DOCUMENT RESUME

ED 050 250 VT 012 439

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TITLE Vocational-Technical Education in Agricultural Resources. Final Report.

INSTITUTION Pennsylvania State Univ., University Park. Dept. of Agricultural Education.
SPONS AGENCY Pennsylvania Research Coordinating Unit for Vocational Education, Harrisburg.
PUB DATE 69
NOTE 46p.

EDRS PRICE EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS *Agricultural Education, *Agricultural Occupations, Agricultural Technicians, *Instructional Materials, Measurement Instruments, Occupational Information, Off Farm Agricultural Occupations, *Program Content, *Program Development, Questionnaires, Recreational Activities, Technical Education

ABSTRACT

Suitable program establishment guides and teaching materials are needed to develop programs in agricultural resources that will qualify students to enter and advance in existing and emerging occupations in the areas of conservation, recreational utilization, and protection and regulation. The first phase of the project sought to determine the attitudes of five groups of 20 agricultural-related persons each toward 56 items of program establishment and 64 items of instructional units. The consensus of opinion among the groups found in 81 percent of the items justifies the use of agricultural resource persons in determining program and instructional content and the development of a guide for establishing programs. The second phase of the project focused on the preparation of a teacher's resource unit for an introductory course for high school students. The survey instruments and the availability of publications developed through the project are appended. (GB)

FINAL REPORT

VOCATIONAL-TECHNICAL EDUCATION IN AGRICULTURAL RESOURCES

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1969

This research (Project 17050, 18050, 19050) was supported in part by the Bureau of Vocational, Technical and Continuing Education of the Pennsylvania Department of Education through funds granted by the Vocational Education Acts of 1963, P.L. 88-210

Pennsylvania Department of Education
Research Coordinating Unit
for
Vocational Education

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PREFACE

This project was an effort to determine the vocational-technical education needs of persons engaged in or preparing for employment in occupations dealing with Agricultural Resources and to plan instructional programs. The management of natural resources involves knowledge of soil, water, air, forest, recreation, wildlife, and of related mechanics and business skills. A classification of occupations into groups which function to promote (1) conservation, (2) protection and regulation, and (3) recreational utilization of agricultural resources was approved at the start by the following advisory committee members who then continued to perform valuable consultant services:

Name	Title	Organization Represented
James C. Fink	State Supervisor Agricultural Education	Pennsylvania Department of Education
T. Dean Witmer	Consultant, Vocational Post-Secondary & Adult Ed.	Pennsylvania Department of Education
Samuel S. Cobb	State Forester	Pa. Dept. of Forests and Waters
Charles Slaton	Public Information Officer	USDA Soil Conservation Service
Charles F. Hess	Director, State Soil and Water Conservation Commission	Pennsylvania Department of Agriculture
John W. Bergstrom	Assistant to the Director	Agricultural Extension Penn State
John C. Frey	Director	Institute for Research on Land and Water Resources Penn State
Joseph R. Cardenuto	Associate Professor	Rural Sociology Extension Penn State
John R. Zubler	Teacher of Agriculture	Penns Valley High School
James M. Freyermuth	Teacher of Agriculture	East Juniata High School
James S. Shadle	Chairman, Education Committee, and President	Pa. Assn. of Soil and Water Conservation District Directors, Inc.

The graduate assistant on the project during the first two years was Howard I. Downer. He conducted the survey of items of program establishment and course content. Thomas C. Leamer assembled the teacher resource unit and student examination. Dr. S. M. Curtis aided in revision of the SCS Technical Guide, a student handbook for soil and water management.

ABSTRACT

Vocational-technical education for occupations in Agricultural Resources has only recently become a recognized instructional area in public schools. Suitable program establishment guides and teaching materials are needed to develop comprehensive programs that will qualify students to enter and advance in existing and emerging occupations in the (1) conservation, (2) protection and regulation, and (3) recreational utilization of agricultural resources.

The purpose of the first phase of the project was to determine the attitudes of five groups of persons toward items of program establishment and instructional units concerned with occupational education in the area of agricultural resources. The attitudes were measured by the importance rating the respondents gave to the items. The items judged to be of the highest importance were used to develop a guide in planning vocational-technical programs for high school students and continuing education for adults.

The major research hypothesis tested was that there would be a consensus of opinion among five groups of persons on each item as measured by the importance ratings given the item by individuals within the groups. The statistical hypotheses were: (A) There are no significant differences among the five groups of persons interviewed in their importance ratings as measured by the mean rating for each item by each group. (B) There are meaningful groupings of items within categories as determined by the clustering of items by factor analysis with varimax rotation.

A schedule containing 56 items of program establishment and 64 items of instructional units was administered to five groups of 20 people each. The people who made up these groups were randomly selected from lists of persons closely associated with agricultural resources and/or education. The groups were: (1) professional workers in agricultural resources, (2) persons engaged in agricultural resource business, (3) high school teachers of agriculture, (4) high school principals, and (5) agricultural extension workers. The data were obtained by a personal interview.

Analysis of variance procedures revealed that there were significant differences in the mean importance ratings among the groups on 10 items of program establishment and on 12 instructional unit items. The mean ratings of the extension group were significantly lower than one or more of the other groups on 16 items. The mean ratings of all but the professional group were higher on the 64 items of instructional units than on the 54 items of program establishment. The grand mean ratings for 33 items were higher than 4.0, and 84 item means ranged from 3.0 to 3.9. Only three items showed grand mean ratings lower than 3.0.

Factor analysis failed to cluster meaningful groupings of items of program establishment. Six meaningful factors were found in the 64 instructional unit items. The groups were nearly the same as the categories in the interview schedule with the exception that the soil, water, and air items clustered into one group. The clustering of instructional unit items indicates that the five groups of people interviewed had consensus of opinion in their ratings of the items within the categories.

The consensus of opinion among the groups found in 81 percent of the items in the schedule justifies the following conclusions: (1) The priorities of items of program establishment and instructional units to be used as guides in planning vocational-technical programs for occupations in agricultural resources can be determined from the importance ratings given the items by persons closely associated with the occupational area as well as by persons in education. (2) The guide published from results of this study can be of valuable assistance in planning and establishing comprehensive programs of instruction that will enable the student to gain the knowledge, skills, attitudes, and appreciations necessary to enter and advance in occupations in conservation, protection and regulation, and recreational utilization of agricultural resources.

The second phase of the project focused on the preparation of a teacher's resource unit for an introductory course for high school students. The outline of units was built upon the factor analysis of items of instruction. The groupings were (1) business management, (2) soil, water, and air, (3) related mechanics, (4) occupational information, (5) related animal science, and (6) related plant science.

Student learning activities were developed for selected key segments of knowledge and skill in entry jobs available to young workers in occupations in natural resources. A multiple choice test was constructed covering soil, water, air, forest, and wildlife areas of environmental conservation, protection and regulation, and recreational utilization, as well as mechanics and business skills needed. An item analysis was made of the scores of 172 students in eight schools.

