THEME: Energy Education
Developing Energy Consciousness

Energy education is to educate people in the efficient use of all available energy. In common use, the words "energy" and "fuel" are unfortunately used interchangeably. There is a fundamental difference between the two. "Energy" refers to the ability to do work, while "fuel" is any substance that can be burned to produce heat. Scientists say that the amount of energy in the universe always remains the same. The amount of specific fuels does change. And this is precisely the problem we face today.

Several forms of energy are available: solar, chemical, electrical, mechanical, and nuclear. Today's crisis is caused by the production of the chemical fuels in the forms known as fossil fuel. Of the fossil fuels, petroleum supplies 45 percent of the energy used in the world. Coal, another fossil fuel, furnishes 30 percent of the world's energy. Of course, the primary source of all energy has been and is the sun. It is impossible to accurately measure the amount of solar (sun) energy that is used.

As the available natural sources of fuel are exhausted, alternatives must be sought. New sources of energy are needed while at the same time more efficient use must be made of the available fuels. Conservation practices must be developed and adopted.

Facilitating the adoption of new energy practices is a primary mission of vocational agriculture in energy education. The present programs should not be so much on energy education itself as it is on modifying existing practices in agricutural industry. An energy consciousness must be built into all instruction, whether it be livestock or crop production, agricultural mechanics, horticulture, forestry, or agribusiness.

Start Now

The theme of this issue of the Magazine is "Energy Education," and each article elaborates on the effects of funding cuts in all areas of society. The amount of cut in Federal funds is projected to be at least 20% of total funding, not just for one program, but for many programs. Vocational education has been hit as one of these programs.

Is a cut in funding for vocational education justifiable? After all, isn't vocational education a valuable contributor to economic development? How can the economic well-being of the United States be improved if funds for preparing people to be economically viable are reduced? If we want to improve the economic situation in the United States, reducing funding for vocational education doesn't make good sense. Inadequate funding will likely result in inferior programs. Reducing the aggregate educational capability of our people will reduce their economic productivity.

The Legislative Policy Seminar

A Legislative Policy Seminar sponsored by the American Vocational Association was held in Washington in March. A number of political and vocational education leaders attended and spoke. The speakers were disappointed, except for Gene Bottoms and Tony Carnaval.

AVA Executive Director Bottoms took a firm stand for at least continuing the current level of Federal funding for vocational education. He feels that vocational education has all ready had its cut since the level of funding has not been increased over the last decade when inflation is considered.

The position of Dr. Bottoms has been highly commendable when most other vocational educators speaking at the Seminar did not express enthusiasm for trying to increase or continue the level of Federal funding.

Carnaval, an officer in the Carter Administration, introduced the Seminar participants to the new language and mold of the Congressional office. He used a number of terms which impact the so-called "battle of the budget." Psychoeconomics, reindustrialization, supply side economics, stimulative policies, and revitalization were among the new additions to the Washington vocabulary.

In analysis, the Seminar was very enlightening. It provided the opportunity to learn about plans of the new Republican Administration. It provided the opportunity to find out what is being done among the group participating, support vocational education, and who isn't. It provided the opportunity to learn the stance of the American Vocational Association.
The stress needs to be on the development of needed employment competencies in the specific areas of vocational education, such as agriculture. Good education for the world of work is needed by all individuals, both advantaged and disadvantaged. The best way for the disadvantaged to overcome their handicapping conditions is through good education for work. And this is best achieved by emphasis on specific vocational areas.

Vocational educators can not and should not merely accept a cut in funding for vocational education. During economic adversity, good vocational education is needed more than ever. We need to take a strong stand to prevent the level of funding needed for quality vocational education. We must not "buy" the big "sell."

By Dr. R. Kirkland, THEME EDITOR

Energy's importance to agriculture and to the food chain is universally accepted. Agriculture must go through transition to a new technology that uses less energy or at least uses energy more efficiently. There is controversy over how agricultural systems should be modified in response to limited supplies of higher priced energy. Many researchers are addressing this problem but significant contributions in this new technology are not expected for several years. That leaves energy conservation and alternative energy sources as the immediate partial solutions to our problem. Most experts agree that we cannot conserve ourselves out of the problem nor can alternative energy sources replace our total demand for energy now met by non-renewable sources. However, they can buy us time and provide a vehicle for making the transition to a new technology.

I would like to briefly discuss some alternative sources of energy for agriculture and encourage the use of demonstration projects in vocational agriculture programs. The following alternative energy systems are well-suited for use in high school programs: solar water heating, solar greenhouse heating, solar crop drying, gasification (wood or crop residue), and methane generation.

By DIRELLA BAILO, Editor's Note: Dr. Baid is Associate Professor of Agricultural Engineering at the University of Florida, Gainesville.

Tax credit for homeowners (15% for business) and in some states, additional tax credits, make solar energy applications even more attractive. A typical family of four using 80 gallons of hot water per day would pay about $30 per month ($7 c/kWh) to operate an electric water heater. A properly designed solar system can cut water heating costs from 50% to 80% (using an electric back-up) or 100% if the back-up is not used. A commercially available solar water heating system can be installed for $1500 to $2500. A mobile solar water heating demonstration system has been constructed at the University of Florida. Useful publications include "Buying Solar." "A Guide to Solar Water (Continued on Page 6)"
Alternative Energy Sources for Agriculture

(Continued from Page 5)

Heating in Florida,” and “Build Your Own Solar Water Heater.” These should be helpful in constructing or purchasing a solar water heating system. (See end of article for more information on the publications.)

Solar Greenhouse Heating

The greenhouse industry is critically dependent upon a reliable energy supply. Heating costs of $50,000 per acre of greenhouse floor area occur and represent an ever-increasing amount of total production costs. Even though the energy for heating greenhouses and the associated cost appear to be excessive, greenhouses play an important role in our society by providing vegetable yields up to 10 times that of field production and provide food, transplants, and ornamentals during seasons when they cannot be produced locally outdoors. The use of greenhouse-residence combinations is also gaining interest. In this case, the open dimension in living space as well as supplemental heat and space for producing plants, including food production.

