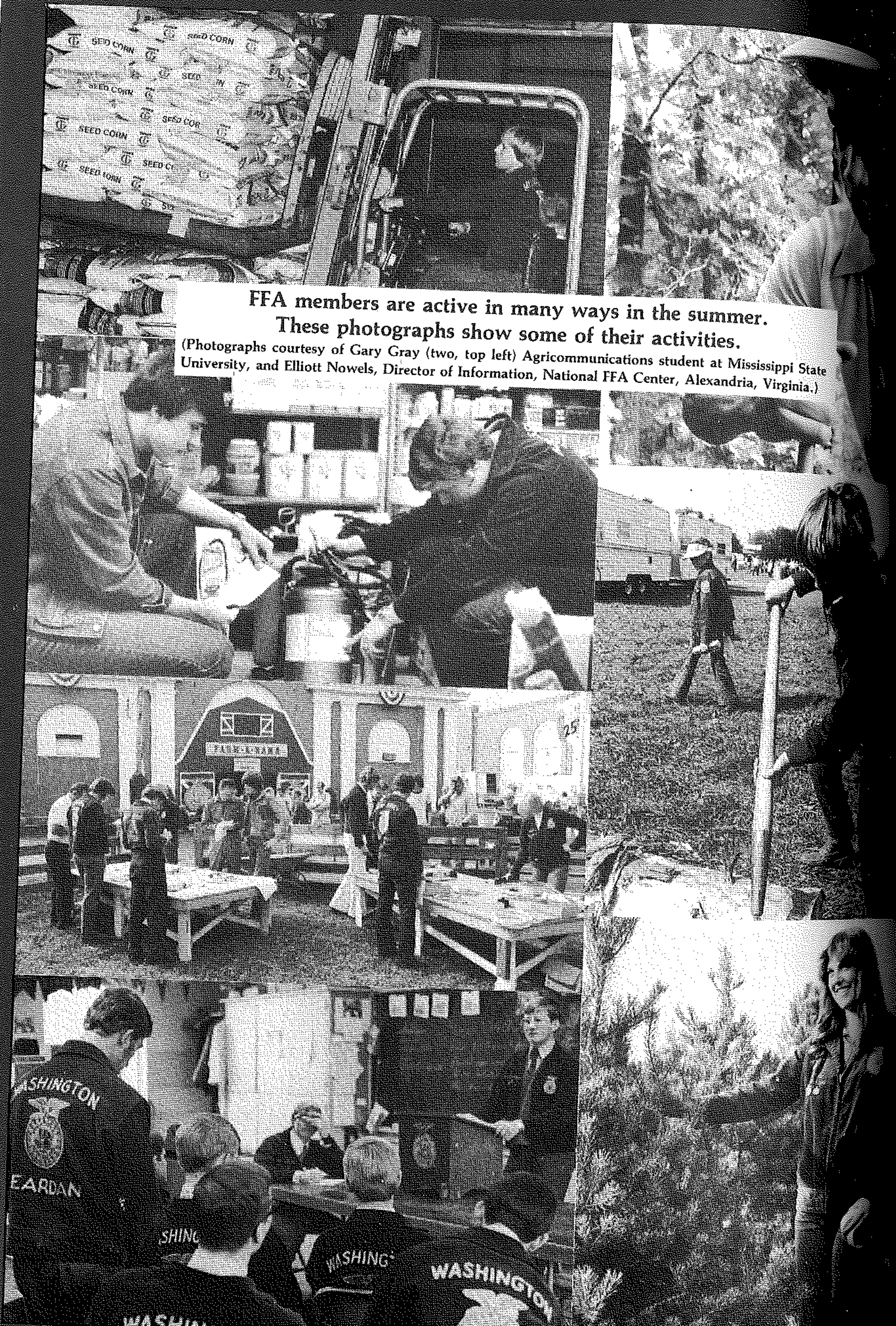


FFA members are active in many ways in the summer. These photographs show some of their activities.
(Photographs courtesy of Gary Gray (two, top left) Agricommunications student at Mississippi State University, and Elliott Nowels, Director of Information, National FFA Center, Alexandria, Virginia.)

The Agricultural Education Magazine

THEME: Technology in Agricultural Industry

THE
AGRICULTURAL EDUCATION
MAGAZINE

July, 1980 Volume 53 Number 1

Table of Contents

ARTICLE SUBMISSION

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

PUBLICATION INFORMATION

THE AGRICULTURAL EDUCATION MAGAZINE (ISSN 0002-144x) is the monthly professional journal of agricultural education. The journal is published by THE AGRICULTURAL EDUCATION MAGAZINE, INC., and is printed at M & D Printing Co., 616 Second Street, Henry, IL 61537.

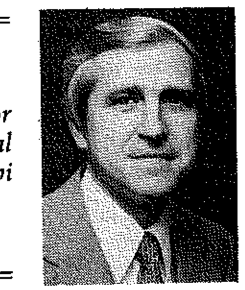
Second-class postage paid at Henry, IL.

POSTMASTERS: Send Form 3579 to Glenn A. Anderson, Business Manager, 1803 Rural Point Road, Mechanicsville, Virginia 23111.

SUBSCRIPTIONS

Subscription prices for THE AGRICULTURAL EDUCATION MAGAZINE are $7 per year. Foreign subscriptions are $10 (U.S. Currency) per year for surface mail, and $20 (U.S. Currency) airmail (except Canada). Student subscriptions in groups (one address) are $4 for eight issues. Single copies and back issues less than ten years old are available at $1 each. All back issues are available on microfilm from Xerox University Microfilms, 300 North Zeeb Road, Ann Arbor, MI 48106. In submitting subscriptions, designate new or renewal and address including ZIP code. Send all subscriptions and requests for hardcopy back issues to the Business Manager: Glenn A. Anderson, Business Manager, 1803 Rural Point Road, Mechanicsville, VA 23111.

Coping With Technology In Agricultural Industry



JASPER S. LEE, EDITOR
(The Editor also serves as Professor and Head, Department of Agricultural and Extension Education, Mississippi State University.)

Agricultural educators are continually striving to keep up to date in the new technology of agricultural industry. This is by no means an easy task, but one which requires perseverance and acceptance. Being closed minded to new technology will quickly move us out of date, and our instruction will be of little use to students. It is better for students to receive no instruction than to receive irrelevant, out-of-date instruction.

All phases of agricultural education are subject to the pressures of new technology. This includes secondary and postsecondary teachers, teacher educators, and supervisory and administrative personnel. The challenge is to find ways of keeping up to date at all levels of professional involvement. It is just as important to have up-to-date supervisors and teacher educators as it is to have up-to-date teachers. Some of the traditions and regulations of agricultural education are obstacles to keeping current.

Agricultural educators are faced with changes in two major areas: educational technology and agricultural industry technology. Keeping agricultural educators up to date is a challenge faced by all segments of our profession.

Problems in Keeping Current

Agricultural education largely operates within the structure established for all public education efforts. It is subject to program standards, teacher certification regulations, accreditation requirements, government laws and regulations, and college and university systems. Each of these helps to provide support for agricultural education, yet each can become an obstacle to providing education in new technology.

Inappropriate program standards can become the maximum rather than the minimum for agricultural education. Standards must be written to move our program forward rather than to establish levels for attainment. Unfortunately, when standards are achieved, there are those who become satisfied and fail to continue to incorporate new technology. We must guard against allowing program standards to keep us from coping with new technology.

Teacher certification regulations can be more restrictive than about any other factor having input into personnel qualifications. Some states have enacted regulations which are actually contrary to the preparation of teachers who can deal with new technology. In some cases, these regulations tend to channel all preservice and inservice teachers through the same preparation. This is not all bad, but it is not all good. For example, to require individuals preparing to be kindergarten teachers and agriculture teachers to take the same college courses in curriculum is ridiculous! Teacher certification regulations need to provide flexibility so that agriculture teachers can meet requirements specific to their needs. More and more agricultural teacher certification is becoming less oriented to technical agriculture and more oriented to areas of education. Agriculture teachers need to be well prepared in learning theory and pedagogy and in technical agriculture. Without good preparation in the technology of agricultural industry, there is nothing to be delivered. It is like the person who prepares for a trip but doesn't know where he is going.

Colleges and universities have much to contribute to the technical competence of teachers. Flexibility is important. Rigid degree requirements can hamper the scheduling of courses needed to develop and expand technical competence.

Inservice Education

Inservice education is a vital part of keeping technically competent. Such education can be provided in a number of ways, including workshops, independent activities, credit courses, and on-the-job experiences in agricultural industry. The first step is the establishment of an inservice education effort, both collectively by the profession and individually by each member of the profession. The valuable role of inservice education must be recognized. Each state should have a plan for delivering planned inservice activities. Each individual should have a personal commitment to keeping technically current.

Individual Initiative

Agricultural educators cannot sit back and wait for new technology to be bestowed upon them. They must take the initiative to seek out and learn. Many of those who have excelled in our profession were self-starters. Good, technically up-to-date vocational agriculture/agribusiness programs require the exertion of effort.

Individual initiative is needed in coping with technology in agricultural industry. Local program quality is more a function of individual initiative than anything else.

July, 1980

This issue of the MAGAZINE focuses on technology in agricultural industry. The Theme Editor, George Wiegers of the University of Tennessee, has arranged articles on several areas of agricultural industry. He and the authors are to be commended.

THEME

Technology in the Agricultural Industry

By George W. Wiegers, Jr., Editor

Editor's Note: Dr. Wiegers is Professor of Vocational-Technical Education, University of Tennessee, Knoxville. He is a member of the Tennessee State Advisory Council for Vocational Education.

Since the passage of the Smith-Hughes Act in 1917, leaders in vocational agriculture have been more concerned with applied science than with theoretical science. This is to be expected, because vocational agriculture functions as one of the major means of preparing individuals to enter and succeed in selected agricultural occupations. The trained agricultural worker would benefit tremendously from a knowledge of the scientific mode of inquiry that underlies processes and why things happen, but they must know and be able to do with some degree of expertise that which their particular work demands.

Technological developments in America have enabled our agricultural industry to grow and expand beyond expectations. Our farmers, for example, can efficiently produce more food and fiber with fewer acres of land and fewer numbers of livestock than farmers in underdeveloped countries.

The new technical knowledge and skills needed by agricultural workers require higher levels of experience and training than in the past. The "pick-up" method is now much too slow and inefficient.

Workers in the agricultural labor force no longer needed to produce food and fiber must find work in other areas. Many of them can and do move into related service occupations in the broad field of agricultural industry. But many of these individuals need assistance in locating work and in training to enter and progress in their new jobs.

New jobs arise or are created in the field of agriculture when technology changes processes and products. Many of the jobs created through technological changes are classified under the broad umbrella of agricultural industry. These changes create challenges for the workers to learn safe and effective ways to carry out their jobs. The vocational agriculture teacher cannot help learners solve new problems with outdated information and skills.

Not only do some adults need new training and others need to update their work behavior, but young people preparing to enter the field of agriculture must also solve problems that did not exist a few years ago. Most vocational agriculture teachers today spend a greater part of their working time preparing for and teaching secondary students. Some might argue it would be safer to teach more principles and less practice because principles which support practice do not change rapidly. One might ask what part of the typical teacher's teachable content would be classified as "basic principles" and what part would be classified as "application or practice?" Unless vocational agriculture teaching has changed significantly across the country recently, the major part of the curriculum is still "application or practice" oriented. This situation creates real challenges to the alert, capable teacher because practices do change, and some at a very rapid rate.

Keeping Up To Date

What options are open to keep the local vocational agriculture teachers up to date? They can seek assistance from the many delivery systems available to keep up to date and to grow in the profession. Teachers should keep their programs flexible. They may have to re-define the limits of their instructional program in order that accurate and up-to-date information and skills can be taught. Perhaps those who cannot, or do not, keep up to date should seek other employment where there is a need for yesterday's knowledge and skills.

The state supervisory staff has a responsibility to provide opportunities for teachers to learn new knowledge and skills needed to teach students preparing to work in the present and future agricultural industry. The teacher training institution, including the colleges of agriculture and departments of agriculture, should provide up-to-date materials and experiences to train new teachers and update those already on the job. For too long, colleges of agriculture have provided many of their services in a cafeteria style on the college campus, and some colleges of education have shown little concern for keeping teachers up to date technically. Fortunately, some teachers have used local advisory committees to help bridge the gap between technology and the teaching of vocational agriculture.

