form of teleconferencing can be greatly enhanced if written and visual materials are examined by participants before, during, and after the teleconference session. Special teleconference updates for agricultural teachers can become more commonplace if teacher educators work closely with teachers to plan technical update programs.

## Workshops

Inservice workshops can serve as a very effective means of updating teachers in the animal sciences. Due to their brevity, workshops generally provide a great setting for action while the highlights of new developments are observed, demonstrated, and practiced. Workshops aimed at improving animal science knowledge and skills can be offered in conjunction with teachers' conferences and area or district teachers' meetings, or scheduled as a separate activity. Since workshops are generally hard-hitting and to the point, teachers have always responded well to these opportunities for updating their technical skills.

**Melissa Aiken and Eric Sickles working at the computer.**

Although workshops may be offered on a wide basis, teachers are usually required to pay fees for these updating activities. As in summer courses, teacher educators can help increase the use of workshops by assisting teachers in securing resources to defray the cost of necessary fees. Again, the role of teacher educators in providing technical update to teachers through workshops is primarily one of planning, obtaining resources, and overseeing execution and evaluation of the workshop.

## Summer Internships in Agriculture

One of the best ways to update teachers in the animal sciences is to arrange summer internships for teachers in an agricultural production and research setting. Teacher educators can assist in this update activity by establishing experimental internship programs with research and development project support. Many states are placing more emphasis on bringing teachers up to date in their technical fields. As a result, special funds may be available to provide special updating activities such as summer internships.

Teacher educators can also provide assistance in identifying internship sites and promoting the program to teachers. Internships on university campuses might provide a unique blend of research and livestock production experience, leading to significant improvement in the teachers' technical agriculture base. Summer internships can provide vocational agriculture teachers with excellent opportunities to refresh and improve their knowledge and skills in the animal sciences.

## Technical Update Programs

Several states now offer special one or two day programs aimed entirely at updating teachers in various areas of technical agriculture. These technical update programs have been well-received by teachers and have typically required heavy involvement of teacher educators. Needs assessment, program planning, promotion, facility acquisition, arrangement of presenters, and program evaluation activities represent the broad involvement of teacher

*(Continued on Page 22)*

## Animal Science Update Programs — The Role of Teacher Educators

*(Continued from Page 21)*

educators in this type of update effort. Although most technical update programs have been located on university campuses, similiar programs in the future could involve more joint efforts between universities, post-secondary institutions, and the animal science industry. The sharing of physical and personnel resources could result in improved scope and teacher participation.

### Field Days

Various departments in colleges of agriculture hold annual field days designed primarily to help producers improve efficiency and/or production in their operations. These programs can be an excellent means of updating teachers in agricultural knowledge and practices, but they generally do not provide opportunities for psychomotor skill development or improvement. Teachers often receive research reports and other materials that are very informative and useful in carrying out their teaching responsibilities. The involvement of teacher educators in this activity has traditionally been limited to identifying programs available for updating activities, program promotion and dissemination of materials.

### Curriculum Materials Development and Dissemination

One of the most direct ways teacher educators can support the technical update of agricultural teachers is through the development and distribution of special curriculum materials. Most teacher education programs are continually involved in the production of curriculum materials in technical agriculture and agricultural education. Videotape productions are becoming more available and can serve as an excellent supplement to written materials. Providing free copies of publications and new curriculum materials as a part of project funds ensures widespread distribution of selected high quality materials. Special workshops may also be held for the purpose of helping teachers plan for the most effective use of newly developed materials. Teacher educators can play an important role in making teachers aware of new materials as they become available.

### Expanded Computer Use

The microcomputer has had substantial impact on the education of America's teachers and students, but its potential uses in education generally are yet to be realized. Although the technology is present, microcomputers have been used to a very small degree for the technical updating of teachers of agriculture. With the exception of market information, the frequent sharing of recent developments in agriculture via computer communications seldom occurs. However, microcomputers can serve as an excellent means to relay on a daily, weekly, or monthly basis the latest information pertaining to the animal sciences: research summaries, reports by Extension specialists, product information, and new developments. Perhaps teacher educators can work with their colleagues in agriculture to bring about such a service.

### Summary

Animal agriculture is undergoing constant and significant change which is requiring teachers to continually seek to upgrade and improve their knowledge and skills. The current move toward more general education in baccalaureate degree programs will likely increase the need for inservice activities in technical agriculture. Teachers must be dedicated to the systematic improvement of their knowledge and skills in animal science and teacher educators must play a significant role in this technical process.