The use of solar energy in greenhouse heating can help reduce the dependence on our diminishing fossil fuel supplies and could help save our greenhouse industry. There are many varied designs being tested for utilizing solar energy to heat greenhouses. There is probably justification for many different designs since the weather conditions and plant requirements vary drastically. Several solar heating systems are described in the University of Maryland publication, “Energy Conservation and Solar Heating for Greenhouses.” A system has been developed at the University of Florida which utilizes the greenhouse itself as a solar collector. Rocks located under the plant-support benches store heat for night use. This system is primarily designed for southern climates and crops with a low light requirement, such as ornamental foliage. This design has the advantage of no structural collectors (although they could be added if necessary) and very low maintenance costs. For northern climates, a system utilizing external collectors should be used.

Rutgers University has developed a system which utilizes water as the heat transfer fluid and storage medium. The collectors are constructed primarily from plastic and the heat storage is in the floor of the greenhouse. This system appears to be economically feasible for some applications. A vocational agriculture department should have the equipment and skills necessary for constructing either these greenhouses or at a relatively low cost.

Solar Crop Drying

Solar crop drying is a particularly attractive application of solar energy since the design and construction is much simpler than other solar energy systems. A solar crop dryer may be simply an air heater with no thermal storage and no additional heat exchangers. For example, in some applications of solar grain drying, the conventional drying or storage bins can be used. This solar component then consists of a solar air heater which could be integrated into the roof and walls of a farm building or could be constructed from inexpensive materials such as wood and plastic. A solar air heater can be constructed from greenhouse-grade polyethylene and a small amount of wood. The collector is inflated using a low-pressure blower. The cost of material for this solar collector is less than 5¢ per sq. ft. and the life of the collector would be several years if it was disassembled and stored after the drying season. Wooden locking strips are used to hold the plastic, when inflated, so that no nails or other fasteners are required to secure the plastic.

Total cost of drying with such a system is about the same as a conventional gas-fired system. However, farmer- ers are slow to adopt solar energy systems since they require more management and are presently at a break even point with today’s fuel prices. This is based on about 30 days of use per year. If the system could be used for drying other crops or for other low-temperature applications, the economics would obviously be much better. (Designs of plastic air heaters are in the publications, “Solar Grain Drying Under Hot and Humid Conditions” and “Low Temperature and Solar Grain Drying Handbook,” as listed at the end of this article.)

Wood or Crop Residue Gasification

Gasification of wood and some crop residues is an alternate energy technology that should be given strong consideration. This is not a new technology because wood gas or coal gas has been used to power internal combustion engines since their invention. The low price and convenience of liquid fuels has displaced their use. The current price of fuels available to the farmer seems to indicate a possible retum to the use of gasification. This is despite of several disadvantages which include storage problems, low energy content per volume or weight, long start-up time (10-15 minutes), increased maintenance, reduction in power output (about half the power unless engine is modified), and wood gas is dangerous since it contains about 20% carbon monoxide — an odorless, tasteless and very poisonous gas. It appears that the use of gasification in agriculture may be particularly attractive since wood or crop residues would be readily available and the disadvantages listed above might not be as significant as in other sectors of our economy. Agricultural applications which appear promising include operation of stationary engines for irrigation pumps, drying fans, refrigeration and air conditioning equipment, and gas for space heating and drying operations.

Downdraft wood gas generators which supply gas for internal combustion engines which in turn operate electric power generators are currently being studied. The system will produce enough electric power at a rate of about 4 kilowatts for 4 hours, on a fuel charge of 40 pounds of small wood blocks. This amounts to about 21 pounds of wood per kilowatt hour. Heat from the burning of fuel in the combustion zone produces charcoal from the wood placed in the top of the chamber. In the reduction zone, which is in the bottom of the chamber, carbon in the hot charcoal forms chemicals with carbon dioxide and water vapor to produce the fuel gases: carbon monoxide and hydrogen. The gas leaving the generator should be about 20% carbon monoxide, 20% hydrogen, 10% carbon dioxide, and 50% nitrogen plus traces of other gases and particulates. From the generator, the gas passes through a cyclone separator which removes approximately 75% of the particulate matter and then into a cooler and final cleaning unit.

Although the design and construction of a wood gas generator can be rather complicated, several successful units have been built from readily available materials. Most vocational agriculture shops should be capable of producing a workable system with the information contained in publications such as “Generator Gas - The Swedish Experience” (U.S. Dept. of Agriculture) and “How to Power a Gasoline Engine With Wood.”

Methane Generation from Livestock Waste

The generation of organic materials such as animal wastes, to an easy to use form of energy can be accomplished by a number of methods. The process which appears to be the most immediate potential is anaerobic fermentation or digestion which converts organic materials to methane and other gases, called biogas. Sewage treatment plants generate biogas from the sewage sludge as part of their treatment process. This concept has been extensively applied in Europe and India during energy shortages. This energy source shows considerable promise for some use in agriculture since it will help dispose of wastes while at the same time producing fuel that normally can be used as liquid for transportation problems or storage and transportation. One of the major disadvantages of methane as compared to liquid fuels and LP gas is that it is impractical to transport in tanks, which eliminates its use as a motor vehicle fuel. For example 8 cubic feet of methane gas compressed to 300 psi would run an average tractor for only 6 minutes.

The main component of an anaerobic digester for biogas generation is a container to receive the liquid wastes, which can be either a vertical or a horizontal, constant temperature. Constant conditions of temperature, pH, and fresh organic material promote maximum methane production. Usually the temperature is maintained at about 103°F. Higher temperature may be used if held constant. Each 20°F. rise will result in a doubling of the gas production, up to a maximum of 125°F. In addition to constant temperature conditions, there must be a balance between the numbers of acid-forming bacteria. If this balance is not maintained, the process stops. Methane is produced by bacteria which are sensitive to temperature, loading rate, toxic elements, and pH.

Methane is drawn off the top of the digester and is commonly stored in a "floating cover" type vessel. Other devices such as regulators, pressure gauges, traps, scrubbers, and relief valves are normally used. A very simple apparatus can be used to produce biogas. The amount of gas and the reliability desired have a great influence on cost and complexity of the system. A simple batch-loaded digester can be constructed from readily available materials, such as family cisterns, but one should be familiar with the characteristics of anaerobic digestion before building a system.

