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## ABSTRACT

The document is a catalog of behavioral objectives organized by units of instruction in agricultural education. Each of the six units contains an outline of the content, a goal statement, and general and specific objectives. The units were developed by teachers in summer workshops to provide: (1) a bank of objectives for task analyses and job descriptions; (2) a bank of test items for studies of program effectiveness; and (3) materials for use in a delivery system for objectives and a computer bank of test items, as in the pilot project Behavioral Objectives Organized in a System for Teachers (BOOST). (Author/AG)

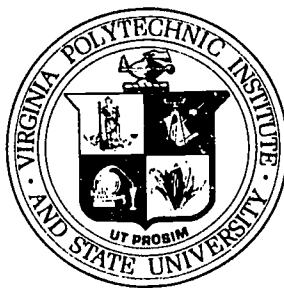
# *Vocational Education Evaluation Project*

## Behavioral Objectives for Selected Agricultural Education Units

Richard K. Hill, Editor

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## FOREWORD

The primary objective of the Vocational Education Evaluation Project is to develop a management information system for the planning and programming of vocational education. To facilitate the accomplishment of this objective, the work of the project has been divided into a macro-subsystem and a micro-subsystem. The macro-subsystem is primarily concerned with guidelines and systematic procedures at the state level, while the micro-subsystem is emphasizing the assessing, planning, and programming of individual vocational education programs in local schools.

Direct costs for this project were funded on a 90 percent reimbursement basis by the Division of Vocational Education, State Department of Education, Richmond, Virginia. These funds came from Part C of the Vocational Education Amendments of 1968. The remaining 10 percent of direct costs and all indirect costs were funded by the Research Division, Virginia Polytechnic Institute and State University. The Division of Educational Research and Statistics, State Department of Education, provided the data processing for the Vocational Education Reporting System.

Special gratitude is expressed to the Division of Vocational Education and the Division of Educational Research and Statistics, State Department of Education for their financial assistance and staff support.

The units contained in this catalog were developed for use in the micro-subsystem. These materials are the products of an effort to develop a means of assessing the effectiveness of local instructional programs.

This publication is one in a series of publications of the Vocational Education Evaluation Project. The intent of this series is to inform educators in Virginia, as well as the nation, of the project's work.

Dewey A. Adams, Director  
Division of Vocational and  
Technical Education  
College of Education

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## INTRODUCTION

### WHAT IS IN THE CATALOG

This is a catalog of behavioral objectives organized by units of instruction in agricultural education. Each unit contains an outline of the content, a goal statement, and general and specific objectives.

### HOW THE UNITS WERE DEVELOPED

These units were developed during workshops conducted on the campus of Virginia Polytechnic Institute and State University during the summer and fall of 1972. Agricultural education teachers from throughout the Commonwealth participated. They received instruction on how to develop these materials and then wrote them in workshops. During the workshop, their work was supervised by Dr. Hill and several graduate research assistants (Heler Simmons, Ned Swartz, Bill Moore, June Schmidt and Randy Williams). At the conclusion of the workshop, the materials were collected and edited by the graduate students.

### WHY THE UNITS WERE DEVELOPED

The original intent in writing the units was three-fold: to provide a bank of objectives which could be related to task analyses and job descriptions, to provide a bank of test items which could be used in state-wide studies of program effectiveness, and to develop materials which could be used in BOOST (Behavioral Objectives Organized in a System for Teachers). There is an explanation of BOOST starting on page 6.

## HOW TO USE THE CATALOG

### How These Objectives Are Written And Organized

A set of behavioral objectives must be comprehensive and specific. It must be comprehensive for planning purposes because the exclusion of any objective might be critical. (For example, if a unit is written on good grooming and all the objectives that relate to understanding why good grooming is important are left off, it might as well not have been started. Surely, someone who understands "how" but not "why" is unlikely to exhibit the behaviors desired when he is no longer restrained by the testing situation.) The objectives must be specific for evaluation purposes because reliable tests cannot be developed if the objectives which determine the questions to be constructed are subject to varying interpretations.

The way objectives typically are written is to attempt to develop one comprehensive set of specific objectives. This approach would yield a satisfactory solution if, in fact, it were possible to do. Since it usually is not, when they are asked to do it, most teachers encounter great frustration. Their usual response is to develop a long list of objectives which require recall of the content to be presented, and little more. Of course, if they were asked if that list of objectives reflected their true intent, they would respond negatively. However, the construction of this first list takes so long that they usually stop there, having little time or desire to continue. This unsatisfactory situation need not continue. This current approach of writing objectives ignores the fact that there really is no need for a set of comprehensive objectives to be specific, nor for a set of specific objectives to be comprehensive. This will be explained in greater detail.

The objectives must be comprehensive for planning purposes. But teachers can plan their instruction at least as well from more general statements as they can from specific ones, and frequently even better. For planning purposes,

it should be permissible to use words such as "understand," "appreciate" and "comprehend." So long as the objectives are written so that teachers can communicate with each other with reasonable clarity, further specificity is not required.

The purpose of writing specific objectives is to have a starting point for the development of test questions. But a test is never comprehensive; therefore, there is no need for the specific objectives to be comprehensive either. They only must be representative.

This alternative approach to writing objectives was used in the development of this catalog. Each unit contains one set of objectives which is comprehensive and clear, but not specific, and then another set of objectives which is specific and representative, but not comprehensive. With this approach, the former set of objectives (called general objectives) is written first. The latter set is written by taking each general objective, and writing five to eight specific objectives for each. The specific objectives should cover as many different aspects of the general objective as possible. Their main purpose is to help define and add clarity to the general objective.

The reason for putting limits on the number of specific objectives to be written for each general objective is to help insure representativeness. It is easy to succumb to the temptation of writing a few specific objectives for some general objectives, and writing dozens of specific objectives for a general objective that covers a broad content base, but this practice leads to the development of a test which is unbalanced.

This method recognizes that teachers and evaluators have different reasons for writing objectives. (It is assumed here that the teacher and evaluator are two different people. Of course, it most commonly happens that

the teacher changes hats and becomes his own evaluator, but we will make a distinction between these two for purposes of discussion.) A teacher needs to feel that his list of objectives is complete, because it may well be that the worth of a unit is lost if one major component is missing. An evaluator does not need such a complete list, because the measures he uses are always samples anyway. He needs only a representative sample.

#### HOW TO DEVELOP YOUR OWN UNIT

The first point to be emphasized is that the units are not written as someone's suggestion as to how you should teach your students. The material is organized into units simply because it will be much easier for you to locate the objectives you want to use. Therefore, do not consider this book to be some official guide which requires you to teach certain objectives when teaching the units listed herein.

The second point to be remembered is that you should use the general objectives to plan your teaching. Use the specific objectives only to help clarify what is meant by the general objective. Keep in mind that only a sample of specific objectives is given for each general objective. Do not consider this to be a comprehensive set of specific objectives. The philosophy under which these were written precludes the possibility of generating such a set.

To use this catalog in teaching, you might proceed in the following way:

1. Jot down a title for the unit you want to teach. Think about what your students will be doing as a worker with the material you are going to present in class. If you can write a work-oriented goal statement like the ones in this catalog, go ahead and do so.

2. Turn to the table of contents of this catalog. Note any titles of units which might have objectives related to your proposed unit.

3. Read those units, and then write down the general objectives that you can glean from them that are appropriate for your unit. You may be able to find objectives from several units that you can use in the one you are writing.

4. Review the set of general objectives to make sure they are complete. Remember, the general objectives must be comprehensive. Ask yourself if you have ever had a student who could succeed on all the objectives you have listed, but still failed on the job. If you can figure out why he failed, that should give you an idea for another objective. For example, suppose you are writing a unit on contacting customers over the telephone. Perhaps you once had a student who knew what to say and was very polite, yet his employer was dissatisfied because his voice sounded so immature on the phone that he could not use it effectively. With this information in mind, you should add a general objective that reads something like, "The student will use a speaking voice which sounds authoritative." Of course, now you must help to define what you mean in this general objective by writing a sample of specific objectives which cover it as representatively as possible.

5. When you are satisfied that your general objectives are complete, (usually somewhere between 5 and 10 general objectives) develop your content to cover them.

6. Teach the unit.

7. When ready to develop a test, go back to the specific objectives listed under each general objective you decided to use. Develop a test item which will measure each one. For example, in the unit titled "Orientation and Guidance," the first specific objective under general objective I is:

I.A.--Specifically the student, after familiarizing himself with the background of the hypothetical student, Joe Brown, will be able to determine the number of hours that Joe Brown will work during his adult life.\*

\*A description of Joe Brown is given elsewhere.

One way to test whether or not the student can actually do this would be with the following test question:

1. How many total hours can Joe Brown expect to work from the time he is 20 years old until he is 60?
  1. 10,000
  2. 30,000
  3. 50,000
  4. 80,000

That should be all there is to doing a whole unit. Of course, there is no need for this unit to be taught to a whole class. If you individualize your instruction, it might well be developed for only one student. But whether you do it for one student or for thirty, the time savings should be substantial, while you still have a unit which is yours alone, and written with your students and their needs in mind.

#### BOOST

BOOST (Behavioral Objectives Organized in a System for Teachers) is a delivery system for objectives, such as those contained in this catalog, and a computer bank of test items associated with the objectives. Rather than having teachers develop their own tests as explained above, the tests are generated for them. In the computer bank, there are several test items written to measure each general objective. A test is developed by selecting items from the pool which are related to any given set of objectives.

A pilot project of BOOST is being conducted with stenographic block teachers of business education in Hampton, Richmond, and Prince William County during the spring of 1974. The extension of BOOST to additional areas in vocational education is dependent upon the availability of funds.

ORIENTATION, GUIDANCE, RURAL AND URBAN LIVING



Activity: ORIENTATION AND GUIDANCEProblem Areas:

1. Getting acquainted with the agricultural education program
2. Getting acquainted with Virginia and U.S. agriculture
3. Getting acquainted with career opportunities in agriculture

Outline of Unit

- I. The Importance of Choosing a Career
- II. Personal Qualities Necessary for the World of Work
- III. Occupational Requirements and Sources of Information
- IV. Choosing a Career in Agriculture

Goal Statement

The student must select a career in the field of agriculture that will maximize the use of his abilities, interests, and potentials.

General and Specific Objectives

- I. The student will appreciate the importance of career planning. Specifically, the student after familiarizing himself with the background of the hypothetical student, Joe Brown, will be able to:
  - A. determine the number of hours that Joe Brown will work during his adult life.
  - B. define 4 of the most important reasons Joe Brown should choose a career.
  - C. determine the financial returns Joe Brown can expect from an 8th grade, high school graduate, and college graduate levels of education over a 40 year work life.
  - D. list 3 career alternatives Joe Brown will have to consider concerning his life at the completion of high school.
- II. The student will have an understanding of the mental and physical characteristics which influence his occupational choices. Specifically the student after familiarizing himself with the background of the hypothetical student, Joe Brown, will be able to:
  - A. identify Joe Brown's abilities.
  - B. identify Joe Brown's limitations.
  - C. identify Joe Brown's interests.
  - D. evaluate Joe Brown's health, strength, and stamina.
  - E. evaluate the value of Joe Brown's previous experience.
  - F. determine Joe Brown's educational aspirations.

- III. The student will have an understanding and appreciation of procedures for appraising his interests and abilities. Specifically the student after familiarizing himself with the background of the hypothetical student, Joe Brown, will be able to:
- A. recognize Joe Brown's aptitude through results of the state required Differential Aptitude Test.
  - B. identify Joe Brown's academic strengths and weaknesses through his past school performance records.
  - C. recognize Joe Brown's interests and abilities through his participation and involvement in leadership, social, athletic, and public service organizations.
- IV. The student will apply facts about himself and occupations in order to begin career planning. Specifically the student after familiarizing himself with the background of the hypothetical student, Joe Brown, will be able to:
- A. select the 4 best sources of career information for Joe Brown.
  - B. determine a primary and secondary agricultural career choice for Joe Brown.
  - C. determine the occupational facts of the primary and secondary career choices for Joe Brown.
  - D. compare what the occupation requires with what Joe Brown has to offer.
- V. The student will have a favorable attitude toward making a career plan that is challenging enough to fully utilize his abilities and interests. Specifically the student, after familiarizing himself with the background of the hypothetical student, Joe Brown, will be able to:
- A. identify the specific production and service activities performed in the primary and secondary agricultural occupations chosen for Joe Brown.
  - B. identify the agricultural knowledge and skill required to perform these activities.
  - C. inventory the marketable agricultural knowledge and skill which Joe Brown possesses.
  - D. list the necessary agricultural knowledge, skill, and characteristics Joe Brown needs to acquire.

#### BACKGROUND OF HYPOTHETICAL STUDENT JOE BROWN

Joe was raised in a small town in a rural county of Virginia. He is the only child of parents who teach in the local high school. He is keenly interested and active in the Boy Scouts and his church youth fellowship group. He enjoys camping, hiking, fishing, and hunting as hobbies. Although he does not live on a farm he spends his summer vacations each year working on his uncle's dairy farm. In school his participation in intramural athletics and school clubs are limited to a non-leadership role. He is taking a college preparatory curriculum in high school and maintains a B average. His strongest subjects are science and biology while his weakest is math. After school and on weekends he works at a local grocery store as a stock clerk. Joe's ambition since early childhood is to be a dairy farmer. Joe has few close friends, a quick temper, and a poor opinion of his own abilities.

Activity: THE FUTURE FARMERS OF AMERICA

Problem Area:

3. Becoming familiar with the history and development of the FFA

Outline of Unit

- I. Beginnings of Agricultural Education
  - A. Smith-Hughes Act of 1917
  - B. Vocational agriculture in secondary schools
- II. Early Attempts at Organization
  - A. Local agricultural clubs
  - B. Future Farmers of Virginia
  - C. Other state organizations
- III. Beginning of the FFA
  - A. Founders of the FFA
  - B. The first national convention
  - C. The first state to be chartered
- IV. Development of the FFA
  - A. FFA foundation
  - B. Expanded membership to other groups
  - C. FFA international programs
  - D. Present scope of FFA
- V. Purposes of the FFA
  - A. Primary purpose of the FFA
  - B. Aims and purposes
  - C. FFA motto
  - D. FFA creed
- VI. Leadership Development within the FFA
  - A. Importance of leadership
  - B. Areas of leadership training
  - C. Comparison with other organizations
- VII. Influence of the FFA on Agriculture
  - A. Usefulness of the FFA experience in an occupation
  - B. Contact of the FFA with the industry of agriculture

## Goal Statement

All citizens must have a knowledge of how and why people organize, exhibit leadership ability, recognize leadership ability in others, and understand the benefits of cooperation. Members of the farm industry must know the purposes and functions of organizations to which they belong and feel a sense of pride for such organizations.

## General and Specific Objectives

- I. The student will know why the FFA was organized. Specifically the student will be able to:
  - A. explain the desire on the part of many persons for establishing agricultural clubs at the local level, given the situation of high school vocational agriculture in the early 1920's.
  - B. list examples of activities that could be carried out between agricultural clubs from different schools.
  - C. relate reasons for establishing an agricultural club or organization.
  - D. explain the advantages of establishing a state-wide organization for vocational agriculture students.
  - E. explain the advantages of establishing a national organization for vocational agriculture students.
  
- II. The student will recognize the part that Virginia played in the early development of the FFA. Specifically the student will be able to:
  - A. state when the Future Farmers of Virginia organization was formed.
  - B. explain why the FFV was formed.
  - C. conclude that many of the principles of the FFV were used when the FFA was founded.
  - D. list four men from Virginia who helped form the FFV and later the FFA.
  - E. state when the FFA was formed.
  - F. identify Virginia as the first state to receive a charter in the FFA organization.
  - G. list examples which show that Virginia has a strong FFA program at the present time.
  
