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CLEMSON UNIVERSITY

ANNUAL
REPORT

1971-1972

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PREFACE

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PREFACE

The basic role of Clemson University was determined by the provision of the will of Thomas Green Clemson, the acceptance of its terms and conditions by Act of the General Assembly of South Carolina, and by the Morrill Land-Grant Act passed by the National Congress in 1862. From its beginning in 1889 this basic role has not changed nor will it be changed. Clemson University has always served the needs of South Carolina and its people. Founded at a time when the economy of the state was based primarily on agriculture, Clemson immediately assumed a leading educational role in promoting a more scientific study of agriculture and all the interests related to it. Recognizing also that the industrial growth of South Carolina needed to be encouraged, curricula were established at the very first for the training of engineers. Teaching, research, and public service in agriculture and engineering have been a most important part of Clemson's educational mission throughout all the years of its existence as a state-supported, land-grant institution of higher education.

The educational needs of the state were not confined, however, to the areas of agriculture and engineering. As the movement toward a more inclusive and more broadly-based education for all the people gained momentum in the nation, Clemson responded to the demands for more highly educated and better trained personnel in many other critical areas. Some of these such as the textile industry and the profession of architecture have enjoyed a long and close association with this institution, for this has been the educational institution in the state which has offered the specialized and professional training required of their leaders.

More recently in response to clearly indicated needs the University has greatly expanded and strengthened its teaching and research in the basic sciences, the humanities, and the social sciences. The Clemson undergraduate can now receive as excellent preparation in these fields as he can in the more technical and professionally oriented ones.

In keeping with its continuing examination of how it can best serve the educational needs of South Carolina, Clemson

has established in recent years three new colleges. They are the College of Education, the College of Forest and Recreation Resources, and the College of Nursing. Each of these new academic units is already proving its worth by training young men and women for the many positions which are open to them in education, forestry and recreation industries, and nursing.

Clemson University has nine colleges and the Graduate School. They are: Agricultural Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, Nursing, Physical, Mathematical and Biological Sciences, and the Graduate School.

Supporting these units—in fact, the entire University—are the Robert Muldrow Cooper Library, the Computer Center and the Communications Center.

Following are commentaries on how each of these is serving South Carolina.

ACADEMICS

College of Agricultural Sciences

Luther P. Anderson, Dean

College of Architecture

Harlan E. McClure, Dean

College of Education

Harold F. Landrith, Dean

College of Engineering

Linvil G. Rich, Dean

College of Forest and Recreation Resources

W. H. Davis McGregor, Dean

College of Industrial Management and Textile Science

Wallace D. Trevillian, Dean

College of Liberal Arts

H. Morris Cox, Dean

College of Nursing

Geraldine Labecki, Dean

College of Physical, Mathematical and Biological Sciences

Henry E. Vogel, Dean

Graduate School and University Research

Arnold E. Schwartz, Dean

AGRICULTURAL SCIENCES

Instruction in agriculture basic to South Carolina's needs is completely in harmony with the purpose of Clemson University as outlined in the will of Thomas G. Clemson and in the Morrill Act of 1862, which established the land-grant colleges.

The population of this nation and the world continues to increase significantly, requiring greater quantities of food and fiber. To meet this demand, a larger number of college agricultural graduates will be needed.

The total agricultural industry is dynamic and complex. The College of Agricultural Sciences is continuously revising and modernizing its educational programs to ensure that graduates will be properly prepared for future demands. For instance, students in many curricula now can specialize by choosing a minor in Science, Business, Production, International Agriculture, or Environmental Science. In addition a student may select a minor in a second department, or a department other than the one in which he is majoring. This minor may be in the College of Agricultural Sciences or in one of the other colleges of the University.

A significant expansion of the equine teaching program is needed. South Carolina has long been a major winter training area for horses with most training activities concentrated in the vicinity of Aiken and Camden. In the last few years interest in the family horse used primarily for recreation has increased tremendously. Currently there are 65,000 horses in the state. Twenty-five hundred boys and girls are enrolled in 4-H horse projects. Qualified graduates are needed to work with the county groups as a part of the extension program, while students with specialized education are also needed to work with other aspects of the total horse industry. Recent experience indicates the number of students interested in this instructional program will increase markedly.

In addition to the undergraduate and graduate degree curricula, the Office of Resident Instruction provides leadership and assistance in special educational activities. In this connection the College of Agricultural Sciences conducted in 1971-72 the third annual faculty-student symposium on the

improvement of instruction, and the ninth Student Science Training program in Biology for outstanding high school students from throughout the state and the nation.

TWO-YEAR AGRICULTURAL TECHNOLOGY PROGRAMS—Since 1966-67 the College of Agricultural Sciences has cooperated with the State Board for Comprehensive and Technical Education, and the State Department of Education in conducting two-year programs in agricultural technology at select technical education centers. The role of the college in this special educational activity primarily involves curriculum planning and development, and program evaluation. In addition the college assists in program operation by making available the research programs and facilities at Clemson and the branch experiment stations for class field trips, laboratory sessions, and demonstration purposes, and by providing instructional staff at cost as necessary and feasible for successful program operation.

Currently eight two-year programs in agricultural technology are offered at seven technical education centers in the state.

Enrollment in the two-year agricultural technology curricula has been increasing rapidly—from 88 in 1969-70, to 198 in 1971-72, to approximately 275 in 1972-73. Job opportunities and salary levels for graduates of the technology curricula have been very good.

CONTINUING EDUCATION—Modern agriculture is a rapidly changing industry. The fast pace of both adoption of new technology and application of new research results in modern agriculture and rural living necessitates a program of continuing education for professional educators and other agricultural workers to ensure that ongoing programs in which they are involved will be modern, timely, and will utilize the latest research and other information available. Personnel associated with agriculture and rural living in this state who especially benefit from continuing education programs include the county staff of the Cooperative Extension Service, vocational agriculture teachers, Soil Conservation Service personnel, State Land Resources Conservation Commission personnel, members of agricultural organizations and agencies, farmers, and other special groups.

There are two basic concepts of continuing education. The first is the use of continuing education programs as a means of constantly updating professional educators and other agricultural workers in the specialty areas in which they were professionally trained and are employed. To meet this type of continuing education need, periodic workshops and short courses are held in specialties such as swine, dairy science, and horticulture. The second concept of continuing education places emphasis on providing specialized educational programs on subjects of immediate or impending importance such as occupational safety, environmental protection, and specific plant or animal disease control. Participants in such programs are then in a position to conduct further educational programs in these topical areas. For example, in South Carolina a state-wide extension program in nutrition was conducted successfully by county extension personnel after they participated in a series of in-service training programs in nutrition. Both these concepts have been emphasized in planning continuing education programs in the College of Agricultural Sciences.

Continuing education activities in agriculture were expanded significantly in 1968-69 as a result of a special appropriation; however, the appropriation for this program has remained at the same level since then. Continuing education activities in the college currently encompass special training programs for Cooperative Extension Service personnel and vocational agriculture teachers in subject matter areas considered to be of greatest importance. During fiscal year 1972-73 about 20 such programs will be conducted in areas like communications, general agriculture, home furnishings, nutrition, and environmental pollution. Approximately 1,000 professional agricultural workers will participate in these programs.

ARCHITECTURE

The state of South Carolina is rich in the beauty and diversity of her terrain, yet compactly contained in a geometric shape, making each area easily accessible to all other parts. This physical dominion extends from the coast with excellent and historic port cities, sea marshes rich in marine life and handsome sandy beaches, to the well-watered central mid-

lands, the seat of the State Capitol, thence upward to the industrial Piedmont, and finally to the mountain highlands.

Some historic structures have real merit, and we have, despite a long sequence of periods characterized by economic problems, produced some fine contemporary buildings. In spots, real environmental design excellence has been achieved. Yet there are large portions of the population that are poorly housed. Much of the educational plants are obsolete, and much of our city building has been haphazard and despoiled by speculation, rather than planned.

At this very time of new and rapid growth, our people have an urgent common need for an appropriate physical development conceived in the public interest and with sensitivity and balance.

The very qualities that can produce this result have been anticipated by Clemson University. The College of Architecture has as its central task the education of those professionals who will be involved in environmental design at all scales and at all levels. The interrelated programs of education, research, and public service in this professional school have effectively utilized South Carolina as a living laboratory for the past 17 years. The College has developed prototype techniques for its own architectural and planning development and its own timely state services.

CITY NEEDS AND THE PROGRAMS—The College of Architecture has the only professional programs in the state which train young people for careers in City and Regional Planning, Architecture, and Building Science. It also offers the state's only program in Visual Studies, directed toward developing an appropriate detailed visual environment consistent with the aims and objectives of other College programs. For several decades the state has become increasingly urban. It is clear that a growing population, expanding economy, coupled with the urban location of our people in close proximity to one another cannot achieve a satisfying life style without the help of the best environmental design professionals—architects, planners, and designers. This change from a largely rural to a more urban society presents implications and problems to each of these types of environment.

The College of Architecture has purposely developed its academic programs of coordinated undergraduate and professional graduate study to respond to these very challenges. One need only look at the continuum of city and urban development ("Megalopolis") which extends from New England into Virginia to find convincing proof that South Carolina, with its natural beauty and as yet unspoiled rural spaces, must anticipate the end results of unplanned growth and develop significant statewide, regional, and local planning programs which will keep appropriate land in agricultural use, and develop new towns in the right places.

The solutions generated for our state can and should conserve our natural, social, and economic resources. Students in each of the professional programs of the College, and particularly at upper and graduate levels, learn the techniques of research and investigation at firsthand, gaining experience in working with urban officials at all levels and collaborating with other colleges within the University to utilize the special expertise and skill which enrich the University. Thus, transportation engineers, economists, experts in sanitation and pollution, urban sociologists, and persons involved in educational research, physicians, psychiatrists, and sociologists are brought into the classrooms, laboratories, and studios of the College as it becomes necessary in the pursuit of our "real world" research and public services.

CITY AND REGIONAL PLANNING—The development of South Carolina should be preceded by physical, social, and economic planning at all levels. The philosophy of the planning program at Clemson is to educate professionals with an understanding of planning at all scales from the state and regional to the city, the village, and the hamlet. Actual planning projects have long been used as studio assignments, and students are fully immersed in the political and social implications of successful work. This learning experience in the two-year graduate program includes attendance and participation in public hearings. The development of actual working budgets is used in clinical studies conducted in collaboration with the state and its poorest cities in research and planning. Students thus achieve an ability to stimulate citizen participation and support, and learn to collaborate with the archi-

tectural and building science students in joint ventures which may include complex programs involving housing, zoning, sub-division regulations, and the development of varied kinds of public fiscal and capital improvements. As in other programs of the College of Architecture, teaching methods used in studio courses are problem-solving systems, dependent upon technical and economical resources, and above all, conceived for the needs of the people.

Special efforts are made to assure the student the very best educational experience through research and public service program experiments. These are necessarily noncompetitive with, but supportive of, the work of practicing professional consultants. For this reason, the College offers an unusual service to small urban areas with populations of less than 10,000 people unable to afford the much needed range of planning services. A continued sharp and keen attention to minimal budgets is of unusual benefit to the students of the College, rendering them immediately ready for practice.

ARCHITECTURAL STUDIES—Population growth and structural obsolescence will require that our nation rebuild its environmental structures during the next 30 years. On the state level South Carolina has undergone many years of normal sub-growth, coupled with substandard and inadequate housing. The economic health of the state is now growing yearly, and South Carolina will experience far greater construction needs during the next decade than most other parts of the country. It is clear that herein lies a great need for more professional architects.

The population of the College of Architecture has grown threefold in the last 18 years, yet now prepares graduate-professional architects in fewer numbers than presently required by the state and the region which it serves.

Architectural curricula have been developed, modified, and expanded to anticipate the growing needs of the state—in particular her building resources—and the need for educating more and better trained architects. Architects have been, and are increasingly being, trained in new techniques of management, new technological tools, and with the ability to solve building problems of growing complexity. The imminent con-

struction of a new wing on Lee Hall (the Architecture building) will double the physical capacity of the College and will provide space for it to increase its faculty and its professional enrollment to provide for necessary expansion.

BUILDING CONSTRUCTION—The building construction industry, in terms of dollar volume, is perhaps the largest single industry in the nation. Construction has undergone fantastic cost inflation since World War II and thus must be combatted.

The College of Architecture has the only program in South Carolina with the aim of training those professional Building Science-Managers with the expertise to confront our construction needs and solve building cost spiraling. The Construction Manager of the future will work in new and different ways with the architectural profession, with business, and with other areas of management. The Building Entrepreneur will utilize new professional techniques, new building systems, and develop more rapid and efficient means of erecting structures.

Per capita income in South Carolina has expanded from an average of \$893 in 1950 to an average of \$3,910 in 1970. Measured in comparative "real money" terms, the South Carolinian's income is closing the gap with the national average and will likely achieve a comparable level or exceed it during the coming decade. During this period, a significant portion of his expenditures will be for housing and for his share of the costs of other structures in which to study, worship, work, and play. The present professional enrollment in Building Construction at Clemson must be tripled in the next 10 years. To fail to increase the enrollment in this magnitude would mean an inability to answer clearly-expressed state needs.