Since methane is an explosive gas, extreme caution should be used when operating a methane producing system. Methane is lighter than air and may be trapped in the top of a silo during a very dangerous situation, therefore digesters should be operated outside of buildings.

Helpful Demonstrations

The alternative sources of energy described in this article have some promise. Their success depends upon improvements in them and the long-term trend of traditional energy sources.

Useful References on Alternative Energy Sources


A mobile downdraft wood gas electric generator.

THE AGRICULTURAL EDUCATION MAGAZINE

MAY, 1981

(Continued on Page 8)
FUEL SHORTAGE? GROW YOUR OWN!

Farmers can grow, harvest, and process their own fuel and convert their gasoline and diesel engines to run on this fuel. The junior author of this article, a retired LaCozne, Florida vocational agriculture teacher has built America's first woodburning tractor. The tractor has been running on a farm since June, 1980. Its use is proving that wood powder is one of the better alternative fuels sources available now for farmers.

In August, 1980, the authors conducted a demonstration of wood powder technology for the Alachua County vocational agriculture teachers. Since this time, the wood-burning tractor has been demonstrated for several vocational agriculture classes.

Wood Power Potential

The concern about farm energy has many people in agriculture looking for alternative fuels. A further concern is the effect alternative fuels (including coal) will have on the environment as well as the pocketbook.

Wood power offers a clean burning fuel with a tremendous potential for renewable energy. Wood energy is one energy source that uses a product that is not also a food for humans or livestock. Many farmers could run one or two of their tractors on wood that is largely wasted at present.

The wood-power tractor uses fuel/wood from 2' to 2' 2' legs cut into 2' x 3' lengths. These limbs come from trees that have been cut for timber and firewood. Small cut trees from oak saplings and oaks that sprout along fence rows are also used. Many farmers could run one tractor on elk and waste wood from harvesting, thinning, and pruning operations. The preferred fuel wood is from Water Oak (Quercus nigra) and Laurel Oak (Quercus laurifolia). Another fact in favor of wood power is that farmers

By Ed Thompson and R.H. Hargrove
Editor's Note: Mr. Thompson is Vocational Agriculture Teacher in Gainesville, Florida. Mr. Hargrove is a retired Vocational Agriculture Teacher in LaCozne, Florida.

Wood Powert Technology

Wood power (wood gasification) is an old technology. During World War II, many American service men saw "gasogens" or "gas-gas" trucks, buses, cars, and tractors in operation around the world. These vehicles had been converted to run on the gases from wood or charcoal. Fuels included wood, peat, coal, charcoal, and many other combustible products. Considerable research and development in gasogen technology was conducted during the World War II era in Europe and Australia. One of the best research publications on wood gas is a translation of the Swedish book, "Generator-Gas, The Swedish Experience From 1939-1945." This book is available from National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161. The cost was $16.00 in 1980. Anyone seriously considering construction of wood-burning engines should study this book. This book includes theory, chemistry, wood procurement, design of all components, installation, operation, safety and troubleshooting.

During the 1973 energy crisis, many Americans remembered seeing gasogens in operation and interest in this technology grew. The journal had reported about wood-burning trucks in Germany during World War II. Information was located on using wood for wood alcohol or gasification. The search led through many old publications and through a few new articles about gasification. Don Post, Professor of Forestry at the University of Florida, was also very interested in wood powder. During 1978, Professor Post started on the first wood-burning pickup truck in Florida. Construction of the tractor was started in 1979. Since this time, Professor Post and associates at the University of Florida have built and run five different models of gasoters. The wood-burning tractor was completed in June, 1980, and another is now under construction.

Wood Gasification Technology

Proponents of wood energy development have had considerable difficulty in getting help from governmental circles to conduct research and develop wood gasification. Some interest is now being expressed.

The potential for renewable energy for America from fields and woodlands is tremendous. Wood energy for grain will help clean up the air. The by-products and emissions from wood gasification are cleaner than from coal and shale.

It still appears that wood energy development will be dependent on individual effort by those who believe in this source of renewable energy.

Florida has a favorable climate for rapid wood and woody crop energy production. The authors plan to continue active work in wood energy research and development.

BOOK REVIEW


The second edition of Feeds and Feeding was written primarily to update the NRC nutritive requirements and to add new information. The book is improved, more complete text. Sixty-five chapters of feed information, in addition to study questions and problems, tables on nutrient requirements, feed composition, and a glossary of terms related to animal nutrition are included. The fundamentals of animal nutrition are discussed along with the more complicated areas of balancing and formulation of feed rations.

Each area of livestock is discussed: dairy, horses, sheep, swine, and poultry. No information on poultry is given. Balancing rations and the feeding of animals in different ages and conditions are discussed. Metrics are used along with the English measures. Pastures and pastures are explained and compared with their production. Chapters in "Feeding Animal Waste" and "Performance Stimulants" are particularly up to date.

The author, Arthur E. Callison received his B.S., M.S., and Ph.D. from the University of Illinois. He is currently Professor of Animal Science at the University of Georgia. He has done much research concerning animal growth and nutrition which has been published. Callison is an experienced and knowledgeable in the area of animal nutrition.

Feeds and Feeding is written primarily for an undergraduate college course in animal nutrition. It is written above the level of high school students, except for selected chapters. It is an excellent reference book for vocational agriculture instructors and advanced vocational agriculture students.

Reid Ledbetter
North Fredell
Olin, North Carolina

THE AGRICULTURAL EDUCATION MAGAZINE

FERTS AND PENNING, BY ARTHUR E. CALLISON. BENTON PUBLISHING COMPANY, INC., 1979, SECOND EDITION, 595 PP., $12.95.