Sensitivity To Needs

Vocational agriculture must continue to be sensitive to the labor market needs of the agricultural industry and to the various segments of the population who are preparing for and who have entered work in the field of agriculture. It is a reality that the shifting of workers from one line of work to another, creating new jobs and categories of jobs, has demanded and will continue to demand better educated and better workers in the agricultural industry. As technology changes the world of work, it inevitably affects workers and students; it also affects school curriculum and vocational agriculture teachers. Our ultimate goal is to produce workers who find their work satisfying and for those who work for others to also satisfy their employers.

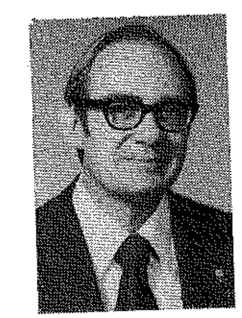
The following theme articles will help readers sharpen their perception of technology in agricultural industry today. Dr. Leuthold challenges the practitioner to evaluate attributes of each item of technology in the decision making process. According to Dr. Beamer, advisory councils can play a major role in bridging the gap between the technological world of work and the world of education. Dr. Williams recognizes the value of both the "old" and "new" technology in horticulture. Dr. Cheatham presents a broad picture of technological developments in agricultural mechanization, and Dr. Iverson gives new direction to performing an old animal service occupation.

The Cover

The Sandhills Community College Horticulture Club (Southern Pines, North Carolina) won the "Best of Show" award for this garden design at the Southern Living Show held in Charlotte, North Carolina, and sponsored by Southern Living Magazine. The exhibit, entitled "Patterns of a Hillside," shows a garden for a sloping residential lot. (Photograph courtesy of Leone H. Koster, Sandhills Community College, Southern Pines, North Carolina.)

THEME

How Vo-Ag Is a Part of the Adoption of Agricultural Technology



By Frank O. Leuthold

Editor's Note: Dr. Leuthold is Professor of Agricultural Economics and Rural Sociology at the University of Tennessee, Knoxville. He is past president of the University of Tennessee Faculty Senate.

Is vocational agriculture training needed to assist in the diffusion of new agricultural technology when the United States has vast availability of public and commercial change agencies which constantly inform farmers of the merit of new technology? The answer, I believe, is not only a clear yes, but farmers in the future will need better training in scientific and economic principles as these relate to agriculture. Vocational agriculture instruction is one of the primary providers of these principles. I believe that only systematic instruction over an extended period will adequately prepare the farmer of tomorrow to handle new agricultural technology.

Scientific Farming

Successful farmers in the future must: 1) understand biological, chemical, and ecological principles and relationship in order to properly apply and assess the utility of new technology; 2) have knowledge of engineering principles in order to operate, maintain, and calibrate equipment used in the application of technology; 3) be able to properly execute "experimental" procedures to conduct on-farm tests to determine the advantages and profitability of agricultural innovations; and 4) be capable of translating varying inputs and outputs of technology into amount of economic return. The family farmer of the future must know vastly more of these aspects. The goal of vocational agriculture is not just to teach present improved technology, but to train decision makers to adequately handle technology which will be developed.

Discontinuance

The purpose of this article is to help vocational agriculture instructors appreciate the processes farmers use in accepting, rejecting, continuing, and discontinuing agricultural technology. While other farmers and change agents are essential in convincing farmers to try new items of technology, the farmer's "own experience" with trial results is the most critical factor in the continuance of the technology. Further, the rate of continuance of new agricultural technology has been found to be just as important in determining a farmer's overall level of use as is willingness to try technology originally.[1] Low level users of agricultural technology try new items only slightly slower than other farmers, but they discontinue practices at a high rate. Conversely the factor which most often separates the highest level users of technology from moderate level users is a high rate of continuance of the practices tried. Since few farmers fully incorporate a new item without a probationary period, the on-farm test is critical for determining continuance of use and, hence, the overall level of use of agricultural technology. Not only must positive results occur in the farm trial of improved practices, but the positive results must be observed and translated correctly.

Decision Making Process

Past research on farmers' acceptance of new agricultural technology has shown that different sources of information about new items of technology are used to different extents at the different stages of the "decision-making pro-

(Continued on Page 6)

How Vo-Ag Is a Part of the Adoption of Agricultural Technology

(Continued from Page 5)

cess." Rogers and Shoemaker outline four stages of the innovation decision process: knowledge, persuasion, decision, and confirmation.[2]

The initial stage, *knowledge*, occurs when the decision maker or farmer learns of the existence of a new item of technology. Mass media and cosmopolitan interpersonal communication channels are of great importance in creating basic awareness and knowledge.

The second stage, *persuasion*, occurs when the farmer actively seeks information about the innovation in order to secure more details as to its utility for him. Local information sources — such as other farmers, dealers, and public change agents — are mainly used at this stage, as well as printed materials prepared by public and private change agencies. Mass media from extra-community agencies are of lesser importance.

The third stage, *decision*, occurs when the farmer decides to try or reject the innovation. Even with use of the innovation there is often a probationary period during which the farmer makes an on-farm trial to determine the value of the new item of technology. The farmer's own observation is of great significance. Trusted and local persons, such as other farmers, are also consulted at this stage, but the result of the trial is the most important factor.

The fourth stage, *confirmation*, occurs when the farmer fully incorporates the technology into his farming operation. Some farmers move rapidly from "trial use" to "full use" while other farmers continue the trial period, or make only intermittent use. Vocational agricultural instructors can be of greatest assistance at this stage by systematically teaching future farmers to analyze, evaluate, and translate results of on-farm experiments so that confirmation of use results for improved practices rather than discontinuance.

Attributes of Technology

Every item of technology has a bundle of *attributes* or characteristics which greatly affect adoption decisions. Also, there is a difference between the "real" attribute and the "perceived" attribute by the farmer. Five attributes which affect the use of technology are: 1) relative advantage, 2) trialability, 3) complexity, 4) observability, and 5) compatibility. While *relative advantage* is the key attribute, it is not the only critical one since an improved practice needs to be compatible with a farmer's needs, beliefs, and existing farm operation. Further, the positive results of the practice must be observed for it to be continued. A complex practice may not be tried or it may be improperly applied so that poor results occur and discontinued use results.

While relative advantage is often viewed as economic profitability, it includes other dimensions such as low cost, low risk, decrease in discomfort, ease of application, saving of time and labor, immediacy of reward, social prestige and social approval. Relative disadvantages would be the converse of these dimensions.

Economic profitability is not a simple concept but involves amount of total profit and relative profit on investment. For instance, application of $2,000 of additional fertilizer on a corn crop may result in $3,000 of added yield. The profit would be 50% of the investment or $1,000. On the other hand, the use of $100 of Vitamin A for livestock may produce a return of $400 or a profit of 300% or $300. These examples also illustrate the need to translate the use of technology into profit statements. A farmer might perceive after use that spending $2,000 on the additional fertilizer was largely a loss or the purchase of $100 of Vitamin A was a wasted effort unless the added production can be observed and translated into profit. The cost of these items of technology would be clearly known by the farmer and without a clear idea of added production use may be considered risky.

One of the major objectives of vocational agricultural instruction should be to train future farmers how to use "experimental" procedures to test the advantages of items of technology. The problem is complicated because many new items of technology which result in increases in production cannot be simply observed, but must be carefully measured. For instance, if a new seed corn variety is purported to increase yields but is also more expensive, how would a farmer be able to test the profit? Would it pay if yields increase from 130 to 135 bushels per acre and the cost of seed was $10 more per bushel? With $2.50 corn prices and 400 acres of corn, the added corn yield would be worth $5,000 (5 × 400 = 2,000 bushels) at an added investment of $1,000 in seed cost ($10 × 100 bushels seed). In order to correctly determine the advantage of the new variety, a farmer would have to plant the two varieties under the same conditions and accurately measure the yield of each since few farmers can see the five bushels per acre difference by observation. The breakeven point in purchase of the new seed variety would be far less than the increase in yield which few farmers could accurately assess without careful analysis.

Many items of technology require changes in other inputs because of an "interaction affect" in combination with other variables. For instance, the new seed corn variety may require a greater seeding rate and more fertilizer in order to be profitable. Production interrelations are difficult to explain to farmers who do not possess this knowledge. The challenge of vocational agricultural training is to help future farmers obtain this knowledge and to accurately assess the advantages of improved agricultural technology.

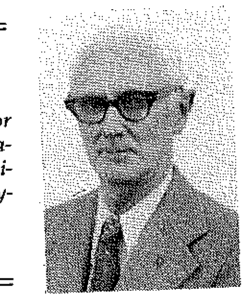
References

1. Leuthold, Frank O. "Discontinuance of Improved Farm Innovations by Wisconsin Farm Operators," Ph.D. thesis, Madison: University of Wisconsin, 1967.
2. Rogers, Everett M., and F. Floyd Shoemaker. **Communication of Innovations**, New York: Free Press of Glencoe, 1971.

Advisory Councils — A Mechanism For Coping

By Rufus W. Beamer

Editor's Note: Dr. Beamer is Executive Director of the Virginia State Advisory Council on Vocational Education. He is former Head of the Division of Vocational Education at Virginia Polytechnic Institute and State University.



Technological change has, rather suddenly, thrown up a dramatic challenge to this nation's political, economic, social, and educational institutions. Though the full scope of this challenge may not be comprehended for years to come, its dimensions are now clear enough to call for a massive response on the part of American education. All levels of education must quickly move to assume greater responsibilities for preparing men and women for entry into the changed and changing world of technological work. Unless far more and far better education on the semiprofessional, technical, and skilled levels is soon made available to greater numbers of citizens, the national economy and social structure will suffer irreparable damage.[8]

This statement by Venn in 1964 summarizes in a very succinct way the situation that has developed in the agricultural industry over the past several years. No segment of the American economy (and the American society) has been changed more drastically by the impact of science and technology than has agriculture. The agriculture of the 1920's and 1930's no longer exists. Agriculture has changed from what was commonly referred to as "farming" to a large, complex, and sophisticated industry which includes "on-farm" and "off-farm" activities. Like most other industries in our post-industrial society, agriculture has witnessed the introduction of automation and computers into its operations and structure, and this has impacted greatly on the type of training needed by the industry's labor force. The technology of the industry pretty well dictates the type and level of skills that employees of the industry must possess if the industry is to grow and develop, be competitive in world markets, and make a substantial effort toward providing the people of this country (and others) with an adequate supply of food. A major problem for educational institutions (all types and levels) that have a responsibility for providing the agricultural industry with competent employees is keeping up-to-date with the types and levels of skills the employees need to possess. Too frequently, our educational institutions (high schools, vocational-technical centers, community colleges, four-year colleges and universities) are equipping their students with obsolete skills, or skills that are not geared to the industry's needs — as they are and as they are becoming. Educational institutions, particularly those designed to provide vocational training, must do everything possible to make sure that their students are being equipped with the kinds of skills needed by the industry.

Keeping in Touch

This brings up a tremendously important question. How do, or how can, educational institutions stay in touch — keep up-to-date — on the training needs of an ever-changing and rapidly changing industry? What are some strategies or mechanisms for coping with this problem?

One mechanism that has been established by the United States Congress for dealing with this problem in the broad field of vocational education is a network of vocational education advisory councils. The Federal Vocational Education Amendments of 1968 mandated a National Advisory Council on Vocational Education. It also mandated that each state establish a state advisory council on vocational education. The Education Amendments of 1976 mandated that each eligible recipient of vocational funds establish a local advisory council on vocational education.

The National Advisory Council advises the President, Congress, and the Secretary of Education on matters pertaining to vocational education. The State Advisory Council performs a similar function with the State Boards of Education or the State Boards for Vocational Education. The local advisory council advises the local governing boards of eligible recipients (school divisions, community colleges, and four year colleges and universities) on vocational education programs, services, and activities.

The intent of Congress with respect to vocational advisory councils is clear. It views these councils as a means of infusing **citizen** participation in the vocational education decision-making process. Its view was clearly expressed in a letter of April 30, 1973 to the Secretary of Health, Education, and Welfare from Congressmen Albert Quie, William Stieger, and Lloyd Meeds:

We strongly believe that independent, lay advisory councils, at both the national and state levels, infusing the views and perspectives of business, labor, and the general public into the educational process, are especially important in the area of vocational education. They provide advice to both the educational administrators and to Congress which cannot be furnished by professional educators.