HISTORY AND VISUAL STUDIES—The Department of History and Visual Studies offers the only programs at the University, and indeed in the state, in the history of architecture, in some areas of art history, and those creative areas of the visual arts which are and will be necessary to enrich the buildings and the physical environment of the South Carolina of the future. As the environment becomes more urban, the need for visual sensitivity, richness, and delight

becomes more acute. As people are less related to the beauty of the country, man-made beauty must be found in the city. Artists, who work in concert with architects and planners and who are educated to collaborate, must fill this need. The country itself must be retained as a place of refreshment and for the life-giving industries of agriculture, fisheries, and forestry.

The Department of History and Visual Studies thus performs several important functions: to supply important areas of the curricula in architecture, building construction, and planning; and to provide such undergraduate and graduate curricula as may be necessary to produce excellent designers, painters, sculptors, photographers, and other creative artists equipped to work with particular relationship to the physical environment and its problems.

EDUCATION

The state of South Carolina is the classroom of the College of Education. Each semester more than 900 prospective teachers, administrators, supervisors and counselors serve as teachers aides, student teachers and interns in the public schools, technical education centers, and colleges and universities in the state. During the academic year 1971-72 the College of Education faculty conducted more than 60 in-service courses in 16 counties. More than 2,100 teachers used these courses to improve their instructional competencies.

As a professional school in the land-grant institution, the College of Education has responsibilities in the areas of teaching, research, and public service. Its programs and services reach all educational levels. Fulfilling these responsibilities requires the cooperative efforts of Clemson University, the State Department of Education, the public schools, and other concerned agencies.

CURRICULA—The College has 21 undergraduate programs for the preparation of teachers. Curricula on the graduate level are available for the preparation of specialists in 15 areas.

Services and programs are especially geared to the vocational needs of the state. The College has been heavily involved

in preparing faculty and staff for vocational and technical education centers. Since the College has a widely-recognized reputation in the community college field, it expects to continue to play a leadership role as technical education centers become community colleges.

In 1970 the South Carolina State Department of Education assessed the educational needs of the state and developed a program of action. The State Board of Education adopted the basic principles and specific objectives to be implemented in South Carolina by 1975. The College of Education evaluated these objectives and needs and has determined its priorities based upon the functions, resources, and personnel of the College. Among these needs and ways in which the College of Education is meeting them are:

- Reduce the number of public school dropouts. Currently less than 50 per cent of the students in the first grade graduate from high school. A majority of the dropouts are not prepared for gainful employment.

The Vocational Education Media Center—funded by the State Department of Education—is engaged in preparing packets of instructional materials for vocational students. Two other departments—Agricultural Education and Industrial Education (Trades and Industries)—have been developing school-based career programs and preparing teachers to work with occupationally-oriented students. These programs are designed to develop job awareness and employability skills at each grade level from junior high school through high school and the two-year college. The College has supplied consultants to work with school districts and taught in-service courses in career education throughout the state. The vocational counseling program prepares public school and college guidance personnel to assist students in developing career awareness and in making occupational decisions.

- Develop an adequate educational program for youth with physical, mental, and emotional handicapping conditions. South Carolina has a large number of handicapped children who are capable of some kind of training which would enable them to participate more fully in society.

The College has the basic special education courses to prepare teachers in these areas and plans to expand its offering on both the undergraduate and graduate levels. The faculty is currently serving as consultants and teaching in-service courses in the public schools. The College has the additional capability of preparing vocational teachers to work with handicapped children.

- Provide an adequate occupational training program for 100 per cent of the secondary school students who desire it. Less than twenty per cent of South Carolina students completing high school enter college.

The College places great emphasis upon preparing teachers for vocationally-oriented careers. It also prepares multi-media curriculum materials and provides consultant services in the various vocational areas. The College has developed programs of in-service education to retrain teachers in other areas to teach occupational courses.

- Increase the number of high school graduates entering post-secondary institutions. The future growth and industrialization of South Carolina depends to a large extent upon the educational level and training of the people.

The College, with its expertise and experience in community college and technical education center education, plays a major role in preparing faculty and administrators for these institutions. It provides consultant services and offers in-service teacher education programs to up-grade the technical and teaching skills of the faculty, and has the capability to plan and provide services ranging from a one-day workshop to organizing complete guidance and developmental programs.

- Provide in-service training programs for public school and post-secondary personnel.

The College has made its greatest contribution in the area of in-service education. It has received recognition from the American Association of Colleges for Teacher Education for its programs and services. While most colleges of education teach regular graduate courses as off-campus in-service courses, the College of Education organizes and teaches courses to meet the specific needs of teachers in a school district or institution. All in-service courses carry resident credit.

- Provide degree programs and a comprehensive in-service program for school personnel throughout the state.

Through contracts with public schools the College has the capability of teaching courses in any area of the state. The University has cooperative agreements with five private colleges—Columbia, Erskine, Newberry, Presbyterian, and Wofford—to teach Clemson University graduate courses using their faculty and facilities. The College offers complete graduate degree curricula in Greenwood and expects to expand to other areas of the state as needs arise.

- Provide advanced training for specialists to work with the developing vocational, technical, and community college systems.

The College is developing a professional program leading to the Doctor of Education degree to prepare vocational administrators, curriculum and technology specialists, and vocational teachers to meet the growing needs of community colleges, technical educational centers and county and regional vocational centers.

- Develop and maintain a system of continuous evaluation and up-grading of education.

The emphasis in teacher preparation is shifting to competency-based or performance-based teacher education (PBTE). This new concept places emphasis upon demonstrated competencies on the part of prospective teachers. The College of Education has converted one curriculum to competency-based objectives and is working to convert others to student-centered courses with measurable behavioral objectives.

ENGINEERING

The College of Engineering addresses the needs of the state by contributing to the advancement of technology, providing education to satisfy the state requirements for engineering manpower resources, and by contributing significantly to the continuing education of the professionals it serves. During the past three years the need for more and better engineering, both at state and national levels, has become so critical that a new term—technology transfer—has been used to empha-

size the severity of the situation. To meet this challenge, the College of Engineering has made contributions directed at satisfying state needs. These efforts range from a single three-hour consultation with a local company to continuing development of a large and comprehensive program for wastewater treatment plant operators that covers the entire state.

WATER RESOURCES—Ten years ago South Carolina assumed that its source of fresh water and power were unlimited. But planners today are not sure if the needs of the state's citizens can be suitably met beyond 1980. Fortunately, this problem was recognized by the College of Engineering as early as 1964, with the result that there is now a viable and productive water resources program in operation. This program works in conjunction with the Water Resources Research Institute in meeting its many responsibilities.

To date, this program has brought in more than \$345,000 in federal funds and employed over 100 students as graduate research assistants or undergraduate student assistants.

An example of significant research findings and the impact on state needs is the economic, ecologic model developed for the Charleston area and used in the Beaufort area to evaluate the economic and environmental consequences of alternate types of development. The State Development Board, the S. C. Water Resources Commission and other state and federal agencies have utilized the product of this research.

Another example is research to improve existing wastewater treatment facilities through the use of inorganic coagulants. These methods increase the removal of total bacteria, suspended solids, organic carbon and total phosphate, thereby producing striking results which have helped municipalities and industries meet proper levels of treatment with minimal capital expenditures.

HEALTH CARE—South Carolina, like all other states, has its share of citizens who require the spectrum of health care. Engineering programs address this problem by developing new instrumentation for use in the clinical environment and by working in collaboration with the Medical University of South Carolina faculty in studying microcirculation and its effects on mental health and aging.

Other examples of important engineering studies relevant to the health needs of South Carolinians include the design of an implanted oral prosthesis which permits aging persons to use dentures and return to solid diets, the fabrication of special braces for crippled children, and the improvement of surgical instrumentation for patient care. Other promising programs involve artificial tooth implants, permanently-attached artificial limbs, and improved artificial heart valves. Clemson hosts an annual biomaterials symposium which attracts 200 physicians, scientists, and engineers from all over the country. More than \$2 million has been brought into the program through outside research support. Collaborations with some 45 hospitals and medical schools are a matter of record.

The Bioengineering Program supports undergraduate instruction for nearly 150 students per year in premedicine, pre-dental, pre-veterinary and nursing studies. In addition, evening courses have been offered off campus to practicing physicians, mainly orthopedic residents.

ENVIRONMENTAL PROGRAMS—South Carolina's environmental needs are a matter of recorded controversy. Air and water pollution, radiological health, and other areas are studied in engineering. Through perceptive planning, an Environmental Systems Engineering group was formed in the College of Engineering as early as 1963 and by 1968 had grown to departmental status. This department's program is unique in South Carolina and is nationally known.

In meeting the crucial problems associated with pollution, the Environmental Engineering staff has grown from two to six members in eight years and increased its graduate enrollments from six to 38 students.

A significant portion of the responsibilities of the College's environmental group centers around the comprehensive continuing education program operated through correspondence manuals which focus on the education of treatment plant operators.

Topics such as operator training, treatment plant design and coastal zone pollution management are included in other continuing education activities. Two faculty members in the

program sit in key positions on the South Carolina Pollution Control Authority Board and the Advisory Committee for the State Board of Health.

Industry associated with the manufacture of textile products is one of the lifebloods of the state economy. The College of Engineering works directly with this industrial community in the areas of instrument design, process control, operations research and industrial wastewater recycling. All of these projects are long-term and comprehensive efforts. Two of the larger projects involve over \$100,000 each, invested by companies in contractual support for College of Engineering researchers.

MULTIDISCIPLINARY EFFORTS—Other examples of “technology transfer” have occurred and are yielding results which are clearly related to the state’s needs. These are primarily multidisciplinary efforts with strong contributions from engineers in the general area of thermodynamics, fluids and mechanical design. Some of the efforts include:

—development of a new textile and paper wastewater treatment system which will allow recycling of some industrial waste, reuse of hot water previously lost, reduced industry costs due to water recycling and energy demand reductions, and total industry conformance to EPA restrictions on waste disposal in state streams and lakes.

—development of advanced biomedical concepts in conjunction with the Medical University of South Carolina and the Shriners’ Hospital for Crippled Children in Greenville. The developments include burn treatment devices, cataract removal devices, advanced trachea cuffs, and blood infusion devices.

—development of new fuel resources which may in the long range future provide a new cash crop for South Carolina farmers through the production of gaseous hydrocarbons from plants. This obviously is a development of long range application, i.e., when the supply of fossil fuels is such that such methods may compete economically.

TEACHING PROGRAMS—The College of Engineering offers six professionally-oriented undergraduate programs:

Agricultural Engineering, Ceramic Engineering, Chemical Engineering, Civil Engineering, Electrical and Computer Engineering and Mechanical Engineering.

The College also offers an engineering science-oriented program—Engineering Analysis. In addition to these seven engineering programs, a baccalaureate program in Engineering Technology is offered. Total enrollment for these programs is currently 1,109 students.

The College offers Master's degree programs in 12 areas: Agricultural Engineering, Bioengineering, Ceramic Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering, Engineering Mechanics, Environmental Systems Engineering, Materials Engineering, Mechanical Engineering, Systems Engineering and Water Resources Engineering. Enrollment in the Master's programs is 167 students.

Doctoral programs are offered in Agricultural Engineering, Bioengineering, Chemical Engineering, Civil Engineering, Electrical Engineering, Engineering Mechanics, Environmental Systems Engineering, Materials Engineering, Mechanical Engineering, Systems Engineering and Water Resources Engineering. Thirty-four students are currently enrolled in Ph.D. programs.

TECHNICAL OPERATIONS—During the past 10 years South Carolina evidenced, along with continued industrial expansion, the development of a very comprehensive technical education system. This activity has been successful in training a work force at the skills or technical level. It has become apparent in the state that a gap has developed between the four-year engineering curriculum and the two-year technical program. Realizing this vacuum the College of Engineering instituted the Technical Operations (Engineering Technology) program designed to be consistent with the guidelines set forth by the Engineers Council for Professional Development in their description of Engineering Technologist programs.

CONTINUING EDUCATION—In 1967 the Office of Industrial and Municipal Relations for the College of Engineering was formed. All public service and continuing education

programs for the College have been administered through this office since that date.

The range of activities has included seminars, conferences, short courses, symposiums, workshops, engineering refresher courses and short schools. Many of these programs have been jointly sponsored by various federal and state agencies and by a number of professional societies.

The growth in attendance at these various on-campus and off-campus activities has been spectacular. By the end of 1972 more than 5,100 industrial executives, engineers, government officials and specialists will have attended one or more of these continuing education programs. The annual attendance for 1972 alone will exceed 1,600.

More than 80 public service-type programs have been presented during the six-year period. Their duration ranged from one-day seminars to one or two week short courses.