THE SECOND EDITION OF FEEDS AND FEEDING WAS WRITTEN PRIMARILY TO UPDATE THE NRC NUTRITIVE REQUIREMENTS AND TO ADD NEW INFORMATION. THE BOOK IS IMPROVED, MORE COMPLETE TEXT. SIXTY-FIVE CHAPTERS OF FEED INFORMATION, IN ADDITION TO STUDY QUESTIONS AND PROBLEMS, TABLES ON NUTRIENT REQUIREMENTS, FEED COMPOSITION, AND A GLOSSARY OF TERMS RELATED TO ANIMAL NUTRITION ARE INCLUDED. THE FUNDAMENTALS OF ANIMAL NUTRITION ARE DISCUSSED ALONG WITH THE MORE COMPLICATED AREAS OF BALANCING AND FORMULATION OF FEED RATIONS.
A Training Program:

Providing For Energy Efficiency
In Homes And Small Buildings

We are running out of fossil fuels. There must be new developments made in the use of alternate sources of energy. This is a big task. Meanwhile, it is necessary that we conserve as much energy as possible — at least until new sources can be developed. One of the best places to save energy is in buildings. Approximately thirty-two (32) percent of energy consumed in the United States is used in heating, lighting, and cooling of buildings.

Without reducing our comfort and conveniences appreciably, certain measures may be taken that will save at least 2/3 of this amount, thus reducing the total consumption by 10 percent.

There are many steps involved in saving energy. Some are minor and seem unimportant. Yet all of them must be taken. Secondly, these steps must be taken by all people if the savings is to be significant. This is the 64-dollar question: How can the most people be informed and motivated to participate in this important venture?

There is no better place than in the classrooms and laboratories of our public schools, vocational-technical schools, and junior colleges. There is no substitute for formal training with hands-on experiences.

There was not available a satisfactory instructional training program for delivering these skills to students and this is why the American Association for Vocational Instructional Materials (AAVIM) in cooperation with the U.S. Department of Energy developed such a program with the title of PROVIDING FOR ENERGY EFFICIENCY IN HOMES AND SMALL BUILDINGS.

Description of the Program

The project has resulted in a complete training program which consists of three manuals, a student workbook, a teacher guide, and two audiovisuals. The program is described as follows:

Part One: Understanding and Practicing Energy Conservation is an 87-page illustrated text explaining the energy dilemma, how energy is used in buildings, and suggestions for conserving energy in buildings.

Part Two: Determining Amount of Energy Lost or Gained in a Building is a simplified procedure for computing the amount of energy lost or gained in a building using the ASHRAE method. It contains 66 pages.

Part Three: Determining Which Practices are Most Efficient and Installing Materials gives detailed instructions on how to determine and apply energy-saving techniques in buildings. There are 88 pages in this volume.

The Student Workbook includes questions related to the subject as discussed in the text. Also, laboratory exercises are suggested.

The Teacher Guide gives answers to the questions, objectives, tools and materials needed and teaching strategies for classroom and laboratory activities.

The audiovisuals are based upon two of the manuals: Part I, Understanding and Practicing Energy Conservation in Buildings, and Part II, Determining Which Practices Are Most Efficient and Installing Materials. Part I consists of 124 slides and 3 cassettes. Part II has 745 slides and 3 cassettes. Both programs have audible and inaudible advance signals.

All five publications are 8½ x 11 inches and are well illustrated in black and white. Each of the three manuals may be used as separate texts. The audiovisuals parallel the two manuals as designated and they are produced in full color.

Single copies of the manuals, teacher guide and student workbook are available from the U.S. Department of Energy, Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. The audiovisuals are available from AAVIM. Part One lists for $65 and Part Three, $98.

Using the Training Program

The training program is designed to educate secondary and post secondary level students and individuals in the importance of conserving energy. It also provides for developing skill needed in the application of energy-saving techniques that result in energy-efficient buildings. Upon successful completion of this course of instruction, a student will be able to perform at the job entry level.

Alternatives are provided in this program to allow for specific instruction in energy-saving methods and procedures, or for integration with construction courses. It may also be used for self-paced instruction.

When taught as a separate course, it can be used two ways: (1) for a workshop or seminar lasting 5 days or longer, and (2) for a semester course in classroom instruction.

Examples of Contents

One of the jobs taught in the program is selecting and installing insulation. For example, recommendations are given for R-Values in cold, moderate and warm climates (Table I) and R-Values for different insulations are given (Table II). Illustrations show where the insulation should be installed (Figure 1) and how to do it (Figure 2).

Contents of Parts One, Two and Three

Contents of the training programs include the following:

Part One

1. Understanding the Importance of Energy
   A. What is Energy?
   B. What are the Primary Known Sources of Energy?
   C. What are the Major Uses of Energy?

2. Developing a Concern for Saving Energy
   A. How Long Will the Present Supply of Coal Last?
   B. What are the Prospects for Alternate Sources of Energy?
   C. What Effect May the Energy Situation Have on the Individual?

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Providing Energy Efficiency in Homes and Small Buildings

(Continued from Page 11)

K. What Type of Ventilation to Use?
L. What Type of Lighting to Use?
M. What Type of Water Heater to Use?
N. What Type of赴 piano to Use?

II. Installing Energy-Saving Materials

A. Installing Insulation
B. Installing Vapor Barriers

III. Improving Efficiency of Equipment

A. Improving Efficiency of Heating Systems
B. Improving Efficiency of Cooling Systems
C. Improving Efficiency of Ventilation Systems
D. Improving Efficiency of Lighting Systems
E. Improving Efficiency of Plumbing Systems
F. Improving Efficiency of Appliances and Equipment

THEME

Put Energy in the FFA Program of Work

Current energy problems in this country are hot topics in the agricultural community. Costs of fuel and other energy forms are of major concern to ranchers and farmers. An FFA program that will provide ideas to reduce the energy costs of farming will be most welcome in any agricultural community.

Program of Work Activities

A major responsibility to insure that an energy conservation program will be successful is to initiate an awareness campaign. Energy conservation is not as simple a problem to solve as limiting our use of petroleum and "reducing our dependence on foreign oil." Some alternatives are as costly or even more expensive than the petroleum products that they replace. For example, gasohol, because of the cost of grain and the energy required to obtain the end product, may make the alternative fuel a higher cost than gasoline.