A supporting service during the final year of the project was publication of a revised edition of the SCS Technical Guide, a student handbook valuable in planning the management of specific soil types as mapped on land owned or leased for agricultural, industrial, or public uses. Teachers in over forty schools received individual consultation.

INTRODUCTION

General Statement of the Problem

It was a purpose of this investigation to study the attitudes of individuals in five selected groups toward establishment of programs of vocational-technical education for occupations concerned with conservation, protection and regulation, and recreational utilization of agricultural resources. These five groups were: (1) professions engaged in resource management, conservation, and outdoor education; (2) owners, managers or operators of businesses engaged in resource development for recreational use; (3) teachers of agriculture in comprehensive and vocational-technical secondary schools; (4) administrators of these schools; and (5) agricultural extension personnel directly involved in resource planning and development. A further purpose was to develop a teacher's resource unit plan for an introductory course for high school students. Consultations with teachers in schools where agricultural resources instruction is being introduced served to improve teaching procedures.

Through the efforts of leaders in outdoor education and conservation, there has been a dramatic increase in the number of schools offering outdoor education in the elementary grades. Many students have become interested in environmental subjects and have acquired a vocational interest in the activities of conservation, protection and regulation, and recreational utilization of natural resources. There is, however, very little instruction in conservation and outdoor education at the secondary level where students are encouraged to make a vocational choice and pursue courses of study that will fit them for their choices.

Agricultural education traditionally has been considered as preparation for agricultural production occupations. The Vocational Education Act of 1963 (37) authorized federal funds for agricultural education programs that would provide vocational-technical education in any occupation involving knowledge and skills in agriculture. Thus courses of instruction in agricultural resources may be included in high school and post high school agricultural programs receiving federal funds. These courses will enable interested students to gain the knowledge, skills, attitudes, and appreciations necessary for entry and advancement in occupations in conservation, protection and regulation, and recreational utilization of these resources.

In order to develop occupational education programs in agricultural resources it was deemed necessary to determine the factors to be considered in program development, and the importance of instructional units to be included in the course of study. It was felt that this could best be accomplished by studying the attitudes of persons closely associated with agricultural resources and education. The factors judged to be of highest importance for program development, and the instructional units receiving a rating of important would be used to select subject matter and develop learning experiences that can help students to develop knowledge, skills, attitudes, and appreciations necessary to successful entry and advancement in agricultural resource occupations.

Definition of Terms

There are certain terms used in this study that are not a familiar part of the nomenclature of either education or agriculture at the present time. In order to clarify these terms, the following definitions are set forth.

Agricultural resource instruction -- a combination of subject matter and planned learning experiences concerned with the principles and procedures involved in the preservation and/or improvement of natural resources such as soil, water, air, forests, fish and wildlife for economic and recreational purposes. Instruction emphasizes the competences needed to enter and advance in occupations in conservation, protection and regulation, and recreational utilization of the resources.

A. Conservation includes those activities associated with the development, management and maintenance of soil, water, air, wildlife, fisheries, forested and other natural areas, aesthetic and historical sites and structures, and land for agricultural production and for multi-purpose use by the public.

B. Protection and regulation includes those activities for which the main function is to protect the resources by control of fire, disease, insects and pollution, and to regulate the natural population of plants and animals by harvest or propagation.

C. Recreational utilization means those activities associated with the development, operation, and management of agricultural resources by public and private agencies for outdoor recreation and aesthetic and historical appreciation. Such activities are more closely allied to the facilities for these activities than to the activity itself.

Instructional unit -- a planned sequence of teaching-learning activities which leads the learner to acquire desirable learning outcomes, understandings and insights, attitudes and appreciations, values, skills and behavior patterns needed for a career in agricultural resources.

Occupational education -- an organization of subject matter and learning experiences that will provide the student opportunity to acquire the competences needed to successfully enter and advance in an occupation.

Agricultural competences -- knowledge, skills, attitudes, and appreciations in animal science, plant science, soil science, water management practices, agricultural mechanics, and business management procedures.

METHODS

Teachers of agriculture generally have included instructional units for conservation in their programs, but for the most part these units have dealt with the farm-related conservation practices of soil and water management. In order to determine the amount of instruction in agricultural resources currently being offered by teachers of agriculture in Pennsylvania, a preliminary survey was made in 1966 of selected schools throughout the state. It was found that 23 of 32 teachers surveyed included agricultural resources as an area of instruction. Of the teachers devoting instructional time to conservation of resources other than soil and water, 25 included this instruction in plant and animal science units. These same 25 indicated that such instruction included wildlife management, but only 12 teachers indicated that they taught recreational area development. The inclusion of agricultural resources as a major unit of instruction in agriculture was favored by 23 of the 32 teachers.

The literature failed to reveal any information from other states on the number of programs in agricultural education that include agricultural resources as an instructional area. It might be assumed that in states where courses of study in this area have been developed, there would be a significant number of such programs.

A survey conducted in three New York counties to determine the interests of students in five agricultural occupation groups found that among the choices of occupational groups, boys consistently placed conservation first, agricultural mechanics second, farm operation third, ornamental horticulture fourth, and agri-business fifth. The study further found that forestry, conservation, campsite activities, and work in conservation of water, soil, and wildlife resources, were most interesting to these students. This indicates that students would like to be employed in agricultural resource occupations and that courses of study in this area are needed.

The emergence of local, state, and federal programs for developing and maintaining parks and other facilities to provide recreation for our expanding population will require trained recreational conservationists to service these areas. As the use of farm land and forested and other natural areas for recreation increases, there will be new occupational opportunities for protection and regulation so that these resources will be conserved to meet the demand in the years to come (see Appendix A for selected occupational titles).

Survey of Attitudes Toward Program Establishment and Items of Instruction

It is general practice to develop courses of study from literature and technical information at hand. It was believed that courses of study for agricultural resources should also reflect the consensus of opinion among persons engaged in agricultural resources management, development, and utilization, and by persons in education.

In order to attain the purposes of the study, the research hypothesis tested was that there is a consensus of opinion among the five groups of persons interviewed on each item of program establishment and units of instruction as measured by the importance rating given the items by the individuals in the groups. More specifically, the statistical hypotheses were:

A. There are no significant differences among the five selected groups of persons in their importance ratings of items as measured by the mean rating for each item by each group.

B. There are meaningful groupings of items within categories as determined by clustering or grouping of items by factor analysis with varimax rotation of the factor loadings.

An interview schedule (Appendix B) was developed on the premise that there were two distinct parts to the inquiry and clarity could be better maintained by keeping the items of program establishment discrete from items of instructional unit content. Items for both parts were developed from a critical review of the current literature in the area of agricultural resources education. The items were collected into categories for convenience of the respondents.