FOREST AND RECREATION RESOURCES

Forestry and Recreation together contribute more than one billion dollars to the economy of South Carolina. Hundreds of businesses and thousands of jobs are directly dependent on these fields. But beyond this, the wellbeing and the quality of life for each person in the state is dependent on properly managed forests for wood products, protected watersheds, wildlife habitat, forest recreation opportunities, and general aesthetic values; and properly planned, organized and implemented recreation and park programs, services, and facilities to provide opportunity and incentive for recreative use of leisure that will be of greatest satisfaction to the individual and greatest benefit to the community.

These needs require enlightened, professional managers and leaders, and Clemson is the only institution of higher education in South Carolina preparing professionals in these fields. Both fields will have rapidly increasing demands placed on them in meeting the needs of people for recreational opportunities and for housing, furnishings, paper, pure water, clean air and other contributions toward a satisfying standard of living.

In general, the purpose of the College of Forest and Recreation Resources is the gathering and dissemination of knowledge to all fields of forestry or recreation through: undergraduate education, graduate programs, active and creative research programs, and services to and cooperation with the public.

Forestry, as a profession, seeks to sustain an abundant flow of goods and services for people from forest lands.

Recreation and Park Administration as a profession seeks to develop leadership proficient in guiding people in their recreative use of leisure through the provision and management of the broad range of recreation programs, services, and facilities.

EDUCATIONAL PROGRAMS

FORESTRY

(1) Undergraduate curriculum in Forestry with 11 different emphasis areas.

(2) Undergraduate curriculum in Wood Utilization with emphasis areas in Wood Industries Management and in Wood Science (approval pending for initiation in fall, 1973).

(3) Graduate programs leading to the Master of Science and the Master of Forestry degrees. These graduate programs have broad option opportunities, including wood utilization and multidisciplinary fields.

(4) Short courses, lectures, and symposia which often are a public service function but which meet important educational needs.

RECREATION AND PARK ADMINISTRATION

(1) Undergraduate curriculum with emphasis opportunities in Recreation and Park Administration and in Park Management.

(2) Undergraduate option in Therapeutic Recreation, being implemented to serve a rapidly expanding field.

(3) Graduate program leading to the Master of Recreation and Park Administration professional degree, with broad departmental and multidisciplinary option opportunities.

(4) Recreation-Physical Sports courses elective for all University students offered as service courses (approval pending to be offered beginning in the fall of 1973).

(5) Special Programs such as Camp Hope for the mentally retarded, and College Week for Senior Citizens. These programs, though primarily a public service activity, are an integral part of the teaching process, involving students directly in planning and programs as a part of their education.

NEEDS — RELATION TO KEY PROGRAMS — Success in an educational program is measured by the quality and quantity of its graduates.

Since 1959 when the first class in Forestry graduated, 244 students have received B.S. degrees. Eighty per cent of the available graduates are employed in forestry or forestry-related fields.

South Carolina's return from her investment in these young conservationists is substantial—64 per cent of the available Forestry graduates are employed in South Carolina. Significantly, 97 per cent of those graduating in Forestry are employed in the South.

The current concern with our environment and the deep interest in our natural resources has caused increasing numbers of young people to turn to forestry in their desire to become involved in conservation.

Forestry enrollments have grown at an average rate of 19 per cent each year for the past three years. The leveling off period is not yet in sight because even the percentage rate of growth is increasing each year.

Since 1968 Recreation and Park Administration has graduated 263 students with the B.S. degree. A majority of the available graduates are employed in the Recreation-Park Administration field. Precise figures are not available, but a substantial proportion of the graduates are working in South Carolina. Thus, the educational program is having a direct impact on improved delivery of recreation services to the people of South Carolina.

With shorter work weeks, higher incomes, and a higher standard of living for South Carolinians, the need and de-

mand for leisure services will increase. The need for programs to deal with the special needs of handicapped and exceptional children, with the aged, with the ill, and with the culturally disadvantaged also make this a challenging field for today's young people. They are increasingly turning to the Department of Recreation and Park Administration for the knowledge and skills needed for professional competence toward meeting these needs.

LIBERAL ARTS

Any self-governing society requires that its citizens have a basic general education in those fields of knowledge which enable them to lead full and useful lives and to contribute to the general welfare, regardless of their occupational and professional interests. It is generally considered that basic courses in the humanities and the social sciences are a necessary part of the education of every individual who expects to play an intelligent and meaningful role in society.

The justification for public support in a democracy of any level of education from the kindergarten through the university is the belief that the educated person will govern himself and others more wisely and more humanely than the ignorant one and that through this education the quality of life for all will be enhanced. It has been the experience of civilized man that a knowledge of history and government, of language and literature, and of the social studies has contributed greatly to this end. All men must and do communicate, and the educated man must know what it is from both the past and the present that is most worthy of communication.

THE SERVICE—The College of Liberal Arts comprises the departments of English, Languages, Music, History, Political Science and Sociology, and Psychology. Basic instruction for all undergraduate students in the University is provided in each of these units. With the exception of the Music Department, each unit offers an undergraduate major. The departments of English and History offer the master's degree.

Growth of students and faculty has been impressive during the past few years, but growth in quality has been even

greater. Qualified graduates from this college have no difficulty entering outstanding graduate, medical, law, and other professional schools.

Improvement in the quality of the faculty is indicated by the increase in percentage of those holding terminal degrees—from 34 per cent in 1969 to approximately 50 per cent in 1972.

There is constant scrutiny of the curricula and course offerings are revised whenever necessary. The number of undergraduates majoring in Political Science, Psychology, and Sociology has increased significantly and now compares favorably with those majoring in English and History. Enrollment in the Languages is increasing.

THE FUTURE—There is every indication that during the 1970's there will be continued growth in the area of the Social Sciences. The expanding role of government in all walks of life and the growing population and urbanization of South Carolina will create additional demand for public officials trained in the science of government. The Department of Political Science and Sociology will help meet this need and in addition will furnish consulting expertise and in-service training. One logical step in this direction would be the offering of an M.A. degree in Public Administration.

The State's acknowledged leadership in the field of mental health has already created a shortage of properly trained personnel in this area. The College of Liberal Arts in cooperation with others must help alleviate this shortage by offering the desired training at both undergraduate and graduate levels.

Increasing availability of funds from the Federal government and other sources for research in the social sciences—in hopes of finding solutions to problems of poverty, race, class, pollution, and urbanization—will increasingly involve Political Science, Psychology, and Sociology faculty members in specialized research and consulting activities with both government and industry.

In addition to their teaching activities the faculty in the Social Sciences will become more involved in off-campus public service. They are already seeking Federal and other

funds for their research, assisting with the preliminary planning for a Center for the Aging, and expanding into consulting and opinion survey activities.

The humanities will probably remain campus oriented and contribute most significantly in the areas of teaching and personal research. The growing tendency to require the Master's degree for teaching in public schools will possibly exert pressure to offer the Master's degree in French and Spanish. As the state progresses toward greater economic affluence, more individual leisure time, and expanded cultural affairs opportunities, there will be an inevitable increase in interest and support for such activities as music and drama at all levels, from the university down to the public schools. This trend will hike the demand for persons trained in performing and teaching these activities.

INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

The prime mission of this college is an extension of the University—teaching, research, and service. The College is responsible for 14 degree programs.

This college also offers the Ph.D. in management science (jointly with the College of Physical, Mathematical and Biological Sciences); is responsible for those students seeking a Ph.D. in chemistry who select a major in textile chemistry; and offers the Master of Business Administration degree (jointly with Furman University).

The College of Industrial Management and Textile Science is geared to serve the entire state. It is generally known that the textile industry in South Carolina is the basis of the state economy. The textile and allied industries employ more than two-thirds of the state's blue collar workers, the tax base of the state is directly dependent upon the textile industry, and this college not only serves the textile industry but all industry in the state.

ACADEMIC PROGRAMS—The professional staff consists of 59 faculty who conduct the research, teach the classes, provide the services, and each semester offer some 186 courses.

The talent required to conduct the programs includes textile scientists, economists, accountants, polymer scientists,

chemists, industrial engineers, management scientists, and lawyers. Expertise is reflected in a variety of areas, including occupational safety and health, defense studies, textile waste treatment, textile dyeing and finishing, labor law, financial analysis, and hospital administration.

Three programs are the result of cooperation among this College and other academic units on campus. The College of Industrial Management and Textile Science and the College of Engineering pioneered the concept of Engineering Management in the United States.

The Mathematics Department of the College of Physical, Mathematical and Biological Sciences and the Industrial Management Department of this college pioneered the Ph.D. in Management Science.

In 1963, the University combined the Department of Industrial Management with the School of Textiles to form the present complex of the College of Industrial Management and Textile Science. This complex brings together the applied studies so essential to the state's economy—economics, management, and textiles.

This College in cooperation with Furman University pioneered the concept of a public institution joining with a private one to maximize resource allocations to provide a service for the Piedmont area that was unobtainable elsewhere—the development and offering of a joint Clemson-Furman MBA Program. A total of 150 graduate students (all employed the Piedmont area) are currently enrolled.

RESEARCH—The research activity of this College is directly related to the training and education of its students. However, a cursory examination of a few of the topics will clearly indicate how such research is related to South Carolina, its industry, and its people. To meet the competition from other nations, the state's textile industry must have a catalyst to provide the means for innovation and research. This college is that catalyst. Among the research projects by faculty of the College of Industrial Management and Textile Science are:

1. The broadening of the use of solvent dyeing by the textile industry.

2. The study of the absorption of dyestuffs from activated carbon to reduce stream pollution.
3. Recycling explorations to reduce waste from industrial plants.
4. Study of noise control and noise abatement to improve the quality of life.
5. Flame retardant controls for textile fibers and fabrics to reduce the hazards of everyday living for our people.
6. Continued analysis and recommendations in the field of occupational safety and health.
7. Spinning performance of fibers, a project directly related to textile industry efficiency.
8. Instrument development for measuring cotton fiber properties, directly related to the benefits for cotton farmers.
9. Modification of textured yarn properties, directly related to efficiency of textile industry.
10. Improvement of fabric finishes (graft polymerization of cotton cellulose), related to efficiency of the textile and finishing industry.
11. Textiles for man-made human ligaments, directly related to health of our people.
12. Investigations into the maximum return in longrun in area of defense spending.
13. Feasibility of manufacture and market for low cost housing.
14. Transportation problems of the aged, rural and urban.

SERVICE—The Color Science Center, located in this college, is one of two in the United States. It serves industry in the very sophisticated area of measuring color by instruments. Clemson pioneered this concept and has provided this service to hundreds of individuals associated with the textile industry.

One of the most successful public service efforts in its history is continued this fall by the College as it completes its 15th Annual Professional Development Program of continuing education.

Bringing to the campus a wide range of executives from universities, corporations, and government agencies, the 1972

program featured more than 130 speakers from Clemson and the business community. These academic and industrial leaders presented new ideas, new courses, and approaches to timely problems whose solutions were urgently requested by large and small companies and organizations alike.

During a time of tight industrial budgets, Professional Development's 1972 enrollment increased 71 per cent over last year (from 636 to 1,089), and the number of companies represented increased 75 per cent (from 275 to 481). Participants from South Carolina numbered 717, compared with 260 last year.

The Professional Development Program this year did not confine its activities to the Clemson campus, but attempted to reach the needs of South Carolina industry where they exist. Two programs were presented off-campus: one in New York City and the other at Hilton Head Island.

NURSING

In recent years, much effort has been expended by all governmental agencies to improve the quality of health care in South Carolina. Problems exist today that cause a South Carolinian at birth to have a shorter life expectancy than the resident of any other state.

The College of Nursing was established with the aim to contribute to the health and welfare of the people of South Carolina. The College prepares individuals who will become highly skilled and broadly competent in the practice of professional nursing.

The successful recruitment of faculty with high academic qualifications and clinical nursing expertise gives promise to the continued development of programs of excellence. The expanding student enrollment (320 in August 1972) attests to the relevancy of the curriculum and to the need for a corresponding increase in the number of faculty and administrative assistance.

COOPERATIVE PROGRAMS—Cooperative programs arranged with South Carolina State College, Central Wesleyan College, and Erskine College enable students at these institu-

tions to enroll in a program similar to that offered students on the Clemson University campus then transfer to Clemson for study related to the major in nursing. The Bachelor of Science in Nursing is awarded by Clemson University. It is anticipated that the first students from Central Wesleyan and South Carolina State College will transfer to Clemson University in May 1973. Erskine students are expected to transfer in May 1974. Several other colleges have expressed interest in a similar program.

RECRUITMENT OF MINORITY STUDENTS—There is high interest on the part of administration, faculty and students to recruit representative minority groups for the programs in nursing. The first thrust is the cooperative program with South Carolina State College. Additional effort will become a reality as soon as a project director is recruited to give leadership to a program to recruit and counsel the educationally disadvantaged—many of whom will represent minority groups. This program will be supported for the first two years through funds from United States Public Health Service Capitation Grant Funds. Support, if not available with federal funding after 1974, will be sought from private and state funds.