An awareness program may consist of several activities to better inform the public of energy costs and conservation methods. Several ideas for energy awareness activities are:

1. Conduct inspection surveys to identify sources of wasted energy on farms.
2. Sponsor a community energy fair.
3. Set up demonstration farms to illustrate energy-saving practices.
4. Prepare a fact sheet that points out sound management practices which reduce energy costs.
5. Prepare a chart that compares and contrasts advantages, disadvantages, and costs of synthetic fuels with petroleum fuels.

Instructional Strategies

For an energy conservation awareness project to be effective, the vocational agriculture teacher will find a need to first instruct the students in solving energy problems. Informal and problem-solving units of instruction may be added to the curriculum. However, an effective way to teach energy topics without expanding an already bulging curriculum is to incorporate energy conservation and management problems into existing units being taught. Enterprises which involve energy input in the production process provide opportunities to discuss and solve energy problems. Some examples are:

1. Planning housing for livestock.
2. Planning and designing the farmstead layout.
4. Selecting tractors and machinery.
5. Planning irrigation systems.
6. Servicing and maintaining tractors and machinery.
7. Improving the farm residence.
8. Selecting and installing electric motors.

Ideas for Instruction

Vocational agriculture teachers have been teaching energy conservation principles for years. A strong management program includes the costs of fuels in production and ways of reducing these costs. Some examples of management decisions that influence energy consumption on the farm are:

1. Minimum tillage practices
2. Tractor maintenance and tuneup
3. Machinery selection
4. Insulation for farm buildings
5. Farmstead windbreaks
6. Use of herbicides and pesticides
7. Measuring the efficiency and use of irrigation pumps
8. Record keeping

Energy Management Ideas

Several simple practices can be used to effectively manage energy problems in farm production. One method is to maintain fuel consumption records on farm vehicles and self-propelled machinery, using the sample records shown in Figures 1 and 2.

Figure 1. Vehicle Fuel Use Record — Vehicle No.

<table>
<thead>
<tr>
<th>DATE</th>
<th>ODOMETER READING</th>
<th>GALLONS FUEL</th>
<th>QUARTS OIL</th>
<th>MPG</th>
</tr>
</thead>
</table>

Figure 2. Tractor Self-Propelled Equipment Fuel Record — Model No.

<table>
<thead>
<tr>
<th>Date</th>
<th>Hour Meter When Filled</th>
<th>Gallons Fuel</th>
<th>Per Hour Field</th>
<th>Operation Depth</th>
</tr>
</thead>
</table>

Another practice is to utilize agriculture engineering extension staff to assist in determining irrigation pump efficiency. A sample irrigation pump efficiency record is shown in Figure 3.

Figure 3. Irrigation Efficiency Test Record

<table>
<thead>
<tr>
<th>Date</th>
<th>WATER FLOW</th>
<th>EFPM</th>
</tr>
</thead>
</table>

In a small rural area of northern Alabama, passive solar greenhouses are being built by using students as part of their supervised occupational experience for home improvement projects, and for adult classes. In addition, they are helping to conserve energy. These multi-use structures have been an outgrowth of a project started by the vocational agriculture program at Section High School.

The first three greenhouses were constructed with funds and recycled materials gathered from throughout the community. Later, a grant from the Department of Energy provided funds for students to construct a 10 x 6' greenhouse attached to the vo-ag building. Interest in the project grew as people in the community learned of the success and benefits of the solar greenhouses. To date, 22 solar greenhouses have been constructed and placed in operation. Several of the greenhouses have been constructed as a community service by vo-ag students for families with low or fixed incomes.

The solar greenhouses being constructed in this community consist of lean-to type structures, 10 to 12 feet wide and up to 60 feet long. They are often attached to the south wall of a house or mobile home.

Constructing a Solar Greenhouse

Construction factors necessary for good greenhouse performance are:

1. Selecting fuel tractors and using the Nebraska tractor test.
2. Attach hay conditioners to subtract the number of trips over the field.
3. Keep equipment choppers well maintained and adjusted to reduce fuel costs.
4. Consider alternative fuels when costs are an advantage over conventional fuels.
5. Utilize wind and solar power for pumping water and keeping stock watering tanks thawed.

Include Energy Conservation Every Year

An FFA program of work can include energy conservation activities every year. Sound programs may include a variety of activities involving the acceptance of approved practices ranging from conventional procedures to some of the newer ones such as solar power and alternative fuels.

The public relations benefits from a well-organized program should be far-reaching. But, most importantly, a successful program of work activity on energy conservation will develop from a sound integrated program that develops in students the ability to make sound management decisions.

Vo-Ag Students Use Sun Power

By Gordon D. Patterson and Jerry Holcomb

Editor's Note: Dr. Patterson is Assistant Professor of Vocational and Adult Education at Auburn University. Dr. Holcomb is Vocational Agriculture Teacher at Section High School, Section, Alabama 36777.

In a small rural area of northern Alabama, passive solar greenhouses are being built by using students as part of their supervised occupational experience for home improvement projects, and for adult classes. In addition, they are helping to conserve energy. These multi-use structures have been an outgrowth of a project started by the vocational agriculture program at Section High School.

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The attached greenhouse allows heat to be transferred into the house through openings (windows, doors or vents) to supplement the home heating system. The heat is also stored during daylight hours to provide night time heat for the greenhouse. Heat is "stored" in 55 gallon drums painted flat black, filled with water, and placed in the greenhouse. As the sun goes down and the air inside the greenhouse cools, heat is released from the drums and provides heat for the greenhouse. In addition to the drums, other solid objects in the greenhouse, such as concrete, limestone floors and walls store heat.

No mechanical device is used for the heating system, hence, the term "passive solar greenhouse." This system provides sufficient temperature to

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THE AGRICULTURAL EDUCATION MAGAZINE

MAY, 1981

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Avoid Information Overload: Keep Energy Education in Proper Perspective

It is amazing how an EPA awards program and a challenge from the President of the United States altered the course content of many vocational agriculture programs. Vocational agriculture teachers have drastically searched for new information so their students could learn about energy conservation and renewable energy conserving programs. While this happened, established course content and other activities sometimes went unattended. Rather than eliminate a part of an instructional program, many areas of instruction were undoubtedly covered more in detail in order to make way for new energy related materials.