Part I of the schedule consisted of factors of program establishment. There were 56 items in eight categories (see Appendix B). The categories were as follows:

1. Objectives of agricultural education programs in secondary and post-secondary schools.
2. Instructional areas for agricultural education programs.
3. Clientele to be served.
4. Educational institution that should offer agricultural resources programs.
5. Instructional arrangement for agricultural resources.
6. Desirable work experience arrangements.
7. Occupational orientation for agricultural resources.
8. Placement responsibilities of school offering programs.

Part II of the schedule consisted of instructional units basic to agricultural resources. There were 64 items in eight categories. The categories were:

1. Applied mechanics basic to agricultural resources.
2. Applied soil management practices basic to agricultural resources.
3. Applied water management practices basic to agricultural resources.
4. Applied air pollution protection practices basic to agricultural resources.
5. Applied animal science basic to agricultural resources.
6. Applied plant science basic to agricultural resources.
7. Applied business management procedures basic to agricultural resources.
8. Occupational information basic to agricultural resources.

The assembled schedule was submitted to 11 persons who are experienced, hold positions of leadership, and who might be expected to be knowledgeable in the field of conservation and/or agricultural education. They judged the questionnaire on clarity of statements and directions for completion of the schedule. They also suggested changes as to the homogeneity of the factors and instructional units, and suggested additions to and deletions from the schedule.

The questionnaire was designed with a five point Likert-type scale based on level of importance. As the respondents recorded their evaluation of each item, the importance was determined by the following scale explanation:

1. Unimportant
2. Little importance
3. Some importance
4. Important
5. Very important

The instrument also included an information section which was used to determine the following:

1. Name
2. Occupational title
3. Type of agency, business, or organization represented
4. Education level completed
5. Years of experience in present occupation
6. Curriculum major in high school, post-high school, and college

It was determined that inasmuch as consensus of attitude was an important factor in this study, the sample should be drawn from lists of individuals who were closely associated with agricultural resources and/or education. Sixty to 90 names of qualified persons in each of five groups were secured from state and federal agencies, organized associations, and other reliable sources. The names were sorted into five groups according to the occupational positions they represented. The groups were: (1) professional, (2) business, (3) teacher, (4) principal, and (5) extension. Twenty names were randomly drawn from each group.

Group one was made up of 20 persons who held professional positions in resource management, conservation, and outdoor education.

Group two was made up of 20 owners and/or managers of businesses or agencies engaged in resource development for recreational uses.

Group three included 20 teachers of vocational agriculture in comprehensive and vocational technical secondary schools.

Group four included 20 principals in these schools.

Group five included 20 agricultural extension personnel involved in resource planning and development.

The data were gathered through personal interview. An explanation of the purpose of the research and of the instrument was given. The schedule was left with the respondent for completion, and was picked up at a later time or returned by mail, whichever was more convenient.

The schedules were scored by using the importance rating given each item by each respondent. These scores were punched on IBM cards. The data were processed by standard programs in use at the computer center at The Pennsylvania State University: analysis of variance (single classification), Duncan's multiple range test (using Harter's critical values for 'P' levels of .05 and .01), symmetric correlation, principal component analysis (factor analysis) with varimax rotation.

The analysis of variance procedure was used to determine the mean score and standard deviation for each group of persons on each item, and to discover those items on which there were significant differences among the groups of persons, at the .05 level.

Duncan's multiple range test was used to determine significant differences between the mean rating of each group on items found to be significantly different by analysis of variance procedure, and to determine whether these differences exceeded the shortest significant range as calculated by the program.

The symmetric correlation procedure yielded a correlation matrix for all possible pairs of variables to be used in the factor analysis program. Also produced were the grand means for each item.

Factor analysis was used to solve successively for the most dominant factors represented in the correlation matrix. The final program was varimax rotation which performed an orthogonal rotation of the factor loadings in order to cluster or group the items in each factor.

Teacher's Resource Unit, Examination, and Revision of SCS Technical Guide

In the second phase of the project, an outline of course content was constructed, learning activities listed, and a comprehensive test containing sixty multiple choice questions in a balanced distribution covering all of the instructional units was written. The test was administered to 172 students in eight high schools and an item analysis made. The revised test is included in the published teacher's resource unit guide.

Finally, a revised edition of a previously issued student handbook on soil management was prepared. New information had been made available from soil scientists. Consultations with some forty teachers who have used the educational adaptation of the SCS Technical Guide were utilized in simplifying the teaching procedures offered in the unit.

RESULTS AND FINDINGS

A summary of the personal data furnished by the individuals in the five groups revealed that they were employed in 48 different counties in Pennsylvania. There were 96 men and 4 women representing 28 different occupational titles. The mean years in present occupation and mean years of education for the five groups were:

Group	Mean years in present occupation	Mean years of education
Professional	19.05	15.75
Business	14.85	11.75
Teacher	15.45	16.75
Principal	12.35	17.40
Extension	16.60	16.50

Further examination of the data revealed that 76 percent had a baccalaureate degree or higher, 6 percent had received post-high school training, 13 percent had earned a high school diploma and 5 percent had not completed high school.

Attitude Mean Scores of Five Groups of Persons Toward Program Establishment and Items of Instruction

Grand mean ratings for each group were calculated for the 56 items of program establishment, 64 items of instructional units, and for the total 120 items. The grand mean ratings for the groups are reported in Table 1. Four of the groups had higher grand mean ratings on the 64 items of instructional units than on the 56 items of program establishment.

Mean ratings for each of the 16 categories in the schedule were calculated and reported in Table 2. These mean ratings were compared to determine if a pattern of ratings by the groups could be identified. The mean rating by the extension group was lowest of the five groups on 10 of the 16 categories. The business group recorded the lowest rating on three of the categories and next to low rating on five categories. The mean rating by the principal group was lowest on two and the professional group was lowest on one.

Table 1. Grand Mean Ratings on the Two Types of Items by Five Groups of Persons Interviewed

Groups Interviewed	Mean Rating on 56 items[a]	Mean Rating on 64 Items[b]	Mean Rating on 120 Items
Professional	3.80	3.71	3.77
Business	3.52	3.92	3.71
Teacher	3.78	3.96	3.91
Principal	3.73	3.81	3.77
Extension	3.39	3.65	3.54

[a]Items of program establishment.

[b]Items of instructional units.

Table 2. The Mean Ratings for Each Category by the Five Groups.