SIGNIFICANCE OF NATIONAL HEALTH INSURANCE—It appears that within the next year Congress will approve some kind of national health insurance. This health insurance will not only affect medical care delivery, but will also affect nursing care delivery. While such a program is under development, curricula will have to be flexible and experimental. Nursing will not only be involved in trying to determine how best to educate students to practice within a system four years hence, but will also have to adjust to demands of that system as the laboratory experiences are designed and carried out at the same time the system is being designed. This situation will create many problems in curriculum planning, in relationships with other health disciplines and in the model of care we attempt to create as we teach nursing care. Faculty—those now employed and the new ones—will have greater demands placed on them by agencies, students, colleagues in the health professions and licensing agencies.

With development of a national health insurance will come a greater challenge—that of accountability. While in the past nursing education programs have been divorced from nursing services, the demand for relevance and the demand for meaningfulness in educational experiences will result in the need for increased cooperative relationships with service agencies such as the joint appointments of clinical nurse specialists established with the Greenville Hospital System and to be established with the Anderson-Oconee-Pickens Mental Health Center and the Clemson Day Care Center.

Furthermore, recognition of the increasing concern that the professional nurse assume greater responsibility for primary health care is reflected in the present curriculum with its emphasis on values, creative thinking and independent study.

PEDIATRIC NURSE PRACTITIONER PROGRAM—The College of Nursing is now developing a program to prepare the Pediatric Nurse Practitioner who will practice in a colleague relationship with physicians as a Pediatric Associate. The Pediatric medical staff of the Greenville Hospital System who hold appointments on the faculty at the Medical University of South Carolina will cooperate in developing a program which should meet the needs of the state in educating the nurse in this extended role. Federal funding has been applied for. The need for nurses with this special preparation is so urgent that such a program should be supported through state funds if federal funds are not allocated.

OCCUPATIONAL HEALTH—The relationship between health status of employes and economic development is a very close one. Illnesses of a chronic nature, physical and mental, erode the effectiveness of workers and hence production. Information concerning occupational health nursing is a component within the Baccalaureate Program.

CONTINUING EDUCATION—The College of Nursing, in fulfilling its commitment to improving the quality of nursing care, has given attention to the development of workshops with programs which focus on linking new knowledge to practice. In addition to programs which have featured presentation of new research by the nurse researcher and programs

which focus on communication skills and interpersonal relationships, the College has offered the first in a series of workshops to improve the practice of beginning staff nurses in public health agencies. The latter is a cooperative venture with the Community Health Service Division of the State Department of Public Health.

NURSING HOMES AND IN-SERVICE PROJECT—The plight of people confined to nursing homes is a source of great concern to students and faculty. An effort will be made to provide some improvement in attitudes, understanding, and techniques of care through an In-Service Education Nursing Project which is expected to be transferred from the Appalachian Health Policy and Planning Council to the College of Nursing. A delay in funding created by the need for hard cash matching funds from the College's source has been responsible for the delay.

The project, with its humanitarian goals, has high significance for our educational programs. As presently designed, it is to be of short duration. To make any impact on the quality of nursing care it should be continued for a minimum of five to seven years. This will require support from other agencies or from budget allocations.

ASSOCIATE DEGREE PROGRAM—In view of the present educational and administrative framework, the associate degree nursing program will provide the technical registered nurse practitioner as the middle-level person within the three dimensional cluster of the professional nurse practitioner, the technical nurse practitioner, and the assistants to the nurse practitioners within the health care delivery system of the State of South Carolina.

Student enrollment in the associate degree program reached an all-time high this academic year. Eighty-five students, including 45 freshmen, are currently enrolled. A ceiling of 45 was set this year due to the number of faculty employed and the clinical experiences available. It is anticipated that an increased number of students can be accommodated as the number of faculty increases and as explorations for new clinical resources within Anderson Memorial Hospital and the Anderson-Oconee-Pickens communities continue.

GRADUATE EDUCATION—Current work on a graduate program leading to a master's degree is focused on the identification of curriculum. The central idea of the program is to prepare a specialist in family health nursing in a curriculum that is flexible enough to provide minors in such areas as parent-child nursing, rehabilitation, gerontology, nursing advocacy, pediatric nursing practice, and nurse midwifery.

The intent of the program has been supported by collaborating faculty from the Department of Public Health Nursing of the University of North Carolina. The need for such nurses and the opportunities for employment have been verified by nursing leaders from South Carolina who are serving in an advisory capacity to the Dean and faculty. Included in this advisory group are nursing directors of hospitals and local public health agencies, a director of a rehabilitation unit and a representative of public health nursing at the state level.

PHYSICAL, MATHEMATICAL AND BIOLOGICAL SCIENCES

The College of Physical, Mathematical and Biological Sciences has three main responsibilities within the organizational framework of the University. First, it offers all undergraduate courses necessary for those who are working towards a major in one of the basic sciences, as well as providing the basic scientific instruction required in all other curricula in the University. Second, it maintains an ongoing research program which is the foundation of the graduate program in the sciences while at the same time offering the specialized courses necessary for master's and doctoral degrees in the sciences, as well as in other disciplines in the University. Third, it is involved in various public service activities such as evening courses for science and mathematics teachers working toward graduate degrees, and specialized programs such as planetarium lectures for the general public and school children.

TEACHING—Since Clemson University is heavily oriented towards science and technology, it is not surprising that this college is responsible for more than one-third of the total teaching effort of the University and that it has the largest number of undergraduate majors of any college in the University. The College is composed of seven units: the depart-

ments of Biochemistry, Botany, Chemistry and Geology, Mathematical Sciences, Microbiology, Physics and Astronomy, and Zoology. In addition the college is responsible for undergraduate programs in medical technology, prepharmacy, pre-medicine, and pre-dentistry.

In view of the large number of undergraduate degree programs offered in the college as well as its supporting role in practically all curricula in the University, it is also not surprising to find that the total enrollment in all its classes during a given semester exceeds 11,000. This number exceeds the total student population of Clemson University, indicative of the fact that many students take more than one course in this college each semester.

RESEARCH—A strong research program is essential to graduate instruction in the sciences. Unfortunately, basic scientific research is all too frequently categorized as “ivory tower” research with no ultimate practical application. While it is true that the goal of basic scientific research is to understand natural phenomena, in recent years the time lag between a basic discovery and its utilization in practical devices or in the solution of problems of mankind has been drastically shortened. This point can be illustrated by briefly listing a research project under way in each department which is applicable to problems of the state and surrounding regions.

(1) The Department of Biochemistry is involved in research which could lead to a clearer understanding of the process of aging and consequently to the means for expanding human life expectancy.

(2) A faculty member in Botany has discovered and is testing a fungus which has the unique ability to destroy mosquito larvae apparently without adversely affecting other forms of life or upsetting the ecological balance of a region.

(3) A faculty member in Chemistry is trying to isolate compounds from certain herbs which seem to have had a beneficial effect in the treatment of cancer, while another researcher is developing new membranes which will improve the effectiveness of the kidney dialysis machine and will be much cheaper than membranes now in use.

(4) Geology faculty members have been active in mapping the location of water-bearing rock in the state, which is of significance in the overall development of an accurate picture of the water resources in this region.

(5) The computer science area within Mathematical Sciences is continually developing new information management systems which will benefit the rapidly increasing number of businesses who must depend upon computers for their day to day operation. A faculty member in statistics has developed a statistical approach to the process of contract negotiations for equipment, a project which has elicited considerable interest from the Federal government, particularly the Department of the Navy.

(6) The Department of Microbiology is conducting a comprehensive study of nearby lakes to determine the ecological effect of various insecticides and herbicides which wash into the lake from surrounding terrain.

(7) The Department of Physics and Astronomy has a large research program involving the properties of superconductors, which might be used to provide much more efficient transmission of electrical power over the great distances separating the generating station from the ultimate user. One faculty member is using the complex techniques of electron paramagnetic resonance in research which should lead the way towards developing greater flame resistance for man-made textile fibers.

(8) A faculty member in Zoology is using radar to investigate migratory habits of birds. The United States Air Force is supporting the project, since the knowledge gained will help reduce the danger of airplane crashes and costly damage to jet engines caused by bird-aircraft collisions during heavy migrations.

In addition to their benefits for the state and region, all the above projects, along with many others, provide the foundation for the graduate program leading to the master's and doctoral degrees in almost all the departments in the college.

PUBLIC SERVICE—In the area of public service the College is primarily involved in assisting public school teachers in improving their competence in science and mathematics

while at the same time offering special programs and lectures of interest to them and their students. The Department of Mathematical Sciences is extensively involved with late afternoon and evening courses on the main campus, as well as extension and in-service training courses off campus designed to serve the needs of mathematics teachers who want to update their approach to mathematics while working towards a graduate degree.

The Department of Physics and Astronomy provides planetarium shows at no charge to public school students and other organized groups. During the 1971-72 academic year more than 2,500 public school children attended planetarium lecture-demonstrations. In addition to these efforts, all the science departments make their services available to any public school science teacher in the state who wishes assistance in the form of a lecture-demonstration presented in the teacher's classroom or in scheduling a visit of the class to the campus to view specific science areas and give the students an opportunity to talk personally with professional scientists.

GRADUATE SCHOOL

Clemson is committed to programs involving service, research and teaching. The justification for the Graduate School as an integral part of the University is contained in the policy statement of the role of the University, which notes that fulfilling this role means "continuing development of a strong graduate program which is necessary in all major fields of the University for maintaining the scholarly staff and atmosphere essential to a strong undergraduate program and a creative research program."

The graduate program has always reflected the needs of the state, and its future programs will continue to support these needs. Although the first master's degree was awarded in 1924, it was not until the fall of 1957 that graduate work at Clemson began to assume an important place in the University. From 1960, when there were 150 graduate students enrolled, Clemson in 1972 now has a graduate enrollment of 1,850, or a better than twelvefold increase over a 12-year period.

RESIDENT PROGRAMS—Currently, graduate programs leading to the Master of Science degree are offered in the following fields:

Agricultural Economics	Horticulture
Agricultural Engineering	Management
Agronomy	Materials Engineering
Animal Science	Mathematics
Biochemistry	Mechanical Engineering
Bioengineering	Microbiology
Botany	Nutrition
Ceramic Engineering	Physics
Chemical Engineering	Plant Pathology
Chemistry	Poultry Science
Civil Engineering	Systems Engineering
Dairy Science	Textile Chemistry
Electrical Engineering	Textile Science
Engineering Mechanics	Water Resources
Entomology	Engineering
Environmental Systems	Wildlife Biology
Engineering	Zoology
Forestry	

The Master of Arts degree is offered in:

Economics
English
History

Professional master's degrees are offered in:

Administration and Supervision	Forestry
Agricultural Education	Industrial Education
Agriculture	Personnel Services
Architecture	Recreation and Park Administration
Business Administration	Secondary Education
City and Regional Planning	(major in teaching areas of English, History, Mathematics, Natural and Biological Sciences)
Engineering	
Fine Arts in Visual Studies	

Doctoral programs which are presently offered lead to the Doctor of Philosophy degree in:

Agricultural Economics	Management Science
Agricultural Engineering	Materials Engineering
Agronomy	Mathematics
Animal Physiology	Mechanical Engineering
Bioengineering	Nutrition
Chemical Engineering	Physics
Chemical Physics	Plant Pathology
Chemistry	Plant Physiology
Civil Engineering	Systems Engineering
Electrical Engineering	Textile and Polymer Science
Engineering Management	Water Resources Engineering
Engineering Mechanics	Zoology
Entomology	
Environmental Systems Engineering	

OFF-CAMPUS PROGRAMS—In addition to the graduate programs noted above which are given on the Clemson campus, a variety of off-campus programs are offered. Some of these are administered through the College of Education in cooperation with private institutions such as Columbia College, Erskine College, Newberry College, Presbyterian College, and Wofford College. The College of Education also offers graduate work off-campus in cooperation with various school districts in the state. Clemson off-campus graduate study arrangement leading to the Master of Education degree has been established at Piedmont Technical Education Center in Greenwood. Other off-campus graduate work is offered through the College of Industrial Management and Textile Science. This involves the joint sponsorship with Furman University of the Master of Business Administration degree program. With 150 students currently enrolled, the program more than justifies itself as the answer to a definite need in this industrial area.

ROBERT M. COOPER LIBRARY

In 1971-72 the Library received the strongest financial support in the history of the institution. As a result, significant

improvements were made including increased subscriptions to periodicals and a strengthened reference collection.

LIBRARY COLLECTIONS—During the year, two very significant reports were received by the Library: (1) the Library section of the study by the South Carolina Commission on Higher Education, *Goals for Higher Education to 1980*; and (2) the Report of the Visiting Committee of the Southern Association of Colleges and Schools.

In its introduction, the Commission on Higher Education report noted that in South Carolina:

“Library resources, with few exceptions, are alarmingly limited in quantity, and massive financial support for library resources will be required if the state is to improve its present low ranking in the region and the nation.