As a result of this and other energy-type programs that begins, students may begin to suffer from “information overload.” Information overload is the condition that begins to exist as more and more information is given to the student, resulting in less of the information being retained and applied. Students may lose interest and become uncertain about what they should know and do. Teachers are also affected as they begin to question what happened to the student and end up blaming them for their poor academic performance.

Energy education has a place in the vocational agriculture curriculum, but it must be kept in proper perspective. That place can only be determined after the teacher has sought answers to several questions:

1) Do I as a teacher want to take the time to keep up to date in the energy area?
2) What are the needs of my students and community?
3) How does my energy instruction duplicate or reinforce what the rest of the school is doing?
4) Will it be necessary to eliminate important concepts to make room for energy education?
5) Will elimination of the concepts affect employability of the student?
6) What important concepts have been eliminated by other teachers that now must be covered in vo-ag to meet the needs of students?

Only after these questions have been satisfactorily answered should you consider incorporating energy education into the vocational agriculture program.

Energy Education in Vo-Ag

Energy education has a place in vocational agriculture if it is made a part of the existing instructional units and not made into an instructional unit by itself. An instructional unit on crop production could include the following information:

1. The energy required to produce fertilizer.
2. Why proper application of fertilizers conserves total energy.
3. Energy requirements of different cropping systems.
4. The crops that will play an important role in the production of bio-fuels.
5. The effects of competition among manufacturers of bio-fuels for crops that are used for human food.
6. Why irrigation water use and conservation are energy saving techniques.

An instructional unit in animal science might include the following:

1. Feeding of bio-fuel wastes.
2. Methane production from animal wastes.
3. Space requirement for confined livestock.
4. How solar energy could be used for the space heating of livestock facilities.
5. Cost-effectiveness of a heat exchanger to pre-heat the water used in a dairy facility.

An instructional unit in agricultural mechanics could contain the following:

1. Fuel saved by an engine tune up.
2. Comparative fuel consumption among different pieces of farm machinery.
3. Effects of excessive speed.
4. Effects of building location and design on space heating requirements.

Insulation as an energy saver.

These are a few examples of how energy education could be incorporated in the present vocational agriculture program without requiring major curriculum changes.

Accepting the Challenge

When former President Jimmy Carter asked the EPA to “take the lead amongst all youth groups in the United States in our war for energy security” he was asking the local vo-ag teacher to become involved in energy education. I suggest that we accept that challenge only after considering all the consequences and keep it in proper perspective.

Letters

"Letters to the Editor" is a feature to encourage dialogue among readers of the magazine. Selected letters will be printed without comment or editing. Your letter will be welcomed! (Send letters to Editor, The Agricultural Education Magazine, P.O. Drawer AV, Mississippi State, MS 39762.)

Editor:

I am writing about an article I read in the January, 1981, issue of THE AGRICULTURAL EDUCATION MAGAZINE. Although the theme on "Time Management" was very interesting to me, I felt the article by William C. Tindall, Jr. was especially geared to read. What Mr. Tindall said about the utilization of time was very accurate. I, as a student, find Mr. Tindall’s comments true. I must not abuse valuable time or else I will lose it and the consequences.

Sincerely,
Clint Zellner
Agricultural Education Student
University of Illinois-Urbana
State-Level Structure For Administering Agricultural Education

The administration of agricultural education programs from the state level to the local level has become a growing concern of agricultural educators for a number of reasons. Recently, the trend seems to have been away from specialists who served as state directors of agricultural education within the state department of education and more toward generalists.

Two main things appear to be commonly accepted by teachers and supervisors of vocational agriculture across the nation. First, it has been generally agreed that state-level supervisors of vocational agriculture are becoming generalists, with responsibilities for areas other than agricultural education. Secondly, the status of vocational education, including agricultural education, has diminished within the state education agency.

The Study

As part of a recent state audit, the administrative structure for vocational education for the 50 states was investigated. One of the purposes of the study was to determine the characteristics of state-level administrative structure for vocational education within the departments of education. An instrument was designed to collect information from the head state supervisor for vocational agriculture in each state regarding the state-level administrative structure and how state supervisors of vocational agriculture work with local teachers and local programs of vocational agriculture. From the data, three criteria were identified to be used in categorizing states on the basis of state-level administrative structure for agricultural education.

Responsibilities of State Supervisors.
The responsibilities of state supervisors of vocational agriculture was one criterion used to categorize states. From the data it was determined that in 30 states, state supervisors of vocational agriculture have responsibilities only in vocational agriculture. In the remaining 20 states, state supervisors have additional responsibilities. These additional responsibilities include such things as evaluation of all vocational programs, career education, vocational curriculum development, and local plans. Supervisors of vocational education programs in these 20 states appear to be generalists by job description.

Location of Agricultural Education.
A second criterion that was identified to categorize states was the location of agricultural education in the state education agency hierarchy. Specifically, the study investigated the position of the head state supervisor of vocational agriculture and the chief person responsible for vocational education in the state. In 19 states, the head supervisor for vocational education reports directly to the state director of vocational education. In eight states the head state supervisor reports only to the state director of vocational education and not directly to the state director of vocational education.

In the remaining 31 states, the head state supervisor reports to someone other than the state director of vocational education. The head state supervisor in those 31 states reports to an instructional services director, program operations chief, deputy vocational director, vocational instruction coordinator, or similar titles.

Number of Teachers.
The number of vocational agriculture teachers in each state was a third criterion used to categorize states. Three groups were developed: less than 100 teachers, 100 to 400 teachers, and over 400 teachers. Based on this criterion, there are 18 states in the less-than-100 group, 22 states in the middle group, and 10 states in the large-state group.

The information regarding size of state was used in connection with the other two variables to determine any patterns. Table 1 identifies the number of states grouped by responsibilities of state supervisors, location of agricultural education in the state education agency, and number of teachers in the state.