- III. The student will understand the present scope of the FFA. Specifically the student will be able to:
  - A. explain that the FFA involves all the states in the U.S.
  - B. identify the approximate membership of the FFA.
  - C. state that organizations patterned closely after the FFA have been formed in other countries.
  - D. identify the approximate size of the Virginia FFA association.
  - E. point out areas of the FFA program not directly related to farming.
  - F. distinguish developments that have occurred within the FFA which have made it a stronger organization.

- IV. The student will understand the aim and purposes of the FFA. Specifically the student will be able to:
- A. state the primary aim of the FFA.
  - B. list specific purposes of the FFA.
  - C. explain whether his own beliefs and goals are in harmony with the aims and purposes of the FFA.
  - D. explain why the aims and purposes of the FFA are suited to an organization of rurally oriented youth.
  - E. distinguish how the aims and purposes of the FFA are in harmony with those of other school organizations.
  - F. distinguish how the aims and purposes of the FFA are in harmony with the heritage and goals of our nation.
  - G. explain how the individual member can benefit from utilizing the aims and purposes of the FFA.
- V. The student will recognize the potential for leadership development within the FFA. Specifically the student will be able to:
- A. explain how knowledge of leadership will be helpful in an occupation.
  - B. explain how knowledge of leadership will be helpful in civic and community work.
  - C. give examples of activities in the FFA that provide leadership training.
  - D. select the areas of participation within the FFA which will be of the most value to him based on his talents and interests.
  - E. explain the areas of leadership training which are available in the FFA that are not available in other organizations.
- VI. The student will understand the contributions of the FFA to agriculture. Specifically the student will be able to:
- A. give examples of various FFA activities which can provide good background experiences for occupations in agriculture.
  - B. list contributions of former FFA members to the agriculture industry.
  - C. explain how participation in the FFA provides contact with many persons involved in agriculture.

Activity: RURAL AND URBAN LIVING

## Unit B: Providing Farm and Home Safety

## Problem Areas:

1. Determining importance
2. Understanding principles of safety
3. Eliminating hazards
4. Providing first aid

Outline of Unit

- I. Determining Importance
  - A. Understanding common home and farm accidents
  - B. Costs of home and farm accidents
  - C. Home and farm fatality statistics
- II. Understanding Principles of Safety
  - A. Defining safety terms
  - B. Proper instruction in the operation of equipment
  - C. Reading and utilizing operating manuals
  - D. Understanding safety color coding
  - E. Understanding electrical color coding
  - F. Reading labels before using chemicals
  - G. Understanding the dangers of liquid fuels
  - H. Operating farm machinery
- III. Eliminating Hazards
  - A. Placing safety signs at hazardous places
  - B. Eliminating hazardous rugs and fixtures in the home
  - C. Making safety checks of home and farm
- IV. Using Safety Equipment
  - A. Placing first-aid kits and fire extinguishers
  - B. Listing emergency phone numbers
  - C. Safeguarding slow moving farm vehicles on highways

Goal Statement

A farmer must recognize and correct hazardous conditions on the farm and in the home. He must use logical and practical solutions to provide a safe environment.

## General and Specific Objectives

- I. The student will understand the importance of safety. Specifically the student will be able to:
  - A. identify kinds of accidents as to their number and causes for both farm and home.
  - B. identify when most accidents occur on the farm and in the home.
  - C. predict the results of an uncorrected hazard.
  - D. identify economic losses due to accidents on the farm and in the home.
  
- II. The student will understand the principles of safety. Specifically the student will be able to:
  - A. define prevention as a basic rule of farm and home safety.
  - B. relate preparedness as a basic rule of farm and home safety.
  - C. demonstrate that accidents are caused, they do not just happen.
  - D. demonstrate the meaning of color codes for a given situation.
  - E. explain why the cost of prevention is more justifiable than the cost of the accident which could happen.
  - F. explain the need for good lighting on the farm and in the home.
  
- III. The student will recognize hazards. Specifically the student will be able to:
  - A. identify the contributing causes of a possible accident.
  - B. distinguish unsafe conditions in a given situation.
  - C. identify the dangers of slow moving vehicles on highways.
  
- IV. The student will know how to prevent hazards. Specifically the student will be able to:
  - A. given an area on the farm or in the home (such as electricity, firearms, etc.), explain the safety rules to be followed.
  - B. identify proper storage of flammable liquids and gases on the farm and in the home.
  - C. clear working areas of grease, rags, and other potential fire hazards.
  - D. analyze repairs needed to steps and other given areas which are potential hazards.
  - E. follow safety practices for operating machinery on the highway.
  - F. identify the four areas of standards under the Williams-Steiger Occupational Safety and Health Act of 1970 which affect agriculture.
  - G. place safety signs in the barn, shop, home and other areas.
  - H. properly label poisonous materials.
  - I. use caution when handling livestock.
  - J. identify hazards of smoking when handling gasoline and other combustible materials.
  - K. use hand rails on stairs.

- V. The student will understand the use of safety equipment. Specifically the student will be able to:
- A. relate the types of safety devices to given machines or portable power equipment.
  - B. identify proper uses of eye protection equipment.
  - C. select safe clothing for a given situation.
  - D. make proper adjustments to safety guards of electric grinders.
  - E. explain why proper ventilation for a given job enclosure is necessary.
  - F. identify where fire extinguishers are necessary on the farm and home.
  - G. list phone numbers of the fire department, rescue squad, physician and police on telephones.



Activity: RURAL AND URBAN LIVING

## Unit E: Improving the Quality of the Environment

## Problem Areas:

1. Understanding environmental pollution
2. Controlling air pollution
3. Controlling water pollution
4. Controlling animal and plant pollution
5. Controlling agricultural chemical pollution
6. Correcting soil exploitation and abuse
7. Controlling solid waste accumulation
8. Controlling noise

Outline of Unit

## I. Understanding Environmental Pollution

- A. The importance of ecology in supporting life
- B. The magnitude of pollution in the United States today
- C. The problems that pollution is causing

## II. Controlling Air Pollution

- A. Sources of air pollution
- B. Harmful effects of air pollution
- C. Methods of controlling air pollution

## III. Controlling Water Pollution

- A. Sources of water pollution
- B. Harmful effects of water pollution
- C. Methods of controlling water pollution

## IV. Controlling Solid Waste Accumulation

- A. Reasons for the magnitude of solid waste accumulation
- B. Problems caused by solid waste accumulation
- C. Methods of disposing of solid waste

## V. Controlling Noise

- A. Types of noise considered undesirable
- B. Harmful effects of noise
- C. Methods of controlling noise

## VI. Controlling Soil Exploitation

- A. Ways that the soil is exploited
- B. Harmful effects of soil exploitation
- C. Improved ways of using the soil

## VII. Controlling Agricultural Pollution

- A. Kinds of pollution (chemical, animal, and plant)
- B. Sources of pollution
- C. Harmful effects of pollution
- D. Methods of controlling agricultural pollution

### Goal Statement

An agriculturalist must understand his relationship to his environment so that the actions which he takes in his occupation and in his life improve rather than diminish the quality of the environment.

### General and Specific Objectives

- I. The student will understand the meaning of ecology. Specifically the student will be able to:
  - A. define the word "ecology."
  - B. categorize the steps in a food chain.
  - C. explain the interdependence of animals and plants in relation to their use of oxygen and carbon dioxide.
  - D. explain ecological problems that can develop when a species gets out of control.
  - E. recognize the importance of water in supporting life.
  - F. list ways by which man fits into the ecological system.
  
- II. The student will understand the importance of individual concern for the prevention of pollution. Specifically the student will be able to:
  - A. explain how man is dependent upon his environment.
  - B. analyze the effect of pollution on the lives of people.
  - C. analyze cases in which man is a polluter.
  - D. explain what the individual can do in initiating community action and legislative programs to control pollution.
  - E. structure steps which an individual may take to lessen the amount of pollution he is causing.
  - F. predict the condition of the world in 10 years if present conditions of pollution continue.
  
- III. The student will understand the magnitude of pollution in the United States. Specifically the student will be able to:
  - A. list problems caused by the population explosion
  - B. explain how increasing population affects the amount of land available for agriculture.
  - C. relate why the United States, with 6% of the world's population, uses 50% of its resources and produces 50% of its pollution.
  - D. explain why a nation with a high standard of living has many more pollution problems than a nation with a low standard.
  - E. define the term "biodegradable."
  - F. list specific kinds of pollution.
  - G. analyze the causes and results of each type of pollution.
  - H. evaluate the dangers to the environment which are caused by each type of pollution.

- IV. The student will know proper and improper farm practices relating to water pollution. Specifically the student will be able to:
  - A. describe how a sufficient amount of pure water is necessary in any farming operation.
  - B. define the term "water table."
  - C. explain the importance of maintaining the water table to avoid exhausting the water supply.
  - D. explain the effect of animal wastes on the water supply.
  - E. explain the effect of herbicides on the water supply.
  - F. explain the effect of fertilizers on the water supply.
  - G. explain the effect of silt accumulation from soil erosion on the water supply.
  
- V. The student will know proper and improper farm practices relating to air pollution. Specifically the student will be able to:
  - A. explain how odors from livestock wastes can be a problem in populated areas.
  - B. explain how air pollution is caused by open burning of crop residues and other wastes.
  - C. describe the impact of gasoline and diesel engines of farm machinery on rising levels of air pollution.
  
- VI. The student will know proper and improper farm practices relating to any soil exploitation. Specifically the student will be able to:
  - A. explain why there is less land available for production each year.
  - B. evaluate the results of constantly taking land for purposes other than agriculture.
  - C. explain the effect of improper application of fertilizers to soil.
  - D. explain the effect of herbicides and other chemicals on the soil.
  - E. explain how over-cropping has depleted soils of nutrients.
  - F. explain soil problems caused by wind and water erosion.

ANIMAL SCIENCE

Activity: BEEF

Unit B: Feeding and Caring for Beef Animals

Problem Area:

1. Feeding and caring for the breeding herd

Outline of Unit

- I. Identify feeds for the breeding herd
  - A. Nutrient value of certain feeds
  - B. What feeds are best adapted for beef animals
- II. Identifying nutrient needs of the breeding herd
  - A. Nutrient needs for bulls
  - B. Nutrient needs for cows at different stages of maturity and condition
- III. Balancing rations for breeding herd
  - A. Pearson Square Method
- IV. Evaluation of ration for breeding herd
  - A. Cost
  - B. Productivity

Goal Statement

The farm manager must balance rations, feed the breeding herd, and effectively evaluate the total feeding program.

General and Specific Objectives

- I. Understand nutrient needs of beef animals. The student will be able to:
  - A. interpret nutrient requirement charts.
  - B. compute nutrient requirements for bulls.
  - C. compute nutrient requirements for beef cows at various stages of maturity and condition.
  - D. explain why nutrient requirements vary for different animals.
  - E. formulate a ration for a beef herd.
  - F. determine the amount of a ration to feed cows at various stages of maturity and condition.
- II. Understand the kinds and value of feeds for beef animals. The student will be able to:
  - A. identify the kinds of feed.
  - B. distinguish between classes of feed.
  - C. interpret nutrient feed charts.
  - D. choose feeds suitable for beef cattle.
  - E. predict results of the quality of feed for different storage facilities.
  - F. distinguish proper and improper methods of handling feeds by the effect on feed quality.

- III. Understand how different nutrients affect beef cattle. The student will be able to:
- A. select the most important feed nutrients for beef animals.
  - B. explain the function of various nutrients.
  - C. detect symptoms of nutrient deficiencies.
  - D. select a means of correcting nutrient deficiencies.
  - E. predict the results of a nutrient deficiency.
- IV. Understand how to formulate rations. The student will be able to:
- A. distinguish which kinds of feeds can be mixed.
  - B. select proper supplements for various feeds and feed mixtures.
  - C. formulate a feed mixture from several types of feeds.
  - D. calculate concentrate-roughage ratio.
  - E. balance a ration.
- V. Understand how balanced rations and other feeding practices are related to the efficiency of the beef operation. The student will be able to:
- A. explain how quality of feed affects production and efficiency of operation.
  - B. explain how quantity of feed affects production and efficiency of operation.
  - C. compute cost of ration.
  - D. compare economic effects of over and under feeding.
  - E. determine the point of diminishing returns.

Activity: BEEF

Unit F: Marketing Beef Cattle

Problem Areas:

1. Selecting the market
2. Grading cattle for market
3. Preparing animals for sale

Outline of Unit

- I. Selecting the Market
- II. Grading Cattle for Market
- III. Preparing Animals for Sale
- IV. Types of Business Organizations
- V. Regulations of Markets and Marketing
- VI. Prices for Different Types of Cattle

Goal Statement

The producer of beef cattle manages his operation efficiently to insure maximum return for his investment. He observes good practices in preventing disease in his herd and obeys regulations which govern transporting and marketing cattle.

General and Specific Objectives

- I. The student will understand the importance to the beef cattle industry of safely transporting cattle. Specifically the student will be able to:
  - A. list four methods of transporting beef cattle to market.
  - B. list the advantages of truck transportation.
  - C. compare railroads to trucking as a source of transportation.
  - D. describe the methods of transporting beef cattle today.
- II. The student will appreciate the importance of the processor and wholesaler to the beef industry. Specifically the student will be able to:
  - A. explain the function of the wholesaler.
  - B. relate the function of the wholesaler to consumer costs.
  - C. evaluate the factors affecting the number of cattle slaughtered daily.
  - D. describe the wholesaler's techniques for absorbing sudden cost increases.
  - E. describe beef grades and cuts.

- III. The student will understand the different steps which farmers may take to improve livestock prices. Specifically the student will be able to:
- A. describe methods of fattening cattle.
  - B. identify the best time to buy feeder cattle.
  - D. evaluate a fattening ration.
  - E. describe how to select supplements for feed.
  - F. explain how to analyze feed combinations.
- IV. The student will understand the market channel for moving cattle to a wholesale market. Specifically the student will be able to:
- A. identify channels for moving farm products to wholesale markets.
  - B. identify an order buyer.
  - C. describe a feedlot.
  - D. describe an auction market.
  - E. list general jobs done by a beef wholesaler.
- V. The student will understand specific regulations for markets and marketing beef cattle. Specifically the student will be able to:
- A. identify the Federal laws regulating beef cattle markets.
  - B. explain the Federal beef grades for consumer protection.
  - C. identify where the most tender cuts can be found on a beef carcass.
- VI. The student will recognize the factors which influence the price of beef cattle. Specifically the student will be able to:
- A. interpret livestock and grain prices from charts.
  - B. explain reasons why beef cattle prices change.
  - C. recognize the beef cattle production areas of the United States.
  - D. describe beef cattle consumption trends.
  - E. explain why some beef cuts retail for less than wholesale.



Activity: DAIRY

Unit A: Selecting and Buying Dairy Animals

Problem Areas:

1. Selecting by physical appearance
2. Using records
3. Buying

Outline of Unit

## I. Selection by Physical Appearance

- A. Advantages and disadvantages of buying calves, open heifers, bred heifers, and older cows
- B. Advantages and disadvantages of each of the five major breeds of dairy cattle
- C. What does an ideal cow look like?

## II. Selection by Using Records

- A. Records that are important in herd selection
- B. Using records in herd selection

## III. Buying

- A. Different methods of buying cattle for dairy herd replacement
- B. Advantages and disadvantages of each method

Goal Statement

The modern dairy farmer frequently confronts the problem of acquiring replacements and additions to his dairy herd. To do so, he must have the ability to choose animals which will improve, or at least maintain his herd. Today's farmer must be able to select animals with skill in order to be competitive with other farmers.