It is evident that Congress believes advisory councils can play a major role in bridging the gap between the world of work and the world of education. It has said through legislation that advisory councils on vocational education are

(Continued on Page 8)

Advisory Councils — A Mechanism For Coping

(Continued from Page 7)

no longer an **option** but a **necessity** for quality vocational programs and services.

Advisory Council Responsibilities

All of the councils — national, state, and local — have responsibilities for addressing curriculum relevance and labor market needs, but the major duty of the local councils as stated in the law is to advise the eligible recipient on current job needs and the relevance of programs (courses) being offered by the local educational agency in meeting current job needs. The only other mandated duty of the local advisory council is to consult with the eligible recipient in developing its application to the State Board. Of course, local councils can and should perform duties other than those that are mandated if they perceive them to be helpful to vocational education.

The presence of a local advisory council on vocational education (which includes agriculture as one of the major program areas) does not replace the need for program and craft advisory committees. There needs to be an advisory committee for the vocational agriculture curriculum and for the various options within the overall curriculum. The committee for each option can be extremely helpful to teachers, supervisors, and administrators especially in the area of curriculum relevance — keeping the educational program geared to the real needs of the agricultural industry. The program and craft advisory committee should address their concerns and needs to the advisory council established to advise the local governing board on the overall vocational education program.

The concept of using lay advisory councils to keep the educational community in tune with the needs of business and industry is not new. It has been around for a long time. Congress gave the concept a new dimension by building it into a legislative mandate, and most people who are knowledgeable about what is going on in the advisory council arena would agree that the legislation has been helpful to the movement. But let us not be misled. Strong and productive local advisory councils on vocational education will not be the result of legislation. As indicated, legislation can help. But strong and productive local advisory councils will be the result of the leadership given to them by the educators, and more specifically, the vocational educators. Business and industry are willing and anxious to give of their time and expertise, but the initiative for capitalizing on this indispensable resource in building and implementing skill training programs to meet the needs of business and industry rests squarely with the education community. It is the education community that must assume the initiative if the full value of advisory councils is to be realized.

Leadership is the Key

The key to a successful local advisory council is leadership. It has been the observation of state councils who provide technical assistance to local councils that the educational personnel in the local school division and community college need assistance in how to work with local councils. Some of this assistance can come from state councils and state departments of education, but it is the writer's opinion that vocational teacher education departments need to make a much greater effort than they are now making in preparing personnel (undergraduates and graduates) with the competencies necessary to provide local advisory councils with the type of leadership needed for a successful operation. The competence to work effectively with the advisory council concept should be a high priority in the preservice and inservice training of vocational education personnel. It would also be helpful if teacher education institutions would take on the responsibility of providing technical assistance to local advisory councils — the lay personnel which constitute the membership of the councils.

It is the writer's opinion that advisory councils in vocational education represent one of the best mechanisms, if not the best, for coping with the impact of science and technology on our economy and on our society at large. The vocational education community is urged to give greater emphasis to the development and utilization of these councils than it is now doing.

[1]Venn, Grant. **Man, Education, and Work.** Washington, D.C.: American Council on Education, 1964.

THEME

Technology In Agricultural Mechanization

By W.J. Cheatham

Editor's Note: Dr. Cheatham is Assistant Professor of Agricultural Engineering at the University of Tennessee, Knoxville. He previously taught vocational agriculture in Alabama.

The modern farmer has been provided a never-ending supply of improved equipment which enables him to be an efficient producer of food and fiber. A wide range of technical advances has brought rapid change to agricultural mechanization, and the change is still in progress. New challenges and problems bring new concepts and solutions each year.

With these technological advances, education must narrow the lag between research and development and practical application. No machine is better than man's understanding of it and his skill and ability to use it. Adequate training, therefore, is essential if new machinery is to serve the owner efficiently and make a profit for the manufacturer as well. Obviously everyone gains from education and training in agricultural mechanization.

Let's look further at some of the technological advances. First, we will briefly explore some of the more recent innovations; secondly, we will see how these changes affect agricultural mechanics education.

Tractor and Machinery Power

The internal combustion engine will continue to be our primary source of machinery power. Advancements are constantly being made in improving efficiency and reducing the amount of pollutants resulting from combustion. Tractors today are larger and more powerful than ever before.

Planting and Care

Precision and accuracy are the necessary descriptions for modern crop planting, cultivating, and chemical applying machines. Seeds must be inserted into the soil at precise depth and spacing. Plant food and pesticides must be accurately and uniformly applied. Two of the more recent advances in this area are the plateless planter and the air planter. Both of these machines will plant with great speed and accuracy to assure maximum seed germination.

Harvesting Equipment

Gigantic capacity — hundreds of tons or thousands of bushels per day — characterize the productivity of modern equipment which harvests most grain, forage, and fiber crops. On the other hand, many fruit, vegetable and nut crops still defy successful mechanization.

Because of their ability to pick only the "ripe" or opened cotton boles, mechanical cotton pickers are amazing machines. They rank among the most complex of all harvesting equipment.

Thousands of bushels of soybeans, wheat, oats, barley, rye, or seed crops can be harvested per day with a self-propelled combine. It cuts the crop and then threshes and separates the grain from the straw.

By using a multiple-row "corn head" instead of a "grain platform," a self-propelled combine can pick, husk, and shell thousands of bushels of corn per day.

Balers are available that will make huge round bales weighing up to 1,500 lbs. each. Because large, round bales of grass hay shed rain readily, they can be left in the field for livestock to feed upon during the winter. Additional research is being done to make these bales even more durable.

Among the most recent developments in harvesting equipment is the axial flow combine. The term "Axial-Flow" refers to the way the crop flows through the threshing mechanism in a direction parallel to the axis of the rotor, rather than perpendicular to the cylinder axis as in a conventional combine. The crop passes between the rotor, the concave and the grates several times, not just once. The result is more complete threshing and more thorough separation.

Crop Processing

Subsequent to final usage, by either man or animals, most harvested crops require additional processing. Modern high capacity machines and related equipment efficiently convert them into livestock feed, prepare them for shipment and/or storage, protect them from deterioration during storage, and incorporate remaining residues back in the soil.

Livestock and Poultry Production

The great quantities of high quality meat, milk, and eggs produced on modern farms require a highly diverse mix of specialized equipment. Automation, which is proceeding at an accelerating rate, has become necessary to step up efficiency and to replace an ever-declining supply of farm labor.

In this area we find electrically powered silo unloaders, automatic cattle feeders, climate controlled farrowing houses, and fully automatic milking parlors. In high-volume production of hogs and poultry, a totally enclosed system is often used which includes equipment for automatically controlling ventilation, humidity and temperature, plus feeding and watering the animals.

Electrically powered mechanical cleaners remove large volumes of manure quickly and effectively from dairy barns. Liquid manure resulting from confined livestock systems is pumped from concrete collection pits into liquid manure spreaders which spray it onto crop land.

Application to Teaching

These and other changes in agricultural mechanization necessitate that professional agricultural educators make appropriate changes in their teaching efforts. Teaching efforts should be expanded in the following areas:

- Efficient and safe use of machinery
- Proper selection of machinery for specific purposes
- Understanding of the principles of mechanics, including
  - Hydraulic systems
  - Fuel systems
  - Electrical controls
  - Heat transfer
  - Water systems
- Preventive Maintenance
- Establishment of farm shops
- Understanding of chemical application equipment
- Understanding of anti-pollution practices
- Supervised occupational experience in all types of agricultural establishments
- Understanding of career opportunities in agri-mechanics
- Effective use of awards programs in agri-mechanics

Summing Up

Our present understanding is at least broad enough for us to realize that however great our past and present accomplishments, much remains to be done.

Vocational agriculture teachers will be more involved with mechanics in the future. It is an exciting future that lies ahead, full of things yet to be learned and goals yet to be achieved.

Through improved and revitalized preservice and inservice education, research, and experience, the challenges of the future will be met.

Technology In Ornamental Horticulture

By Donald B. Williams
Editor's Note: Dr. Williams is Professor and Head of the Ornamental Horticulture and Landscape Design Department at the University of Tennessee, Knoxville.

This article applies to the production and sale of turfgrasses and nursery and greenhouse plants, and their effective use for the benefit and enjoyment of people. While the overall purpose is to emphasize fairly recent technological advances it seems appropriate to relate past developments to the present. On the one hand, this will show some modern sophisticated techniques. On the other hand, it will show that what we are trying to do with plants today is not so different than 50 or 100 years ago.

The Necessity of "Old" Technology

It would seem too simplistic to say the student of ornamental horticulture must learn everything of the past plus the present. But it is not enough to learn of new technologies and not be able to relate them to the overall industry. To do so would be like assuming you could build a car by just knowing the new things going into automobiles like automatic transmissions, emission controls, gasoline efficiency, and shock absorbing bumpers. The real requirement is to know these things plus everything else about automobiles. Do you ever stop to think of the ways today's cars are the same as those of 50 years ago? Consider the four wheels, the windshield, the radiator, lights, the battery, etc. The design of all these have changed, but their purpose is still the same.

Things are much the same with the industry of producing grasses, trees, shrubs, and greenhouse plants and selling them to the customer. Plants still grow requiring 16 elements plus the sun. The idea of transplanting, fertilizing, controlling pests, and pruning is still the same although techniques have changed. The principles of landscape design taught by Andrew Jackson Downing in 1852 still apply. The fact that today we plant using container grown shrubs and prune with electric clippers does not minimize the validity of past knowledge. This past knowledge should only be discarded when proven wrong or totally replaced by new technology. Until this happens even "old" information can be considered "new" as far as the student is concerned simply because to the student it is "new". Accordingly, there is no convenient way to separate "new" and "old" technology except by establishing some arbitrary date and saying everything more recent is new and everything older is old technology. Other than this, is there any difference between the new and old providing both are still valid and both are needed to be learned by the student?

Just as surely as there is older information that must be incorporated with the new there are also some things that are perpetuated with amazing ease, but should be forgotten. For example, the need for foundation shrubs around the home is rather minor, yet the "definition" of landscaping to most people is to "plant the foundation." Few books ever said to prune shrubs into individual roundish balls, but nearly everyone does it. The guiding principle for placing shade trees is equal distance apart and in rows, but up-to-date landscapers advocate this. How many people know that cutting the top out of a young maple tree will make it spread? The fact that it isn't true hasn't stopped the spread of this "knowledge." One more example concerns fertilizing shade trees. In this case books and teachers advocate placing complete fertilizers in holes. Research has not yet proven the need for this, but the "technology" is still with us.

The "New" Technologies

As with all agricultural industries, the obvious recent technological changes have dealt with chemicals and mechanization. There are chemicals not only for control of insects, diseases, and weeds but also those that inhibit plant growth and replace the need for pruning. Just as the home gardener was becoming convinced there is a chemical for nearly every cultural operation the environmentalist began waving warning flags that this new technology was going to have to give way very soon to something less likely to harm the environment. One result is integrated pest management which intends to take advantage of all available technology and result in minimum use of pesticides. Currently it is being applied to insects and diseases, but a new look at weed control will soon be forthcoming.

The nurseryman and greenhouse operators have their own specific problems that differ from big field operations. The nurseryman is dealing with plants that stay in place for 3 to 7 years. Tractor and sprayer designs are different. The greenhouse is more or less a closed system, and pest control practices are modified accordingly.

While the farmer of large fields switches to even bigger tractors, those in the ornamental horticulture business have access to many kinds of smaller engines and motors to help mechanize business. Hence the need to know all about small engines. Examples include mowers, mixers, cultivators, sprayers, dethatchers, conveyors, digging machines, edgers, sod cutters, and trenchers.

While most crops continue to grow in natural soils, many nursery and greenhouse crops grow with little or no soil. Instead there are mixes of peat, bark, perlite, vermiculite, and sand. As we attempt to utilize more of our wastes, more changes will be made in production. Uses are to be found for waste heat, composted garbage, lumber wastes, and solar energy.