Conclusions
State-level administrative structure is different among states with less than 100 vocational agriculture teachers. In half of these states, the head state supervisor of vocational agriculture has no responsibilities in addition to vocational agriculture. The state director of vocational education and the chief person responsible for vocational education in the state education agency hierarchy. Specifically, the study investigated the position of the head state supervisor of vocational agriculture and the chief person responsible for vocational education in the state. In 19 states, the head supervisor for vocational education reports directly to the state director of vocational education. In eight states the head state supervisor reports only to the state director of vocational education and not directly to the state director of vocational education.

Ag Educators, It's 1981: Do You Know Where Your Industry Is?

By Myron A. Essenburg

The days of the agricultural educator are filled with classroom teaching, on-the-job visitations, students, administrative paperwork, chapter activities, and professional meetings. We often get so busy with the job that we are unable to take time to take a good look at what we are teaching, why we are teaching, and whom we are serving.

Stop! Think for a minute! Ask yourself these questions:

1. Am I teaching the same things I was teaching 5 or 10 years ago?
2. Have I allowed time to upgrade my technical knowledge of agriculture? Where would you get your next teaching materials?
3. Has agriculture and farming in my area changed faster than my teaching in the past 5 years?

Now, consider this: If you were to have a fire in your office and all of your textbooks and curriculum guides were destroyed and you couldn't replace them, what would you teach? Where would you get your next teaching materials? Would you be your most valuable source of up-to-date agricultural knowledge? Do you know what your educational responsibilities are?

Unanswered Questions

As the data are analyzed, several questions are raised. What role do state education agencies organize the way they are? Do they provide an integral part of the state's economy? In what way? Do state education agencies have their own political agenda? Do state education agencies have the same responsibility as the state's agricultural agencies?

Banker, and an agribusiness firm manager to ask them what they think needs to be done to help today's youth who desire a future in agriculture. You are certain to find that these professionals will point out the need for teaching the student capital management skills along with basic technical agricultural knowledge. But, they will stress that these need to be taught from the proper perspective. They need to be taught to meet today's economic and world conditions.

Breaking Out

What you have taught in the past may not meet the needs of your students today and in the future. How can you determine if your curriculum is in tune with the needs of students and industry?
Constructing a Weld Tester

By Forrest Bueh
Editor's Note: Dr. Bueh is Professor in the Department of Agricultural Engineering at the University of Minnesota, St. Paul, Minnesota 55101.

Students first learn welding fundamentals and then make sample welds. To complete the educational process, the student should test the samples. A weld may have a satisfactory appearance but might not be strong enough to make the welded section strong as the other parts.

A three-ton hydraulic jack will make a 180 degree bend on 2 butt welded 1/4" x 2" x 4" test plates. Thicker plates would require pressures greater than safe loading for a three ton jack.

The die for the tester can be made from solid stock or laminated from a combination of smaller members. Use a hard surfacing electrode to build up the ends and then grind the desired shape.

When a test plate is being bent, there is considerable force and it will spread the two upper dies apart, therefore, it is necessary to make heavy fillet welds by using stitch beads. A 3/4" black iron pipe cap will usually fit over the swivel plate on most three ton jacks. A safety screen could also be fabricated for the test joint area.

Bill of Material

- 2" x 20' O.D. black iron pipe
- 4 1/4" x 1/2" x 20' iron
- 4" x 8" x 1/4" plate (top die)
- 3/4" black iron pipe cap, threads, reversed
- 1" x 20' x 4" H.R. mild steel (could be laminated)
- 1 1/4" x 1/4" x 8" angle iron (support for return spring)
- Return springs

References
Special Needs People In My Classroom: Students, Teacher, or Both?

A major thrust of education in recent years has been the detection and inclusion of educationally disadvantaged and handicapped students and well it should be. Agricultural education was not an exception in this regard. The leaders in recognizing good ideas whose times have come. The renewed emphasis being placed on special needs education is no exception. However, in the rush to be among the leaders we may sometimes lose sight of where we have been and where we are going. A pause for reflection is sometimes in order.

Reflections

The value in this exercise is as much for myself as it is for anyone else. You see, I am a vocational agriculture teacher. Not a great one perhaps, but probably not a bad one. I have been teaching for several years. I am always trying to better myself and enjoy my job. I put a lot of work and effort into it and sometimes lately, I have thought maybe I am working too hard for what I am getting done.

Late I have begun to realize that I have a whole lot of unanswered questions, one of which is "What is my problem?" Some of them never occurred to me before. I guess they should have but I was too busy to think about them. My problem? Oh! The special needs kids in my classes, of course. The questions? Here is a whole list.

Who, in my vocational agriculture classes, has special needs today? What am I going to do about them? What do I need to know about these students? Have I got access to that to be effective? When and where do I begin?

Does any of this sound familiar to you? If so, you are in the club. It is a big group and we have some fine company. Lots of good vocational agriculture teachers share this same kind of experience. Teach for several years, begin to think you have a large number of answers, then suddenly— you realize that you didn't even have the right questions. What do you do? Well, you have just taken a twelfth grade math course, and that interference serious with your ability to make yourself understood? Do you then proceed to explain your math concepts, for example, in a language rate. We may not like this fact, and may indeed not accept it, but we must deal with it. Next week, I will probably do it. Survive your immediate problem but leaves his untouched.

Most of us will never be experts at dealing with special needs students, but all of us can and must try to learn some effective strategies. Some of us may never be able to teach a child, but we can always try to make him help students. Remember, all of our students can learn. All of them can learn essentially the same way and the same things. However, all future learning is based on what we now know and what we have experienced.

People tend to learn what they perceive as important by starting at an advantage in working with special needs students but we do not have to remain at the disadvantage.

Who is the Special Needs Student?

Many times, the identification of the special needs student group has been confused. The labels have also been used in identifying the student. Let's now turn our attention to where the criteria simple for once and not label our students either. Remember, the students are taught by our standards, not his or hers.