General and Specific Objectives

- I. The student will understand the advantages and disadvantages of buying calves, open heifers, bred heifers, and older cows. Specifically the student will be able to:
  - A. list the advantages and disadvantages of buying calves.
  - B. list the advantages and disadvantages of buying open heifers.
  - C. list the advantages and disadvantages of buying bred heifers.
  - D. list the advantages and disadvantages of buying older cows.
- II. The student will understand how to choose the best type of replacement animals for his herd. Specifically the student will be able to:
  - A. given the variables of a buying situation, list the proper choice of replacement animals for his herd.

- III. The student will have an understanding of each of the five major breeds of dairy cattle and will know the advantages and disadvantages of each breed. Specifically the student will be able to:
- A. identify each of the five major breeds by looking at pictures of them.
  - B. list advantages and disadvantages of each breed.
- IV. The student will have an understanding of what an ideal dairy cow should look like and be able to recognize undesirable qualities in such animals. Specifically the student will be able to:
- A. given a list of characteristics of dairy cows, identify the desirable and undesirable ones.
  - B. given pictures of four dairy cows, rank them on the basis of desirable qualities.
  - C. identify strong and weak points of pictured dairy cows.
- V. The student will develop the knowledge to understand and use the different kinds of records usually kept by dairymen. Specifically the student will be able to:
- A. make a list of the records usually kept by dairymen .
  - B. list the type of information a dairyman needs to obtain from records
  - C. given several sets of records about different animals, analyze the data and choose the best animal.
- VI. The student will have an understanding of the major diseases and parasites of dairy cattle and will understand the importance of proper treatment of these. Specifically the student will be able to:
- A. identify the major diseases a dairyman buying cattle should be concerned about.
  - B. given a situation for buying dairy cattle and the health records of various animals, determine which diseases the animals should be tested for.
  - C. list steps to follow in bringing new stock into a dairy herd to assist in disease prevention.
- VII. The student will have an understanding of the various methods for buying dairy cattle. Specifically the student will be able to:
- A. identify different methods for buying dairy cattle.

Activity: DAIRY

Unit C: Feeding and Caring for the Dairy Herd

## Problem Areas:

1. Feeding and caring for the dairy bull
2. Feeding and caring for dairy cows during lactation
3. Feeding and caring for the "dry" cow

Outline of Unit

- I. Importance of Caring for the Cow and Calf
  - A. Cost of replacements
  - B. Rate of herd replacements
- II. Caring for the Cow Before Calving
  - A. Signs of calving
  - B. Management practices before calving
  - C. Feeding
  - D. Housing
- III. Caring for Cow after Calving
  - A. Management practices
  - B. Feeding
- IV. Management of Calves
  - A. Feeding
  - B. Housing
  - C. Diseases and pests

Goal Statement

The dairy farmer gives proper care to the cows and their calves. He realizes that by giving proper care he increases his profits from dairy farming.

General and Specific Objectives

- I. The student will understand how to care for the cow before calving. Specifically the student will be able to:
  - A. list the reasons for giving the cow a dry period.
  - B. explain the time to dry off cows.
  - C. explain how to properly feed dry cows.
  - D. explain the proper housing of dry cows.
- II. The student will understand how to care for the cow at calving time. Specifically the student will be able to:
  - A. identify signs of calving.
  - B. explain practices to follow while cow is calving.
  - C. list things to do in assisting a cow in calving.
  - D. explain practices to follow immediately after calving.

- III. The student will understand how to feed calves. Specifically the student will be able to:
- A. explain how to feed the calf during the first 48 hours.
  - B. explain how to feed milk after the first 48 hours.
  - C. describe a suitable grain mixture for calves.
  - D. explain why roughage is necessary in the calves diet.
  - E. explain why you must use precautions when feeding calves.
- IV. The student will understand the housing needed for calves. Specifically the student will be able to:
- A. state the minimum sizes for calf pens.
  - B. describe the different accessories needed in a calf pen.
  - C. describe the proper environment in a calf shelter.
  - D. explain how to properly supply bedding.
- V. The student will understand the proper management of calves. Specifically the student will be able to:
- A. list management practices to follow when raising calves.
  - B. explain why these practices are important.
  - C. compute a time table for managing calves.
- VI. The student will understand the common calf ailments. Specifically the student will be able to:
- A. list common ailments of calves.
  - B. list the common pests of calves.
  - C. explain how the ailment affects the calf.
  - D. explain how pests affect calves.
  - E. explain how to control these ailments and pests.

Activity: SHEEP

## Unit B: Feeding and Caring for Sheep

## Problem Areas:

1. Feeding and caring for the flock ram
2. Feeding and caring for the breeding flock
3. Feeding and caring for the ewe and lamb from birth to weaning
4. Feeding and caring for the growing and finishing lambs

Goal Statement

A producer of sheep uses basic knowledge and skills in feeding and managing his flock to insure maximum wool and lamb production.

General and Specific Objectives

- I. The student understands the relation of proper feeding to productivity. Specifically the student will be able to:
  - A. understand the food needs of the breeding ewe to insure healthy lambs.
  - B. explain the special food requirements of the flock ram.
  - C. describe efficient management of grazing land for the flock.
  - D. explain the importance of creep feeding lambs.
- II. The student will have an understanding of the importance of providing shelter for the flock. Specifically the student will be able to:
  - A. list guidelines for construction of adequate shelter for the flock.
  - B. explain how to protect the flock during dangerous weather.
  - C. determine shelter floor space required for flock.
- III. The student will have an appreciation of the importance of health maintenance of flock. Specifically the student will be able to:
  - A. recognize symptoms of disease in the flock.
  - B. recognize symptoms of parasites in the flock.
  - C. describe treatment of flock for internal parasites.
  - D. describe treatment of flock for external parasites.
  - E. recognize foot rot in the flock.
  - F. explain how to prevent foot rot.
- IV. The student will have an understanding of the castration and docking of lambs. Specifically the student will be able to:
  - A. recognize equipment used for castrating and docking.
  - B. explain at what age lambs should be castrated and docked.
  - C. describe the procedure to safely perform castration.
  - D. describe the procedure to safely perform docking.

- V. The student will understand the importance of keeping adequate records of the flock. Specifically the student will be able to:
  - A. compute expected lambing date at breeding time.
  - B. distinguish between expense items and income items.
  - C. distinguish between variable and fixed costs.
  
- VI. The student will understand the importance of management practices at lambing time. Specifically the student will be able to:
  - A. describe the procedure for preparing ewes for lambing.
  - B. list the best management practices for the newborn lamb.
  - C. describe diseases of lambs.

Activity: SWINE

Unit A: Selecting and Buying Swine

Problem Areas:

1. Selecting by physical appearance
2. Using records
3. Buying

Outline of Unit

- I. Identifying the Different Breeds
- II. Predicting the Best Selling Dates
- III. Record Keeping for the Swine Operation
- IV. Laws Which Regulate Swine Trade

Goal Statement

The producer of swine selects breeds which bring in maximum returns. He keeps adequate records and estimates selling time to insure the greatest possible profit.

General and Specific Objectives

- I. The student will know how to identify different breeds of swine. Specifically the student will be able to:
  - A. describe six major breeds of swine.
  - B. list the strong points in each breed.
  - C. list the color characteristics of each breed.
- II. The student will understand the factors which influence the selling price of hogs. Specifically the student will be able to:
  - A. chart the trend in hog prices.
  - B. list the reasons why hog prices change from season to season.
  - C. list the factors in a given community which influence business transactions in the swine industry.
- III. The student will understand the importance of keeping accurate and adequate records of the swine operation. Specifically the student will be able to:
  - A. list the information needed for tax filing purposes.
  - B. describe a profit and loss statement.
  - C. describe an income and expense statement.
  - D. describe the benefit of a breeding and production record to the swine producer.

- IV. The student will know how to keep the necessary records of a swine operation. Specifically the student will be able to:
- A. identify resource people who may assist the farmer in setting up a record keeping system.
  - B. keep a record of a swine operation.
  - C. evaluate the records of an existing operation.
  - D. describe the characteristics of a satisfactory record keeping system.
- V. The student will know how to use records in planning for future transactions. Specifically the student will be able to:
- A. make a workable budget for a year of swine operation based on previous year.
  - B. estimate amounts of feed needed for a year based on the record of the past year's feeding.
- VI. The student will understand the factors which determine the best type of swine for a given situation. Specifically the student will be able to:
- A. judge swine according to accepted standards.
  - B. describe the characteristics of the best animal for breeding.
  - C. describe the characteristics of the best animal for grazing.
  - D. describe the characteristics of the best animal for pen feeding.
- VII. The student will understand the regulations and legislation of local, state and federal agencies which are concerned with a safe pork supply. Specifically the student will be able to:
- A. list the regulations which deal with transportation of swine.
  - B. describe the regulations which govern the marketing of swine.
- VIII. The student will know the consequences of failure to adhere to the regulations which govern swine production. Specifically the student will be able to:
- A. list diseases which may make a herd unfit for marketing.
  - B. describe the penalty for failure to obey regulations governing the transportation of swine.
  - C. describe the penalty for failure to obey regulations governing the marketing of swine.



AGRICULTURAL MECHANICS

Activity: AGRICULTURAL CONSTRUCTION AND MAINTENANCE

Unit B: Sketching, Drawing, and Interpreting Plans in Agriculture

Problem Areas:

1. Selecting equipment
2. Using basic procedures for lettering and viewing an object
3. Performing free hand sketching
4. Reading and interpreting plans

Goal Statement

A mechanic makes neat and accurate sketches and drawings. He selects and uses proper equipment to read and interpret drawings for agricultural mechanics projects.

General and Specific Objectives

- I. The student will appreciate the value of developing sketches and drawings before beginning a project. Specifically the student will be able to:
  - A. describe the uses of drawings in a given situation.
  - B. state the uses of sketches.
  - C. list the equipment needed for drawing.
  - D. select the proper equipment for a given drawing technique.
- II. The student will understand the importance of neatness in sketching and drawing. Specifically the student will be able to:
  - A. list the procedures for constructing neat letters.
  - B. demonstrate the techniques of neatness.
  - C. relate valid reasons for neatness.
  - D. explain reasons for neatness.
- III. The student will be aware of the value of project sketches and drawings as guides to construction. Specifically the student will be able to:
  - A. list the values of sketches and drawings.
  - B. demonstrate the value of a sketch.
  - C. relate the sketch and drawing to the project.
  - D. discriminate between sketching and drawing.
  - E. determine what is needed to sketch or draw.
- IV. The student will appreciate the contribution of proper equipment to the accuracy of drawings. Specifically the student will be able to:
  - A. list the advantages of drawing and sketching equipment.
  - B. select the proper equipment.
  - C. demonstrate the use of equipment.
  - D. interpret data on drawing.
  - E. apply the interpreted data in a practical situation.

- V. The student will appreciate the importance of proper care and storage of tools. Specifically the student will be able to:
- A. list desirable storage for equipment.
  - B. select techniques for storage.
  - C. evaluate storage facilities for tools.
  - D. describe proper care and storage of tools.
- VI. The student will understand the terminology used in connection with sketching and drawing. Specifically the student will be able to:
- A. define terms used in drawing.
  - B. recognize different views of drawing.
  - C. apply correct terms to a drawing exercise.
  - D. list basic terms for understanding a project.
- VII. The student will understand the importance of safety practices in using drawing tools. Specifically the student will be able to:
- A. list the types of accidents that could occur.
  - B. determine safety practices for tools.
  - C. discriminate between safe and unsafe practices.
  - D. select safe practices for drawing.
- VIII. The student will understand the terminology used in connection with sketching and drawing and the use of sketches and drawings in construction.
- A. give examples of the necessary views of objects used in drawing.
  - B. describe a blue print title section.
  - C. categorize the materials needed for a given project.
  - D. select materials for a project plan.
  - E. explain possible changes and illustrate the changes.
  - F. select materials for the changes.
  - G. revise costs for changes.
  - H. explain the advantages of the changes.
  - I. show the project with the changes.
  - J. contrast the old with the new.
  - K. select materials for project construction.

Activity: AGRICULTURAL CONSTRUCTION AND MAINTENANCE

## Unit L: Paints and Preservatives

## Problem Areas:

1. Using safety practices
2. Understanding the basic needs for paints and preservatives
3. Selecting paints and preservatives for specific jobs - metal, wood
4. Selecting application equipment - hand and power
5. Using and protecting application equipment
6. Estimating job costs

Outline of Unit

- I. Safety Practices
  - A. Hand and power equipment
  - B. Storage and handling
- II. Basic Need for Paints and Preservatives
  - A. Protection of surfaces
  - B. Beautification
  - C. Lighting and safety factors
- III. Selection of Proper Paint or Preservative
  - A. Surface on which to be applied
  - B. Location of the surface
  - C. Climatic factors
  - D. Types of paints
- IV. Selection of Application Equipment
  - A. Hand application equipment
  - B. Power application equipment
- V. Using and Protecting Application Equipment
  - A. Use and protection of hand equipment
  - B. Use and protection of power equipment
- VI. Estimating Job Costs
  - A. Cost of materials
  - B. Cost of labor

Goal Statement

For each painting job, the painter must correctly select the appropriate paint or preservative and safely use the best method of application. He must also compute costs for the application.

General and Specific Objectives

- I. The student will have an appreciation of the importance of proper safety practices in the application and storage of paints and preservatives. Specifically the student will be able to:
  - A. differentiate between safe and unsafe methods of application.
  - B. demonstrate the safe application of paints and preservatives using hand and power equipment.
  - C. describe the proper storage of paints and preservatives.
  - D. organize a proper storage area for paints and preservatives, using the given criteria.
  - E. given a sample area, evaluate the paint storage.
  - F. given a particular situation, predict the consequences of not using proper storage safety practices.
  
- II. The student will understand the need for paints and preservatives. Specifically the student will be able to:
  - A. state reasons for the use of paints and preservatives.
  - B. given a particular situation, describe the consequences of not applying a paint or preservative.
  
- III. The student will understand the importance of selecting the proper paint or preservative. Specifically the student will be able to:
  - A. identify the various kinds of paints or preservatives.
  - B. given a particular situation, select the best choice of paint or preservative.
  - C. select from a list the proper paint or preservative for different materials and locations.
  - D. given a certain situation, explain the consequences of not applying the proper paint or preservative.
  - E. select paint according to the variables of cost, rate of application and the quality of the paint.
  - F. recognize paint failures.
  
- IV. The student will understand how to paint properly. Specifically the student will be able to:
  - A. identify brushes according to the burn test.
  - B. use each kind of application equipment properly.
  - C. determine the best conditions for painting.
  - D. select the best method of applying a paint or preservative in a given situation.
  - E. identify different types of application equipment.
  - F. describe how to prepare a surface to be painted.
  - G. select the proper method of cleaning equipment.
  - H. select the proper method of storing equipment.

- V. The student will appreciate the importance of accurately estimating job costs. Specifically the student will be able to:
- A. determine the amount of paint needed for a specific job.
  - B. determine the cost of paint and cleaning materials for a specific job.
  - C. determine the cost of application equipment for a specific job.
  - D. determine labor costs for a specific job.
  - E. compute the total cost of a job.
  - F. given a particular situation, evaluate choices of paint and application equipment and select the most economical of each.
- VI. The student will understand the terminology of the trade. Specifically the student will be able to:
- A. restate in his own words the terminology used in the painting trade.
  - B. from a given list, select the term that describes a particular situation.
  - C. differentiate painting terms that are similar in meaning.
  - D. use correct terminology given a new situation.