Much of the nursery industry still practices traditional methods of production in fields, but production in containers is increasing. Switching to containers calls for numerous technological changes. There is the problem of simply handling thousands of plastic and metal containers, getting them filled with a growing medium, and planted. Methods of hauling containers to and from the growing area had to be invented.

All the practices of fertilization, weed control and irrigation are different for containers than for field culture. The plants in containers require winter protection far greater than plants in field soil. However, all this has lead to changes in garden center operations, customer purchases and landscaping methods. Some garden centers sell nearly all their plants in containers. They are easily loaded in cars to be carried by the customer to be planted nearly any time of year. Once in the landscape, however, there are differences in the care needed at least the first year. A container grown shrub is planted with all its roots, but this alone does not assure survival.

A brief mention of some other areas of change will further emphasize the kinds of technologies needed by the ornamental horticulture industry. More sod is being produced, and more lawns are being established instantly with sod. Hybrid Bermudagrasses need to be established vegetatively and this calls for special equipment. The care of lawns has benefited by the development of slow release fertilizers. The removal of some herbicides from the market is putting new emphasis on management as a way to control weeds.

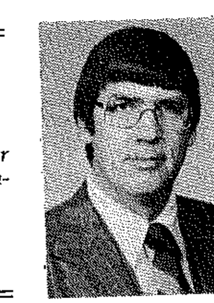
The greenhouse must use less energy, and there are many ways to do this. Substitute energy sources including solar and burning waste products are being considered. Inside the greenhouse there are tremendous increases in production of bedding plants. Also, we find house plants being grown close to markets instead of all being shipped from Florida or other location. The greenhouse operator now uses trickle irrigation to conserve water. Also there are the sophisticated methods of applying necessary fertilizers in the irrigation water. Growers nearly have to be chemists to understand the use of the chemicals to inhibit growth, force flowering, improve color, overcome dormancy, and increase branching. They have to be biologists to understand methods of pest control.

In the landscape there are new technologies needed for using some new kinds of mulches, for controlling weeds, for managing plant growth, for controlling pests, and for insuring plant survival and growth. The knowledge of the landscaper must go beyond that of handling plants. Many other materials are needed in the landscape including lights, water, structural materials, and forms of art.

Today's need for understanding new technology is not an impossible challenge. The task will be made easier by fully understanding the "old technologies" that still apply and being able to recognize the ones that no longer apply.

Farrier Training — Old Skills, New Technology

By Maynard J. Iverson
Editor's Note: Dr. Iverson is Associate Professor in the Center for Vocational and Adult Education at Auburn University.



Current official estimates put the number of horses in the United States at 8.5 million, located on over 350,000 farms and ranches and at numerous stables and racetracks throughout the country.[1] A relatively small[2] but highly specialized and dedicated group of blacksmiths — called farriers, platers, or horseshoers — serve the horse industry by providing essential foot care.

For early Americans, the village blacksmith was as vital as the country doctor. Agriculture during that period, though primitive by today's standards, was heavily dependent on iron and steel in the form of such technological advances as the plowshare, wagon wheel "bands," tools, and horseshoes. Today, technology has bypassed the blacksmith's traditional role, but the specialty work of the farrier remains important in the expanding equestrian industry. Almost alone in a world of rapidly expanding technology, the occupation of farrier retains much of the skill and art of past generations. Although the job has been made easier by machine-made "key" or manufactured horseshoes, advanced forging and welding technology and a wider choice of metals, tools, and padding material, the work still demands the skills of a craftsman. This is especially true in shoeing "performance" horses (racehorses, working horses, etc.), where the legs and hooves must withstand tremendous stress. The farrier must be able to diagnose weaknesses in the horses' feet and lower legs and shoe them accordingly. Failure to correct problems could result in loss of an extremely valuable animal.

(Continued on Page 12)

Results of Research

A recent study of the occupation[3] revealed the following job description:

FARRIER

DOT[4] Number: 418.381-010 (Animal Service Occupation)

Other Titles: Horseshoer, Shoer, Blacksmith, Plater

Job Description: A farrier is a skilled craftsman who performs the following major functions: Prepares feet and hooves of horses, mules, and burros, for shoeing; forms and shapes manufactured or handmade shoes; fits and fastens metal shoes to the hooves of horses, mules, and burros; handles animals safely and humanely; secures, utilizes and maintains hand tools, equipment and supplies needed for farriery work; diagnoses and corrects foot and gait problems (through corrective shoeing); manages scheduling, record keeping, billing, collections, taxes and other aspects of the farrier business; and secures, applies and keeps updated in knowledge of: the anatomy of equine feet and legs, techniques in shoeing, use of horseshoeing tools and equipment and supplies; and customer relations. The farrier works outdoors or in barns, shops or other enclosures, semiprotected from the weather; he or she possesses the strength and endurance to work in a stooping position for long periods while supporting an animal. The person exerts independent judgement in determining procedures, conforming to quality standards and complex shaping/angling functions using hand tools. Farriers are entrepreneurs who may work "on call," on a "route," or contract with and work primarily at a riding stable, a race track, or other horse-related businesses. Active, full-time farriers can earn ten thousand dollars or more per year, depending on skill and effort.

The researchers conducted a search of the literature, including contact of known public institutions across the nation which offered farrier education programs. A tentative listing of skills was generated and submitted to a "review group" (jury of practicing farriers in Kentucky). The revised listing was mailed to farriers in eleven states throughout the nation; 36 (35.8%) responded. Eight competencies needed by farriers and 55 tasks or subcompetencies were identified.

All of the respondents were males who worked full time as horseshoers. Typically, they had been practicing farriery for 10 years and received training in a private (commercial) farrier school. Most of them worked on two or more types of horses and were located in the western half of the U.S. They typically shod 200 to 1000 horses per year.

Competencies Identified and Validated For Farriers

Competencies	Weighted Mean*
1. Gain a working knowledge of farriery.	3.5
a. Understand the anatomy and physiology of a horse's foot, pastern, and legs.	3.8
b. Recognize normal and abnormal flight of the foot, common errors in shoeing and their effects on foot and leg structures.	3.8
c. Know the safety practices in handling horses for shoeing.	3.7
d. Understand the needs of horsemen.	3.2
e. Know metal types and temperatures.	2.8
2. Secure farrier's equipment.	3.2
a. Maintain tools and equipment.	3.5
b. Assemble horseshoer tools and equipment.	3.4
c. Secure farrier supplies.	3.4
d. Select machine-made shoes.	2.7
3. Use a forge and welder.	3.1
a. Build fires in the forge.	3.4
b. Make therapeutic shoes.	3.4
c. Make bar shoes.	3.3
d. Construct horseshoes from barstock.	3.0
e. Make brace for broker bones or deformities.	2.6
4. Perform normal shoeing of a horse (shoes a horse flat).	3.8
a. Fit the shoe.	3.9
b. Secure the shoe to the hoof wall.	3.9
c. Prepare the foot.	3.9
d. Make a preliminary examination.	3.8
e. Select the shoe.	3.8
f. Remove old shoes.	3.7
g. Raise and hold the animal's feet for shoeing.	3.6
h. Inspect the newly shod animal.	3.5
5. Practice corrective shoeing.	3.6
a. Construct a shoe or modify a factory shoe for treatment of problems.	3.7
b. Apply corrective shoes.	3.7
c. Inspect the newly shod animal standing and moving (gaits).	3.6
d. Diagnose foot problems.	3.6
e. Test for lameness.	3.6
f. Diagnose faulty gaits.	3.6
g. Diagnose conformation faults.	3.5
h. Apply treatment.	3.5
6. Practice special shoeing.	2.9
a. Shoe quarterhorses (for shows, working or racing).	3.3
b. Shoe thoroughbreds.	3.1
c. Shoe standardbreds.	2.9
d. Shoe gaited horses.	2.9
e. Shoe hunters and jumpers.	2.9
f. Shoe draft animals (for show, work or pulling).	2.7
g. Shoe polo horses.	2.5
7. Handle the problem horse (refractory, vicious).	2.2
a. Use shanks (lip chain).	2.8
b. Use a twitch.	2.5
c. Has tranquilizer administered by a veterinarian.	2.4
d. Use a cuff and surcingle (for the front leg).	2.2
e. Use a cuff and sheet bend on the tail (for the hind leg).	2.1
f. Use scotch hobbles.	2.1
g. Throw and tie the animal down (as a last resort).	1.8
h. Use a shoeing stock.	1.6
8. Manage the farrier business.	3.4
a. Practice good customer relations.	3.8
b. Schedule and keep appointments.	3.8
c. Secure customers.	3.7
d. Collect fees.	3.6
e. Set up the business.	3.5
f. Keep records.	3.4
g. File taxes.	3.4
h. Prepare and submit statements.	3.1
i. Secure insurance.	3.0
j. Contract for work.	2.7

**Averages of 36 responses on a scale of 4.0 = Essential, 3.0 = Important, 2.0 = Of Some Importance, 1.0 = Not Important and 0.0 = Does Not Apply. Respondents were practicing farriers from the states of Alabama, Connecticut, California, Colorado, Georgia, Montana, Nebraska, Oklahoma, Oregon, Pennsylvania, and Washington.*

Extent of Farrier Education Programs

Persons can become horseshoers by attending public colleges or vocational school courses, private schools, or working with a qualified farrier (apprenticeship) for up to four years as a farrier assistant. At least three to five years of special training or experience are needed to qualify for shoeing horses competently. Farriers at racetracks ("platers") must pass a licensing examination involving a demonstration of corrective shoeing (performance test.)[5]

Thirty-one public colleges and universities offer courses of instruction in "the art and craft of the farrier."

Thirty-eight private schools offer farrier training, but caution was urged by several respondents because of the extravagant claims made by some schools. Counselors and persons considering enrolling at any farrier school should check to see that state licensing standards (if any) are met, that criteria[7] of the American Farrier Association are considered, and that farriers in the area are satisfied that the school is producing qualified graduates.

The public college and university farrier courses studied ranged from 11 weeks to two semesters and from 232 to 1300 hours of instruction. A typical professional course[8] was as follows:

Lecture Outline
- Anatomy and functions of lower leg and foot.
- General horsemanship.
- Explanation of various therapeutic and cosmetic shoes.
- Lamenesses, first aid, and treatment (when ethical by farrier)
- Farrier's role in treatment and filling prescriptions by a veterinarian.
- Specialized shoeing.
- Business ethics, customer relations, keeping records.
- Farrier related subjects: welding, training, etc.

Lab Outline
- Demonstrations and student forge work.
- Making different shoes.
- Shoeing live horses.
- Field trips.
- Advanced work for experienced farriers.

A short course conducted by a leading university[9] had the following schedule:

Length of Course — 16 weeks (Forty hours per week)
5 hours — Anatomy of the horse's foot
15 hours — Theory of corrective shoeing
400 hours — Forge work
220 hours — Trimming feet — Fitting and nailing of shoes

What about the outcomes of farrier education programs? The head of the department in a Western university indicated that, "due to a lack of physical strength and/or manual dexterity, one-fourth of the average graduating class will do very little with their training; about one-half will be reasonably competent for on-the-ranch care of saddle horses and general blacksmithing, and the remainder will actually go into the trade — after serving an apprenticeship — as a union farrier on the race tracks and show circuits."

Implications for Agricultural Education

The nature of farrier work makes it nearly ideal for two-year post-secondary agricultural institutions. This program is likely to expand to more such institutions during the 1980's.