Category	Group				
	Profes-sional	Busi-ness	Teacher	Prin-cipal	Exten-sion
Part I, Program Establishment					
A. Objectives of programs	3.76	3.55	3.80	3.73	3.75
B. Instructional areas	3.99	3.64	4.00	3.95	3.60
C. Clientele to be served	3.73	3.45	3.50	3.54	3.23
D. Institutions that should offer programs	4.14	3.78	4.25	4.15	3.87
E. Course sequence	3.84	3.33	3.45	3.34	3.36
F. Work experience arrangement	3.81	3.51	4.01	3.77	3.49
G. Occupational orientation	3.45	3.24	3.60	3.57	3.18
H. Job placement responsibility	3.92	3.71	3.96	3.97	3.75
Part II, Items of Instruction					
A. Applied Mechanics	3.85	3.94	4.01	4.09	3.77
B. Soil Management practices	4.20	4.25	4.29	4.40	3.75
C. Water management practices	3.79	3.98	3.95	4.05	3.51
D. Air pollution protection	3.89	4.00	3.99	3.93	3.39
E. Animal science	3.54	3.80	3.95	3.51	3.53
F. Plant science	3.71	3.85	4.06	3.85	3.79
G. Business management	3.51	3.52	3.86	3.30	3.51
H. Occupational information	4.09	4.01	4.26	4.16	3.98

The significant differences found in the mean importance ratings among the five groups on 10 items of program establishment and on 12 items of instructional units would fail to confirm the first hypothesis. Consensus of 98 of the items is an indication that the mean ratings of these items reflect the importance they may have for inclusion in vocational-technical education programs.

Analysis of variance of mean ratings on the 56 items of program establishment (Appendix B) revealed that there were significant differences at the .05 level among the groups on 10 items of the 56. Duncan's multiple range test was used to identify the pairs of groups having mean ratings with a significant difference. The items and the pairs of groups having significant differences on these items were:

Item No.[a]	Significantly higher group	Significantly lower group
A.3	Teacher	Extension
	Principal	Extension
	Professional	Extension
	Business	Extension
A.6	Principal	Extension
	Teacher	Extension
A.8	Teacher	Extension
	Professional	Extension
C.1.c	Professional	Business
	Principal	Business
C.2.c	Professional	Extension
	Teacher	Extension
D.1	Teacher	Extension
	Teacher	Business
	Principal	Extension
	Principal	Business
E.1	Extension	Business
	Extension	Teacher
	Extension	Principal
	Professional	Business
	Professional	Teacher
	Professional	Principal

Item No.[a]	Significantly higher group	Significantly lower group
F.2.a	Teacher	Business
	Principal	Business
	Professional	Business
G.1	Professional	Business
	Professional	Extension
	Professional	Teacher
	Principal	Business
	Principal	Extension
	Teacher	Business
G.4	Principal	Extension
	Principal	Professional
	Teacher	Extension

[a]See Appendix B.

Analysis of variance on the 64 items of instructional units revealed that there were 12 items with an F-ratio significant at the .05 level. Duncan's multiple range test determined the pairs of groups having mean ratings that were significantly different. The 12 items and the pairs of groups having significant differences were:

Item No.[a]	Significantly higher group	Significantly lower group
B.2	Teacher	Extension
	Business	Extension
	Principal	Extension
B.3	Principal	Extension
B.4	Principal	Extension
	Teacher	Extension
	Professional	Extension
	Business	Extension
C.2	Business	Extension
	Principal	Extension

Item No.[a]	Significantly higher group	Significantly lower group
D.4	Business	Extension
	Teacher	Extension
	Principal	Extension
	Professional	Extension
E.4	Business	Professional
	Business	Principal
	Business	Extension
E.5	Teacher	Professional
	Teacher	Extension
	Business	Professional
	Business	Extension
	Principal	Professional
E.9	Teacher	Professional
	Teacher	Extension
E.10	Business	Professional
	Business	Principal
	Teacher	Professional
	Teacher	Principal
E.11	Teacher	Extension
	Professional	Extension
	Business	Extension
G.11	Business	Principal
	Business	Professional
G.12	Professional	Principal
	Business	Principal
	Teacher	Principal
	Extension	Principal

[a] See Appendix B.

Factor Analysis of Program Establishment and Items of Instruction

The second hypothesis was that there are meaningful groupings of items within categories as determined by clustering or grouping of items by factor analysis with varimax rotation. The data were treated as two discrete parts as previously stated. There were no meaningful factors found in the 56 items of program establishment. This failure to identify meaningful groupings categories may have been due to an interpretation by the respondents that if one item in a cetagory were to be rated high the other alternatives (items) should be rated lower even though they were directed to treat the items as mutually exclusive.

Factor analysis of the data from the 64 items of instructional units yielded six factors with meaningful grouping of the items within categories:

Factor one emerged as a clustering of eight items of business management basic to agricultural resources. The items and factor loadings were:

Item No.	Factor loading	Item
G.8	.79	Development of hiking and riding trails.
G.10	.76	Planning and operating a riding stable and bridle trail program.
G.7	.73	Camping and picnic grounds operation and maintenance
G.3	.73	State and local laws pertaining to operation of recreational enterprises.
G.2	.71	Recreational facilities as a business or supplementary enterprise.
G.5	.71	Developing a plan for area recreational facilities.
G.9	.70	Operation of winter recreational areas.
G.4	.69	Establishing a safety program for recreational enterprises.

Factor two clustered 13 items from the soil, water, and air pollution categories. Traditional grouping of soil, water, and air in reference to natural resources may have been the underlying communality that developed this clustering. The items and factor loadings were:

Item No.	Factor loading	Item
C.2	.76	Planning and using drainage systems.
C.1	.74	Water course and streamway improvement and protection practices.
B.3	.70	Planning, layout, and maintenance of erosion control systems.
C.3	.69	Pond site selection, construction, and maintenance.
B.1	.68	Interpretation of soil surveys for land use planning.
B.4	.66	Federal, state, and local programs of soil conservation.
C.4	.65	Federal, state, and local programs of watershed management.
A.10	.52	Selection, planning, and maintenance of water systems.
B.2	.51	Programs of air pollution abatement.
D.4	.51	Protection of plants and animals from poisoning due to air pollution.
B.2	.51	Soil testing and interpretation.
D.1	.50	Effects of air pollution on plant and animal populations.
C.5	.46	Managing ponds and marshes as a habitat for fish, waterfowl, and fur bearers.

Factor three emerged as a cluster of seven items of applied mechanics basic to agricultural resources. The clustered items and factor loadings were:

Item No.	Factor loading	Item
A.4	.75	Selection and service of electric motors, switches and fusing devices.
A.9	.73	Mixing, placing, and curing concrete.
A.2	.70	Selection and maintenance of hand and power tools and chain saws.
A.5	.69	Selection, operation, and maintenance of arc and oxy-acetylene welding equipment.
A.3	.69	Selection, operation, service, and adjustment of gasoline and diesel power units and outboard motors.
A.1	.66	Safe operation, use and storage of equipment, tools, and supplies.
A.7	.52	Construction and maintenance of buildings and structures.