Activity: SOIL AND WATER MANAGEMENT

Unit A: Planning for and Conserving Soil and Water

## Problem Areas:

1. Developing a soil and water conservation plan
2. Reading aerial maps and plans
3. Constructing waterways and water outlets
4. Constructing terraces
5. Laying out contours
6. Controlling gullies

Outline of Unit

- I. Developing a Soil and Water Conservation Plan
  - A. The economic importance of soil and water conservation
    1. Benefits to the farmer
    2. Benefits to the general public for recreation
  - B. Increasing the Gross National Product
    1. Through farm production increase
    2. Through recreation and wise use of leisure time
- II. Reading Aerial Maps
  - A. Use of aerial maps
  - B. Problems in understanding aerial maps
- III. Constructing Waterways and Water Outlets
  - A. Determining locations
  - B. Determining the number
- IV. Constructing Terraces
  - A. Determining the types of terraces
  - B. Determining the number of terraces
  - C. Determining the equipment needed
  - D. Determining the beginning and end of each terrace outlet
- V. Laying Out Contours
  - A. Equipment needed
  - B. Accurately laying out a contour strip
  - C. Contour strips versus terraces
- VI. Controlling Gullies
  - A. Determining the extent of gullies
  - B. The extent to which gullies can be controlled
  - C. Equipment needed to control gullies

Goal Statement

The soil conservationist saves soil by constructing waterways and water outlets. He reads and interprets aerial maps, plans and safely constructs terraces, lays out and constructs contour strips and fills gullies to prevent the loss of soil by erosion.

## General and Specific Objectives

- I. The student will understand the basic principles of soil conservation. Specifically the student will be able to:
  - A. identify different types of erosion and prescribe a method of control for each erosion type.
  - B. compare the advantages of the ridge terrace with the channel terrace.
  - C. describe the effect that terracing has on a hilly field as compared to the effect on a flat field.
  - D. given a description of soil and water loss in a certain field, decide how to effectively prevent soil erosion and how to control water run-off.
  - E. relate the advantages and disadvantages of terraces.
  - F. relate the advantages and disadvantages of contour strips.
  - G. compare the economic situation of one farm where soil and water are conserved to another farm where they are not.
  
- II. The student will appreciate the need for soil and water conservation. Specifically the student will be able to:
  - A. state why there was a "Great Dust Bowl" in the West during the 1930's.
  - B. describe how wind and water cause erosion of the soil.
  - C. illustrate how the loss of topsoil affects the Gross National Product.
  - D. explain how soil and water conservation practices may improve a farmer's chances for increased income.
  - E. list three methods of filling or controlling gullies and show how each method can be compared with the epigram "A stitch in time saves nine."
  
- III. The student will understand the importance of waterways, water outlets, terraces, and contour strips as methods of conserving soil and water. Specifically the student will be able to:
  - A. define waterway, water outlet, terrace, and contour strip.
  - B. describe how soil is moved by water from the hills to the waterways.
  - C. explain the advantages and disadvantages of using terraces.
  - D. explain the advantages and disadvantages of using waterways.
  - E. explain the advantages and disadvantages of using contour strips.
  - F. illustrate how ridge terraces and channel terraces are different.
  - G. given a situation that needs correcting, describe the best soil conservation method to use in conserving the soil.
  
- IV. The student will appreciate aerial map symbols as aids in working out soil and water conservation plans. Specifically the student will be able to:
  - A. given an aerial map, identify the metes and bounds of two farms.
  - B. identify two possible locations for tile drainage systems to be installed, based on the contour aerial map and state two reasons for selecting each location.
  - C. identify and list 10 symbols commonly found on maps.
  - D. identify objects on an aerial map by making use of (1) the tone or shade of gray, (2) shape, (3) shadow, and (4) relationships of objects to each other.



- E. given a contour map, determine the scale of the map, the contour interval, and the general shape of the ground.
  - F. study an area in detail and make recommendations from an agricultural point of view.
- V. The student will understand the basic principles of operating the machinery and equipment used in constructing soil and water conservation devices. Specifically the student will be able to:
- A. explain the operation of the machinery and equipment used in the construction of terraces.
  - B. describe the method of constructing the ridge terrace.
  - C. compare the machines needed to construct a channel terrace with those required for the ridge terrace.
  - D. identify safety precautions that must be observed when operating machinery on hillsides.
  - E. illustrate safety precautions necessary for terracing hillsides.
  - F. identify measuring devices used in conservation practices.
  - G. identify the machines needed to correct specific problems.
- VI. The student will understand the importance of using safe practices in the operation of equipment for the construction of conservation devices. Specifically the student will be able to:
- A. list five safety practices in handling fuels and lubricants.
  - B. identify three safety hazards in handling machinery and equipment on seriously eroded fields.
  - C. describe the safety precautions necessary for safely cutting a grass waterway.
  - D. illustrate a safe procedure for stopping large gullies.
  - E. prescribe types of clothing to wear as a safety precaution when operating equipment.
- VII. The student will understand the technical terms used in soil and water conservation work. Specifically the student will be able to:
- A. given a list of technical terms, supply the correct definitions.
  - B. compare the terminology used in soil conservation practices with that used in water conservation practices.
  - C. determine where certain practices, described in technical terms, would be used in the soil and water conservation system.
  - D. explain the effects of rainfall using technical terms.

Activity: FARM POWER AND MACHINERY

## Unit A: Tractor Maintenance

## Problem Areas:

1. Lubricating the tractor
2. Cleaning and maintaining the cooling system
3. Cleaning and maintaining the air cleaner
4. Maintaining and servicing the tires
5. Adjusting and maintaining the brakes
6. Servicing and adjusting gasoline fuel systems
7. Servicing diesel fuel systems
8. Maintaining and adjusting governors
9. Adjusting the clutch
10. Adjusting the valves

Outline of Unit

- I. Lubricating the Tractor
- II. Cleaning and Maintaining the Cooling System
- III. Cleaning and Maintaining the Air Cleaner
- IV. Maintaining and Servicing the Tires
- V. Maintaining the Ignition System of Gasoline Tractor
- VI. Servicing and Adjusting Gasoline Fuel Systems
- VII. Servicing Diesel Fuel System
- VIII. Maintaining and Adjusting Governors
- IX. Adjusting the Clutch
- X. Adjusting the Valves

Goal Statement

The agribusinessman who conducts his operation in a business-like manner soon learns that regular and proper maintenance of his tractor is a profitable investment. He understands the function of each part in the tractor and follows a systematic procedure for repairs. He understands the various units of the tractor, their purpose, and operation. He is able to disassemble, trouble-shoot, make repairs, reassemble the unit, and get the tractor to function properly under field conditions.

General and Specific Objectives

- I. The student will understand the principles of operation of the farm tractor. Specifically the student will be able to:
  - A. identify the stationary parts.
  - B. explain the moving parts of the tractor.
  - C. explain the operation of the four-cycle gasoline engine.
  - D. explain the operation of the three cylinder, two-cycle engine.
  - E. explain compression ratio.
  - F. explain the operation of the four-cycle diesel engine.
  - G. explain the electrical system.
  
- II. The student will understand the importance of the principles of tractor maintenance. Specifically the student will be able to:
  - A. service the battery properly.
  - B. check and maintain the DC generator, voltage regulator, current regulator, and cutout relay.
  - C. check and maintain the cooling system.
  
- III. The student will understand the importance of safety practices involved in tractor maintenance. Specifically the student will be able to:
  - A. identify proper ventilation while conducting maintenance.
  - B. explain the reason for using tools properly.
  - C. select the proper tools for a specific job.
  - D. explain the reasons for using certain tools.
  - E. identify tools properly.
  - F. identify machinery hardware properly for safety purposes.
  - G. given a micrometer, the student will be able to adjust and read it properly.
  
- IV. The student will comprehend the construction of the component parts of the tractor. Specifically the student will be able to:
  - A. adjust the proper piston clearance for a certain kind of piston.
  - B. adjust carburetor properly by use of test instruments.
  - C. adjust breaker points properly.
  - D. check the cylinder head for warpage.
  - E. adjust and maintain proper ring clearance.
  - F. explain the operation of the valve train.
  
- V. The student will appreciate the contributions which the operator's manual makes in the service and adjustments necessary for tractor maintenance. Specifically the student will be able to:
  - A. prepare a parts order according to the operator's manual listing.
  - B. determine idle RPM according to manual specifications.
  - C. determine correct spark plug torque.
  - D. correctly determine alternator drive belt tension.
  - E. determine the correct oil filter by reference to the operator's manual.

- VI. The student will understand the importance of correct diagnosis of problems which arise with a tractor. Specifically the student will be able to:
- A. recognize existing malfunctions of a generator.
  - B. recognize existing malfunctions of the valve train.
  - C. given an engine with faulty valves, the student will be able to select the proper test equipment.
  - D. given an internal combustion engine, the student will be able to select the proper test equipment to measure actual engine power.
  - E. given a diesel engine that knocks, the student will be able to recognize the possible causes.
- VII. The student will understand the importance of using the proper supplies in servicing the tractor. Specifically the student will be able to:
- A. explain the composition of gasoline.
  - B. explain the composition of liquid petroleum.
  - C. explain the cetane number of diesel fuels.
  - D. select proper coolant for winterizing the tractor.
- VIII. The student will understand the contributions which the carburetor makes to overall tractor operation. Specifically the student will be able to:
- A. explain the function of the venturi.
  - B. given a carburetor with a faulty float, make proper test for leakage.
  - C. given a carburetor with incorrect preassembly adjustments, employ proper corrective action according to manufacturer's specifications.

Activity: FARM POWER AND MACHINERY

Unit E: Small Engines

## Problem Areas:

1. Servicing the cooling system
2. Maintaining and repairing power train
3. Maintaining and repairing the valve train
4. Servicing the fuel system
5. Adjusting the governor
6. Maintaining the lubrication system
7. Maintaining and testing the ignition system
8. Servicing the starter-generator system

Outline of Unit

- I. Servicing the Cooling System
- II. Maintaining and Repairing the Power Train
- III. Maintaining and Repairing the Valve Train
- IV. Servicing the Fuel System
- V. Adjusting the Governor
- VI. Maintaining the Lubrication System
- VII. Maintaining and Testing the Ignition System
- VIII. Servicing the Starter-Generator System
- IX. Using the Operator's Manual

Goal Statement

The agribusinessman must diagnose, adjust, repair and service the operational parts of a small engine in a safe and efficient manner.

General and Specific Objectives

- I. The student will understand the importance of a properly operating small engine. Specifically the student will be able to:
  - A. explain economic values of properly operating engines.
  - B. explain factors involved in keeping engines functioning properly.
  - C. identify the pieces of equipment in which small gasoline engines are used.

- II. The student will understand the meaning of technical terms related to small engine operation. Specifically the student will be able to:
- A. list common terms used in small engine operation.
  - B. use correct terms in sentences relating to small engines.
  - C. identify terms with actual engine parts.
  - D. explain the differences between kinetic and potential energy.
- III. The student will understand the importance of safety practices in the service of small engines. Specifically the student will be able to:
- A. identify safety practices involved.
  - B. recognize unsafe operating and working conditions.
  - C. given a lawn mower to refuel, recognize all unsafe practices.
  - D. discuss the importance of safety when replacing the cutting blade of a lawn mower.
- IV. The student will understand the importance of correct diagnosis of faulty component parts of a small engine. Specifically the student will be able to:
- A. identify faulty parts.
  - B. identify existing engine problem areas.
  - C. explain the causes of worn components.
  - D. suggest measures for prevention of engine problems.
  - E. given an engine with improper point setting, select the proper test equipment for engine diagnosis.
- V. The student will understand how to effectively communicate diagnostic results, repair and/or adjustment procedure steps necessary for efficient operation. Specifically the student will be able to:
- A. explain procedures for replacing defective parts.
  - B. use proper terms when talking about engines.
  - C. use proper procedures when repairing parts.
  - D. use proper procedures when adjusting parts.
- VI. The student will comprehend the construction, operation and function of the components of the small engine. Specifically the student will be able to:
- A. define the functions of component parts.
  - B. discuss the differences in two and four cycle engines.
  - C. explain the different strokes of engines.
  - D. explain how the reed valve operates in the two-cycle engine.
- VII. The student will understand the proper use of tools in small engine repairs. Specifically the student will be able to:
- A. given the job of replacing piston rings, the student will be able to select the proper set of tools for the job.
  - B. given various tools, the student will be able to select the proper tool needed for repair.

VIII. The student will understand the importance of maintenance and storage of small engines. Specifically the student will be able to:

- A. identify the results of improper storage.
- B. discuss the importance of routine care and maintenance.

Activity: FARM POWER AND MACHINERY

Unit G: Electrical Power and Processing

## Problem Areas:

1. Understanding electrical terms
2. Calculating electrical cost and need
3. Planning and installing the farmstead wiring system
4. Selecting, operating, and maintaining farm electrical motors

Outline of Unit

- I. Review of Basic Principles
  - A. Electron theory as related to electricity
  - B. Magnetism and its relation to electricity
  - C. Sources of electricity
- II. Understanding Electrical Terms
- III. Calculating Electrical Needs and Cost
- IV. Identifying and Selecting Tools, Equipment and Supplies
- V. Electrical Symbols
- VI. Electrical Circuit Diagrams
- VII. Electrical Safety
- VIII. Maintaining the Home Wiring Systems

Goal Statement

Agribusinessmen maintain the electrical systems of both the home and business. Minor repairs are frequently required and must be performed safely. Future business growth makes proper estimating of materials and overall costs important. Also of importance is the ability to oversee major electrical modification thus insuring quality work for the money expended.

General and Specific Objectives

- I. The student will understand the fundamentals of electricity. Specifically the student will be able to:
  - A. explain basic principles of electricity.
  - B. give an example of the principles.
  - C. distinguish between controlled and uncontrolled electricity.
  - D. describe an electromagnet.
  - E. distinguish between conductors and insulators.



- II. The student will be able to effectively communicate using appropriate terminology. Specifically the student will be able to:
- A. define electrical terms in his own words.
  - B. use terms in discussing electricity.
  - C. interpret a given sentence containing some of these terms.
  - D. match electrical terms with their meaning or use.
  - E. distinguish between AC and DC current.
  - F. distinguish between single phase and 3 phase current.
- III. The student will be able to estimate electrical needs. Specifically the student will be able to:
- A. describe a situation where you would need to estimate future electrical needs.
  - B. given the wattage, amperage or horsepower for a piece of equipment and the hours used per day to calculate the amount of kilowatt hours used per month.
  - C. given the kh factor of a meter, the number of disc revolutions for a timed period and number of hours of use, to calculate the kilowatt hours of use per month.
  - D. given a circuit of known amperage and list of appliances with known amperages connected to that circuit, decide whether to add an additional appliance to that circuit.
  - E. interpret the figures on a pointer type meter.
  - F. given voltage and wattage, calculate amperage.
- IV. The student will know how to calculate the cost of electricity. Specifically the student will be able to:
- A. give reasons for calculating electrical cost.
  - B. describe a situation where he may need to calculate electrical costs.
  - C. given the cost of electricity and the wattage rating of an appliance, calculate the cost per hour of operation.
  - D. given kilowatt hours, cost per kilowatt hour and the length of time an appliance is used, calculate the cost of running the appliance.
  - E. given the number of kilowatt hours used in a month and a rate schedule, calculate the monthly electrical bill.
- V. The student will understand the importance for having the proper tools, equipment and supplies. Specifically the student will be able to:
- A. give reasons for using proper tools.
  - B. select the proper tool for a given job.
  - C. select tools needed to make an average minor repair job around a home or business.
  - D. given the prices of two tools identical except quality, decide which to purchase.
  - E. explain why electrical tools and equipment should be insulated.