There is only one really useful criterion by which to determine if a student is or is not special needs. I am not talking about meal eligibility, ADHD, or special needs student: (and does) provide the student achieve at a satisfactory level? I am talking about the student, the ability to do with the class. If the student is not, the student has a special needs student. Other criteria may also be applied under specific circumstances. However, as a teacher, if you achieve satisfactorily, I want to know why and what they need to help. Not only the students who have special needs, I do as well. Apply as strict criteria as necessary under your program and curriculum. It is the determining factor.

An exception occurs to this criterion, as the student that achieves beyond the norm for the class may well serve a special needs student also. Allogether too often they are forgotten and serve as an example of how far we go in a given level from all others as well.

We are supposed to be preparing students to enter the world of agricultural work. Performance standards applied on a job site are not necessarily the same as what may be the case in the classroom. Neither should they be lowered because a work is good performance that the student will probably not do it. Solve your immediate problem but leaves his untouched.

Extraneous Methods

Now that we have identified our special needs students, what kinds of extraneous methods do we have to use to teach them? We haven't been trained for this kind of teaching and don't know what to do.

Relax a bit, more often than not there is no need for extraneous methods of any kind. Instead, take a look at everyday teaching techniques we are using and see what minor changes can be made to help students. Remember, all of our students can learn. All of them can learn essentially the same way and the same things. However, all future learning is based on what we now know and what we have experienced.

People tend to learn what they perceive as important by starting at an advantage in working with special needs students but we do not have to remain at a disadvantage.

Special Resources Available

I have a difficult time selecting the best place to play for us in working with special needs students. It is especially important because of the FFA program. Opportunities for success, successful experiences, needed badly by many of the members in the FFA. Involve them, even arrange transportation and alternative ways to pay that will not be necessary. But work to get them involved.

A supervised occupational experience is an integral part of the role of agricultural education which provides a great source of motivation for students to achieve satisfactorily. This component often makes a difference between whether a student becomes a graduate or a dropout.

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THE AGRICULTURAL EDUCATION MAGAZINE

MAY, 1981
Ag Ed Advisory Committee Meets

By Gerald R. Fuller
Edith Mark-Dr. Fuller is Professor and Chairperson of the Department of Vocational Education and Technology at the University of Vermont, Burlington, Vermont 05405. He also serves as Secretary of the National Agricultural Education and Training Committee.

3. Update the position and role of the vocational agriculture teacher in the secondary schools.
4. Develop a plan for implementation of the "standards" which were developed in 1978.
5. Investigate and prepare a plan for postsecondary teachers and programs to become an integral and recognized dimension of the agricultural education profession.
6. Organize a system for utilization of agricultural business, industry, and labor in agricultural education program development and implementation.
7. Update the preparation, supervision, and inservice education for teachers of agriculture to meet their needs in a changing societal and educational environment.
8. Develop models for dissemination of agricultural education concerns and information to state and federal legislators.

The Council discussed the mission of agricultural education in some depth. There was consensus among Council members that agricultural education has always included in its mission the "Acquisition of knowledge and skill in agriculture for vocational or general education purposes, orientation to and exploration of occupations requiring knowledge and skill in agriculture, preparation for advanced study of agriculture, preparation for employment or self-employment in occupations requiring knowledge and skill in agriculture, and upgrading and retreading of persons employed or self-employed in occupations requiring knowledge and skill in agriculture."

During the discussion, Council members suggested that the primary emphasis of agricultural education should be on items 4 and 5 with supplemental emphasis placed on items 1, 2, and 3. It was brought out that goals of a program may be "vocational" but goals of a student may not be "vocational." It was suggested that a high quality agricultural education program may serve students who have a variety of goals. The teacher should know the goals of each student and should help each student grow regardless of whether or not the student's goal is "vocational."

Dennis Clark, the Fort Jones FFA advisor, said the local project, "People like wildlife here and pheasants are really pretty birds."

Raising the birds could have provided a more fun and educational project, finding money to support them. "But we had no trouble at all," Clark said.

Working with other members of the community, a BOAC project require ment, Clark said the project drew a variety of local support. "The local Fish and Game Commission helped fund a $2,000 for the birds with money they had collected from fines. Farmers donated food. We received donations from people who don't even like to hunt."

Clark said FFA members will release the birds in the spring, a non-hunting season, "when man will be less predator they'll have to face. Food shouldn't be a problem, he said. Many farmers are growing grain crops again.

Reactivating a Town

In Mooray, Bay, California, population 8,000, vocational agriculture instructor Mel Souza said his BOAC project, which won a national gold em-blem award in 1979 from the FFA, has more than doubled in size this year because of support from nearby civic groups.

FFA members helped reactivate the town's business area by building planter boxes and planting flowers. This year, they are also helping to develop a nearby state park by upgrading hiking trails for joggers and putting up exercise stations.

"We're considered a rural town, primarily a fishing community with some tourist trade," Souza said. "But we've gotten key community groups interested in what we're doing, and the project has snowballed. It felt great to win the gold, but more important, the project has really added to our community."

BOAC projects are carried out by thousands of FFA members in 50 states. Nationally, projects range from improving high schools to crime prevention to park improvement, all in an effort to make small and rural communities better places in which to live.

Constructing a Classroom

When the school board of Franklin, La., last year decided it was necessary to move into a new $32,000 classroom, the board looked to an unusual source for the support it needed.

More than 3,100 U.S. communities received millions of dollars of community development aid this past year through proposals submitted by the Revolving Loan Community of Future Farmers of America. Three examples of Building Our American Communities (BOAC) programs are described here.

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Constructing a Classroom

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Alfred J. Mannebach (second from left), Associate Professor at The University of Connecticut, is shown during a visit to headquarters of the Cooperative Extension Service, Rio de Janeiro, Brazil. Severino de Melo Araujo (left) is a doctoral student working under Dr. Mannebach's direction.

Many changes are taking place in the use and development of fuels for farming. A model alcohol plant (shown here) can be useful in teaching farm fuel production. (Photograph courtesy Myron A. Eighmy, University of Minnesota-Waseca.)

Moisture testing is an important crop management practice. Electronic moisture testers enable students to quickly determine moisture content of feeds and grains. (Photograph courtesy of Bruce McKee and Sharon Andrews, University of Minnesota-Waseca.)