A highly meaningful grouping was represented in factor four which developed a cluster of eight items in the category of occupational information. The items and factor loadings were as follows:

Item No.	Factor loading	Item
H.4	.78	Occupations in conservation of agricultural resources.
H.5	.78	Occupations in protection and regulation of agricultural resources.
H.6	.68	Occupations in recreational utilization of agricultural resources.
H.2	.67	Working conditions, salary, and future in agricultural resource occupations.
H.8	.66	Participation in occupational experience programs.
H.7	.64	Technical and professional education in agricultural resources.
H.1	.58	Occupational requirements and sources of information about agricultural resource occupations.
H.3	.53	Applying for a job.

Grouped under the fifth factor were five items in the applied animal science category:

Item No.	Factor loading	Item
E.4	.70	Harvest controls for game species.
E.7	.69	Confinement rearing of game birds.
E.10	.66	Management of game animals and birds for hunting and shooting preserves.
E.5	.65	Control of predators.
E.9	.64	Trapping fur bearers.

The sixth factor emerged as a grouping of three items in the plant science category. The loadings were high enough to be considered a significant grouping. The items and factor loadings were:

Item No.	Factor loading	Item
F.4	.69	Establishment and maintenance of landscapes.
F.3	.69	Propagating nursery stock.
F.2	.68	Establishment and care of lawns and turf.

In an effort to describe the communalities that may have contributed to the clustering of the factored items the mean ratings of these items by each group were reviewed. A comparison of the wording of the items as they appeared in the research instrument was also made to determine if this may have contributed to the clustering. It was noted that statements with similar subjects grouped together in the clusters. One instance of the usefulness of factor analysis was demonstrated by the inclusion in the soil, water, and air grouping of one item relating to water that had been assumed to belong in the applied mechanics category. It was the item on selection, planning, and maintenance of water systems.

Although the failure to factor meaningful groups of items within the categories of program establishment did not confirm the second hypothesis, it must be recognized that this may have been due to the organization of the items in the categories of this part of the instrument. The meaningful groupings attained with the items of instructional units does indicate confirmation of the second hypothesis.

SUMMARY AND RECOMMENDATIONS

The findings have been presented as a summary of the statistical analysis of the data. The findings were used to construct a guide that can be used by school authorities, teachers, and others interested in developing vocational-technical programs of occupational instruction in the area of agricultural resources. This guide was based on the items of program establishment and instructional units that received a grand mean rating considered to be high enough to be of significant importance.

The items of program establishment were arranged so that they could be presented by descriptive paragraphs. The items mentioned received the highest mean importance ratings in the several categories.

Program Establishment

The items of program establishment are concerned with the factors of organization and administrative procedures that should be considered when establishing occupational education programs in agricultural resources.

Objectives of Agricultural Education Programs in Secondary and Post-Secondary Schools:

Programs of vocational-technical education in agriculture in secondary and post-secondary schools should provide instruction for any occupation requiring knowledge and skills in agriculture, as well as a program of instruction for on-farm occupations. These programs should prepare students for both immediate employment as well as advanced courses in area vocational-technical schools or other non-degree programs.

Instructional Areas for Agricultural Education Programs:

Agricultural resources as an area of instruction was rated along with agricultural production as being most important for inclusion in vocational-technical programs. Other areas rated as important are agricultural mechanics, agricultural supplies, agricultural products (marketing and processing), forestry, and ornamental horticulture, in that order.

Clientele to Be Served:

The clientele to be served by agricultural resources programs in secondary education are average academic ability students and/or students who score high in agricultural areas on vocational interest tests. Post-high school programs should serve employed workers in agricultural resources and related fields and/or high school graduates who were enrolled in agriculture in high school.

Educational Institutions that Should Offer Agricultural Resources Courses:

Agricultural resources courses should be offered in the area vocational-technical school at the 11th and 12th year level, and as a post-high school certificate program. It is very important that the four-year colleges or universities include agricultural resources courses in their curricula for the student who is interested in the professional occupations in this area.

Course Sequence for Students Electing Agricultural Resources Courses:

The course sequence that received the most acceptance was for the student to be enrolled in vocational agriculture for the 9th and 10th years, and take the agricultural resources course the 11th and 12th years. This course sequence fits well with the area vocational-technical schedule for high school students.

Desirable Work Experience Arrangement While Enrolled in Agricultural Resources Courses:

Work experience programs should be carried out in the evenings and on weekends or during summer vacation time. Supervision of the work experience should be by both the teacher and cooperating employer.

Occupational Orientation for Students Enrolled in Agricultural Resources:

Occupational orientation for students in agricultural resources programs can best be accomplished by on-the-job observation of employees performing occupational responsibilities and by a specific instructional unit in the agricultural resources course.

Job Placement Responsibilities of Schools Offering Agricultural Resources Programs:

Job placement responsibilities of the school can be discharged by providing information on job opportunities in the area to graduates of the agricultural resources course, and by providing personal recommendations to prospective employers.

Instructional Units

The following instructional unit areas to be given consideration in occupational education programs were selected for their importance in preparing students for occupations in conservation, protection and regulation, and recreational utilization of agricultural resources:

Occupational Information:

1. Working conditions, salary, and future in agricultural resources occupations.
2. Occupational requirements and sources of information about agricultural resource occupations.
3. Participation in occupational experience programs.
4. Occupations in conservation of agricultural resources.
5. Applying for a job.
6. Technical and professional education in agricultural resources.
7. Occupations in protection and regulation of agricultural resources.
8. Occupations in recreational utilization of agricultural resources.

Applied Plant Science:

1. The use of plant cover in erosion control.
2. Establishment of plant cover on disturbed and ravished areas.
3. Identification of plants, shrubs and trees.
4. Management of wooded areas for forest production.
5. Management of plant cover for wildlife protection.
6. Establishment of lawns and turf.
7. Establishment and maintenance of landscapes.
8. Propagating and planting nursery stock.
9. Aquatic plants, their reproduction and control.