“Only in recent years have expenditures begun to approach national norms, but on the whole recent support has not been adequate to compensate for the under-funding of the past.”

In its projections of library needs, Clemson has taken into consideration the fact that the Ph.D. degree is offered in 24 fields, the master's in 46 and that programs at the undergraduate level are expanding in breadth and in depth.

The Report of the Visiting Committee of the Southern Association endorsed the Library recommendation and commented that, “It is recommended that the book budget proposals set forth in the Self-Study report be implemented as rapidly as possible. It must be remembered that these proposals represent minimum standards, and that they are long overdue if any sound graduate study is contemplated.”

The report did point up that “the Library has developed a strong basis in the historically strong areas of the University's competence” and that “the goals proposed in the Self-Study report are reasonable and appropriate.”

LIBRARY BUILDING—When the Library was constructed, provision was made for its orderly expansion in three stages of construction. The first stage, ground floor expansion, was begun during the summer and hopefully will be completed in the near future. The expansion will provide

more stack space and seating accommodation, microfilm reading facilities, and an area for the staff and equipment required for ordering books.

The second phase of the building expansion—increasing the stack space in the Science, Technology, and Agriculture Division—is needed immediately. Books that should be readily available are being removed from the shelves and placed in storage in the basement because of lack of shelf space on the second floor. The need for a second tier of stacks on this floor is a top priority for the Library. When completed, the space available for books and journals in science, engineering, and agriculture will be doubled.

LIBRARY STAFF—The Library staff continues to work with competence. In the Library self-study, areas where additional staff is needed were recognized and provision was made for this in the library budget of 1971-72. The Report of the Visiting Committee recognized the high level of competence and excellence of the staff.

COMMUNICATIONS CENTER

The University Communications Center provides service to the University's needs in television, radio, photography and visual aids.

In July of 1972, Clemson's agricultural electronic communications activities in the Cooperative Extension Service and South Carolina Agricultural Experiment Station merged with the Communications Center.

The Communications Center provides supportive services to the University's three major areas of concern; teaching, research and public service.

Support of teaching takes many forms: 35mm slides, overhead transparencies, 16mm films, video tapes, audio-visual equipment loan and repair. One of the busier areas of teaching support has been the duplication of audio cassettes for individualized instruction programs.

Research support covers many of the same areas as teaching support, but with more emphasis placed on photographing results of research projects and advising researchers on the best approach to visually present their results.

The main thrust of public service support is television and radio. Each week the Communications Center produces seven radio programs and two television programs which are used by both commercial and educational broadcasters throughout South Carolina.

In addition, staff members shoot, process and edit 16mm motion pictures used in athletic programs and by other agencies at the University. This year more than 200,000 feet of color film was exposed and processed.

A new educational FM radio station, WEPR, licensed to the South Carolina ETV Commission, is located on Paris Mountain in Greenville. A remote studio for the station is in the Communications Center facilities on the Clemson campus. Eleven radio programs covering subjects from Appalachian music, poetry, to weather information for agriculturists are produced each week at Clemson and fed to the station via a micro-wave studio to transmitter link.

As the University expands its commitments, the Communications Center will seek to expand and improve its services to assist the University in achieving its goals in teaching, research and public service.

COMPUTER CENTER

As a service organization, the Computer Center must be responsive to the demands of the University. It must anticipate the needs of its users—academic units for the most part, but administrative groups as well—and be ready with the facilities to meet those needs. Until recently, user demands could be expressed primarily in terms of machine capacity. But the ability to process more jobs is no longer sufficient to meet expanding requirements.

The Computer Center's current phase of development stems from plans initiated in 1970 by the Center staff and the Computer Advisory Committee. They forecast a steady increase in the job load through 1973, tending to level off after that point. In addition, they determined the direction in which the Center was to achieve greater effectiveness: providing faster turnaround for short jobs, and bringing computing services to the user.

STUDENTS

Clemson University's academic year 1971-72 was both a year of institutional landmarks and a year in which several long-developing, student "movements" crystallized into specific, issue-oriented student body organizations and projects.

Above all, it was a year of "firsts."

Clemson awarded its 25,000th degree—a significant milestone in South Carolina's educational history—at its 76th Commencement exercises in May 1972. That occasion also saw a remarkable 25 per cent of the graduating class of 833 cited for outstanding academic achievement.

Clemson graduated the first students from its four-year baccalaureate degree in nursing, established to help bridge the gap in the state's professional health care services, and also admitted the first students to its new five-year premedical curriculum, a joint program with the Medical University of South Carolina which shaves three full years off the usual time required to educate a medical doctor in South Carolina.

In 1971 a Clemson graduate student in environmental systems engineering was selected as one of only 30 national finalists in the White House Fellows program. In 1972 a graduate student in textile chemistry made Clemson history by winning one of the coveted 17 White House Fellowships, only the second South Carolinian to receive the honor since the program began in 1964.

Also in 1971-72 Clemson gained a signal honor with the establishment of the nation's first student chapter of the 15,000-member American Society for Micro-biologists; held its first annual foreign language festival, "Dionysia 72," an innovative and highly praised regional drama competition for language students; celebrated the 10th anniversary of its Honors Program; and saw its first 16 women students enter the Air Force ROTC program. The latter is a concrete indication of the enormous growth in coeducation at Clemson. In the fall semester of 1972 about 33 per cent of Clemson's total enrollment and almost 38 per cent of its freshman class were women.

Total enrollment jumped by nearly 10 per cent in the 1972 fall semester when a record 9,757 students—8,584 on the main campus—registered for classes. Graduate enrollment (2,071) was up almost 25 per cent over last year.

Out-of-state student enrollment on the main campus dipped to 17 per cent (1,414)—down from 31 per cent in 1967 and the lowest since the return to campus of veterans after World War II—in order to accommodate larger numbers of qualified South Carolina students. In April, 1972, the University announced it would have to turn away qualified students who were late in applying for fall semester enrollment because of an unusually high increase (10 per cent) in the number of new students who had already accepted offers of admission. That fall, 100 per cent of Clemson's available dormitory space was being utilized.

Fall semester enrollment comparison for recent years are shown below:

Year	Undergraduate	Graduate and Others	Total
1967-68	5,838	636	6,474
1968-69	6,165	674	6,839
1969-70	6,203	818	7,021
1970-71	6,679	1,359	8,038
1971-72	7,300	1,590	8,890
1972-73	7,686	2,071	9,757

The 1972-73 figures include 559 undergraduate students at off-campus centers—Clemson University at Greenville and Clemson University at Sumter—and 146 students in the Clemson-Furman University Master of Business Administration degree program.

The year 1971-72 also saw a number of longstanding issues and long-talked about problems important to the Clemson student body translated into concrete programs for dealing with them.

Dormitory councils and new procedures for electing student senators from specific dormitory constituencies rather than at large were established to make student government processes more responsive to student needs. The administration established a Student-Faculty Grievance Committee as

an arbitration board on student-faculty relationships, and again held a leadership workshop for top administrators and student leaders—both projects designed to foster better on-campus communication and exchange of ideas. The University also put the final touches on its five-year Cooperative Education Program, which began in the fall of 1972, to give students an option of combining meaningful employment experiences—“relevancy”—with their studies.

On other fronts, the Student League for Black Identity sponsored a popular “Black Awareness Week” with speeches, arts and culture programs, films, concerts, and discussions aimed at heightening appreciation of black culture. Clemson coeds were instrumental in organizing a local chapter of the National Organization for Women (NOW), the oldest and largest women’s liberation group in the United States, and sponsored their own “Women’s Awareness Week.” A team of 12 undergraduates won a prestigious \$11,170 National Science Foundation grant (Student Originated Studies Program) for pollution studies of the Chattooga River, while another group of ecology-minded students formed SURVIVAL, a campus organization dedicated to informal environmental education programs.

Relevant, personal concern for others has long been a theme of American college campus discussion. Public service was a keynote for the Clemson academic year, and in 1971-72 extracurricular public service was again offered by hundreds of Clemson students through the campus Office for Volunteers Program. Volunteers gave time and talents to help in local Head Start programs; as “Big Brothers” and “Big Sisters” in juvenile court cases and mental health centers; to man a Crisis Intervention Center, a telephone hotline for people with personal problems; and as workers in day care centers and children’s homes. These extracurricular activities complemented public service directly connected with academic studies, as for example, nursing students working with elderly patients at Greenville’s Oakmont Nursing Center, education majors serving as special classroom aides in the federally-funded Oakway School Project (Oconee County), and graduate engineering students actively participating in a major pollution control research project designed to help textile

plants develop new ways to clean up and recycle their industrial wastes.

Additional tabular information about the Clemson University student body is given below:

**FALL SEMESTER 1972 ENROLLMENT
BY COLLEGES, AND
DEGREES AWARDED DEC. 1971-AUG. 1972**

	Main Campus Enrollment Fall Semester	Degrees Awarded				Total
		Associate	Bachelor's	Master's	Doctorates	
Agricultural Sciences	415	—	79	26	8	113
Architecture	350	—	64	5	—	69
Education	1,170	—	274	229	11	514
Engineering	1,031	—	212	69	—	281
Forest and Recreation Resources	540	—	99	2	—	101
Ind. Mgt. and Textile Science	1,102	—	172	19	3	194
Liberal Arts	1,013	—	160	6	—	166
Nursing	295	12	3	—	—	15
Phys., Math. and Bio. Sciences	1,203	—	177	31	18	226
Graduate Studies and Others	1,465	—	—	—	—	—
Totals	8,584	12	1,240	387	40	1,679

Degrees awarded since 1896 total 26,133 of which 110 have been associate degrees; 23,598 bachelor's degrees; 2,163 master's degrees; and 262 doctorates.

**Number and Per Cent of Students from
South Carolina and from Out-of-State**

Year	S.C.	Per Cent	Out-of-State	Per Cent	Total
1950	2,416	78	677	22	3,093
1960	3,231	80	817	20	4,048
1965	3,494	70	1,530	30	5,024
1966	3,867	70	1,673	30	5,540
1967	4,201	69	1,856	31	6,057
1968	4,604	71	1,921	29	6,525
1969	4,799	72	1,867	28	6,666
1970	5,219	73	1,969	27	7,188
1971	5,968	75	1,997	25	7,965
1972	7,170	83	1,414	17	8,584

NUMBER AND PER CENT OF BLACK STUDENTS

<i>Year</i>	<i>Number</i>	<i>Per Cent</i>
1972	179	2

NUMBER OF STUDENTS IN SUMMER SCHOOL

<i>Year</i>	<i>Number</i>
1950	948
1960	1,015
1965	3,216
1966	3,539
1967	3,980
1968	4,820
1969	4,472
1970	4,428
1971	4,692
1972	5,232

STUDENT-FACULTY RATIO
(Full-Time Equivalent)

<i>Year</i>	<i>Ratio</i>
1969	12.6 : 1
1970	13.1 : 1
1971	14.6 : 1
1972	14.6 : 1

AVERAGE COLLEGE BOARD SCORE OF FRESHMEN

<i>Year</i>	<i>Score</i>
1960	998
1965	1003
1966	995
1967	1005
1968	1005
1969	1015
1970	1005
1971	997
1972	983

NUMBER IN FRESHMAN CLASS
(New Students)

<i>Year</i>	<i>Number</i>
1950	640
1960	1,363
1965	1,479
1966	1,388
1967	1,559
1968	1,632
1969	1,468
1970	1,774
1971	1,853
1972	1,919

ACCEPTANCE RATE OF APPLICANTS

<i>Year</i>	<i>Rate</i>
1967	79%
1968	79
1969	79
1970	87
1971	87
1972	83

RETENTION RATE OF STUDENTS
(Freshman Class)

<i>Year</i>	<i>Rate</i>
1965	77%
1966	79
1967	76
1968	80
1969	82
1970	78
1971	84

NUMBER OF DORM ROOMS AND
PER CENT BEING UTILIZED

<i>Year</i>	<i>Rooms</i>	<i>Per Cent Utilization</i>
1960	2,900	100
1965	3,624	97
1966	3,920	99
1967	4,348	97
1968	4,780	95
1969	4,764	94
1970	5,190	93
1971	5,174	97
1972	5,174	100

NUMBER OF TEACHERS
(Full-Time Equivalent Teaching Faculty)

<i>Year</i>	<i>Teachers</i>
1970	571.2
1971	580.1
1972	614.8

**CURRENT OPERATING FUNDS
EDUCATIONAL AND GENERAL**

WHERE THE MONEY CAME FROM

Encumbrances, Deferred Income and Restricted Funds Balance	\$ 1,596,272	5.3%
State Appropriations	14,176,111	47.2%
Federal Appropriation (Morrill-Nelson)	113,840	.4%
Student Fees	3,444,709	11.5%
Gifts/Grants	293,175	1.0%
Research Grants & Contracts, Institutes and Training Grants	2,116,199	7.0%
Auxiliary Enterprises and Related Activities	7,127,437	23.8%
Sales, Services, & Miscellaneous Income	994,275	3.3%
Transferred From Other Funds	138,972	.5%
TOTAL	\$30,000,990	100.0%