Public Colleges and Universities With Farrier Programs[6]

Anoka Area Vocational Technical Institute
P.O. Box 191
Anoka, MN 55303

Black Hawk College — East Campus
Box 489
Kewanee, IL 61443

Blue Ridge Community College
P.O. Box 80
Weyers Cave, VA 24482

California State Polytechnic Univ.
3801 West Temple Avenue
Pomona, CA 91768

California State Polytechnic Univ.
San Luis Obispo, CA 93401

Crafton Hills College
11711 Sand Canyon Road
Yucaipa, CA 92399

Central Wyoming College
Riverton, WY 82501

Colby Community College
Colby, KS 67701

Colorado North Western Community College
School of Horseshoeing
Box 9010
Steamboat Springs, CO 80477

Cornell University
Extension Veterinarian
Ithaca, NY 14850

Dodge City Community College
14th at 50 By-Pass
Dodge City, KS 67801

Lamar Community College
2400 South Main
Lamar, CO 81051

Merced Community College
Department of Agriculture
Merced, CA 95340

Middle Tennessee State Univ.
College of Agriculture
Murfressboro, TN 37130

Montana State University
Departments of Animal & Range Science and Continuing Education
Bozeman, MT 59715

New Mexico State University
P.O. Box 3501
Las Cruces, NM 88003

Olympia Vocational Technical Inst.
2011 Mottman Road S.W.
Olumpia, WA 98501

Oregon State University
Corvallis, OR 97331

Pennsylvania State University
College of Agriculture
University Park, PA 16802
(short course)

Pierce College
Animal Science Department
Woodland Hills, CA 91364

Pitt Technical Institute
P.O. Drawer 7007
Greenville, NC 27834

Rogue Community College
3345 Redwood Pass Highway
Grants Pass, OR 97526

Sierra College
500 Rocklin Road
Rocklin, CA 95677

State University of New York
Cobleskill, NY 12043

Sul Ross State University
Alpine, TX 79830

University of Connecticut
College of Agriculture & Natural Resources
(short course)
Storrs, CT 06268

University of Maine
Extension Livestock Specialist
332 Hitchner Hall
Orono, ME 04473

University of Wisconsin — River Falls
College of Agriculture
River Falls, WI 54022

Utah State University
Conference and Institute Division
Logan, UT 84322

Valley Vocational Center
15359 Proctor Avenue
City of Industry, CA 91744

West Kern Community College
(Taft College)
29 Emmons Park Drive
Taft, CA 93268

Another high potential is in adult short course programs. The writer observed an outstanding adult horseshoeing course organized by Charles Berry, a young vocational agriculture teacher in Wolfe County, Kentucky. Mr. Berry had a local farrier teach his enrollees to prepare the hoof, select shoes, and perform the basic tasks in fitting the shoe. A demonstration was held on specialty shoeing (of Tennessee Walking Horses) and hands-on experience was provided. Fourteen "adult" students — who varied widely in age (from teenagers to the upper 50's) — completed the course. The students were uniformly enthusiastic about their experience; several indicated a desire to continue training in the occupation. Such innovative programs can provide an excellent service in many communities.

High school teachers of vocational agriculture/agribusiness should be aware of the employment opportunities, nature of the work, and requirements for training and advancement, so that proper advice and counseling can be given to students interested in the job. A realistic presentation of information[10] to the local counselor may also prove helpful to prospective students of the occupation. Because of the high interest in use of horses for recreational purposes, teachers may wish to develop a short unit on the subject and secure a farrier to serve as resource person in demonstrating care and maintenance of horses' feet and hooves. Opportunities for field trips and skill practice abound in most communities.

Summary

The farrier is a highly specialized and important service occupation of the equestrian industry. Agricultural educators — through counseling, organizing of courses and referral of student to effective farrier education programs — can provide strong leadership in this, perhaps the last, agricultural occupation where human skills have yet to be overshadowed by mechanization or technology.

[1]Figures on horse numbers are from the American Horse ... ington D.C.; farm and ranch numbers are from U.S. ... *Agriculture*, Volume II, 1974, p. 32.

[2]Although exact numbers are unknown, it was estimated ... Taylor, President, American Farrier Association, ... Phoenix, AZ 85016, that were approximately 40,000 ... ing full- or part-time in the U.S. in 1979.

[3]"Farrier" in *National Ag Occupations Competency* ... Report. USOE Project No. 498AH60366; 1978, pp. ... ducted by Ms. Bill Baker, Kentucky Equine Education ... Dr. M.J. Iverson, Auburn University.

[4]U.S. Department of Labor. *Dictionary of Occupational* ... Edition, 1977, p. 279.

[5]U.S. Department of Labor. *Occupational Outlook Handbook* ... p. 61.

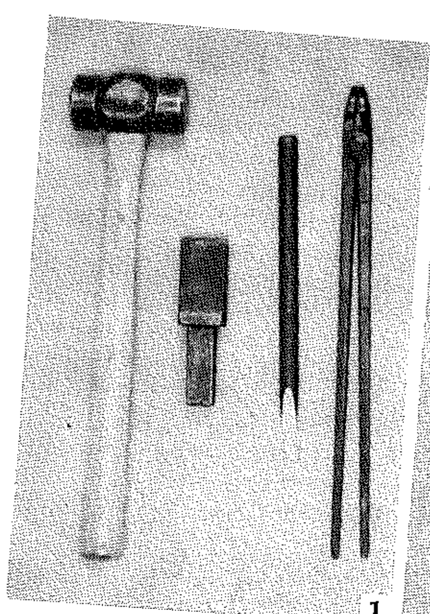
[6]Sources for the list are: The American Farrier Association, ... berquerque, New Mexico 87103 (March, 1973, list) and ... *tory of Two-Year Post-Secondary Programs in Agri-business and Renewable Resources Occupations*, ... Arnold Mokma, Agricultural Education, The Ohio State ... Distributed by USOE, DHEW, Washington, D.C., 85 pp.

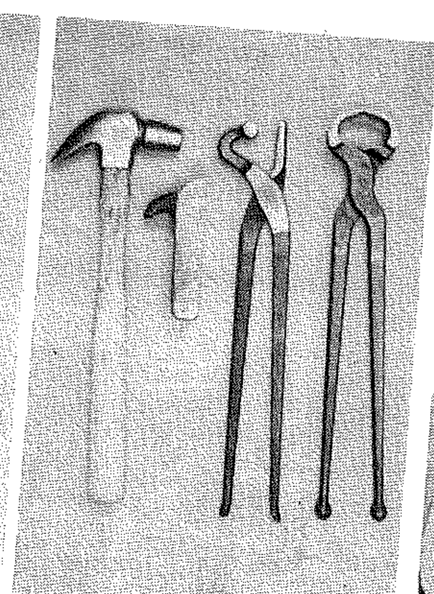
[7]In a 1976 release, the Association stated: "While school ... finally be a matter of individual choice, there are ... against which one should evaluate the school. Important ... students to primary instructor; number of horses actually ... shod during a course; cost; length of course; ratio of ... forge work to time spent shoeing or trimming; depth of ... taught, i.e. anatomy, physiology, history; disease; injury ... restraint; horseowner relationships; horse psychology ... management; and general reputation of the school. One ... consider any correspondence course or 3-5 day 'short course' ... as viable training. Above all, one must not assume that ... to a school produces a competent farrier. It is merely a ... from which one must learn and build."

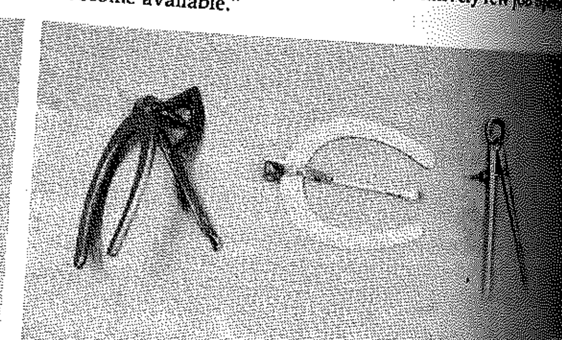
[8]This course ran 8 hours per day for 11 weeks. Source: Horse... School, Montana State University, Bozeman, MT 59715.

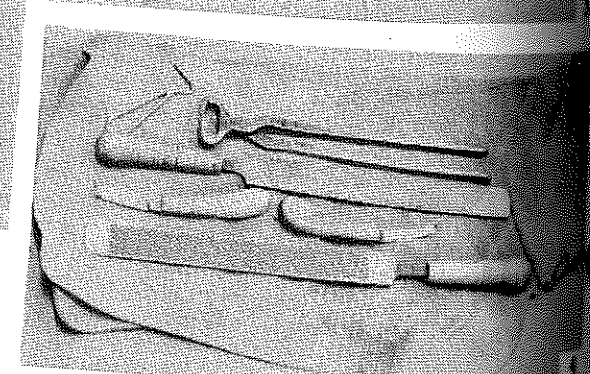
[9]From a syllabus sent by Cornell University, Ithaca, NY 1485...

[10]The *Occupational Outlook Handbook* (U.S. Department of ... Bureau of Labor, Bureau of Labor Statistics, 1978, p. 61) ... average earnings for farriers in 1976 were $10,000 to $12,000 ... ($15,000 for racetrack work) and cautioned that "Employment ... riers may increase slightly due to the growing popularity of ... racing and the increased use of horses for recreational ... Since this is a small occupation, however, relatively few job ... will become available."


1


2


3


4

No. 1 (left to right): hammer, hardy (from anvil), pritchel.
No. 2 (left to right): driving hammer, clinch block, nail clincher, pulloffs.
No. 3 (left to right): hoof gauges, dividers.
No. 4 (top to bottom): leather apron, hoof pick, nippers, fine rasp, right hand and left hand hoof knives, coarse rasp.

ARTICLE

Summer — The Time To Strengthen Your Public Relations Program

By Paul R. Vaughn and Dan Ware

Editor's Note: Dr. Vaughn is Associate Professor of Agricultural and Extension Education at New Mexico State University. Mr. Ware is Assistant State Supervisor for Vocational Agriculture with the New Mexico Department of Education.

One of the most neglected parts of a summer vocational agriculture program is the part which deals with public relations. This is despite the fact that summer is an ideal time for the vocational teacher to bolster this aspect of his/her program. One reason it is so neglected is because many teachers hold the view that there just isn't that much going on during the summer and, therefore, not much to publicize. What a critical error! That viewpoint, if projected to the local citizenry, can only lead to one conclusion: the ag teacher doesn't do anything in the summer. Everyone in the local community should realize that summer is one of the busiest times of the year for the vocational agriculture teacher. The responsibility for letting them know about it rests with the individual teacher.

How does one go about strengthening the public relations program in the summer? By doing several common-sense things which inform people about your vo-ag program. It is impossible to list them all, but we think the following represent the most common things an intelligent teacher will do to ensure that his/her program is receiving the attention that it deserves.

Make your school administrators aware of what you are doing. The summer is an ideal time to sit down and talk with your school principal and superintendent. School is out, and they are no longer faced with the everyday crunch of disciplining students, arranging for sports events, etc., and should have more time to meet with you.

Arrange for at least one meeting (early in the summer) primarily for the purpose of letting your administrators know what your plans are for the upcoming months. A written plan of your activities is extremely helpful in this regard, and all FFA meetings and activities should be noted at this time in order to ensure that they are placed on the school calendar. It may be possible that your administrators will indicate they are not concerned about what you are going to do, but let them know anyway! Ask them for suggestions as to what they feel the vocational agriculture program should be accomplishing during the summer. At the end of the meeting the administration should know that you have a job to do during the summer and you have the plans for doing it.

Many vo-ag teachers try to get their administrator(s) to go on several SOE visits during the summer. This is an excellent idea. Again, the summer is ideal, as the administrator will have a much more flexible schedule and will probably enjoy the opportunity to get out of the office. During the visits, an opportunity is provided to relate some of the accomplishments of students in the program and to point out the value (and necessity) of SOE. We cannot over emphasize the tremendous return (in terms of good public relations) that can be gained by this adventure. The few hours you spend with your administrators keeping them informed, will pay many dividends in the future.

Make yourself highly visible in the community. There are a number of in-door jobs that the vo-ag teacher must take care of during the summer. Inventorying supplies and equipment, watering plants, cleaning the shop, and preparing instruction materials — all are worthwhile and necessary activities to conduct during the summer. However, make sure that you aren't spending all your time in the office or laboratory. A considerable portion of your time should be spent visiting students, parents, and prospective students. It's not a bad idea to stop by the local coffee shop on occasions to talk with some of the local people and discuss the vocational agriculture program.

Summer is an excellent time to meet with employers to discuss the possibility of hiring students for work experience programs. This time of year is also a good time to drop by the county extension office to discuss new developments in the field and to coordinate various programs. Remember that the idea is not just to be seen, but to be seen doing your job. You don't have to tell people what you are doing if they can see what you are doing.

Conduct some type of activity which allows the community to come in and see your facilities. Many successful production agriculture and agricultural mechanics teachers have reserved periods of time during the summer where individuals in the community can utilize some of the facilities of the vo-ag program. One individual with whom we are familiar has a shop day once a week where students (and parents) can bring in equipment to be repaired or re-conditioned. Other activities might include demonstration plots on the land laboratory or in the greenhouse. The community could be invited in to view the results and discuss the various techniques which are being utilized.