Applied Animal Science:

1. Insect, disease, and pest control.
2. Cooperative programs with state and federal agencies in wildlife conservation.

3. Identification of important wildlife species and their habitat requirements.

4. Harvest controls for game species.

5. Stimulating population of native species and their habitats.

6. Laws and regulations concerning propagation and commercial use of game birds and fish.

7. Control of predators.

8. Artificial propagation and stocking of wildlife.

9. Management of fishing ponds.

10. Management of game animals and birds for hunting and shooting preserves.

11. Confinement rearing of game birds.

Applied Water Management Practices:

1. Planning and using drainage systems.

2. Managing ponds and marshes as a habitat for fish, waterfowl, and fur bearers.

3. Federal, state, and local programs of watershed management.

4. Water course and streamway improvement and protection structures.

5. Pond site selection, construction, and management.

Applied Soil Management Practices:

1. Interpretation of soil surveys for land use planning.

2. Soil testing and interpretation.

3. Planning, layout, and maintenance of erosion control systems.

4. Federal, state, and local programs of soil conservation.

Applied Air Pollution Protection Practices:

1. Effects of air pollution on plant and animal populations.

2. Protection of plants and animals from poisoning due to air pollution.

3. Importance of clean air to recreational and aesthetic utilization of agricultural resources.

4. Programs of air pollution abatement.

Applied Business Management Procedures:

1. Assistance available for planning and establishing wildlife and recreation enterprises.

2. Establishing a safety program for recreational enterprises.

3. State and local laws pertaining to operation of recreational enterprises.

4. Recreational facilities as a business or supplementary enterprise.

5. Camp and picnic ground operation and maintenance.

6. Developing a plan for area recreational facilities.

7. Orientation and scope of wildlife and recreation business.

8. Operation and management of hunting and fishing preserves.

9. Development of hiking and riding trails.

10. Operation of winter recreation areas.

11. Planning and operating a riding stable and bridle trail program.

Applied Mechanics:

1. Safe operation, use and storage of equipment, tools and supplies.

2. Selection and maintenance of hand and power tools, and chain saws.

3. Selection and service of electric motors, switches, fusing and control devices.

4. Selection, operation, service, and adjustment of gasoline and diesel power units and outboard motors.

5. Construction and maintenance of buildings and structures.

6. Reading and interpretation of blueprints, diagrams, and schematic drawings.

7. Selection, planning, and maintenance of water systems.

8. Selection, operation, and maintenance of arc and oxyacetylene welding equipment.

9. Mixing, placing, finishing, and curing concrete.

10. Construction, maintenance, and repair of recreational facilities and equipment.

The recommendations presented here for planning a course of study represent a composite of the information gained from the review of literature and the findings of the project. The recommendations are:

1. The objective of occupational education in agricultural resources should be to develop the competences needed by the students to enter and advance in occupations in this area. The competences can best be developed by learning experiences that will bring the student in contact with the resource activities connected with his chosen occupation. A well coordinated program of occupational experience supervised by both the teacher of agriculture and the cooperating employer is of vital importance to the student's acquisition of the competences required for successful employment after completion of the program.

2. In order to give the student the comprehensive background in agricultural resources that he should have, his curriculum should include agriculture 1 and 2, biology, chemistry, and appropriate mathematics courses. The specialized instruction in agricultural resources should be included in the curriculum of the student during the 11th and 12th grade.

3. Due to the small number of students in any one school who may be interested in agricultural resources as a course, it seems logical to include it as a part of the area vocational-technical school program. If offered in this situation, adult and out-of-school youth can also be served by the program.

4. It is recommended that at least 30 percent of the instructional time be devoted to mechanics related to agricultural resources. The course of study listed below was designed for 11th and 12th grade students who have completed Agriculture 1 and 2. In situations where students who have not completed Agriculture 1 and 2 are permitted to enroll in the agricultural resources course they should have completed appropriate science and mathematics courses during their 9th and 10th grades and have a strong interest in the field of agricultural resources.

Area of instruction	Number of periods 1st year	2nd year
Occupational information	10	5
Applied plant science	30	15
Applied animal science	20	20
Applied water management practices	10	20
Applied soil management practices	30	20
Applied air pollution protection practices		10
Business management procedures	20	30
Applied mechanics	60	60
	180	180

5. Occupational experience programs should be carried out during the summer between the 11th and 12th grade and during out-of-school time and on weekends during the 12th grade. A total of 400 hours of valuable occupational experience activities could be accumulated by each student prior to high school graduation.

As more schools recognize the importance of adding elective courses in all of the areas of off-farm agricultural occupations, the value of the publications resulting from this project will be increasingly apparent. It may confidently be predicted that further work will be done. Appropriate course materials will be developed for all of the many occupations concerned with quality of environment and utilization of natural resources.

APPENDIX A

OCCUPATIONAL TITLES IN AGRICULTURAL RESOURCES

with D.O.T. Code Numbers

Conservation	D.O.T. Code
Biological Aid (agri.)	049.384
Biologist (profess. & kin.)	041.081
Botanist (profess. & kin.)	041.081
Chief, Fishery Division (gov. ser.)	188.118
Chief Land Examiner (gov. ser.)	018.168
County-Agricultural Agent (gov. ser.)	096.128
Conservation Engineer	
Extension Service Specialist (gov. ser.)	096.128
Fisheries Biologist	
Forest Ecologist (profess. & kin.)	040.081
Forester (profess. & kin.)	040.081
Forest Genealogist	
Instructor, Vocational Training (education)	097.228
Land Reclamation Chief	
Public-Health Bacteriologist (gov. ser.)	041.281
Range Manager (profess. & kin.)	040.081
Roadside Development Engineer	
Soil Conservationist (profess. & kin.)	040.081
S.C.S. Agricultural Engineer	
S.C.S. Civil Engineer	
Soil Scientist (profess. & kin.)	040.081
Teacher, Secondary School (education)	091.228
Teacher, Technical Education (education)	090.228
Zoologist (profess. & kin.)	041.081
Forester Aid (gov. ser.)	441.384
Forest Inspector	
Forestry Technician	
Land Inspector	
Land Use Technician (gov. ser.)	168.168
Roadside Development Technician	
S.C.S. Administrative Employee	
S.C.S. Aid	
S.C.S. Engineering Technician	
S.C.S. Technician	
Conservation Grader and Bulldozer Operator	
Conservation Grading and Excavation Work Manager	
Conservation Grading and Excavation Equipment Worker	
Conservation Shovel Operator	
Construction Worker (const.) I	869.884
Construction Worker (const.) II	869.887

Protection and Regulation	D.O.T. Code
Chief Warden (gov. ser.)	188.168
Fish Warden Superintendent	
Game and Fish Director	
Game and Fish Director, Assistant	
Park Ranger (gov. ser.)	169.168
Weed-Control Supervisor (gov. ser.)	096.168
Blight-Control Foreman (agri.)	465.137
Fire Lookout (gov. ser.)	441.168
Fire Warden (forestry)	441.168
Fish and Game Warden (gov. ser.)	375.168
Fish Warden	
Manager, Pest Control	
Wildlife Conservation Aides	
Fire Patrolman (gov. ser.)	441.687
Fire Tower Operator	
Forest Fire Fighter (gov. ser.)	441.887
Pest Control Worker	
Plant Pest Control Worker	
Predatory-Animal Hunter (hunt. & trap.)	451.781
Sprayer (forestry)	441.887
Trapper (hunt. & trap.)	451.781
Weed Inspector (agri.)	465.781