- VI. The student will know how to use tools, equipment and supplies properly. Specifically the student will be able to:
- A. identify tools, equipment, and supplies.
  - B. given an electrical circuit in which an ammeter is connected backwards, identify the incorrect connections.
  - C. demonstrate the proper use of a volt meter.
  - D. demonstrate the proper use of an ohmmeter.
  - E. given an electrical circuit select the proper supplies needed.
- VII. The student will understand the need for proper care of tools and equipment. Specifically the student will be able to:
- A. list reasons for caring for tools and equipment.
  - B. describe the consequences that may occur when equipment is not cared for properly.
- VIII. The student will understand basic electrical wiring diagrams. Specifically the student will be able to:
- A. identify electrical symbols.
  - B. interpret an electrical diagram.
  - C. given an incorrect electrical wiring diagram, decide where it is incorrect.
  - D. distinguish between a series circuit and a parallel circuit.
- IX. The student will understand the importance of electrical safety. Specifically the student will be able to:
- A. describe a condition which will make a system unsafe.
  - B. given an unsafe electrical system, determine the unsafe condition.
  - C. list 3 possible results of improper safety in a wiring system.
  - D. given an overloaded circuit decide how to correct the situation.
- X. The student will know proper safety precautions to observe when working with electrical components. Specifically the student will be able to:
- A. describe an unsafe working condition.
  - B. given a group of working conditions, decide which is safe, if any.
  - C. distinguish between the equipment which should be used while current is flowing and which should not be used while current is flowing.
  - D. determine when it is safe to work on an electric circuit.

Activity: FARM POWER AND MACHINERY

Unit G: Electrical Power and Processing

Problem Area :

5. Using electrical control devices

Outline of Unit

- I. Electric Motors
  - A. How electric motors operate
  - B. Selecting electric motors
  - C. Motor overload protective devices
  - D. Motor drives

Goal Statement

An agribusinessman must choose the proper electric motors to be used in his business. He must be able to provide the proper overload protection and select the most practical type of electrical control. He must care for and maintain the motors properly after installation.

General and Specific Objectives

- I. The student will understand the importance of electric motors. Specifically the student will be able to:
  - A. explain why electric motors are so popular.
  - B. identify the advantages electric motors have over other types of power.
  - C. explain the difference between AC and DC motors.
  - D. given the size motor, its voltage and amperage, the cost of electricity, and the job to be performed for given conditions; calculate the cost to compare it with the cost of doing it manually using the minimum wage as a basis for manual cost.
  - E. given a job to perform, compare the cost of doing it with an electric motor to a gas engine.
- II. The student will understand how electric motors operate. Specifically the student will be able to:
  - A. explain how a simple motor operates.
  - B. describe the difference between a permanent magnet and an electro-magnet.
  - C. explain why an electromagnet rotor is more powerful than a permanent magnet rotor.
  - D. distinguish between the different ways motors start.
  - E. distinguish between the different ways motors operate.

- III. The student will understand the importance of selecting the proper electric motor. Specifically the student will be able to:
- A. decide what size motor to select for a given set of conditions.
  - B. compare the size motor needed with his power supply and service entrance.
  - C. determine what motor speed to select for stated applications.
  - D. choose a motor of the proper duty for a given job.
  - E. make the proper selection concerning motor type.
  - F. select a motor with the proper type bearings.
  - G. determine the type motor enclosure needed for given applications.
  - H. decide on the type mounting base required for a specific job.
- IV. The student will know how to choose the proper motor overload protective device. Specifically the student will be able to:
- A. explain why motor overload protective devices are needed.
  - B. describe the principles of operation of the overload protective devices.
  - C. given the size motor, determine the suitable protective device.
  - D. given the type operation, select the best protective device.
  - E. determine the effect of the power supply requirements on protective devices.
- V. The student will know how to select the correct motor drive. Specifically the student will be able to:
- A. distinguish between the different types of direct drives.
  - B. distinguish between the different types of speed conversion drives.
  - C. given the equipment speed and distance the motor is from the equipment, determine the proper drive.
  - D. given the size motor, select the correct size direct drive.
  - E. given a specific application, choose the proper size pulley-and-belt drive.
- VI. The student will understand the different electrical controls. Specifically the student will be able to:
- A. explain how different electrical controls work.
  - B. distinguish between the types of electrical controls.
  - C. compare the different means of automatic electrical controls.
  - D. compare the different means of manual electrical controls.
  - E. given conditions under which the motor is to operate, select the proper electrical control.
- VII. The student will know how to properly care for electric motors. Specifically the student will be able to:
- A. conduct preventive motor maintenance.
  - B. clean an electric motor properly.
  - C. appreciate the importance of proper motor maintenance.
  - D. given a common motor problem, determine the solution.
  - E. given a symptom of a motor problem, determine the cause.

FORESTRY, WILDLIFE, AND OUTDOOR RECREATION

Activity: WILDLIFE

## Problem Areas:

1. Identifying important wildlife species and their habitat
2. Determining economic importance of wildlife
3. Managing wildlife populations

Outline of Unit

- I. Identifying Important Wildlife Species and Their Habitats
  - A. Identifying fish species and their habitats
    1. Commercial
    2. Game
    3. Bait and food
    4. Nuisance
  - B. Identifying bird species and their habitats
    1. Upland
      - (a) native
      - (b) exotic
  - C. Identifying animal species and their habitats
    1. Game
      - (a) large game
      - (b) small game
    2. Furbearers
    3. Nuisance and predatory
- II. Stimulating Populations
  - A. Providing cover and food
  - B. Providing nesting areas
  - C. Manipulating cover including forests
- III. Artificial Propagation and Restocking
  - A. Stocking streams, lakes, and ponds
  - B. Game farming
  - C. Releasing of game birds and animals
- IV. Controlling Diseases and Parasites
- V. Controlling Predators and Nuisance Species
- VI. Taking a Game Census
- VII. Understanding Game Laws and Regulations
- VIII. Harvesting the Game Crop

Goal Statement

The farm owner or manager provides for the establishment, reproduction, maintenance and harvesting of game species.

General and Specific Objectives

- I. The individual will know the identifying characteristics of typical wildlife species in a given area. Specifically the student will be able to:
  - A. recognize and identify native and stocked species of wildlife from pictures, illustrations, slides, and descriptions.
  - B. recognize variations in color, size and conformation within a species.
  - C. determine whether a species is primarily game.
  - D. determine whether a species is primarily food.
  - E. determine whether a species is primarily predator or nuisance.
  - F. classify game as to farm type, forest and range, wilderness, or migratory.
  
- II. The individual will know the relative economic value of each game species. Specifically the student will be able to:
  - A. direct attention to those species which are most desirable from a sportsman's standpoint.
  - B. determine when to introduce new species.
  - C. recognize those characteristics which identify animals as game.
  - D. describe potential danger to humans by wildlife populations.
  
- III. The individual will know the characteristics of an ideal habitat that will contribute to successful game management for each game species. Specifically the student will be able to:
  - A. evaluate the elements of natural habitat.
  - B. select species that are compatible.
  - C. select vegetative types preferred by each species.
  - D. describe physical features of land that contribute to good habitat.
  - E. describe food preferences and feeding habits of wildlife species.
  
- IV. The individual will understand the importance of adapting land and farming practices to include desirable wildlife. Specifically the student will be able to:
  - A. provide food.
  - B. provide cover.
  - C. provide water.
  - D. define limiting factors.
  - E. seek assistance and advice from professional workers and agencies.
  - F. use available materials and facilities to provide for wildlife on his land.

- V. The individual will understand the importance of proper harvesting practices. Specifically the student will be able to:
- A. use appropriate methods to estimate game populations.
  - B. establish safe removal rate.
  - C. reserve necessary breeding stock.
  - D. determine age of harvested animals.
  - E. analyze harvest.
  - F. understand and conform to game laws.
- VI. The individual will understand the consequences of using improper harvesting practices. Specifically the student will be able to:
- A. define problems caused by imbalanced harvest.
  - B. estimate when species nears minimum unit of population.
  - C. describe symptoms of excessive hunting pressure.
  - D. list ways the farmer and hunter work together in carrying out proper harvesting practices.
  - E. describe signs of overpopulation.
- VII. The individual will understand how to adapt land and manage wildlife population to encourage reproduction of desirable species. Specifically the student will be able to:
- A. recognize and control diseases.
  - B. control predators.
  - C. accurately estimate the time for restocking.
  - D. select species that conform to limits of range.
  - E. determine when to use artificial propagation of game animals.
  - F. limit game to carrying capacity of land.
  - G. understand governmental programs that provide help for wildlife programs.



Activity: FORESTRY

## Problem Areas:

1. Determining the economic importance of forestry
4. Understanding forest ecology
6. Managing the forest
7. Reproducing the forest

Outline of Unit

## I. Determining the Economic Importance of Forestry

- A. Economic value
- B. Effect on watersheds, soil, and wildlife
- C. Recreational and scenic value
- D. Products obtained from trees
- E. Ownership of forest land
- F. Trends for the future

## II. Tree Identification

- A. Importance
- B. Identifying features

## III. Managing the Forest

- A. Analyzing the forest
- B. Intermediate cuttings
- C. Harvest cuttings

## IV. Reproducing the Forest

- A. Preparing the site
- B. Providing a source of seed
- C. Natural methods of reproduction
- D. Artificial methods of reproduction

## V. Understanding Forest Ecology

- A. Factors affecting the forest site
- B. Seed dissemination
- C. Plant succession
- D. Competition factors
- E. Forest types
- F. Even-aged and uneven-aged stands

## VI. Measuring and Marketing

- A. Units of measurement
- B. Log rules
- C. Measuring logs
- D. Estimating standing timber (board feet)
- E. Estimating standing timber (cubic feet)
- F. Marketing

- IV. The student will know how to identify desirable and undesirable tree species.. Specifically the student will be able to:
- A. identify physical features of trees which can be used in naming the trees.
  - B. identify leaves of forest trees native to Virginia.
  - C. diagram the parts of a leaf.
  - D. select undesirable species present when given available markets for forest products in a particular area and species of trees in a forest plot.
  - E. select species best suited for artificial reproduction when given conditions for a site.
- V. The student will comprehend measures involved in fighting and protecting the forest from fire. Specifically the student will be able to:
- A. identify tools that can be used for fighting forest fires.
  - B. distinguish the components of a fire.
  - C. select major causes of forest fires.
  - D. select the best procedure to follow in order to bring a fire under control when given the details of a particular forest fire.
  - E. identify information required to properly scout a forest fire.
  - F. identify safety precautions to follow when fighting a forest fire.
- VI. The student will understand how to protect the forest from disease, insects and animals. Specifically the student will be able to:
- A. identify the three most common insects which damage forest trees.
  - B. select the most desirable insect control measures to use when planting pine seedlings in a cutover pine area.
  - C. identify three major diseases which damage forest trees.
  - D. choose the best source for obtaining assistance in solving problems that deal with diseases and insects of forest trees.
  - E. identify animals that cause the greatest damage to forest trees.
  - F. distinguish ways that grazing adversely affects forest trees.
  - G. select the best measures for protecting forests from livestock.
- VII. The student will know how to apply ecological principles to the management of forest land. Specifically the student will be able to:
- A. recognize three major factors that affect tree growth on a forest site.
  - B. label the profile of a typical undisturbed forest soil.
  - C. outline the order of plant succession on a given forest site.
  - D. select species of forest trees which are able to endure heavy shade.
  - E. identify species of forest trees which are able to endure little or no shade.
  - F. distinguish the forest type when given the species composition of a forest site.
  - G. identify characteristics of an even-aged forest.
  - H. state recommendations for management when given existing conditions of a forest plot.
  - I. select trees to remove and leave for timber stand improvement when given existing conditions of a forest plot.

## VII. Protecting the Forest

- A. Forest fires
- B. Forest insects and diseases
- C. Animals

### Goal Statement

A manager of forest land determines the merits of using land for forest production; and, once land is committed to forest production, he determines the most profitable and ecologically sound ways to market the forest products. He takes measures to protect the forest from fire, disease, and insects while maximizing forest production.

### General and Specific Objectives

- I. The student will understand the procedures used for measuring forest products. Specifically the student will be able to:
  - A. identify the units of measurement used for forest products.
  - B. use the "VPI & SU Tree Scale" to measure length and diameter of logs.
  - C. use the "VPI & SU Tree Scale" to measure the height and diameter of standing trees.
  - D. compute volume in board feet by using the "International Rule 1/4 Inch Kerf Log Scale."
  - E. compute volume in cubic feet by using the "Tree Scale for Pulpwood."
  
- II. The student will understand the procedures for marketing forest products for the greatest economic return. Specifically the student will be able to:
  - A. identify methods of marketing forest products.
  - B. distinguish among the three types of bids used in selling forest products.
  - C. describe items that should be included in an agreement for selling forest products.
  - D. select the method of selling for the greatest economic benefit, given details of a particular wood lot.
  - E. determine whether a tree should be sold for saw timber or pulpwood, given saw log and pulpwood prices.
  
- III. The student will understand the procedures for forest reproduction. Specifically the student will be able to:
  - A. select the best method for producing a hardwood forest.
  - B. outline ways of reproducing a pine forest.
  - C. choose preferred methods for preparing a site for reforestation.
  - D. identify situations in which the Virginia Seed Tree Law applies.
  - E. select three conditions necessary for successful natural reproduction.

SOILS AND FERTILIZERS

Activity: SOILS

## Problem Area:

1. Understanding the nature and importance of soil

Outline of Unit

- I. Importance of Soil Study
  - A. In relation to plants
  - B. In relation to animals
- II. Origin of Soils
  - A. Factors affecting soil formation
  - B. Soil profile
  - C. Physical forces that affect soil
- III. Classes of Soil
  - A. Texture
  - B. Structure
  - C. Moisture holding capacity
- IV. Composition of Soil
  - A. Organic matter
  - B. Inorganic matter
- V. Soil Fertility
  - A. Commercial fertilizers
  - B. Organic fertilizers
  - C. Soil acidity or pH

Goal Statement

A person working in the agri-business industry must communicate with others about soils, support soil conservation activities, and seek professional assistance in making decisions concerning basic soil use.

General and Specific Objectives

- I. The student will have an appreciation of the importance of soil. Specifically the student will be able to:
  - A. compare the importance of soil to other basic resources.
  - B. distinguish between direct and indirect products of soil.
  - C. distinguish differences among soil, earth, and dirt.
  - D. identify basic needs of man that are supplied from soil.