While there are some inherent problems with such activities, they are extremely worthwhile in terms of public relations. Always be sure to approve any such activity with your administrators beforehand, as there may be school regulations which prohibit them.

Publicize the summer FFA activities. There are a number of activities in which you and your chapter might participate during the summer. These should be publicized. Summer camp, the state convention, leadership conferences, and recreational activities are examples of such activities. Make sure your chapter reporter continues his/

(Continued on Page 16)

Summer — The Time To Strengthen Your Public Relations Program

(Continued from Page 15)

her work through the summer by submitting articles and taking photographs at various events. You will find that this is a good time of year to get articles published primarily because you will no longer be competing with other school organizations in the community for space. The same is true in terms of other media such as radio and television. People should know that the FFA chapter is busy during the summer.

Evaluate your public relations efforts. Take time to get feedback from your local administrators and people in the community. List the summer program as an item on your agenda for an advisory council meeting. You will find that people will not be ... you if you have done an adequate job in publicizing your summer ... Perhaps the best way to tell if you are doing your public relations ... evaluate the questions that people ask you after the summer is over. If people ask "What did you do during the summer?" then you haven't done it adequately. It's when they say "I realize that you do so much during the summer!" that you know you have accomplished your goal.

ARTICLE

Good News and Bad News — Welding Instruction Evalution Has Both

By R.F. Espenschied

Editor's Note: Dr. Espenschied is Professor, Department of Agricultural Engineering, University of Illinois.

Student evaluation of welding instruction usually has good news and bad news. Most students enjoy welding and will give the subject good marks because they enjoyed it. If they receive low grades on their welds they will harshly criticize the instruction, usually because they feel their performance exceeded the grades received. This evaluation is bluntly given, "It's a good course but a bad instructor."

Safety the Watchword

A concerned welding instructor has safety foremost in mind. He/she is aware of safety hazards and insures that the welding laboratory provides a model of safe working conditions. Students should have personal protective equipment: safety glasses, hearing protection, gloves, hard hat, helmet, goggles, etc. Students are instructed about fire, explosions and shock hazards and know what to do in the event of an accident or fire. Equipment is maintained so it is safe. Shop procedures are followed to help prevent accidents. For following safe practices students rate the instructor as "Nobody got hurt."

Scheduled Maintenance

A conscientious welding instructor keeps the equipment in good condition. Periodically the welders, cables, electrode holders, and ground clamps are inspected to be sure they are safe and functional. An electrode holder that is so badly worn that the electrodes drop out is both unsafe and frustrating to the student. The regulators, hoses, welding torch, tips, and cutting attachments are examined to be certain they are in good condition. Students are instructed about the importance of good maintenance and supervised to be sure the equipment is not abused. The inspection and repair of the welding equipment is part of teacher "preparation," for which one period per day is usually allotted by the school. The student reaction to good maintenance will probably be, "Yeah, it all worked OK!"

Adequate Supplies

As welding courses have become more complex, the instructor has been required to keep an inventory of supplies adequate for class needs. A partial list of supplies would include: variety of electrodes (different numbers, diameters); steel, aluminum and stainless steel (different thicknesses); welding and brazing rods; spools of solid and cored wire; cylinders of welding and shielding gas; ceramic cups; and tungsten electrodes. If students lack any item their laboratory time will be wasted. A conscientious teacher takes care of these details ahead of time and the student comment may be, "We always had stuff to work with."

Challenging Classwork

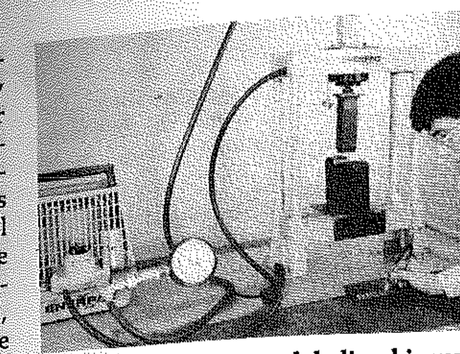
An imaginative teacher selects welding exercises that are similar to the problems the students will encounter when they are on the job. Students should be offered a variety of exercises that will challenge them regardless of experience, skill, and interest. Students should be given the opportunity to build something at the end of the course for themselves. The more advanced students may help those who are less advanced. Teachers should always be alert for new techniques to motivate the class members for skill mastery. Course objectives should be followed so there is little unnecessary deviation from plans. Completed projects and exercises by former students can be displayed to serve as models for challenging all class members. Student reaction may be, "It held my interest, but so what?"

Professional Preparation

The good teacher prepares for class and laboratory instruction. Seminars, workshops, and other activities should be used to keep up to date. The technical literature should be regularly reviewed. Teaching aids (slides or filmstrips, models, overhead transparencies, and charts) should be obtained or prepared. Demonstrations presented to the class should be well prepared. Through preparation the teacher can quickly determine the correct amperage, flame adjustment, travel speed, rod angle needed for the demonstration. The student reaction might be, "The teacher can weld all right! He/she knows the subject! But, he/she just can't grade!"

Finally, we have come to the moment of truth. The bad news, veiled in unenthusiastic responses up to now, is out in the open. Student hostility is based on grading. Students may feel that their exercises were lost, misplaced, stolen, or incorrectly graded.

Students have been know to turn in another student's work. Woe be to the teacher who give the same weld a different grade the second time through! Labeling weld metal with chalk makes it difficult to read and easy to erase. The chalk label may be obliterated by oil or by handling the metal. One way to prevent this from happening is to use paint markers to label welds. Several brands are available from welding suppliers. Two manufacturers of paint markers are: John P. Nissen Jr. Co., Glenside, PA 19038, and Markal Company, 250 North Washtenaw Avenue, Chicago, IL 60612. If students label their welds with their names and exercise number there is likely to be less exchanging of weld exercises. Steel stamping is also effective but takes more student time.



This student is shown labeling his weld with a paint marker prior to submitting it to a guided bend test.

Students should have an opportunity to improve their performance and turn in their best weld for teacher evaluation.

A procedure that is fairly effective is for the students to turn in their welds by kinds of exercises. Good labeling prevents mix-ups! Overhead welds should be graded against overhead welds, not against vertical or downhand welds. The teacher then evaluates all welds of one kind. During a visual examination he/she may look for such things as ripple patten, spatter, undercuttings, weld profile, crevice in center line, concavity, or convexity.

The next step should be the use of a guided bend test or some similar destructive test to help eliminate differences of opinion. How many times has the statement been made, "It may not look very good but it will hold?"

Grimes[1] lists the evaluation techniques available to a teacher as observation, oral questions, written tests, procedure ratings, and product tests. In this instance, we have a good case for the product test.

Shinn[2] describes the situation succinctly concerning a difference of opinion on welding evaluation, "At that point each of us wishes for a simple shop test which would solve these discussions."

Shin further states, "Practice without knowledge of results has appeared to have very little effect on individual performance." Conscientious teachers have tried to let students determine penetration by having them break welds in a vise. A student swinging a blacksmith's sledge at welded metal held in a vise may not be the safest practice or the best use of student time.

Guided bend tests, however, provide students the opportunity to examine their welds. An electric motor driven hydraulic pump gives a quick test and eliminates student waiting to operate a

(Continued on Page 18)

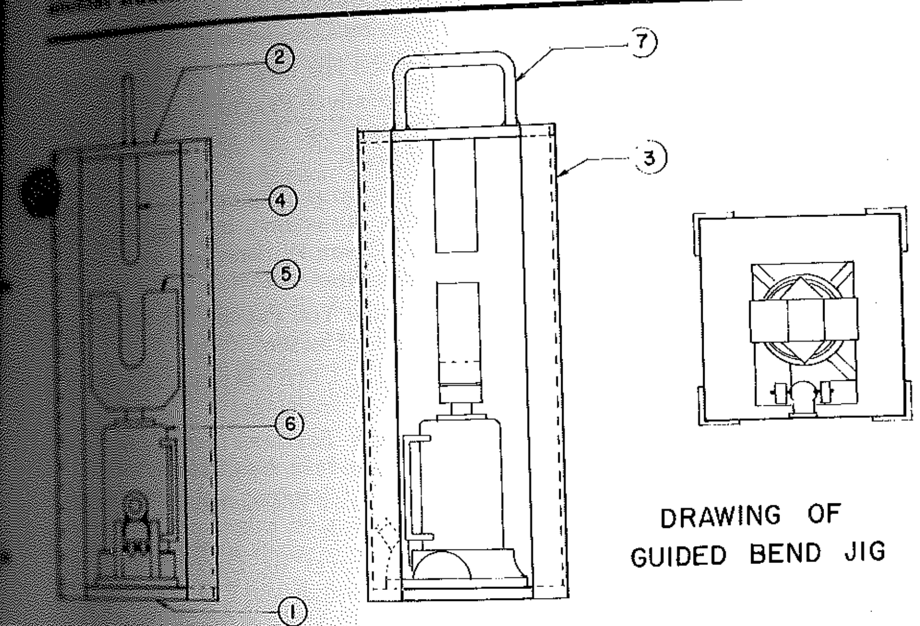


TABLE 1 — BILL OF MATERIAL

Part in Drawing	No. of Pieces	Material	Description
1	1	Mild Steel	Base Plate 10 x 10 x ½"*
2	1	Mild Steel	Top Pate 10 x 10 x ¾"*
3	4	Mild Steel	Tie Angles 1½ x 2 x ¼ Angle 24" Long
4	1	SAE 1045	Make Die Make or Purchase from Hobart
5	1	SAE 1045	Female Die Make or Purchase from Hobart
6	1	- - -	10 Ton Hydraulic Jack 9" Low Height 6" Extended - Purchase locally
7	1	Mild Steel	Handle 3/8" Round Bar 12" Long

*Vary with size of purchased jack.

hand hydraulic jack. The components of the hydraulic tester are:

Part No.	Description	Quantity
A-25	10 Ton Bench Press Frame	1
PEM-1341	Hush-Pup Pump	1
RD-910	9 Ton Cylinder, Double Acting	1
AD-175	9 Ton Press Adaptor	1
GP-10S	Gage	1
HC-913	Hose	2
GR-400	Coupler	2

The guided bend tester may be constructed in the vo-ag laboratory based on plans included with this article. The plans are from Hobart School of Welding Technology. The bill of material is listed in Table 1.

Once the weld is broken a more detailed evaluation can be completed. Cracks can be examined. Inspection will indicate the amount of penetration, incomplete fusion, slag inclusions, and other characteristics. The breaks can be examined to determine whether the base metal or weld metal broke.

On fillet welds the teacher and student can use a weld fillet gage. These gages give a good evaluation of the amount of weld metal deposited. In times of electrode shortages, it is wasteful and expensive to overweld. On the job, the supervisor will quickly reprimand a worker who is wasting electrode metal and time by overwelding.

Guided bend tests and other destructive tests help improve student evaluation of welding classes. [illegible] be surer of their visual [illegible] when they see the welds [illegible] the students will gain [illegible] his/her opinion. The [illegible] markers reduces pilfering [illegible] builds student morale. [illegible] evaluation of the welding [illegible] "It was a good course and [illegible] was fair." That is the good [illegible] want to hear!

References

[1]Grimes, Jay P. "Choice of Tests [illegible]" The Agricultural Education [illegible] April, 1975, p. 233.