Recreational Utilization	D.O.T. Code
Fish Culturist (fish)	041.168
Huntsman (amus. & rec.)	187.168
Manager, Recreation Establishment (amus. & rec.)	187.168
Park Naturalist (gov. ser.)	099.228
Park Superintendent (gov. ser.)	188.168
Animal Keeper, Head (amus. & rec.)	356.138
Fish Farmer (fish)	436.181
Game Farmer (agri.)	419.181
Game keeper (hunt. & trap.)	481.181
Game Propagator	
Huntsman (amus. & rec.)	187.168
Instructor, Fishing (education)	439.228
Lake Manager	
Live Bait Dealer	
Manager, Quail Farm	
Park Foreman (gov. ser.)	407.134
Trainer, Horse	
Animal Keeper (amus. & rec.)	356.874
Camp-Ground Caretaker (gov. ser.)	407.887
Game-Farm Helper (hunt. & trap.	419.884
Grounds Keeper (any ind.)	407.884
Hatchery Man (fish.)	432.884
Hunting and Fishing Guide (amus. & rec.)	452.868
Park Caretaker (gov. ser.)	407.868
Park Worker (gov. ser.)	407.887
Quail Farm Worker	
Recreational Park Worker	

APPENDIX B

INTERVIEW SCHEDULE

Please fill in the following information:

1. Name _____

2. Occupational Title _____

3. Type of Agency, Business, or Organization represented _____

4. Years of experience in present occupational field _____

5. Education: Highest level completed _____

6. Curriculum Major: High School _____, Post-High School _____, College _____

The study is designed to determine the role of Agricultural Education programs in secondary and post-secondary schools in preparing students for occupations in conservation, protection and regulation, and recreational utilization of agricultural resources.

Agricultural resources include forested and other natural land areas, fish and wildlife, and soil, water, and air.

Part I

Program Establishment

Circle the number to the right that represents your rating of the importance to occupational education in agricultural resources of each item in each group, using the following scale:

1 -- Unimportant

2 -- Little importance

3 -- Some importance

4 -- Important

5 -- Very important

All items are mutually exclusive and are to be rated individually.

A. Objectives of Agricultural Education Programs in Secondary and Post-Secondary Schools are to:

1.	Prepare students for immediate employment upon graduation from high school	1	2	3	4	5
2.	Prepare students for advanced courses in area technical schools or other non-degree programs	1	2	3	4	5
3.	Provide a general program for students who plan to enter a college of agriculture upon graduation	1	2	3	4	5
4.	Provide a program of instruction for on-farm occupations	1	2	3	4	5
5.	Provide a program of instruction for any occupation requiring knowledge and skills in agriculture	1	2	3	4	5
6.	Provide programs for all persons who are interested in agriculture, whether the interest be avocational or vocational	1	2	3	4	5
7.	Provide exploratory programs in agricultural occupations for students who have not decided upon a vocational objective	1	2	3	4	5
8.	Provide instructional programs for out-of-school youth and adults	1	2	3	4	5

B. Instructional Areas for Agricultural Education Programs:

1.	Agricultural production (farming, ranching)	1	2	3	4	5
2.	Agricultural supplies (sales and service of feed, seed, fertilizers, and chemicals)	1	2	3	4	5
3.	Agricultural mechanics (sales and service of tractors, other power units and equipment)	1	2	3	4	5
4.	Agricultural products (marketing and processing of meat, fish, poultry, eggs, fruits, vegetables, cereal grains, etc.)	1	2	3	4	5
5.	Agricultural resources (conservation, protection and regulation, and recreational utilization of forested and other natural areas, fish and wildlife, and soil, water, and air)	1	2	3	4	5
6.	Ornamental horticulture (floriculture, nursery and greenhouse management, landscaping and fine turf management)	1	2	3	4	5
7.	Forestry (production, processing, management, marketing, and services)	1	2	3	4	5

C. Clientele to be Served:

1. High School youth

a.	Below average academic ability	1	2	3	4	5
b.	Average academic ability	1	2	3	4	5
c.	Above average academic ability	1	2	3	4	5
d.	All students who wish to enroll	1	2	3	4	5
e.	Students who score high in agricultural areas on vocational interests tests	1	2	3	4	5
f.	Students who score high on outdoor interest as measured by acceptable tests for this purpose	1	2	3	4	5

2. Post-high school students

a.	High school dropouts	1	2	3	4	5
b.	High school graduates	1	2	3	4	5
c.	High school graduates who were enrolled in agriculture in high school	1	2	3	4	5
d.	Employed workers in agricultural resources and related fields	1	2	3	4	5
e.	Unemployed youth and adults	1	2	3	4	5
f.	Two-year terminal area vocational-technical or community college students	1	2	3	4	5
g.	College preparatory community college students	1	2	3	4	5

D. Educational Institutions That Should Offer Agricultural Resources Course:

1.	Comprehensive high school	1	2	3	4	5
2.	Area vocational-technical school, 11th and 12th years	1	2	3	4	5
3.	Post-high school vocational-technical certificate programs	1	2	3	4	5
4.	Community college, two-year associate degree	1	2	3	4	5
5.	Four-year college or university	1	2	3	4	5

E. Course Sequence for Students Electing Agricultural Resources Course:

1.	Agricultural resources course only, 11th and/or 12th year	1	2	3	4	5
2.	Vocational agriculture, 9th, 10th, 11th; agricultural resources 12th year	1	2	3	4	5
3.	Vocational agriculture, 9th and 10th years; agricultural resources 11th and 12th years	1	2	3	4	5
4.	Vocational agriculture, 9th-12th years; individual supervised study of agricultural resources technology and occupations for interested students	1	2	3	4	5
5.	Agricultural resources course 13th and 14th years	1	2	3	4	5
6.	Subject matter of agricultural resources to be integrated into appropriate course in high school biology and/or social studies	1	2	3	4	5

F. Desirable Work Experience Arrangement While Enrolled in Agricultural Resources Course:

1. Time

a.	Assigned period during school hours	1	2	3	4	5
b.	Out-of-school time in evenings and on weekends	1	2	3	4	5
c.	Summer vacation time	1	2	3	4	5

2. Supervision

a.	Supervised by instructor	1	2	3	4	5
b.	Supervised by vocational coordinator other than instructor	1	2	3	4	5
c.	Supervised by cooperating employer	1	2	3	4	5
d.	Supervised by instructor and cooperating employer	1	2	3	4	5

G. Occupational Orientation for Students Enrolled in Agricultural Resources:

1.	Supplied by guidance counselor with each student	1	2	3	4	5
2.	Provided by specific instructional unit in agricultural resources course	1	2	3	4	5
3.	Provided by job analysis outlines to be completed by the student from on-the-job observation	1	2	3	4	5
4.	Provided by use of references such as the dictionary of occupational titles	1	2	3	4	5
5.	On-the-job observation of employees performing occupation responsibilities	1	2	3	4	5

H. Job Placement Responsibilities of School Offering Agricultural Resources Programs:

1.	Direct placement responsibilities	1	2	3	4	5
2.	Referral to employment agencies, both private and public	1	2	3	4	5
3.	Provide personal recommendations to prospective employers	1	2	3	4	5
4.	Provide test scores, grades, and other information from student's class records to prospective employers	1	2	3	4	5
5.	Provide information to graduates of agriculture program on job opportunities in area	1	2	3	4	5

Part II

Instructional Units

for Agricultural Resources Course Content

Below is a list of instructional units for Agricultural Resources course content divided into five subject matter areas. Please indicate your rating of the importance to occupational education in agricultural resources of <u>each item</u> listed under the subject areas.