HOW THE MONEY WAS USED

Instruction and Departmental Research	\$11,320,780	40.6%
Organized Activities Related to Educational Departments	53,021	.2%
Sponsored Research	896,219	3.2%
Other Separately Budgeted Research (Excluding Agricultural Experiment Station)	437,835	1.6%
Other Sponsored Programs	561,177	2.0%
Libraries	950,312	3.4%
Student Services	1,417,442	5.1%
Physical Plant Operation & Maintenance	3,464,465	12.4%
Administration & General Expense	2,079,935	7.5%
Auxiliary Enterprises & Related Activities	6,686,467	24.0%
TOTAL	\$27,867,653	100.0%

Funds for Encumbrances, Deferred Income & Restricted Funds Balance	2,133,337
GRAND TOTAL	\$30,000,990

AGRICULTURAL RESEARCH, AGRICULTURAL EXTENSION, & OTHER PUBLIC SERVICE ACTIVITIES

WHERE THE MONEY CAME FROM

Encumbrances, Deferred Income, & Restricted		
Funds Balance	\$ 394,623	2.9%
State Appropriations	6,147,330	45.8%
Federal Appropriations	5,171,816	38.5%
Sale of Farm & Forest Products	569,526	4.3%
Grants & Contracts	937,479	7.0%
Other Sales & Services	204,987	1.5%
TOTAL	\$13,425,761	100.0%

HOW THE MONEY WAS USED

Agricultural Research	\$ 4,755,779	36.2%
Agricultural Extension Service	6,500,192	49.6%
Livestock-Poultry Health Service	1,356,258	10.3%
Fertilizer Inspection & Analysis	161,399	1.2%
Plant Pests Regulatory & Disease Eradication Services	217,147	1.8%
Other Public Services	118,658	.9%
TOTAL	\$13,109,433	100.0%

Funds for Encumbrances, Deferred Income and Restricted Funds Balance	316,328	
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GRAND TOTAL	\$13,425,761	
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STUDENT AID ¹

WHERE THE MONEY CAME FROM

Loan and Interest Payments	\$ 49,074	
Gifts/Grants for Scholarships, Fellowships, Other Stipends and Loans	1,031,575	
Investment Income	31,694	
TOTAL	\$ 1,112,343	

HOW THE MONEY WAS USED

Educational Loans	\$ 72,770	
Grants for Scholarships, Fellowships, and Special Purpose Stipends	997,875	
TOTAL	\$ 1,070,645	

¹ Does not include student financing through United Student Aid Funds, Inc., commercial educational lending agencies, or scholarships not administered by the University. Funds received and expended for graduate assistantships are reflected in "Educational and General."

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**PUBLIC SERVICE PROGRAMS OF
THE COLLEGE OF AGRICULTURAL SCIENCES
LUTHER P. ANDERSON, Dean**

**SOUTH CAROLINA
AGRICULTURAL EXPERIMENT STATION
O. B. GARRISON, DIRECTOR**

The South Carolina Agricultural Experiment Station is the research and development division of Clemson University's College of Agricultural Sciences. It was established by state law in 1889 and federal laws (Morrill Act of 1862 and Hatch Act of 1887 and other subsequent acts).

The Experiment Station is a state agency operating under state control with annual state appropriations supplemented with annual federal appropriations. It is charged with the responsibility of providing improved agricultural practices and methods coupled with higher standards of living for the people of South Carolina through interdisciplinary and inter-agency agricultural research programs.

Agriculture is basic to life as we know it. When the total spectrum of agriculturally related determinants of higher living standards are considered, agricultural research becomes highly relevant to the people of our state and their aspirations for an improved "quality of life." Agriculture puts the "living in life" by supplying abundant, tasteful, nutritious food; clean air; clear water; comfortable housing; adequate clothing; money to spend; recreational opportunities; and time to enjoy life.

Research is conducted in eleven subject matter departments at five branch stations and at Winthrop College. The Simpson Station serves all departments in the Clemson area, conducting research applicable to the entire state and to the Piedmont area in particular. The Edisto Station serves the upper Coastal Plains and the Pee Dee Station serves particularly the middle and lower Coastal Plains. The Sandhill, Coast and Truck Stations conduct research on special problems peculiar to the areas in which they are located. Research in the area of home economics is conducted on a cooperative basis with the staff of Winthrop College.

HIGHLIGHTS AND ACCOMPLISHMENTS

The brief, highlighted summary of research emphasis which follows reflects only a small portion of the overall program of the South Carolina Agricultural Experiment Station for the period of July 1, 1971, to June 30, 1972.

Insect Control: The Experiment Station continues to be responsive to the needs of the people of South Carolina as reflected by an intensified research effort in the area of environmental quality. Interdisciplinary studies of an environmentally-oriented nature are underway in virtually all subject matter areas.

Emphasis in entomological research has shifted from complete dependence upon insecticides for insect control to a management systems approach which incorporates all known methods of control including use of beneficial arthropods, insect pathogens, cultural control, and selective insecticides with reduced residual effects. In order to devise a management systems approach, researchers are determining the distribution of beneficial arthropods to establish reliable population estimates. An intensive study of factors affecting parasites and predators is also being made. Economic threshold levels of pest species are being determined to allow estimates of allowable numbers of the pest species before control applications are needed.

Entomologists, pest management specialists and insect pathologists have been working out parts of these systems on various crops during the past year as a team, developing more economical and better insect control recommendations that allow profitable production of quality crops while reducing the pesticide load on the land.

Plant Breeding and Development: Agronomists and plant breeders are also playing a very active role in the development of a systems approach to dealing with crop pests. Natural mechanisms of pest resistance are being explored by plant scientists in an effort to breed new varieties of plants which are resistant to destructive insects, nematodes and diseases. The development of resistant crops continues to be a tremendous asset to the state, both environmentally, economically and qualitatively.

A cooperative research effort by plant breeders and animal science specialists is also underway to improve various forage and silage crops. The future of the South Carolina livestock industry is highly dependent upon the development of improved pastures for year-round grazing, management and feeding systems for the state's dairy and beef cattle, poultry, swine and horses. Improved winter forages for the Coastal Plains and improved summer silage crops and better year-round forages are urgent needs and Experiment Station scientists are actively involved in these areas.

Cooperative research efforts between station researchers and personnel of the USDA's Agricultural Research Service have resulted in the release of new varieties of tobacco, corn, Southern pea, peaches, cucumbers, and white clover during the past year. Significant progress has been made toward the release of other new crop varieties at the same time.

Waste Management: State and federal pollution standards are becoming increasingly strict, requiring improvements in present methods of handling wastes from concentrations of cattle, swine and poultry and food processing plants to prevent pollution of soil, water and air.

Monitoring studies have been initiated along streams near dairy and beef farms in 10 counties in order to accurately assess the environmental impact of these operations. Although the data show considerable variation, the pollution directly attributable to these operations has been small thus far. However, more detailed studies are underway so that the dairy, beef, swine, and poultry producers and processors of the state can avoid environmental crises associated with their operations.

A major research effort is being made to facilitate adequate disposal or utilization of waste materials. Research is continuing in an effort to develop methods of utilizing wastes more efficiently.

Studies in agricultural waste management are being put to immediate use providing much needed criteria for design of facilities throughout the state. Continued research progress on problems of waste control and conservation of natural resources will be a contributing factor to an improved environment for the citizens of the state and the region.

Rural Development and Land Use: Consistent with the Experiment Station's responsibility to improve the "quality of life" for the state's people is the research effort by agricultural economists and rural sociologists in the area of rural development.

Even with the rather sharp drop in farm population in recent years, the South Carolina population remains predominantly rural, the 1970 Census indicating 52.4% rural. Although researchers consider and deal with overall state development problems, they recognize their responsibility to help develop the vast potential of the state's rural areas and people. Station personnel realize that development of the rural sector of our society can provide vital economic impetus and improve living standards throughout the state.

Factors such as low economic potentials, substandard living and other environmental conditions and inadequate diets are under attack on many fronts in a joint state-federal effort to enable rural people to live healthy, contented and productive lives.

Interest in land resource planning and management has received increased attention recently at both state and federal levels as new emphasis is placed on rural development. There is a great need for rational land resource planning and management in South Carolina. Experiment Station researchers are designing a system to conserve the state's resources by providing a centralized data storage facility readily accessible to users. Inventoried land data and computer mapping can be especially helpful in providing an inexpensive and quick way of identifying and evaluating the possible effects of various types of land-management policies.

New and improved marketing systems are being investigated to explore opportunities for increased markets, both domestic and foreign, for South Carolina produced products. Various management systems involving a number of different agricultural products have been studied to help producers, at all levels, determine the most efficient and profitable production techniques.

Home Economics: The South Carolina Agricultural Experiment Station conducts home economics-related research at Winthrop College. During the past year studies were con-

ducted in test methods for evaluation of carpets, flammability of children's sleepwear, occupational goals of young people, nutritional status of pre-school children, and food intake and nutritional health of adolescent girls.

A number of the research projects undertaken at Winthrop are consumer oriented and the results are available to both manufacturers and consumers. In this way the home economics research program of the Experiment Station is helping the citizens of the state to more objectively evaluate products and is helping the manufacturer to better meet the needs and requirements of today's consumer.

Curriculum guides in industrial sewing and distributive education were developed during the year in cooperation with the South Carolina State Department of Education.

Disease and Pest Control: The premature death of large numbers of peach trees has been for years a serious problem to peach growers in the Southeastern states. In cooperation with the research staff in neighboring states, a system of peach production is being developed to reduce these losses to a minimum. This system which includes a combination of cultural and chemical procedures, is now being tested on a large scale in growers' orchards.

Researchers are preparing to mount a major research effort against the lance nematode in South Carolina. This pest is causing significant damage to the state's cotton and soybean crop and is probably harming corn and other crops. The general distribution pattern of lance nematodes in South Carolina has been determined. Surveys indicate the pest to be widely distributed in the middle and upper Coastal Plain of the Savannah Valley region. Losses resulting from this costly pest can be reduced by soil fumigation and, at least on some soil types, by subsoiling and other land management practices.

Chemicals for plant disease control have been improved greatly within the past few years. Recommendations are being changed constantly as research indicates new and more effective methods of disease control. Major efforts are being made to reduce the cost of disease control and to reduce the use of pesticides found to be potentially hazardous to man or to his environment.

Engineering: Research progress by agricultural engineers during the year consisted of new developments in fruit and vegetable mechanization, evaluation of procedures in cotton harvesting, new studies on animal waste management, new techniques in herbicide incorporation and weed control procedures, basic studies on soil-water relationships and hydrology of agricultural watersheds, and new studies on criteria for housing low-income families. The progress on these studies should contribute to the primary objective of improving efficiency of production and providing a better quality product for the consumer.

Machine harvesting studies were conducted on fresh market tomatoes, apples, and peaches. Additional innovations show promise in the solution of problems associated with cleaning, sorting and grading, a segment of the total production-harvesting-processing system. Basic research relating light reflectance to maturity of peaches contributed to the overall progress of automation of the system. Various cutting units were tested on the experimental okra harvester. Tobacco mechanization may be enhanced by new findings in the handling and curing phases of the system.

Significant evidence of the progress made during the year is indicated by the patents which were issued on a fruit harvester, an okra harvester, and a tobacco harvester, all three developed by Experiment Station agricultural engineers in cooperation with scientists in other disciplines.

Livestock: A team research effort by specialists, in cattle, swine, and poultry has been expanded in the area of reproductive problems. The research emphasis included investigations into the problems of low calf crops in cattle, low litter number in swine, and low hatchability of eggs.

In dairy cow nutrition the researchers continued to center on the study of corn or sorghum silage as the major forage plus supplements of protein substituting urea.

A concern for the consumer and the quality of his food prompted the investigation of milk quality. Dairy scientists found the somatic cell count in the milk or the type of package used in the retail channel could affect the acceptability of the flavor of milk.

The swine research program was expanded, especially in the areas of nutritional problems and feed efficiency from farrowing through finishing. Techniques are being developed to help stop some of the litter losses which occur during the first few weeks of life.

Cross breeding work with cattle received increased attention as more effort was directed toward improving the overall quality of the state's livestock industry. Animal science specialists are seeking new and improved breeds of cattle which produce more and better cuts of meat at a higher feed conversion rate.

Food Science: A number of research efforts in both applied and basic research have been made in nutritional studies by Experiment Station food scientists. Progress has been made in several projects concerned with such things as raising the protein content of breakfast cereals and snack foods, reducing the undesirable fat content of various meats, developing tasty new foods from peanuts and soybeans, and improving processing methods for prepared foods such as summer sausage.

Food scientists are not content to merely take existing food items and improve them. They are working cooperatively with plant breeders, livestock and poultry specialists, horticulturists, and engineers to make our food supply safer, more nutritious, better tasting, and perhaps a little less expensive.