Through research and instructional activities, teacher educators can help teachers become aware of their needs in animal science updating and their options for improvement. They can assist teachers who desire professional improvement by encouraging the use of a variety of methods of providing inservice to teachers, emphasizing creative approaches that are efficient and effective. The agricultural education profession relies often on teacher educators to initiate, plan, support, and arrange for the delivery of various inservice activities in agriculture. Teacher educators must continue to respond to this challenge, thus helping to ensure up-to-date teachers and high quality vocational agriculture programs now and in the future.

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ARTICLE

# Computer Utilization in the Agricultural Classroom

By Calvin R. Adams

*(Mr. Adams is a graduate student at Alabama A & M University, Normal, Alabama 35762.)*

The recent outpouring of national reports on educational excellence and the movement of some states to eliminate vocational education from the secondary schools have brought us to the point where we must have quality vocational programs. We need not only excellent teachers to produce the kinds of workers business and industry want and need, but to keep the vocational program a viable component of education. Only by achieving high quality programs can we convince local, state, and national policymakers that vocational education belongs in the secondary and post secondary schools in the nation[1]

This means that vocational agriculture teachers must be well trained in the use of the computer. During recent National FFA Conventions, teachers received experiences with computers. These hands-on experiences were provided by AgriData Resources, Inc., because it identified computers as one of the most important areas to work on through vocational agriculture and the FFA.

AgriData realized that production information had been taught for years, but students need to be far better business managers than their predecessors. This is why the computer is becoming a vital tool on the farm and in the classroom. As the future is evolving, the main thrust in agriculture is toward better management and not as to increasing production.[2]

## Increased Need for Knowledge

The innovative ideas of Dean Frischknecht of Oregon State University are an example of what can be done with management training. His "Computer Cow Game" is a way in a short period of time using the computer to help students manage and upgrade their herds. Several students are given 50 cows and 5 bulls and are to increase the yearling weight. This game has given students invaluable experience that they would not have been able to accumulate in their short years.

The vocational agriculture teacher must continue to increase his or her knowledge of computers because new microcomputers are being developed that can do things more efficiently. At present there is a microchip that, when implanted in the animal, is a permanent branding iron. Then, there is the recent development of a system that actually reads a cow's milk production and feeds her proportionately. On the drawing board is a way to scan meat carcasses and grade the meat. This program can be invaluable in teaching students meat evaluation and management techniques without being near the animal.[3]

## Classroom Involvement of the Student

These are factors that make agricultural education a vital part of modern farming. Dr. Goode of Austin Peay State University has developed a computer program that helps students in a farm management class develop their decision making skills based on sound economic principles. The idea of the program is to survive and not bankrupt a 220 acre farm using the information given in class and then programmed into the computer. The regularly updated information requires the student to make more and more decisions. Again, this is an invaluable experience not actually learned on the land, but on a computer. The computer is being used as a tool and not the operator of the farm, just as the tractor.[4]

## Future of Agriculture

No longer are there outlandish dreams in relation to agriculture. It is up to the teacher to keep abreast of these growing dreams. Biotechnology is an excellent example. Researchers are developing corn that seems to be resistant to everything yet produces enough high yields. Our future farmers and present day students need to have opportunities that might enable them to be researchers in all the new areas of agriculture. Without the vocational agriculture teacher's guidance and knowledge, this future seems dismal. But, some teachers are providing this knowledge.

A vocational agriculture student from Lyons, Ohio, has taken his knowledge of sheep and computers to develop a program for sheep herd management. Throughout this experience, he was directed by his parents and teachers to continue developing agricultural related programs. He has also started his own software company, CAMCON. Without the direction of his father, who is his vocational agriculture teacher, he would not have won the top computing awards in Ohio and the U.S. This is not to say the student is a misfit computer whiz. On the contrary, he is actively involved in many other activities not related to computers.

Vocational agriculture has advanced steadily since the Smith-Hughes Act. However, new techniques and strategies are still needed. Without new skills and computers, we will not convince our leaders that we need to be kept in the secondary schools.

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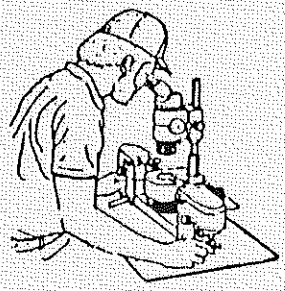
# Stories in Pictures

## GENETICALLY IDENTICAL OFFSPRING PRODUCED BY SPLITTING EMBRYOS

**Microscopic Embryos are Isolated and Bisected with a Microsurgical Blade or Fine Glass Needle**



*(Photos and drawing courtesy of Robert A. Godke of Louisiana State University)*