- II. The student will understand how soils are formed. Specifically the student will be able to:
- A. describe the process of soil building.
  - B. define what is meant by a soil profile.
  - C. differentiate between topsoil and subsoil.
  - D. label a soil profile.
  - E. distinguish why more clay particles are found in subsoil than in topsoil.
  - F. identify the effect that topography or slope of land, has on the depth of soil.
  - G. explain how climate changes can break rock.
  - H. select reasons why parent material is closer to the surface on the top of a slope than in a valley.
  - I. distinguish differences between physical and chemical changes in soil.
- III. The student will have a basic knowledge of classes of soils. Specifically the student will be able to:
- A. distinguish a good soil from a poor soil.
  - B. categorize soil by its texture.
  - C. categorize soil by its structure.
  - D. differentiate between soil texture and soil structure.
  - E. select a desirable soil structure.
  - F. identify undesirable practices that cause topsoil to form a hard crust.
  - G. identify characteristics that allow for the greatest water holding capacity of soil.
- IV. The student will understand the composition of soil. Specifically the student will be able to:
- A. list groups of organic and inorganic materials found in topsoil.
  - B. identify organic matter soil ingredients.
  - C. describe how bacteria make insoluble soil minerals available to plants.
  - D. identify benefits of having matter in soil.
  - E. select type and depth of soil needed for good crop yield.
  - F. choose the form of food that plants can utilize.
- V. The student will have a knowledge of basic soil fertility requirements. Specifically the student will be able to:
- A. identify factors to consider in determining fertilizer requirements.
  - B. identify desirable fertilizer programs for given crops.
  - C. distinguish between organic and commercial fertilizer.
  - D. list the three major plant food elements
  - E. identify the meaning of 5-20-20 as it appears on a fertilizer bag.
  - F. distinguish the percent of organic matter, mineral matter, air, and water that an ideal soil should contain.
  - G. define soil acidity or pH.
  - H. select appropriate soil conservation practices in given situations.

Activity: FERTILIZERS AND MANURE

## Problem Areas:

1. Selecting and buying fertilizers
2. Maintaining the organic matter content of the soil

Outline of Unit

- I. Plant Nutrient Requirements
  - A. General plant requirements
  - B. Garden vegetable requirements
  - C. Field crop requirements
  - D. Lawn requirements
- II. Commercial Fertilizers
  - A. Natural sources
  - B. Artificial sources
- III. Cover and Crop Residue
  - A. Types of cover crops
  - B. Sources of crop residue
- IV. Farm Manures
  - A. Animal sources
  - B. Nutrients available from various sources
- V. Fertilizing
  - A. Determining amounts of various nutrients from various sources
  - B. Most economical sources of plant nutrients
  - C. Determining specific plant requirements

Goal Statement

The plant grower must select the most efficient fertilizer for his crops, based upon soil conditions, crop requirements, cost of commercial fertilizers, and availability of non-commercial fertilizers.

General and Specific Objectives

- I. The student will understand the importance of plant nutrients. Specifically, the student will be able to:
  - A. distinguish nutrients necessary to promote growth of stems, leaves, flowers, and seeds.
  - B. list the nutrients needed by plants to maintain themselves, including replacing and repairing damaged parts.
  - C. specify the various plant components.
  - D. identify the nutrients needed by plants to produce plant products.
  - E. identify the nutrients which are most important in aiding plants in resisting disease.

- F. identify the nutrients that must be returned to the soil in large quantities to aid plant growth.
  - G. explain why most Virginia soils do not have available necessary amounts of nutrients for normal growth.
  - H. explain why varying amounts of nutrients must be applied to different soils to provide for satisfactory plant growth.
  - I. list the varying plant nutrient requirements of several different plants.
- II. The student will understand what the sources of plant nutrients are. Specifically the student will be able to:
- A. identify methods for determining which nutrients are deficient in Virginia soils.
  - B. identify the various practical sources of plant nutrients.
  - C. identify the sources of nitrogen raw materials a commercial fertilizer may contain.
  - D. identify the source of phosphorus raw materials a commercial fertilizer may contain.
  - E. identify the source of potassium raw materials a commercial fertilizer may contain.
  - F. identify the sources of trace element raw materials a commercial fertilizer may contain.
  - G. select commercial fertilizers with the desired quantities of each nutrient needed for a specific plant.
  - H. justify use of a cover crop to protect plant nutrients.
  - I. specify the contributions of a green manure crop in providing plant nutrients.
  - J. explain how crop residues are of value to the soil.
  - K. select methods by which organic matter provides plant nutrients.
  - L. identify the plant nutrients provided by barnyard manure.
  - M. identify the methods of developing organic matter.
- III. The student will understand the functions of nutrients in plants. Specifically the student will be able to:
- A. state the value of nitrogen in plant growth and crop yield.
  - B. describe the role of phosphorus in plant development.
  - C. specify the value of potash to plant growth.
  - D. identify minor nutrients as constituents of plant tissue.
  - E. describe the catalytic effect of minor nutrients in plant functions.
- IV. The student will understand the analysis of fertilizers. Specifically the student will be able to:
- A. compute the pounds of actual nitrogen, phosphorus, and potash from the ratio printed on a commercial bag of fertilizer.
  - B. compute the pounds of actual filler from the ratio printed on a commercial bag of fertilizer.
  - C. calculate the formula appearing on a fertilizer bag containing specified ingredients.
  - D. calculate pounds of a specified grade of fertilizer needed per acre using soil test results.



- V. The student will know how to detect from observation specific nutrient deficiency symptoms in plants. Specifically the student will be able to:
- A. identify symptoms of nitrogen, phosphorus, potassium, magnesium, manganese, and boron deficiencies.
- VI. The student will know how to select and buy commercial fertilizers economically. Specifically the student will be able to:
- A. distinguish between premium and regular grades of commercial fertilizer of the same analysis.
  - B. identify the advantages of high analysis over lower analysis fertilizers of the same ratio.
  - C. locate information which will inform him of individual plant food utilization requirements for various crops, fruits, and vegetables.
  - D. get maximum return for money invested by using the principle of diminishing return in relation to fertilization.
  - E. compute a problem given a set of figures on yields due to fertilizer application per acre to determine at which point it did not pay to add more fertilizer.
  - F. compare the cost of one pound of concentrated mixture of nitrogen, phosphorus, and potassium in several examples with the same ratio with different costs given per grade.
- VII. The student will know how to estimate the amount of non-commercial fertilizer to apply. Specifically the student will be able to:
- A. locate information which will give accurate data as to nutrient composition of various types of manure and how much manure of a specific type is necessary to return exacting amounts of nutrients to the soil.
  - B. compute the average value of a ton of manure to different crops from given data of crop needs and prices of crops.

AGRICULTURAL BUSINESS

Activity: FARM BUSINESS

Unit C: Keeping and Using Farm Records

## Problem Areas:

1. Keeping farm records
2. Summarizing farm records
3. Analyzing and using farm records
4. Preparing income tax and social security reports

Outline of Unit

- I. The Importance of Keeping Records
- II. Financial Recordkeeping .
  - A. Systems of recordkeeping
    1. Enterprise
    2. Whole-farm
    3. Combination
  - B. Kinds of records
    1. Inventory
    2. Cash records
    3. Exchange records
- III. Summarizing Farm Records
- IV. Using Farm Records

Goal Statement

The farmer and agribusinessman must keep complete and accurate records. He must also make decisions and file reports based on summaries of information from his records.

General and Specific Objectives

- I. The student will have an appreciation of the importance of keeping complete and accurate records. Specifically the student will be able to:
  - A. identify reasons why records are kept on business transactions.
  - B. given specific information, select the information that would be most useful to a farm business.
  - C. identify examples of how recordkeeping can improve the supervised farming program.
  - D. recognize the consequences of inaccurate and incomplete recordkeeping.
  - E. recognize the prerequisites of keeping accurate records.

- II. The student will have an understanding of the construction of records. Specifically the student will be able to:
  - A. list the different kinds of records.
  - B. recognize examples of different kinds of records.
  - C. identify the uses of the different kinds of records.
  - D. recognize the essential parts of the different kinds of records.
  - E. identify the relationships between the different parts of records.
  - F. match systems of recordkeeping with their appropriate use.
  - G. given a specific situation, select the best system of recordkeeping.
  
- III. The student will have a working knowledge of the terms used in recordkeeping. Specifically the student will be able to:
  - A. differentiate between similar terms.
  - B. identify the terms.
  - C. recognize examples of the terms.
  - D. match terms with their appropriate definitions.
  
- IV. The student will be able to perform the mathematical skills necessary to keep records. Specifically the student will be able to:
  - A. given specific data, convert it to another specified form.
  - B. given needed formulas and information, compute specific information.
  - C. add numbers.
  - D. divide numbers.
  - E. multiply numbers.
  - F. subtract numbers.
  
- V. The student will be able to accurately record data in a recordkeeping system. Specifically the student will be able to:
  - A. given specific information, select the proper section of the record book to record this information.
  - B. read a column and a line.
  - C. find the point of intersection of a column and a line.
  - D. given specific information, demonstrate the skill of accurately recording information in the record book.
  
- VI. The student will know how to summarize records. Specifically the student will be able to:
  - A. identify information to be summarized.
  - B. identify the summaries to be made for each kind of record.
  - C. define a summary.
  - D. given specific information, demonstrate skill in making a summary.

VII. The student will know how to use records. Specifically the student will be able to:

- A. identify uses for records.
- B. identify the records needed for specific uses.
- C. given specific information, compute the analysis of an enterprise.

Activity: OFF-FARM BUSINESS

Unit E: Selling Agricultural Products, Supplies, and Services

## Problem Areas:

1. Understanding selling techniques
2. Operating business machines and equipment
3. Preparing sales tickets and making change
4. Estimating materials and costs for jobs
5. Understanding marketing regulations

Outline of Unit

## I. Understanding Selling Techniques

- A. Meeting customers
- B. Gathering and using information
- C. Gathering and using information on products
- D. Fitting products and customers to each other
- E. Capitalizing on good physical appearance

## II. Operating Business Machines and Handling Money

- A. Operating a cash register
- B. Operating an adding machine
- C. Making change

## III. Preparing Sales Tickets

## IV. Estimating Materials and Costs

Goal Statement

The salesperson in the agriculture industry must be able to evaluate customers and assist them in the efficient selection of products or services which meet their needs. He must do this in a manner which creates a good relationship between buyer and seller. The agriculture salesperson needs skill in the operation of cash registers, making change, making out and filing sales tickets, and estimating materials and their cost.

General and Specific Objectives

- I. The student will know how to analyze customers to determine their goals and moods. Specifically the student will be able to:
  - A. identify customer goals in order of importance.
  - B. list the three most important things in determining customer goals and moods.
  - C. list characteristics that indicate a customer mood of confidence.
  - D. list characteristics that indicate a customer mood of tolerance.
  - E. list characteristics that indicate a customer mood of challenge.

- II. The student will be able to apply what he has learned about customer goals and moods to assist customers in the selection of products. Specifically the student will be able to:
- A. identify customer buying motives from a simulated example.
  - B. distinguish customer stated needs from real needs in a simulated example.
  - C. determine a proper customer decision even when the buying motive is wrong in a simulated situation.
- III. The student will have a basic understanding of the products he sells. Specifically the student will be able to:
- A. list sources of information for a given product.
  - B. list types of information available for a given product.
  - C. list methods for securing information about a given product.
- IV. The student will understand how to select a product to fit customer needs and desires. Specifically the student will be able to:
- A. list questions that a salesman can ask himself to determine if he has properly analyzed a product.
  - B. given the characteristics of a product, determine the type customer the product would most likely suit.
- V. The student will have a working knowledge of good sales techniques. Specifically the student will be able to:
- A. list good sales techniques.
  - B. given the characteristics of both the customer and the product, choose the most desirable sales technique.
  - C. given a simulated situation, distinguish desirable sales techniques from undesirable ones.
- VI. The student will appreciate the importance of good physical appearance in selling. Specifically the student will be able to:
- A. list reasons why a salesman needs a good physical appearance.
  - B. list factors which determine a good physical appearance.
  - C. identify factors which indicate a good physical appearance for a given sales position.
  - D. identify factors which indicate a good physical appearance for selling a given product.
- VII. The student will appreciate the importance of proper speech in good selling. Specifically the student will be able to:
- A. list reasons why a good salesman should use proper speech.
  - B. list aspects of proper speech for a salesman.
  - C. match definitions to words used in describing proper speech.

- VIII. The student will know how to handle sales transactions using appropriate business machines; handle money properly; and complete sales tickets accurately. Specifically the student will be able to:
- A. list steps in using the cash register.
  - B. list steps in handling money properly.
  - C. identify occasions in which the adding machine should be used.
- IX. The student should have the knowledge to accurately estimate materials and their cost in order to meet the customer's needs. Specifically the student will be able to:
- A. given information about a job and a product, calculate the amount of the product to use.
  - B. given the amount of product needed and the cost per unit, compute the total cost.



ORNAMENTAL HORTICULTURE

Activity: IDENTIFYING ORNAMENTAL PLANTS AND THEIR CHARACTERISTICSProblem Areas:

1. Identifying parts and characteristics of plants
2. Identifying ornamental plants by common and scientific names

Outline of Unit

- I. Importance of Identifying Ornamental Horticulture Plants and Weeds
- II. Terms and Vocabulary Necessary to Understand the Common and Scientific Names, the Parts and Description of Identifying Characteristics of the Plant
- III. Ways of Identifying Plants
- IV. List of Plants by General Groups Adaptable to the Area by Scientific and Common Name and Identifying Characteristics

Goal Statement

A horticulturist identifies the individual plant specimen, adaptable to a given area, by common name, by scientific name and by identifying characteristics.

General and Specific Objectives

- I. The student will understand the importance of identifying desirable and undesirable ornamental horticulture plants by common and scientific names. Specifically the student will be able to:
  - A. describe one reason for being able to identify a plant by its common name.
  - B. describe one reason for being able to identify a plant by its scientific name.
  - C. describe one reason for being able to identify harmful plants.
- II. The student will understand how to use a hardiness zone map. Specifically the student will be able to:
  - A. describe a hardiness zone map.
  - B. locate a hardiness zone map.
  - C. describe the advantage of using a hardiness zone map.
- III. The student will understand how to determine the characteristics of an area in order to locate that area on the hardiness map. Specifically the student will be able to:
  - A. locate a given geographical area in a particular zone, given a hardiness zone map.
  - B. list the factors which determine the zone on the hardiness zone map in which a given geographical area is placed.
  - C. describe the conditions whose existence in an area may help plants to resist extremes in weather and thereby influence the zoning of that area.

- IV. The student will understand the importance of using reliable sources of information in identifying and describing characteristics of desirable and undesirable plants in ornamental horticulture. Specifically the student will be able to:
- A. locate and give title, author and publisher of four reliable sources of information for identifying and describing characteristics of desirable plants in ornamental horticulture.
  - B. describe the characteristics of a reliable reference for identifying and describing desirable ornamental horticulture plants.
  - C. describe the characteristics of a reliable reference for identifying and describing undesirable plants.
- V. The student will understand the ways in which plants are identified. Specifically the student will be able to:
- A. describe the way plants are identified by leaf.
  - B. describe the way plants are identified by bloom.
  - C. describe the way plants are identified by shape.
  - D. describe the way plants are identified by color.
  - E. describe the way plants are identified by habit of growth.
  - F. describe the way plant characteristics relate to common names of plants.
- VI. The student will understand the terminology used in ornamental horticulture to identify and describe specimens. Specifically the student will be able to:
- A. locate terms which are necessary in describing ornamental horticulture plants, given a reliable source.
  - B. interpret descriptions of plants as they are written in a nursery catalog.
  - C. evaluate the nursery catalog description to determine if all essential descriptive information is included.
- VII. The student will know how to describe the characteristics of desirable and undesirable ornamental horticulture plants. Specifically the student will be able to:
- A. describe the identifying characteristics of grasses.
  - B. describe the identifying characteristics of ground covers.
  - C. describe the identifying characteristics of vines.
  - D. describe the identifying characteristics of shrubs.
  - E. describe the identifying characteristics of trees.
  - F. describe the identifying characteristics of annuals, biennials, and perennials.
  - G. describe the identifying characteristics of bulbs, corms, and tubers.
  - H. describe the identifying characteristics of roses.
  - I. describe the identifying characteristics of weeds.