Aquatics: Increased impetus for aquatic and fisheries research was received during the past year through grants funded by the recently approved federal Sea Grant Program.

Subjects of new research projects range from taxonomy of South Carolina fishes to the culture of catfish in cages. A continuing survey is being made of the freshwater fishes of the state and a study of fish parasites in Lake Hartwell is underway. Preliminary examinations have been made on collection sites for evaluating crawfish as a potential for food purposes, and a new source of income for people in the Coastal Plain of the state.

Poultry: Poultry researchers continue to battle a problem which has caused or has been blamed for causing great economic loss to the state's turkey industry. A vigorous research

program has been undertaken in cooperation with the entomology department to clarify the true extent of damage caused by leucocytozoon disease (turkey malaria) and to learn methods of preventing, controlling or minimizing its adverse effects.

Evidence has been found that egg production is reduced in infected breeder turkeys and that the hatchability of eggs is reduced. Experiments are underway to clarify the seriousness of the disease in young growing turkeys. Drugs have been studied for their ability to control leucocytozoon after the bird has been infected and one drug in particular shows promise as a therapeutic agent.

Other research work with turkey diseases indicated a turkey cholera vaccine is progressing to a point where it appears it may become a reality for commercial use in the near future.

Horticulture: A team research effort between horticulturists and specialists in other subject matter areas has demonstrated to growers and industry in the state the potential for a completely mechanized program in the area of fruit and vegetable production.

The feasibility of adapting the Experiment Station's self-propelled over-the-row peach harvester to fresh market peaches has been evaluated both by horticulturists and agricultural engineers. Comparable studies with tomatoes using a mechanical harvester have been conducted and results are encouraging in both cases.

The development of preharvest applied plant growth regulators and a portable dumper-sorter for field sorting of fruit has aided the overall fruit and vegetable mechanization program and speeded its implementation throughout the state.

Ornamental research is progressing rapidly, receiving impetus from the Legacy of Parks Program and a cooperative Horticulture-Floriculture Program with the Coastal Plains Commission. These inputs are establishing a firm foundation for research programs in turf grass, woody ornamentals and floriculture.

Relocation of Pee Dee Experiment Station: During the year approximately 2,200 acres of land were purchased as the new

site for the Pee Dee Experiment Station between Florence and Darlington. This new location will enable an expansion of the Experiment Station's research efforts in the Pee Dee region. The current station site is being crowded by the rapid suburban growth of the city of Florence.

The new location includes some 1,100 acres of cultivated land. There are 12 lakes scattered across the property which will facilitate the development of aquatic research including studies on management of fish in farm ponds for food production and recreation purposes. Crop research can be expanded at the new facility to include not only existing economically important crops, but also crops of potential value.

Although some initial tobacco plantings were made during the past year, most of the relocation effort consisted of detailed planning and the preparation of a land use and conservation map to aid in the most productive utilization of the area and its resources. Several years will be required for the total research program to be relocated to the new station site so that the relocation process can be achieved in an orderly fashion and none of the research programs needlessly disrupted.

FUNDS FOR THE EXPERIMENT STATION OTHER THAN THOSE FROM FEDERAL SOURCES

Classification of Expenditures and Receipts for 1971-72

	Agricultural Research	Operating Revenue
Personal Services	\$ 1,896,938	\$ 148,232
Freight, Express and Deliveries	1,605	343
Travel	38,574	9,235
Communications Services	18,036	6,688
Contracted Services	12,713	6,566
Printing and Advertising	7,608	1,202
Utility Services	43,295	15,775
Other Contracted Services	59,823	25,150
Supplies	172,076	139,026
Rents and Fixed Charges	120,873	31,475
Equipment	86,708	42,392
Land and Structures	-----	10,128
Expenditures	\$ 2,458,249	\$ 436,212
Receipts from State Treasurer (Regular Appropriation)	\$ 2,458,249	\$ 500,821
Operating Revenue Receipts	-----	-----
Unexpended Balance Brought Forward from Previous Year	-----	\$ 33,928
Transferred from Grant Overhead	-----	20,000
Balance Forward	-----	\$ 118,537

**FEDERAL FUNDS
THE SOUTH CAROLINA AGRICULTURAL EXPERIMENT
STATION—1971-72**

	Hatch	Regional Research Funds
Personal Services	\$ 932,755	\$ 187,117
Freight, Express and Deliveries	145	251
Travel Expenses	20,685	4,715
Communications Services	3,662	1,357
Contracted Services	6,845	316
Utility Services	11,884	-----
Other Contractual Services	10,137	3,719
Supplies and Materials	127,864	20,744
Rents and Fixed Charges	4,281	2,262
Equipment	49,929	11,404
Expenditures	\$ 1,168,187	\$ 231,885
Receipts for the year from the Treasurer of the United States	\$ 1,168,187	\$ 231,885

Proper vouchers for all the above disbursements are on file and have been examined by us and found correct.

We, the undersigned, certify that the expenditures have been solely for the purpose set forth in the Agricultural Experiment Stations Act of August 11, 1955 (Hatch Act of 1887 as amended), and in accordance with the terms of said acts respectively, and that the balances, receipts and disbursements are as shown above.

Attest: A. W. Rigsby
Custodian of the Seal

Signed: O. B. Garrison
Director of S. C.
Agricultural Experiment
Station

ACTIVE RESEARCH PROJECTS 1971-72

AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY

Economic Appraisal of Potential Technological and Institutional Changes in S. C. Agriculture.

Market and Production Potential for S. C. Ornamental Crops.

Systems Analysis of the Vegetable Subsector of the Food Industry of the South.

Soil, Water Management Decision Making.

Investigations of the Feasibility of Mechanizing the Production of Vegetables for Fresh Market and Processing in South Carolina.

Physical Properties and Quality of Fruits and Vegetables as Related to Harvesting Equipment and Handling Methods.

Egg Marketing Systems for the South.

- Analysis of Human Resources in Relation to Economic Development in South Carolina.
- The Development of Efficient Equipment, Materials, and Techniques for the Handling, Packaging, Transportation, and Storage of Peaches.
- Evaluation of Beef Industry in the South.
- Physical, Social and Economic Aspects of Functional Housing for Low Income Families.
- Human Capital and Economic Growth Effects of Investments in Formal Schooling.
- An Economic Analysis of Turkey Production and Marketing.
- Economic Evaluation of Dairy Marketing Structures and Organizations in South Carolina.
- Economic Study of Alternative Systems for Distributing Water Supplies in a Decentralized Industrial Area.
- Market Organization, Power, Policies, and Programs in The Dairy Industry.
- Economic Evaluation of Alternative Forms of Vertical Coordination in the Livestock-Meat Industry.
- Predicted Effects of Selected Policy and Technology Changes in the Grain Marketing System.
- The Social Impact of Economic and Population Change in Transitional S. C. Counties.
- Analysis of Demographic Data for the Human Resources of South Carolina.
- The Demand for Environmental Quality: The Theory and Measurement.
- A Study of Factors Affecting Costs of Marketing Cotton in South Carolina.
- An Analysis of Rural Development in the Southeastern United States.
- Development of Human Resource Potentials of Rural Youth In South Carolina and their Patterns of Mobility.
- The Effects of Selected Changes in the Real Property Tax System on Agricultural Land-Use and Tax Revenues in South Carolina.
- Economic and Sociological Aspects of Comprehensive Land-Use and Spatial Planning in South Carolina.

The Feasibility of Marketing Cooperatives in the South Carolina Seafood Industry.

An Economic Study of Alternative Systems for Distributing Water Supplies in a Decentralized Urban-Industrial Area.

Effects of Price Level and Price Change Upon the Domestic Use of Water Over Time.

Improving Market Facilities for South Carolina Products (cooperative with South Carolina Agricultural Marketing Commission, Columbia).

Cotton Quality Survey (cooperative with Clemson University Extension Service, and USDA Testing Laboratory).

Develop and Operate an Information Filter Center to Aid in Marketing S. C. Farm Products (cooperative with S. C. Ag. Marketing Commission and Clemson University Extension Service).

Providing Agricultural Marketing Information for Program and Facilities Planning (cooperative with S. C. Crop and Livestock Reporting Service, Columbia).

AGRICULTURAL ENGINEERING

Hydrology of Piedmont Agricultural Watersheds.

Mechanizing the Production of Vegetables.

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- Quality Maintenance of Mechanically Harvested Horticultural Crops.
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- Effect of Partial Field Drying on the Cost and Quality of Coastal Bermudagrass Pellets.
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- Dynamic Modeling of Weed Control in Cotton Production.
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- Reduction of Carrier and Technical Rates in the Application of Soil-Incorporated Herbicides Through Low-Volume Application and Increased Incorporation Uniformity.
- Pedological Studies in South Carolina.
- Soil Profile Distribution of Plant Nutrients Under Intensive Cropping.
- Hybrid Corn Breeding.
- Studies With Small Grains.
- Variety Testing of Row Crops.
- Factors Limiting Production of Field Crops.
- Breeding Fiber Quality in Cotton.
- Long Time Fertility and Adaptation Experiments.
- Improvements of Flue Cured Tobacco by Development of More Adequate Fertilization and Cropping Systems.
- Improvements by Breeding of Varieties and Strains of Flue Cured Tobacco with Desirable Growth, Quality, and Resistance to the Prevailing Diseases.
- Crop Variety Experiments—Small Grains, Soybeans, Alfalfa, Winter Legumes, Peppers, Sesame and Peanuts.

- Amino Acid Composition and Protein Quality of Corn.
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Dynamic Modeling of Weed Control in Cotton Production.

Mechanisms and Inheritance of Resistance to Mexican Bean Beetle in Soybeans.

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The Influence of Exogenous Progestins on Fertilization, Embryo Survival, and Reproductive Physiology of the Bovine Female.

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Diseases of Cantaloupes and Watermelons and Their Control.

Causes and Control of Diseases of Cereal Grains in South
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- Practical Aspects of Urea Utilization by Ruminant Animals.
- Influence of Exogenous Progestins on Fertilization of Bovine Female.
- Sex Steroids and Their Relationship to Fertility in the Bovine Female.
- Composition Criteria for the Evaluation of Normal and Abnormal Milk from Individual Cows.
- The Role of Methionone and Sulfur in Rations Containing Urea When Fed to Ruminant Animals.
- Waste Disposal in the Dairy Industry and Stream Pollution.
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- External Parasites of Poultry.
- Insects on Corn and Miscellaneous Field Crops.
- Biology of Pine Reproduction Weevils in Coastal S. C.
- Importance of Deer Flies and Horse Flies in S. C.
- Evaluation of *Bacillus thuringiensis* in Controlling *Heliothis* spp. on Cotton and Tobacco.
- Bionomics of Insects of Forest Trees and Wood Products in S. C.
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- Effect of Light on Ripening Characters of Detached Fruits.
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HOME ECONOMICS

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Sweet Potato Seed Certification.

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Breeding Bunch Grapes for the Southeast.

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- Handling, Packaging, Transportation and Storage of Peaches.
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 Physiological Study of Herbicides—Ornamentals.
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POULTRY SCIENCE

- Development of Practical Methods for Production of Eggs with Low Cholesterol Content.
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STATION PUBLICATIONS 1971-72

Bulletins

- SB 557—Inspection and Analysis of Commercial Fertilizers in S. C.
- SB 558—A Producer-Oriented Economic Analysis of Contract Turkey Production in S. C.
- SB 559—Trends in Usage of Cotton and Competing Fibers, 1971.

Technical Bulletins

- TB 1039—Activity of 3-Chlorophenoxy - Alpha - Propionamide (3-CPA), a Peach Thinning Chemical, as Influenced by Spray Additives.
- TB 1040—Analysis of Crop-Environment Relationships and Elaboration of the Temperature Response In Snap Bean Production.
- TB 1041—Wholesale Demand Function for Fresh Peaches in 23 Markets.
- TB 1042—Experimental Housing of Broiler Breeders.

Circulars

- SC 162—SC 71—A New Mosaic-Resistant Flue-Cured Tobacco Variety.
- SC 163—SC 72—A New Tobacco Variety with Resistance to Mosaic and Other Diseases.

Research Series

Agricultural Economics and Rural Sociology

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Agronomy and Soils

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Animal Science

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- 23—Swine Field Day Assembled for South Carolina Pork Conference.