Circle the number to the right that represents your rating of the importance of each item in each subject area, using:

1 -- Unimportant

2 -- Little importance

3 -- Some importance

4 -- Important

5 -- Very important

A. <u>Applied Mechanics</u> Basic to Agricultural Resource Occupations:

1.	Safe operation, use, and storage of equipment, tools, and supplies	1 2 3 4 5
2.	Selection and maintenance of hand and power tools, and chain saws	1 2 3 4 5
3.	Selection, operation, service, and adjustment of gasoline and diesel power units and outboard motors	1 2 3 4 5
4.	Selection and service of electric motors, switches, fusing and control devices	1 2 3 4 5
5.	Selection, operation, and maintenance of arc and oxy-acetylene welding equipment	1 2 3 4 5
6.	Reading and interpretation of blueprints, diagrams, and schematic drawings	1 2 3 4 5
7.	Construction and maintenance of buildings and structures	1 2 3 4 5

8. Construction, maintenance and repair of recreational facilities and equipment 1 2 3 4 5

9. Mixing, placing, finishing, and curing concrete 1 2 3 4 5

10. Selection, planning, and maintenance of water systems 1 2 3 4 5

B. Applied Soil Management Practices Basic to Agricultural Resources:

1. Interpretation of soil surveys for land use planning 1 2 3 4 5

2. Soil testing and interpretation 1 2 3 4 5

3. Planning and layout and maintenance of erosion control systems 1 2 3 4 5

4. Federal, state and local programs of soil conservation 1 2 3 4 5

C. Applied Water Management Practices Basic to Agricultural Resources:

1. Water course and streamway improvement and protection structures

2. Planning and using drainage systems 1 2 3 4 5

3. Pond site selection, construction, and maintenance 1 2 3 4 5

4. Federal, state and local programs of watershed management 1 2 3 4 5

5. Managing ponds and marshes as a habitat for fish, waterfowl, and fur bearers 1 2 3 4 5

D. Applied Air Pollution Protection Practices Basic to Agricultural Resources:

1. Effects of air pollution on plant and animal populations 1 2 3 4 5

2. Programs of air pollution abatement 1 2 3 4 5

3. Importance of clean air to recreational and aesthetic utilization of agricultural resources 1 2 3 4 5

4. Protection of plants and animals from poisoning due to air pollution 1 2 3 4 5

E. Applied Animal Science Basic to Agricultural Resources:

1.	Identification of important wildlife species and their habitat requirements	1	2	3	4	5
2.	Stimulating population of native species and their habitats	1	2	3	4	5
3.	Artificial propagation and stocking of wildlife	1	2	3	4	5
4.	Harvest controls for game species	1	2	3	4	5
5.	Control of predators	1	2	3	4	5
6.	Insect, disease, and pest control	1	2	3	4	5
7.	Confinement rearing of game birds	1	2	3	4	5
8.	Management of fishing ponds	1	2	3	4	5
9.	Trapping fur bearers	1	2	3	4	5
10.	Management of game animals and birds for hunting and shooting preserves	1	2	3	4	5
11.	Cooperative programs with State and Federal agencies in wildlife conservation	1	2	3	4	5
12.	Laws and regulations concerning propagation and commercial use of game birds and fish	1	2	3	4	5

F. Applied Plant Science Basic to Agricultural Resources:

1.	Identification of plants, shrubs, and trees	1	2	3	4	5
2.	Establishment and care of lawns and turf	1	2	3	4	5
3.	Propagating and planting nursery stock	1	2	3	4	5
4.	Establishment and maintenance of landscapes	1	2	3	4	5
5.	The use of plant cover in erosion control	1	2	3	4	5
6.	Aquatic plants, their reproduction and control	1	2	3	4	5
7.	Management of wooded areas for forest production	1	2	3	4	5
8.	Establishment of plant cover on disturbed and ravished areas	1	2	3	4	5
9.	Management of plant cover for wildlife protection	1	2	3	4	5

G. Applied Business Management Procedures Basic to Agricultural Resources:

1.	Orientation and scope of wildlife and recreational business	1 2 3 4 5
2.	Recreation facilities as a business or supplementary enterprise	1 2 3 4 5
3.	State and local laws pertaining to operation of recreational enterprises	1 2 3 4 5
4.	Establishing a safety program for recreational enterprises	1 2 3 4 5
5.	Developing a plan for area recreational facilities	1 2 3 4 5
6.	Operation and management of a marina	1 2 3 4 5
7.	Camp and picnic ground operation and maintenance	1 2 3 4 5
8.	Development of hiking and riding trails	1 2 3 4 5
9.	Operation of winter recreation areas	1 2 3 4 5
10.	Planning and operating a riding stable and bridle trail program	1 2 3 4 5
11.	Operation and management of hunting and fishing preserves	1 2 3 4 5
12.	Assistance available for planning and establishing wildlife and recreation enterprises	1 2 3 4 5

H. Occupational Information Basic to Agricultural Resources:

1.	Occupational requirements and sources of information about agricultural resource occupations	1 2 3 4 5
2.	Working conditions, salary and future in agricultural resource occupations	1 2 3 4 5
3.	Applying for a job	1 2 3 4 5
4.	Occupations in conservation of agricultural resources	1 2 3 4 5

5.	Occupations in protection and regulation of agricultural resources	1	2	3	4	5
6.	Occupations in recreational utilization of agricultural resources	1	2	3	4	5
7.	Technical and professional education in agricultural resources	1	2	3	4	5
8.	Participation in occupational experience programs	1	2	3	4	5

APPENDIX C

Supplementary Materials

Two publications were outcomes of the project. They have been submitted with this report. Additional copies are available from the Department of Agricultural Education, The Pennsylvania State University.

1. Agricultural Resources, a course designed for high school students. (a 42-page teacher's resource unit) Teacher Education Series, Volume 10, Number 1, 1969.

2. An Adaptation of the USDA Soil Conservation Service Technical Guide, Edited for Use by Adults and High School Students. (an 87-page student handbook) Teacher Education Research Series, Volume 8, Number 1, Revised 1969.

Schools are encouraged to purchase the student handbook for class teaching and individual instruction. The teacher's resource unit provides suggested learning activities for ten areas of instruction in an introductory course. It also includes a list of reference materials and other teaching aids.