VIII. The student will know how to identify desirable and undesirable ornamental horticulture plants. Specifically the student will be able to:

- A. identify the common name of grasses from pictures.
- B. identify the common name of ground covers from pictures.
- C. identify the common name of shrubs from pictures.
- D. identify the common name of trees from pictures.
- E. identify the common name of annuals from pictures.
- F. identify the common name of biennials from pictures.
- G. identify the common name of perennials from pictures.
- H. identify the common name of bulbs from pictures.
- I. identify the common name of rhizomes from pictures.
- J. identify the common name of weeds from pictures.
- K. identify the common name of harmful plants from pictures.

IX. The student will understand how to develop a list of desirable and undesirable plants by scientific and common names, with identifying characteristics, which is applicable to a given area. Specifically the student will be able to:

- A. describe the benefit derived from consulting area nurserymen.
- B. describe the services made available through the county extension agent.
- C. describe the resources which are available at a university.

Activity: PROPAGATING ORNAMENTAL PLANTS

## Problem Area:

1. Propagating plants from seeds

Outline of Unit

- I. Importance of Reproduction by Seed
- II. The Germination Process
- III. Viability of Seed
- IV. Conditions for Germination
  - A. General
  - B. Internal seed conditions
  - C. Environmental

Goal Statement

The grower (student) will produce various types of plants by seed, using several methods of seed propagation, and evaluate results.

General and Specific Objectives

- I. The student will understand the economic importance of propagation by seed. Specifically the student will be able to:
  - A. compare the time needed to produce a plant by seed as compared to various asexual methods.
  - B. recognize the value factor in production of new varieties of plants.
  - C. determine factors which would influence cost differences in producing plants sexually and asexually.
  - D. compare the cost of storing, caring for, and preparing seeds to the cost of cuttings and other asexual media.
- II. The student will understand the importance of securing seed from a reliable source. Specifically the student will be able to:
  - A. evaluate various methods of seed harvesting.
  - B. compare values of different methods of storing seed.
  - C. evaluate the types of materials used for packaging seeds for sale.
  - D. evaluate the guarantees on a given group of packages for viability, germination rates, trueness to variety, etc.
  - E. compare seed sources for reliable service reputation, longevity, popularity with local businesses and other valuable data.
  - F. explain the values of certification.
  - G. describe how to perform viability tests.

- III. The student will understand the various methods of germination of seeds. Specifically the student will be able to:
- A. identify advantages of various seeding methods.
  - B. identify disadvantages of seeding methods.
  - C. make a comparison of labor, time and cost for different seeding methods.
  - D. select best seeding method for a given plant under specific conditions.
  - E. match desirable germination method for a given list of plants.
- IV. The student will understand the influence of internal conditions of seed for germination. Specifically the student will be able to:
- A. identify methods of conditioning seed for germination.
  - B. judge quality of seed from observation.
  - C. explain how to test seed for viability.
  - D. match the different parts of a seed with their function as to germination.
  - E. identify seed with the type of rest (stratification) required.
- V. The student will understand environmental influences affecting seed germination. Specifically the student will be able to:
- A. select the most desirable soil texture for seeding.
  - B. determine the proper soil acidity or solubility.
  - C. determine the desired soil moisture.
  - D. select the best method of soil fertilizing.
  - E. select proper types of fertilizer.
  - F. determine level of fertilization.
  - G. determine proper soil and air temperature.
  - H. determine desirable air movement.
  - I. describe the desirable degree of lighting.
  - J. explain how to produce germ or disease free conditions.
- VI. The student will understand the factors affecting the growth of seedlings. Specifically the student will be able to:
- A. select healthy stock.
  - B. identify disease conditions.
  - C. select disease controls for given conditions.
  - D. select proper transplanting method.
  - E. determine fertilization rate and method.
  - F. select watering method and rate.
  - G. determine amount of light desired.
  - H. identify the effects of light on plants.
  - I. select proper spacing for given plants.

Activity: PROPAGATING ORNAMENTAL PLANTS

Problem Area:

2. Propagating plants from cuttings

Outline of Unit

- I. Importance of Reproducing Plants by Cuttings
  - A. Maintain true variety
  - B. Expand volume of an individual plant
- II. Types of Cuttings
  - A. Stem cutting
    1. Hardwood
    2. Semi-hardwood
    3. Soft wood
    4. Herbaceous
  - B. Leaf cutting
  - C. Leaf-bud cutting
  - D. Root cutting
- III. Procedures to Use in Making Various Cuttings
  - A. Method for each type cutting
  - B. Most desirable time to secure cutting
  - C. Type of stock to use
  - D. Equipment used
- IV. Preparation of Cutting for Rooting
  - A. Callusing
  - B. Wounding
  - C. Root inducing materials
- V. Media Characteristics for Rooting Cuttings
  - A. Moisture retention
  - B. Weight of material
  - C. Expansion and contraction of material
  - D. Availability and cost
  - E. Maintaining structure under sterilization
  - F. Acidity and chemical characteristics
- VI. Placing Cuttings in Media
  - A. Preparation
  - B. Procedure
- VII. Care During Rooting
  - A. Light
  - B. Temperature range and method
  - C. Moisture level and methods
  - D. Aeration

## VIII. Preparing Cuttings for Transplanting

- A. Hardening of rooted cuttings
- B. Placing in containers
- C. Special methods for different species

### Goal Statement

The grower produces various plants by each type of cutting and cares for these until he has a marketable product of high quality.

### General and Specific Objectives

- I. The student will understand terminology. Specifically the student will be able to:
  - A. define certain terms used in connection with plant propagation.
  - B. interpret whether terminology is used correctly in a sample data sheet.
  - C. identify specified plant materials and cuttings using correct terms.
  - D. determine whether a labeled drawing of plants uses proper terminology.
  - E. given a choice of written reports, select the report with correct terminology.
  
- II. The student will understand the need for different types of cutting in asexual propagation. Specifically the student will be able to:
  - A. select proper cutting for specific plants.
  - B. determine the proper time to obtain cuttings.
  - C. select methods of handling cuttings.
  - D. evaluate cuttings of each type.
  - E. select the portion of the parent plant which yields highest quality cuttings.
  - F. identify types of cuttings.
  
- III. The student will understand the influence of environmental factors on root development of cuttings. Specifically the student will be able to:
  - A. select proper air temperature to aid root development.
  - B. determine the benefits of bottom heat to root development.
  - C. describe the effect of light intensity on root development.
  - D. explain how to determine the frequency of watering.
  - E. describe methods for watering cuttings.
  - F. evaluate the economics of different watering systems.
  - G. distinguish between factors for air movement requirements.
  - H. explain how to select proper humidity levels.
  - I. correct soil acidity conditions to suit plant specifications.
  - J. determine causes of soluble salt build-up in soils.



- IV. The student will appreciate the influence of chemical and physical properties of root mediums. Specifically the student will be able to:
- A. determine the effect of sterilization on different types of media.
  - B. determine when toxic levels are present in media.
  - C. identify valuable characteristics of media.
  - D. distinguish between the conditions where media weight would or would not be a problem.
  - E. select the most economic media.
- V. The student will develop an appreciation for the influence of root promoting substances on economic production. Specifically the student will be able to:
- A. determine valuable chemicals and hormones present in different brands of root promoting substances.
  - B. determine the importance of time saved by root promoting substances.
  - C. determine the substance most valuable to a specific plant.
  - D. select a method of determining the value of substance to a plant.
  - E. interpret the meaning of an experiment from chart or graph data on rooting substance effect.
- VI. The student will understand management of environmental factors which influence root development of cuttings. Specifically the student will be able to:
- A. explain how environmental conditions affect root development.
  - B. identify plant diseases common to propagation by cuttings.
  - C. given insect damages, identify the type of insect connected with the specific damage.
  - D. given a plant disease, select an appropriate fungicide for control of that disease.
  - E. given a specific insect, select a suitable insecticide for control of that insect.
- VII. The student will understand the procedures and value of hardening-off in connection with successful transplanting of rooted cuttings. Specifically the student will be able to:
- A. distinguish between proper and improper management practices in hardening-off rooted cuttings.
  - B. describe the value of hardening-off to successful transplanting of rooted cuttings.
  - C. select the type of transplanting best suited for each plant type.
  - D. describe the importance of lining-out rooted stock in a field planting.
  - E. describe methods of winter protection to transplanted material.

Activity: PROVIDING PLANT GROWING STRUCTURES

## Problem Area:

1. Selecting types of structures

Outline of Unit

- I. Selecting the Growing Structure
  - A. Greenhouses (framed)
    1. Glass
    2. Plastic
    3. Fiberglass
  - B. Self-supported greenhouses
- II. Installing the Heating System
  - A. Steam
  - B. Hot water
  - C. Forced hot air
  - D. Electric
- III. Selecting and Installing the Air Cooling System
  - A. Arctic or rotary drum cooling
  - B. Fan and pad washed air
  - C. High pressure fogs
- IV. Installing the Ventilation System
  - A. Roof panel
  - B. Side panel
  - C. Fan-jet and tube
- V. Installing Optional or Labor Saving Devices
  - A. Growing benches
  - B. Misting systems
  - C. Automatic watering systems
  - D. Turbulator fans
  - E. Fertilizer injection equipment
  - F. Carbon-dioxide generators
  - G. Temperature and relative humidity indicators
  - H. Time clocks
  - I. Shade systems
  - J. Automatic lighting systems

Goal Statement

The horticulturist must evaluate different types of greenhouse structures and methods of heating, cooling, watering, ventilating, and cropping procedures and select the most efficient structure and equipment for commercially growing the crop of his choice.

General and Specific Objectives

- I. The student will understand the information needed in selecting a commercial plant for production in an artificial environment. Specifically the student will be able to:
  - A. list holidays in which plant materials are appropriate gifts.
  - B. determine plant species that produce desirable flowers or foliage for cut flower arrangements.
  - C. determine plant species that produce desirable materials for potted specimens.
  - D. determine why some plants are grown in an artificial environment even when the outside environment should be right for growth.
  
- II. The student will understand the characteristics of different types of plant growing structures. Specifically the student will be able to:
  - A. determine the various types of plant growing structures that offer environmental control.
  - B. determine the most desirable plant growing structure for a given crop.
  - C. determine the maintenance requirements for a given period of time.
  - D. compute the labor requirements for a given period of time.
  - E. evaluate each type of structure as to the production of a specified commercial crop.
  
- III. The student will understand the costs involved in different types of plant growing structures. Specifically the student will be able to:
  - A. given certain cost figures and assuming that the structure frame costs are equal, compare the cost per square foot for glass, plastic and fiberglass covers.
  - B. given glass, fiberglass, and plastic covers, evaluate each for a twenty year period as to:
    1. maintenance requirements
    2. life-time expectancy
    3. quality of plants produced
    4. quality of light admitted
  
- IV. The student will determine the most efficient heating system for a specific type of greenhouse. Specifically the student will be able to:
  - A. determine the different types of heat available in the local area.
  - B. determine the cost per unit for the different types of heat.
  - C. determine the effects of radiant types of heat upon a given crop.
  - D. determine the effects of forced hot air heat types upon a given crop.

- V. The student will understand the different methods of air-cooling systems for greenhouses. Specifically the student will be able to:
- A. determine the best situations for a rotary drum air cooling system.
  - B. determine the effects of a fan and wet-pad on air cooling a greenhouse.
  - C. analyze the effects of high pressure fog in air cooling.
- VI. The student will determine the most efficient air-cooling system for a specific type of greenhouse. Specifically the student will be able to:
- A. given a plastic covered gothic greenhouse, determine the best air cooling system to install.
  - B. given a corrugated fiberglass greenhouse, determine the most efficient air cooling system.
  - C. given a glass greenhouse determine the most efficient air cooling system.
  - D. determine if air cooling is possible in a self-supported plastic greenhouse.
- VII. The student will understand the different types of ventilation systems for greenhouses. Specifically the student will be able to:
- A. evaluate roof ventilation systems.
  - B. determine the value of side panel ventilation.
  - C. determine the effects of wet-pad and fan ventilation.
  - D. compare the three above types of ventilation.
- VIII. The student will understand and evaluate the optional equipment which may be expensive to begin with, but labor saving or essential for the production of a particular cropping operation. Specifically the student will be able to:
- A. describe the most desirable width, height, and arrangement for cropping benches.
  - B. analyze the needs for a misting system.
  - C. determine the advantages of an automatic watering system.
  - D. determine the importance of a turbulator fan.
  - E. analyze the advantages provided by an automatic fertilizer injection system.
  - F. determine the crops in which the addition of carbon dioxide by CO<sub>2</sub> generator would be beneficial.
  - G. describe the usage of temperature indicators.
  - H. describe the needs of a relative humidity indicator
  - I. determine the advantages of a time clock system.
  - J. identify the needs of a shading system for crop production.
  - K. identify the needs for an automatic lighting system for a given crop.

Activity: POINSETTIASOutline of Unit

- I. Importance of Poinsettias as a Plant Produced for Commercial Sales
- II. Selecting Variety and Producing Plants from Stock Cuttings for Liners
- III. Selecting Variety and Purchasing Cuttings or Rooted Plants for Liners
- IV. Producing Plants for Sale
- V. Preparing Plants for Sale
- VI. Selling Plants
- VII. Helping Poinsettia Plant Purchasers Develop an Appreciation of and the Ability to Care for Their Plants to Make Them More Enjoyable

Goal Statement

A horticulturist must be able to correctly recognize and evaluate potential markets, costs and returns and select the most economical and feasible production methods, determine the most profitable marketing possibilities, prepare for market, and help develop customer satisfaction for each plant that is produced.

General and Specific Objectives

- I. The student will understand how to recognize and evaluate the potential markets available in a given area for the different varieties of poinsettias. Specifically the student will be able to:
  - A. describe how to locate and list all markets in a given marketing area.
  - B. describe how to obtain and compile data through a survey to determine the number of each variety bought by each market and at what price.
- II. The student will understand how to estimate cost of a delivered plant to the market. Specifically the student will be able to:
  - A. explain how to estimate cost of propagating own cuttings, of growth, and of marketing plants to a given market.
  - B. explain how to estimate cost of purchasing cuttings, of growing, and of marketing plants to a given market.
- III. The student will know how to economically produce good quality poinsettias for a selected market. Specifically the student will be able to:
  - A. plan a production program and follow it for the most economical production of each variety.

- B. select and describe the right type of propagation structure.
  - C. select and describe how to operate the right equipment for economical propagation.
  - D. select and explain how to sterilize the right soil for economical propagation.
  - E. describe how to use methods to control growth-maturity date, diseases and insects.
  - F. identify the right people and sources to secure correct information.
- IV. The student will know how to completely finish the preparation and delivery of poinsettias for a selected market. Specifically the student will be able to:
- A. explain how to prepare finished plant--soil and pot for market.
  - B. describe proper preparation of the plant for market delivery.
  - C. tell how to properly select the plant.
  - D. explain how to follow through on the delivery of the plant.
- V. The student will know how to effectively sell the finished poinsettia on a selected market for a maximum profit. Specifically the student will be able to:
- A. describe a pricing schedule.
  - B. tell how to determine the method of billing and payment.
  - C. explain how to execute and follow a contractual agreement.
- VI. The student will know how to help potential and actual purchasers to appreciate and care for the poinsettia that has been grown for sale. Specifically the student will be able to:
- A. describe how to display the plant most effectively.
  - B. explain the care for the plant during its display before sale.
  - C. prepare written or give oral suggestions for the annual care of the plant.
- VII. The student will know how to keep and analyze cost records to determine the most economical methods of producing and selling poinsettias on a given market. Specifically the student will be able to:
- A. describe accurate cost records in detail.
  - B. analyze records to show the cost of each segment of production and marketing.
- VIII. The student will know how to use the analysis of cost records of lower production cost. Specifically the student will be able to:
- A. list people who can give information in ways of lowering costs.
  - B. tell how to devise and implement ways of lowering costs.
- IX. The student will know how to keep and analyze sales records and initiate ways to improve income. Specifically the student will be able to:
- A. describe an accurate and detailed sales record.
  - B. describe an accurate and detailed billing and payment record.