[2]Shinn, Glen C. "Let's Quant[illegible] Instruction" The Agricultural [illegible] Magazine, December, 1973, p. [illegible]

Books To Be Reviewed

The following books are available for review:

Introduction To Agribusiness, by N. Omri Rawlins

Materials Handling In Farm Production, by Bill Butterworth

Introduction To Agribusiness Management, by Don L. Long, J. Dale Oliver, and Charles W. Coale

Agribusiness Procedures and Records, by Delene W. Lee and Jasper S. Lee

Beef Production in the South, by Stewart H. Fowler

Handbook of Livestock Equipment, 2nd edition, by Elwood M. Juergenson

Landscaping: Principles and Practices, by Jack E. Ingels

An Introduction To Seed Technology, by J.R. Thomson

Instant Writing Course, by Joseph J. Marks

Conducting Educational Research, 2nd edition, by Bruce W. Tuckman

The Farm Management Handbook, by Robert A. Luening and William P. Mortenson

Educators Guide To Free Audio and Visual Materials, edited by James Berger

Educators Guide To Free Filmstrips, edited by Mary Horkheimer and James Diffor

Educators Guide To Free Films, edited by Mary Horkheimer and James Diffor

Electrical Wiring, AAVIM, by Thomas S. Colvin

Developing Shop Safety Skills, AAVIM, by Clinton O. Jacobs and J. Howard Turner

Approved Practices In Swine Production, by James K. Baker and E.M. Quarles

The Black Rural Landowner — Endangered Species: Social, Political, and Economic Implications, edited by Leo McGree and Robert Boone

Year Book of Agricultural Co-Operation 1978, by The Plunkett Foundation

Dictionary of Agricultural and Food Engineering, 2nd edition, by Arthur W. Farrall

Soil Processes, by Brian Knapp

The Backpocket Guide To Ornamental Plants, by E. Wesley Conner

Cooperatives — People With A Purpose, by American Institute of Cooperation

Marketing of Agricultural Products, by Richard Kohls and Joseph Uhl

Vegetable Growing Handbook, by W.E. Splittstoesser

Soils and Other Growth Media, by A.W. Fegmann and Raymond A.T. George

Principles of Animal Environment, by Merle L. Esmay

Livestock and Meat Marketing, by John H. McCoy

Field Crop Diseases Handbook, by Robert F. Nyvall

Outdoor Recreation, Douglas M. Knudson

Greenhouse Management, 2nd [illegible] tion, by C.S. Barnard and J.S. [illegible]

Food For Life, by F.E. De[illegible]

Approved Practices in Beef C[illegible] Production, 5th edition, by [illegible] Furgeson

Irrigation Principles and [illegible] tices, 4th edition, by Vaughn E. [illegible] sen, Orson W. Israelson, and G[illegible] Stringham

When You Preside, 5th edition, [illegible] John D. Lawson

Dairy Cattle Science, 2nd edition, by M.E. Ensminger

Plant Breeding and Genetics [illegible] Horticulture, by C. North

Wildlife Management, by Rob[illegible] H. Giles, Jr.

Principles of Dairy Science, [illegible] G.H. Schmidt and L.D. Van Vleck

The Horse, by J. Warren Evans, Anthony Borton, Harold Hintz and L.[illegible] Van Vleck

Greenhouse Operation and Management, by Paul V. Nelson

Profitable Garden Center Management, by Louis Berninger

Producing Vegetable Crops, [illegible] ed., by George W. Ware and J.[illegible] McCollum

Animal Health, by James K. Bak[illegible] and William J. Greer

If you are interested in reviewing an[illegible] of these books, write to the Book Review Editor and indicate which title [illegible] of interest to you.

BOOK REVIEW

[illegible] and Environmental [illegible] by Theodore T. Kozlowski, [illegible] Washington: University of Washington Press, 1979, 184 pp., [illegible]

[illegible] the past few years there seems to have been an increase in public awareness about stresses placed on the environment. In this book, Dr. Kozlowski addresses this issue more specifically upon the Nation's forests and the ecosystems contained therein. The book focuses on the complex biological processes that are effected by different environmental conditions brought about by both natural and man made sources. Physiochemical stress brought about by changes in temperature extremes, water presence or deficit, light intensity and chemical reactions to herbicides and pollutants such as sulfer dioxide are dealt with in terms of physiological response and activity. These conditions bring about changes [illegible] survival. As a forest biologist and botanist, Dr. Kozlowski understands the complexity of the responses and reviews the facts accordingly. The book therefore is probably much too difficult for any but the best high school student who has a good background in biology and some extra information on botany at his disposal. I would recommend its use, exclusively for college level students.

The end of the book deals specifically with the effects of stress on seedlings. Suggestions are made to promote survival and rapid growth, again with an emphasis on the physiological responses within the seedling. Different environments are considered and the tropical forests are dealt within an interesting manner. The fragility of the nutrient balance system is stressed. The succession of plants is also discussed after deforestation and thinning. Another area discussed is containerized seedlings, a method being employed more and more today.

With fossil fuels being rapidly depleted in our country, our interest in renewable resources will continue to increase. Only if the manager understands the mechanism for growth and survival can he hope to promote tree growth rapidly enough to meet the ever increasing demand. Dr. Kozlowski stresses the importance of facts to back up any environment decisions made today by our nation of "instant" ecologists. Once the ecologist reads this book he will perhaps have a better understanding of the complexity of the ecosystem and will leave the decisions to the people who have the best understanding of the material.

Dr. Kozlowski has taught at a number of American and foreign universities and has authored and co-authored a number of books on plant physiology.

Robert Forrester
Fairbanks High School
Milford Center, Ohio

Soil Teaching Aid, by Andrew R. [illegible] Lincoln, Nebraska: University of Nebraska Press, 1979, 140 pp., [illegible]

This reference material was designed to show the user how soils differ and will respond to man's use and treatment of them. The material deals primarily with soils of the Great Plains States.

The material consists of the text, a tape-slide series in a carousel tray, and a map. The text begins by describing the slide series. It continues with a discussion of why soils differ, a listing of plant names, and a glossary of terms. The main content of the text is a presentation of the various soil types found primarily in the Great Plains States. The presentation consists of a description and location of these soils and is accompanied by excellent quality pictures showing the profile and typical use of the soil type. The slide series, consisting of a tape and 140 slides of 70 soil profiles representative of the Great Plains, describes soil locations, uses, and structures. The map is of soils of the Great Plains.

The author is a retired soil scientist. Prior to his retirement he worked for the Soil Conservation Service as the principal soil correlator for the Great Plains States and North Central Region. His office was in Lincoln, Nebraska. Photographs found in the instructional materials were accumulated during his time of active service. He worked in cooperation with soil scientists in each of the Great Plains States to accumulate the materials.

This set of materials is directed toward all levels of instruction in soil science. The material is specific and can best be used in secondary and post-secondary agriculture programs to supplement other references in the soil sciences. It is not a general reference for teaching soils.

Vernon D. Luft, Associate Professor
Agricultural Education
North Dakota State University
Fargo, North Dakota 58105

Profitable Soil Management, by Leo L. Knuti, David L. Williams, and J.C. Hide. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1979, Third Edition, 294 pages, $16.88.

Profitable Soil Management is a comprehensive book about soil management. The book contains 21 chapters and a glossary. The first three chapters of the book contain basic information on the importance of soil and the soil development process. Chapters four through eight address the topics of soil and plant relationships. Chapters nine through sixteen are devoted to the topics of fertility and maintaining fertility. Soil conservation and management practices are contained in chapters seventeen through twenty. The final chapter is devoted to the topic of land judging.

The photographs and graphs are both illustrative and informative. Each chapter concludes with a summary, study questions, class activities, and laboratory/field exercises and demonstrations.

Dr. Knute, Dr. Williams, and Dr. Hide have a variety of expertise used in writing the book. The authors' varied backgrounds and successes in agricultural education and in the area of soils makes them qualified to write this book.

The book is designed primarily for high school vocational agriculture students. The book could serve as an excellent reference for the teacher if its cost prohibits use as a student reference.

Fred W. Reneau
Department of Agricultural Education & Mechanization
Southern Illinois University
Carbondale, Illinois 62901

ARTICLE

An Analysis of Farm Equipment Operator Occupations

By J. Dale Oliver
and K. Kurt Eschenmann

Editor's Note: Dr. Oliver and Dr. Eschenmann are members of the faculty in the Division of Vocational and Technical Education at Virginia Polytechnic Institute and State University, Blacksburg.

American agriculture has assumed the status of being one of the most efficient industries known. This has been brought about by utilizing the latest technology available, thus permitting agriculture to export more goods than any other industry. An illustration of this efficiency is the high productivity of labor used on American farms. From 1950 to 1975 farm productivity increased at an annual rate of 5.3 percent while output per man-hour in nonagricultural industries increased only 2.4 percent; in 1975 one farm worker produced food and fiber for himself and 56 others (LeRoux, 1976).

An integral member of this technological agricultural work force is the farm equipment operator.

A recent study at Oklahoma State University, for example, indicates that because of technological advances and rigid capital substitutions into agriculture many farmers are seeking highly skilled employees who are capable of operating expensive equipment and making sound decisions (Agricultural Experiment Station, 1974, p. 15).

As a result of these technological advances, the farm equipment operator can no longer be viewed as possessing minimal levels of education.

The employment picture for farm equipment operators appears to be quite favorable. In the state of Virginia alone, it has been estimated that 500 trained farm equipment operators will be needed each year (Agricultural Education Service, April, 1975). It would appear that programs designed specifically for the preparation of competent farm equipment operators should be developed and implemented as a part of vocational education programs.

Concern over the preparation of these workers prompted the Virginia supervisory staff in agricultural education to select farm equipment operator occupations as a priority area for study. This research assisted in fulfilling Virginia's obligations as a member of the Vocational-Technical Education Consortium of States (VTECS). This consortium is a cooperative effort among 17 states and two agencies to develop validated catalogs of performance objectives, criterion-referenced measures and performance guides in selected areas of vocational education.

Procedures

This study was based upon the use of task analysis procedures as a foundation for the development of job-relevant instructional materials. The procedures used were as follows:

1. *Develop an Occupational Inventory* — The occupational, or task, inventory was based upon a state-of-the-art study, a review of technical procedures used by workers and interviews with incumbent workers, supervisors, and instructors. The final inventory contained the following: background information for the workers; 183 tasks in four duty areas; and 150 pieces of equipment (Oliver, Eschenmann and Martin, 1976). The duty areas were: A. Performing Routine Administrative Functions; B. Performing Scheduled Farm Machinery Maintenance; C. Performing Nonscheduled Farm Machinery Maintenance; and D. Performing Field Operations.

2. *Survey Incumbent Workers* — Virginia was divided into three regions based on the predominant crop(s) produced. The number of commercial farms by counties in each region was obtained from the **Census of Agriculture: 1969** (U.S. Bureau of the Census, 1969). One number was assigned for each 1000 commercial farms in the counties. Twenty-two random numbers were generated which [illegible] the sample counties.

The state director of the Agricultural Stabilization and Conservation [illegible] (ASCS) was contacted to [illegible] mission to work with the ASCS [illegible] tive directors in the selected [illegible] The county executive directors [illegible] asked to supply the number of [illegible] mercial farms on their [illegible] Random numbers were generated [illegible] each of the 22 counties and the [illegible] ASCS directors were asked to [illegible] numbers to provide the names and [illegible] dresses of 10 commercial farms [illegible] gave the recommended sample [illegible] 220 farmers.

These individuals were sent [illegible] ventory and asked to participate [illegible] study if they were the primary [illegible] tor of equipment on their farm [illegible] however, they employed one or [illegible] full-time employees who could be [illegible] sified as farm equipment operators [illegible] supervisors of farm equipment [illegible] tors, they were asked to have [illegible] these individuals complete the [illegible] tory.

Workers completing the inventory were asked to provide background information, to indicate the equipment used, to check the tasks performed and to rate the relative amount of time spent on each task on a seven-point scale.

3. *Analyze the Data* — The following information was provided: the percentage of workers performing each task, the average percent time spent [illegible] each task, and the percentage [illegible] workers using each piece of equipment.

4. *Prepare the Catalog* — The performance objectives, criterion-referenced measures and performance guides were prepared by a writing team. The members included two [illegible] structors of agricultural education, [illegible] incumbent worker, a supervisor of [illegible] cumbent workers, two technical writers, and a state-level supervisor of agricultural education. After the catalog was prepared, it was field reviewed by consultants to determine its instructional acceptability. Input from these individuals was used to develop the final version of the catalog.

Findings

Responses were received from 181 farm equipment operators. All but 13 of the 183 tasks in the original inventory were performed by one or more workers and seven tasks were added by the workers. Sixteen pieces of equipment from the original list of 150 items were not used by any workers and 29 pieces were added.

The tasks in the top ten percent, based on the highest average time spent by all workers performing them, are shown in Table 1. The percent of members performing each task is also shown. The tasks tended to be concentrated in Performing Scheduled Farm Machinery Maintenance and Performing Field Operations, respectively. This would suggest that equipment maintenance and repair and performing field operations should be emphasized in training farm equipment operators.