- C. analyze in detail--the sales records.
- D. explain how to initiate improvements in sales and sales records.

Activity: LANDSCAPING

## Problem Area:

1. Making the Landscape Design

Outline of Unit

- I. Value of Home Landscaping
- II. Determining the Objectives of the Design
- III. Locating the Landscape Areas on the Lot Plan
- IV. Designing the Landscape Areas
- V. Selecting and Designing Landscape Structures
- VI. Selecting and Designing Plant Groupings
- VII. Selecting Plant Material
- VIII. Budgeting the Design Costs

Goal Statement

The homeowner or renter selects a landscape design for his home grounds which maximizes the beauty and utility of outdoor space.

General and Specific Objectives

- I. The student will appreciate the value of well-designed home grounds. Specifically the student will be able to:
  - A. describe how well-designed home grounds contribute to the loan and resale value of the home.
  - B. identify architectural shortcomings of houses that can be overcome by landscaping.
  - C. identify the outdoor living areas that contribute most to family living.
  - D. suggest features of home grounds that would contribute to community attractiveness.
  - E. identify gardening activities that can be used as recreation or hobbies by various age groups.
  - F. select the factors that make outdoor living space desirable.
  - G. differentiate useful and attractive surface area designs from inappropriate designs.
- II. The student will understand the relationship which should exist between the landscape design areas and the total home grounds. Specifically the student will be able to:
  - A. relate the location of grounds living areas to home living areas.
  - B. describe traffic patterns between living areas.
  - C. describe noise patterns that exist between living areas.
  - D. select appropriate visual patterns.



- E. explain how to determine if competition between the areas for space has been appropriately reconciled.
  - F. identify plant and structural materials that will contribute to design unity.
  - G. select ways to deal appropriately with existing on-site factors.
  - H. explain how to determine if the design is influenced by off-site limitations and opportunities.
  - I. locate site problems on a design plan.
  - J. recognize conditions that might constitute site problems.
- III. The student will understand the contribution different plants may make to the design area. Specifically the student will be able to:
- A. identify the major purposes of plants within a given design area.
  - B. select plant characteristics needed to fulfill a design purpose.
  - C. describe an appropriate procedure for determining if plants have characteristics suitable for a given purpose.
  - D. select plants which are hardy in the area and that have desirable characteristics.
  - E. identify blooming time of individual plants selected.
- IV. The student will understand the characteristics of a design to be used as the basis for installing the home grounds landscape. Specifically the student will be able to:
- A. explain how to determine if the scale used is appropriate for the size of the site and type of design.
  - B. select views of drawings that clearly locate a feature on the design.
  - C. describe the type of drawing detail needed for a specific planting or feature.
  - D. identify categories of information that are needed in a design plan.
  - E. identify reliable sources of landscape design information.
- V. The student will understand the need to estimate the cost of installing a home grounds landscape. Specifically the student will be able to:
- A. categorize landscape installation expenses.
  - B. rank the categories of installation expense in order of magnitude.
  - C. select a budget period for amortizing the expense of a landscape plan.
  - D. calculate the ratio of the cost of landscaping home grounds to total home costs.
  - E. identify possible cost reducing adjustments in a cost estimate.
- VI. The student will recognize the need for climate modification. Specifically the student will be able to:
- A. predict climatic problems peculiar to a given site.
  - B. identify plant types to use as climate modifiers.
  - C. select materials and construction features that can provide climate modification.

- VII. The student will understand the importance of selecting landscape arrangements and features which meet the needs of the family. Specifically the student will be able to:
- A. recognize design elements in an arrangement of plants and material.
  - B. identify the element of design that might create a needed effect in a landscape.
  - C. describe the influence upon the family of omitting a particularly desirable design arrangement or feature.
  - D. compare the desirability of a children's play yard in the home grounds to the use of a public park nearby.
  - E. identify features that would aid the safe use of home grounds.
  - F. describe how surfacing materials add to the use derived from outdoor living space.
- VIII. The student will know how to integrate the needed landscape areas into an efficient and satisfying arrangement. Specifically the student will be able to:
- A. identify design elements that give unity to a home landscape.
  - B. locate incongruous features in a home landscape design.
  - C. analyze the long term effects of a landscape plant or feature.
  - D. identify the maintenance requirements of a design area.
  - E. identify designs that allow for use of space for several different activities.
- IX. The student will analyze family activities which utilize outdoor space. Specifically the student will be able to:
- A. identify outdoor activities and interests of various age groups.
  - B. select suitable equipment for outdoor activities.

Activity: LANDSCAPING

## Problem Area:

## 2. Establishing the Landscape Design

Outline of Unit

- I. Reading the Blueprint
- II. Laying Out the Landscape Plan
- III. Grading the Site
- IV. Constructing Landscape Structures
- V. Soil Modification
- VI. Securing Nursery Stock
- VII. Planting Ornamentals
- VIII. Establishing Turf

Goal Statement

Landscape installers install plant materials and landscape features according to a landscape design. The successful installer works safely and efficiently for the benefit of himself and his employer.

General and Specific Objectives

- I. The student will understand the contribution of the landscape installer to the landscape business. Specifically the student will be able to:
  - A. describe the position of landscape installer as it relates to the organizational chart of the landscape business.
  - B. compare the work of the landscape installer with the work of other positions in the landscape business.
  - C. explain how the quality of the work done by the landscape installer contributes to customer satisfaction.
- II. The student will appreciate the value of proper installation of plants and construction features to the landscape. Specifically the student will be able to:
  - A. select the best installation technique for bare root plants.
  - B. determine whether or not a plant disorder is due to faulty installation.
  - C. select suitable construction features for a specific purpose.
- III. The student will understand the importance of proper use and maintenance of equipment in installing landscape plants and construction features. Specifically the student will be able to:
  - A. recognize the types of power take-off drives used to attach a power unit to equipment needed in landscape installation.

- B. point out moving parts of a power unit that should be guarded.
  - C. describe the procedure for safely starting a power-driven planting auger.
  - D. match the types of lubricants to lubrication use on a power mower.
  - E. describe the operation performed by specific items of equipment.
- IV. The student will understand the importance of properly installing plant supports and protection. Specifically the student will be able to:
- A. describe the correct support in relation to the size of a plant.
  - B. select the proper installation for items of support and protection for a given plant.
  - C. describe the preventive item of support for specific damaging forces.
  - D. estimate the cost of protective supports in relation to damage prevented.
- V. The student will understand the effect of planting soil upon the success of the planting. Specifically the student will be able to:
- A. determine the necessary amendments to a given set of soil conditions for a specific plant.
  - B. understand the reasons for taking a soil sample and having it analyzed.
  - C. predict the fate of given plants in particular soil types.
  - D. select plants which will grow best in a given soil.
- VI. The student will be able to communicate proper maintenance procedures to customers. Specifically the student will be able to:
- A. respond satisfactorily to typical customer questions regarding plant watering.
  - B. respond satisfactorily to typical customer questions regarding plant pruning.
  - C. respond satisfactorily to typical customer questions regarding plant fertilizing.
  - D. define words which are characteristic of the business.
- VII. The student will understand the importance of safe and proper use of materials in building construction features. Specifically the student will be able to:
- A. select suitable materials for given construction features.
  - B. identify phrases describing unsafe working conditions.
  - C. associate bonding or joining methods with given materials.
  - D. justify the use of proper foundations for construction features.
  - E. estimate costs of certain construction features.
- VIII. The student will understand the importance of proper transportation of plants. Specifically the student will be able to:
- A. recognize proper procedures for protecting plants to be transported.

- B. recognize the advantages of the proper procedure for stacking container-grown plants on trucks.
  - C. describe how plants may be damaged if improperly transported.
  - D. explain the economic reasons for following proper practice in transplanting plants.
- IX. The student will understand the relation of proper pruning at planting to plant survival and growth. Specifically the student will be able to:
- A. select the percentage of top growth to prune away.
  - B. select pruning locations from a labeled diagram of a plant to produce a given type of growth.
- X. The student will understand the drainage requirements of plants. Specifically the student will be able to:
- A. select items describing soil conditions that require additional drainage from items that describe well drained or adequately drained conditions.
  - B. identify soil texture by touch.
  - C. relate percolation rate to soil texture.
  - D. explain why plants may wilt in a poorly drained situation.
- XI. The student will be able to recognize properly installed drainage systems. Specifically the student will be able to:
- A. choose drainage materials from a list of general hardware and supplies.
  - B. select a drainage installation suited to planting situations.
  - C. describe a good drainage system.
- XII. The student will be able to interpret and lay out a landscape design on the site. Specifically the student will be able to:
- A. match landscape symbols with names or descriptions of the plant or construction feature indicated.
  - B. choose words and symbols to represent a specific plant or construction feature.
  - C. decide whether a representation is sufficiently meaningful to allow for successful interpretation.
- XIII. The student will be able to safely and properly apply long term pesticides. Specifically the student will be able to:
- A. select the trade name of a commonly used long term pesticide.
  - B. given a pesticide label, choose from a list of applications those that would be safe for that pesticide.
  - C. given the name of a long term pesticide and the application to be made, choose a piece of equipment that could apply the pesticide successfully.

- XIV. The student will be able to prepare and follow work schedules. Specifically the student will be able to:
- A. locate faults in a work schedule.
  - B. put in order of performance the tasks involved in sodding a lawn.
  - C. given a jumbled list of tasks for several operations with time allocations for each and a specific operation to be performed, estimate man hours required to perform the operation.
- XV. The student will be able to install effective irrigation systems. Specifically the student will be able to:
- A. given a description of an irrigation system and its purpose, determine if it is complete.
  - B. select the type of irrigation suited for a particular application.
- XVI. The student will be able to seed or sod lawns. Specifically the student will be able to:
- A. select the names of common lawn grasses in a given area from a merchant's seed list.
  - B. given the design plan, calculate the square feet of sod needed for a landscape.
  - C. eliminate from a list of soil conditions those that are not suitable for lawn establishment.
- XVII. The student will be able to communicate with designers, nurserymen and laborers. Specifically the student will be able to:
- A. describe problems in installing a design feature to a designer.
  - B. describe a landscape plant by trade name, plant characteristics and landscape use.
  - C. select the best procedure for communicating an installation procedure to a laborer.

Activity: GROWING TURFS AND LAWNSProblem Areas:

1. Selecting varieties and seed
2. Planting and sodding
3. Maintaining
8. Controlling weeds
9. Controlling insects
10. Controlling diseases

Outline of Unit

- I. Establishment of the New Lawn
  - A. Lawn building
    1. Grading--for surface drainage and moulding into a desirable shape
    2. Soil preparation, fertility, soil requirements
  - B. Selecting seed varieties
    1. Seed selection and mixtures for the site
    2. Requirements of grasses, germination problems
    3. Sources of seeds and costs
  - C. Seeding the new lawn
    1. When and how to sow the seed selected
    2. Lawn mulches
    3. Irrigation and watering
    4. Management and care until it is established
  - D. Sodding the new lawn
    1. Various sods and their establishment
    2. Lifting the sod and its care during movement
    3. Resetting the sod
    4. Management and care of the sod until it is established
- II. Maintenance of Lawn Turf
  - A. Management of the established lawn turf
    1. Mowing, trimming, edging and cleaning
    2. Fertilization, schedules and materials
    3. Top dressing and aeration
    4. Watering and quantities
    5. Identification and control of weeds
    6. Identification and control of insects
    7. Identification and control of diseases
    8. Maintenance and problems by seasons
  - B. Management of lawn turf in a deteriorated condition
    1. Determining causes of deterioration
      - a. Soil compaction
      - b. Poor drainage
      - c. Heavy matting
      - d. Pest damage
      - e. Poorly adapted plant species
      - f. Competition from other landscaping plants
      - g. Poor management practices
      - h. Physical damage
    2. Recommended practices to correct deterioration

### Goal Statement

The agricultural worker who establishes and maintains lawn turf must determine the best way to produce lawns that meet both aesthetic and useful purposes. He must know how to select seed, handle sod, treat problems, and apply chemicals for disease and pest control in the most efficient manner.

### General and Specific Objectives

- I. The student will know terminology used in the lawn turf industry. Specifically the student will be able to:
  - A. define new terms introduced in the unit.
  - B. identify terms common to the lawn turf industry when given a list of agronomic terms.
  
- II. The student will understand how to carefully prepare a lawn site for seeding. Specifically the student will be able to:
  - A. list the steps of site preparation in a logical order.
  - B. choose the best method of discharging excess surface water from a lawn area when given the slope and/or grade of the site.
  - C. compute the cost of site preparation when given details of a specific site such as slope, soil type and grading.
  - D. select the most desirable source for a soil test.
  - E. distinguish the correct analysis of fertilizer to raise soil fertility to a desired level when given the soil test results.
  - F. identify the amount of lime needed to bring the pH to the desired level when given the pH level of a lawn site.
  - G. select the best equipment for applying fertilizer or lime.
  - H. calculate equipment settings for applying desired amounts of fertilizer or lime.
  
- III. Comprehend the procedures for establishing a lawn from seed. Specifically the student will be able to:
  - A. select the seed or seed mixtures best adapted to a lawn site when given the location of the site.
  - B. compute the amount of seed needed for a given site.
  - C. identify the steps for seeding a lawn.
  - D. identify types of mulches available.
  - E. select advantages of a given mulch.
  - F. choose watering practices that meet the requirements for establishing a lawn turf using visual observations.
  - G. distinguish the three key production factors for growing a good lawn turf.
  - H. identify the management practices for establishing a successful lawn turf.



- IV. The student will comprehend the procedures for establishing a lawn from sod. Specifically the student will be able to:
- A. select a sod type most desirable for a site when given the site location.
  - B. compare advantages of sodding to seeding a lawn turf.
  - C. enumerate the sequence of procedures for resetting sod.
  - D. compute how far sod can be shipped in satisfactory condition.
  - E. compare maintenance required for sod after resetting until establishment with that required for a seeded lawn until establishment.
- V. The student will understand how to maintain a desirable lawn turf. Specifically the student will be able to:
- A. identify proper mowing procedures for different varieties of lawn turf.
  - B. distinguish the most desirable procedures for watering a lawn.
  - C. compute the amount of fertilizer needed to correct a lawn site to a desirable level when given the desired fertility level.
  - D. choose the best method for removal of excessive fertilization salts.
  - E. identify causes of excessive soil compaction.
  - F. distinguish procedures for correcting lawn areas with poor drainage.
  - G. distinguish disadvantages of heavy thatch or matting.
  - H. select the best procedure for eliminating competition from other landscape plants in a lawn turf.
  - I. identify methods for eliminating sources of physical damage to lawn turf.
  - J. distinguish outcomes of poor lawn maintenance
- VI. The student will understand how to control lawn pests. Specifically the student will be able to:
- A. distinguish the practical goals of lawn pest control procedures.
  - B. identify characteristics of lawn pests.
  - C. select appropriate times for implementing lawn pest control procedures.
  - D. identify pesticides suitable for controlling various lawn pests.
  - E. differentiate among the effects of various pesticides on the lawn turf.
  - F. choose the most economical pesticides for a given situation.