Another group of tasks of interest are those relating to the use of welding and cutting equipment (Table 2). Slightly under one-half of the workers performed the task "Arc weld steel to steel." The tasks relating to cutting and brazing were performed by fairly low percentages of workers. These data suggest that a moderate emphasis should be given to welding and cutting in instructional programs for farm equipment operators. The welding and cutting equipment used was reported as follows:

(Continued on Page 22)

Table 1
Tasks Performed by Farm Equipment Operators

Task Description	Percent of Workers Performing
Change engine oil and filter	96.1
Attach farm equipment to drawbar	95.6
Lubricate and grease chassis fittings	95.0
Rake hay	74.6
Clean brush and weeds with rotary mower (bush hog)	76.2
Refuel farm machinery (gasoline)	86.7
Till soil using moldboard plow	81.8
Bale hay with conventional "square" baler	68.0
Prepare farm machinery for storage	91.7
Drive farm equipment on roads and highways	87.3
Prepare farm machinery for use after storage	89.0
Check air pressure in tires	93.4
Start engine using jumper cables	90.1
Replace spark plugs	89.0
Replace battery	89.5
Fertilize soil for planting using fertilizer spreader	73.5
Service the cooling system	86.2
Refuel farm machinery (diesel)	69.1

Table 2
Welding and Cutting Tasks Performed by Farm Equipment Operators

Task Description	Percent of Workers Performing Task
Arc weld steel to steel	46.4
Cut stock metal for repairing farm machinery using an oxyacetylene torch	38.7
Form metal (bend, shape) using an oxyacetylene torch to repair farm machinery	36.5
Braze sheet metal	22.7
Braze brass to steel	21.0
Braze steel to brass	17.1

Table 3
Equipment Used by Over Eighty Percent of All Workers

Equipment Description	Percentage of Members Using
Grease gun	99.5
Hammer	99.5
Shovel	98.9
Axe	97.2
Hack saw	97.2
Fuel can	96.7
Sledge hammer	96.7
Jumper cable	95.6
Funnel	95.0
Tape measure	94.5
Moldboard plow	94.5
Wheel-type tractor	93.9
Electric drill	92.8
Chain saw	92.8
Slow moving vehicle emblem	92.8
Hatchet	92.3
Pick-up truck	89.0
Fuel storage unit	87.9
Pry bars	86.7
Tire pressure gauge	86.7
Mechanics tool set	85.6
Hydraulic jack	82.3
Four wheel wagon	81.8

Table 4
Safety Equipment Used by Workers

Equipment Description	Percentage of Members Using
Slow moving vehicle emblem	92.8
Safety glasses, goggles and hood	72.4
Fire extinguisher	57.5
Protective gloves/apron	51.9
First aid kit	44.2
Respirator (filter mask)	34.8
C-B radio	33.7
Hard hat	27.1
Ear plugs	13.8
Safety belt and line	11.1
Rubber or vinyl suit for chemical application	9.4
Bump hat	5.0

An Analysis of Farm Equipment Operator Occupations

(Continued from Page 21)

Equipment Description	Percentage of Operators Using
Arc welder unit	53.6
Oxyacetylene cutting torch	40.3
Oxyacetylene welding torch	37.0

Table 3 shows the equipment used by 80 percent or more of the workers. This category included 23 out of the 163 pieces of equipment or 14.1 percent of the equipment. A category worthy of special note is that of safety equipment (Table 4). While the use of some items appears to be reasonable, there are areas of potential concern. For example, 62.5 percent of the workers performed the task "Spray farm crops using field sprayer" while only 9.4 percent of the workers reported the use of rubber or vinyl suit for chemical application (Table 4). The use (or lack of use) of respirators, hard hats, ear plugs, safety belts and lines, and bump hats are potential areas of concern.

Conclusions

This study provided a picture of the tasks being performed by workers employed as farm equipment operators and supervisors of farm equipment operators. The data can be used by secondary and post-secondary instructors in developing programs that are realistic in terms of competencies required for employment.

The catalog which has been developed can be used as a planning and management tool for the development of curricula with objectives that have been validated against actual job performance. Use of the catalog will allow teachers to concentrate more on how rather than what to teach, knowing they are teaching career relevant skills.

The catalog can also be used to promote individualized learning. Students can know exactly what is expected of them and be secure in the [illegible] that they are learning the [illegible] for employment. The [illegible] made available to Virginia [illegible] through an in-service training [illegible] and will be distributed [illegible] member states through the [illegible] distribution channels.

REFERENCES CITED

Agricultural Education Service. Farm [illegible] Operator. Richmond: Agricultural [illegible] Service, April, 1975.

Agricultural Experiment Station. [illegible] Economic Evaluation of Wage [illegible] centive Agreements for Full-Time [illegible] on Oklahoma Farms. Stillwater: [illegible] State University, Bulletin B-713, April [illegible]

LeRoux, Frank M. The Myth of U.S. [illegible] tural Prosperity. Walla Walla, [illegible] 1976.

Oliver, J. Dale, Kurt Eschenmann, [illegible] Martin. Occupational Inventory, Farm [illegible] ment Operator Occupations. Blacksburg, [illegible] ginia: Virginia Polytechnic Institute and [illegible] University, 1976.

U.S. Bureau of the Census. Census of Agriculture: 1969. Washington: U.S. [illegible] Printing Office, 1969.

SUBSCRIPTIONS

Subscription Renewal Form

Use this form to renew your subscription to THE AGRICULTURAL EDUCATION MAGAZINE. If your subscription is separate from your professional dues package, you will need to subscribe early to avoid missing an issue of the magazine. Subscription prices are $7 per year. Foreign subscriptions are $10 (U.S. Currency) per year for surface mail and $20 (U.S. Currency for airmail) (except Canada).

(cut on this line)

Please enter my subscription to THE AGRICULTURAL EDUCATION MAGAZINE.

☐ New ☐ Renewal

☐ Check or money order is enclosed.

☐ Please send bill (please enclose purchase order).

Mailing Address:

Name: ____________________

Address: ____________________

Post Office: ____________________

State: ____________ Zip: ________

Billing Address (if different from mailing address):

Name: ____________________

Address: ____________________

Post Office: ____________________

State: ____________ Zip: ________

Send this subscription form to:

Glenn A. Anderson, Business Manager
THE AGRICULTURAL EDUCATION MAGAZINE
1803 Rural Point Road
Mechanicsville, Virginia 23111

Futuros Agricultures de Panama!

BY CARLOS NAVAR AND STEVE FORSYTHE

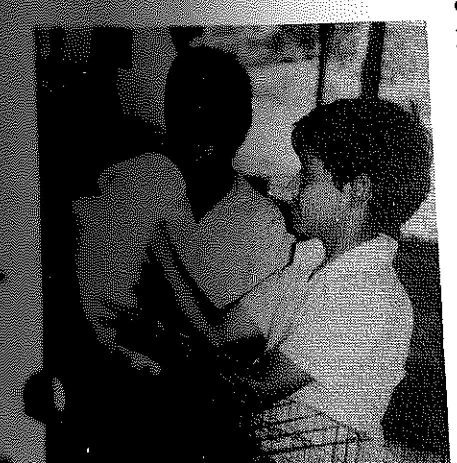
Editor's Note: Mr. Navar, an intern with the National FFA organization, is Senior Program Coordinator in Panama. He plans to return to a dairy farm near El Paso, Texas. Mr. Forsythe is a Graduate Assistant in Agricultural Engineering at Oklahoma State University.

The National FFA organization is working closely with the country of Panama in establishing and strengthening it's counterpart — the FA de P. The purpose of this article is to describe the background of this work.

In 1975 preliminary plans were formulated to provide a way for rural Panamanian youth to have the opportunities for leadership training, supervised occupational experience, and other activities similar to America's National Future Farmers of America. Beginning in 1978, an operational grant proposal to strengthen and expand the "Asociacion de Futuros Agricultures de Panama" was passed. FA de P functions in schools supported by the Ministry of Education, Ministry of Agricultural Development (MIDA), and private schools in Panama. America's AID Mission, the National FFA Association, and others have also been very instrumental in the success of the FA de P. Support also comes from the Patronato Nacional de la Juventied Rural Panamena which is the foundation for Panamanian Rural Youth (Patronato).

Goals

The challenge is here! Fifty percent of the population is under age 18. This places a burden on the education system's ability to provide educational opportunities. The goals for the future include complementing the formal structure of education with a restructuring to include the Future Farmer Clubs and technical training in vocational agriculture to rural Panamanian youth groups. This will hopefully foster a strong sense of commitment to rural areas and cause the people to be more responsive to their need for equity, social justice, skills and economic efficiency.



Rabbits are important projects in Panama.

FA de P

The Futuros Agricultures de Panama is an integral part of the Panamanian educational system. FA de P chapters are located in 39 public and private formal educational institutions in Panama. The FA de P advisors are local agriculture teachers in the Ministry of Education. The Ministry of Education (Mineduc) also has 9 agriculture teachers who serve as regional advisors to FA de P.

The FA de P, like FFA, offers several elements to the vocational agriculture program as a complement to it's formal system.

Organized instruction — carried out in practical application of, and intensification of, special subject areas of agriculture.

Supervised occupational experiences — where students could then apply the knowledge and skills necessary.

FA de P activities — that are numerous and promote leadership, citizenship, and service as well as personal development.

Technical assistance — for farmers in new and improved methods of agriculture farming.

Civil work — during holidays as well as other times in rural areas teaching knowledge and skills acquired in school.

Panama is a beautiful country. Much of the work is in the developing areas with the rural people. It sounds like a typical FFA calendar of events when reviewing the numerous agricultural seminars, contests, and exchange programs for participation.

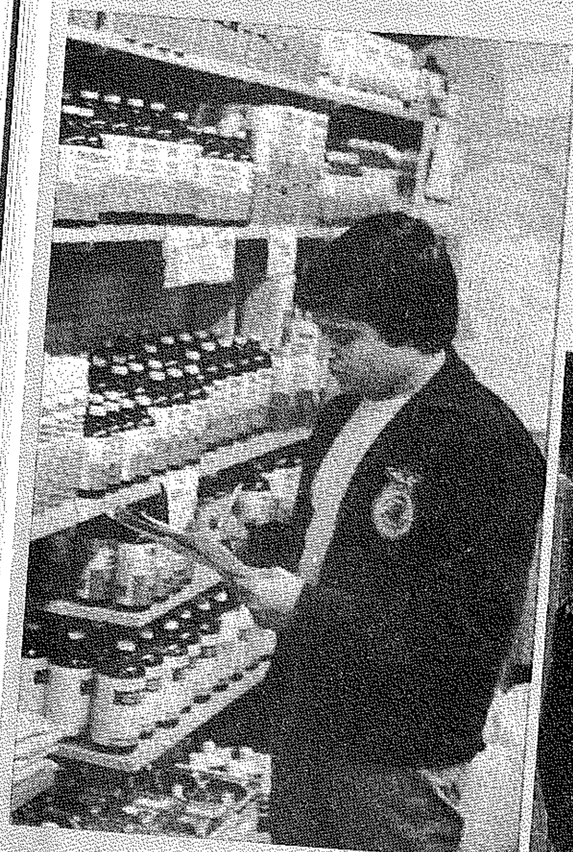
The Future

The young men and women of Panama are learning by doing and the project is succeeding. Much work has been done and much more needs to be done. The enthusiasm of the participants is gratifying as is the opportunity to see Panamanian youth grow in many ways. We believe in the future of farming and the Futuros Agricultures de Panama!

Themes For 1981 Agricultural Education Magazine

Time Management	January
Community-Based Programs	February
Keeping Up To Date	March
Programs in Agricultural Supplies and Services	April
Energy Education	May
Adult/Young Adult Education	June
Professionalism	July
The Beginning Teacher	August
Student Management	September
Teacher/Professional Liability	October
Using Research	November
Relationships with Agricultural/Educational Agencies	December

Stories in Pictures — Technology in Agricultural Industry



Modern agricultural industry requires sp technical competencies. These photographs students involved in agricultural supplies, judging, cheese manufacturing, and equipment ibration.

(Photographs by Gary Gray, Agricommunications Major, Mississippi University.)

The Agricultural Education Magazine

THEME: Using Realia in Instruction