Food Science

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Horticulture

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- 1016 "Nonsusceptibility of Some Avian Species to Turkey Leucocytozoon Infection" By J. Solis
- 1017 "Turkey Leucocytozoon Infection. III. Ultrastructure of *Leucocytozoon smithi* Gametocytes" By W. Milhous and J. Solis
- 1018 "Volatile Fatty Acids in Contents of Pendulous Crops and Normal Crops of Turkey Hens" By J. E. Jones, W. V. Chalupa, and J. C. Ellers
- 1019 "Taste of Turkey Frozen Twenty One Years Versus Turkey Frozen Short Periods" By J. B. Cooper
- 1020 "Day-Time Indoor Resting Species of Female Anophele Mosquitoes of the Delta Region of the Republic of Vietnam" By J. D. Hair
- 1021 "Application of a Version of the Stanford Model to a Piedmont Watershed" By J. T. Ligon and A. G. Law
- 1022 "Life History Observations on the Peony Scale, *Pseudaonidia paeoniae* (Cockerell), on *Camellia Japonica* L. in the Piedmont of South Carolina" By R. F. Nash
- 1023 "Control of the Peony Scale, *Pseudaonidia paeoniae* (Cockerell), and a Wax Scale, *Ceroplastes ceriferus* (Anderson) with granular systemic insecticides on *Camellia Japonica* L." By R. F. Nash
- 1024 "Sorption of ¹⁴C-Herbicides by Isolated Plant Cells and Protoplasts" By M. A. Boulware and N. D. Camper
- 1025 "Encephalitis in Turkey Poults Due to *Dactylaria (Diplorhino-trichum) gallopava*—A Case Report and Experimental Reproduction of the Disease" By H. Gaffney Blalock, L. K. George and W. T. Derieux
- 1026 "Calcium Absorption During Coccidial Infections in Young Chicks" By D. E. Turk
- 1027 "The Influence of Fatty Acids and Amino Acids on the Palatability of Beef *Longissimus*" By G. C. Skelley, T. C. Bonnette and F. B. Wardlaw
- 1028 "Objective Measurement of Sperm Motility" By K. A. Wall and M. A. Boone
- 1029 "Growth Regulating Effects of Two Pyridazinone Herbicides" By G. E. Carter, Jr. and N. D. Camper

COOPERATIVE EXTENSION SERVICE

WAYNE T. O'DELL, DIRECTOR

The Cooperative Extension Service conducts a statewide program in continuing education in 16 disciplines related to agriculture, home economics, youth and community development, and educational information under a Memorandum of Understanding between Clemson University and the United States Department of Agriculture.

Objectives of the Service are closely related to those of the federal-enabling legislation, the Smith-Lever Act, which assigns it the mission of disseminating useful and practical information to all citizens on matters within its assigned areas of responsibility. The Act provides for cooperation of federal, state, and county governments in planning, financing, and conducting programs.

The Cooperative Extension Service is intensively involved in national and state efforts to help people improve their skills, earning capacity, nutrition and health, and to attain the educational, personal, and social attributes that will help them raise their standard of living.

The Service conducts active educational programs for the producers of all crop and livestock commodities of economic importance; carries out programs in marketing and utilization; and directs a wide variety of programs ranging from home economics to community and resource development. In carrying out these missions, the Service attempts to achieve the maximum in coordination with all county, state, and federal agencies.

1971-72 HIGHLIGHTS AND ACCOMPLISHMENTS

Extension Agricultural Programs

Broad Scope of Activity: Extension agricultural specialists and county personnel are serving a broader clientele, increasing their efforts concerning environmental issues, and intensifying their service to commercial agriculture in all commodity areas.

To meet these broader responsibilities, a number of special programs and activities were undertaken during the past year. For example:

Cotton Pest Management Program: Cotton contributes significantly to the livelihood of many South Carolinians, both rural and urban. It ranks third behind tobacco and soybeans in dollar value of the crops produced in the state.

More than 150,000 workers are employed in South Carolina textile mills which used about two-and-a-quarter million bales of cotton during 1971—about 10 times the state production (270,000 bales) for the year. With a carefully planned management system, growers have the opportunity of producing an even larger amount of cotton. Nearness to the mills eliminates much of the freight costs. This, along with the quality characteristics of the crop, makes it attractive to mill buyers.

One of the major costs in cotton production is use and application of pesticides to control crop-crippling insects. Effective control of pests such as boll weevil and bollworm is the key to improved production in both quality and quantity of cotton.

The Clemson Extension Service in 1972 assumed the responsibility of initiating and conducting an integrated pest management program to help the state's cotton growers get maximum efficiency from lowest possible cost in pest control. South Carolina was one of 14 major cotton states taking part in the belt-wide program, a three-year project partially subsidized with USDA funds.

It was designed to help producers develop and implement practical pest management techniques for protecting their crop while reducing production costs and possible environmental contamination from misuse or overuse of pesticides.

With all appropriate Extension discipline areas cooperating, cultural practices were recommended to fully utilize all natural forces and keep pesticide usage to a minimum through timed applications.

As a first step, efforts were made to have growers withhold initial pesticide applications long enough to take full advantage of beneficial insects in the fields.

As an integral part of the program, an intensive cotton scouting program was continued over the state whereby individual fields could be surveyed weekly by Extension-trained observers. On the basis of their reports, prescription-type recommendations for each field were made by Extension personnel and given to the growers.

Approximately 100,000 acres of cotton in 29 counties were scouted weekly and recommendations submitted.

In Calhoun County, selected as a pilot area, a full-season cotton pest management program was initiated. Taking part were all 138 growers in the county, involving some 16,500 acres in 836 fields.

This intensive program made use of cultural, biological and chemical control practices known to result in higher yields through better management of cotton pest populations. Grower adoption of this pest management approach exceeded expectations for the first year.

Soybean Meetings: During 1972, many county educational meetings were held throughout the state on various areas of agriculture. Soybean meetings were conducted in nine counties with participation by more than 600 farmers. Growers at these meetings were informed of Clemson University's current soybean research, Extension activities, and recommendations for improved yields.

Demonstrations: Demonstrations have always been a proven technique for dispersing knowledge concerning agricultural production practices. One of the most significant of many demonstrations conducted in 1972 was one concerning Irish potatoes under the leadership of the Extension horticulture staff in the Sumter County area. The project investigated the possibility of producing potatoes for the Campbell Soup Company in Sumter, and possibly expanding the product to other markets. Four growers produced a total of 25 acres under contract with Campbell. Yields on individual farms ranged from 19,000 to 27,500 pounds per acre. Clemson specialists formulated the production in recommendations as a team. As a result of the effort, growers have committed themselves to expanding combined plantings to 170 acres next season.

Interest in this commodity is high because few crops are currently planted in February and harvested in June or July. If this crop can be grown and marketed on an economical basis, it will provide a new source of income for South Carolina farmers.

Field Days: This long-time Extension teaching tool continues to be a valuable vehicle for showing agricultural producers new methods and results. Many are staged over the

state annually. A "Hay Day" at Edisto Experiment Station last year, planned for a 20-county area, drew some 230 people for the in-field demonstrations of new labor-saving equipment for harvesting and handling hay.

Closed Circuit TV: Given the limited resources available, Extension workers are constantly seeking new techniques to disseminate up-to-date information. Under the leadership of the Extension Animal Science staff, four closed-circuit television programs on beef production and management were conducted during January. All 46 counties took part in viewing the programs, attended by 2,426 people for an average of 606 per program.

Increased Marketing Efforts: Despite the trend toward "bigness" and vertical integration in agriculture, the small farmer still has opportunities in the production and marketing of crops and livestock.

Extension marketing programs have emphasized assistance to these small producers who have expressed a desire to increase their income from farming. Extension marketing staff members used proven techniques of providing marketing demonstrations and of forming interested farmers into cooperative groups with excellent results.

An example of this was the Good Hope Farmers Cooperative organized with the assistance of Extension.

Some 33 members in five counties formed the cooperative, selecting sweet potatoes as an inaugural crop to improve income prospects. Extension marketing specialists aided in charter operations and worked out mass marketing arrangements for the potato harvest before planting. Horticultural specialists and county Extension staff members provided in-field guidance on planting, care and harvest of the potatoes. Members of the co-op are hopeful that other crops and activities may be added in the future.

Extension Home Economics

In home economics, as in agricultural programs, Extension personnel are intensifying an expanded service while maintaining traditional outlets and activities. The Expanded Food and Nutrition Program is one example of the special interest activities which home economists supervise while continuing

to provide day-to-day leadership in the traditional homemaking programs. Other special programs during the year have included:

Consumer Expo '72: Consumer education has always been an important part of home management and other aspects of home economics. In April, 1972 a very significant event, Consumer Expo '72, was held in Charleston. It was significant in several ways. First, because the idea originated at the county level and secondly, because the whole state participated. Throughout the entire period of preparation there was cooperation between businessmen, club women, county staff and state staff.

Co-sponsors of the event were the South Carolina Extension Homemakers Council, Trident Chamber of Commerce, and Clemson University Cooperative Extension Service.

One of the highlights of Consumer Expo was a talk by well-known nutritionist Dr. Frederick Stare. He stressed the importance of good nutrition, weight control, and exercise. The audience also responded well to the lecture-demonstration on weight control given by the Extension Nutritionists.

Home Furnishings: Home furnishings and clothing specialists joined forces to present a demonstration on unusual window treatments and inexpensive accessories. In today's home, window treatments can become a major expense in furnishings, especially if they have to be done professionally. Many homemakers have the abilities necessary to execute many of the window treatments that are attractive and add a very personal touch to their surroundings. They only need inspiration, ideas, and instructions on creating very effective window treatment.

Accessories, another area of furnishings, can be very expensive if not well planned. They add a finished touch to a home and make the surroundings more pleasant. Many accessories can be family projects. This brings a family closer together and helps develop better family relations.

Selection of carpets was the topic of one general session, and was presented by the vice president of a carpet manufacturing company. This portion of the program featured selection of carpet in relation to service needs and available resources.

Food Buying: Today's supermarket stocks about 8,000 items. New products, new forms of old favorites, new packages—all this means shopping know-how is important and needs constant updating. Wise shopping takes time, thought, and planning and today's fast pace of living does not lend itself to these things.

Wise food shopping is, therefore, being given major importance in Extension's Nutrition program. Emphasis is placed on wise shopping rather than merely how to save. A series of lessons, "Buy More With Your Food \$," developed by the Extension Nutritionist, stresses shopping for nutrition as well as saving money. A Food Buying Workshop held in April 1972 was attended by Extension Home Economists from each county. They are receiving in-depth training in planning and conducting a series of Food Buying lessons for county groups. Extension radio and television also are being used to teach food shopping.

Extension Community and Resource Development

Extension's Community and Resource Development broadened its services. Administratively, a new position of State Leader for this program was filled and a new regional specialist was named at Florence. Programs and program emphasis have been strengthened in keeping with broad demands for service in this area.

South Carolina was approved for a sea grant and funds are available for a Sea Grant Advisory Program. This new program will be an Extension effort to provide educational and technical assistance to enhance the development of marine resources in the state and surrounding region.

Emphasis in community and resource development is shifting from the "clean-up, paint-up, and fix-up" efforts to greater concern for new and improved community facilities and services which directly affect income and employment opportunities, while still maintaining adequate concern for protection and improvement of the environment. Rural water systems and fire protection, housing, solid waste collection and disposal, and expanded recreation facilities are examples of the areas in which education and technical assistance is being expanded to enhance community development.

Housing: Early in 1972, Extension efforts in housing were expanded to make education and technical assistance available to builders, lenders, and others of the housing industry in 23 counties. Education programs conducted in one or more counties deal with house plans, building permits and codes, financing, construction practices, heating and cooling, landscaping and home furnishing. Thus, the Extension efforts in housing now encompass industry and consumer interests. Strong participation and support of housing Extension by other academic areas (Architecture, Civil Engineering, Economics and Sociology) have strengthened the total housing Extension program of the University.

Solid Waste Disposal: As a result of recent regulations by the State Health Department governing the disposal of solid waste, Extension and research efforts have contributed to proper planning and implementation of garbage collection and disposal procedures. The Extension Service provided estimates of solid waste generated by households in each enumeration district for all 46 counties. In addition, a study was made in Greenwood to help evaluate alternative procedures for compliance with the State Health Department regulations. Several counties have initiated a system of garbage collection in rural areas by using large containers strategically located. Solid waste disposal is continuing to be a key area in the Community and Resource Development Extension Program.

Four-H and Youth Development

4-H Teen Leader Retreat: The first 4-H Teen Leader Retreat was held June 9-10 at Camp Long. Thirty-seven 4-H teen leaders from throughout South Carolina helped plan the weekend. The program was designed to provide opportunities for 4-H teens to learn new ways of serving as leaders in their home communities.

The 140 teens learned how they might be involved in community development, helping younger 4-H'ers, and working with the Nutrition Day Camp and Shape Your Future programs as well as other special interest programs. They were instructed on the importance of being an involved friend to the mentally retarded, senior citizens, and the deaf and other physically handicapped. Also held were discussions related

to the opportunities and responsibilities for being an involved citizen.

The 4-H teen leaders also served on committees during the retreat, and were hosts and hostesses to the 14 visiting discussion leaders.

Over 200 4-H teens, county Extension personnel, and volunteer leaders rated the first 4-H Teen Leader Retreat a success and have requested that it be a week in length next year.

Special Programs

With the last agricultural census showing more than 50 per cent of all farmers in South Carolina having a gross income of \$2,500 or less, considerable emphasis was placed by Extension in the low-income agriculture area during the first half of 1972.

Crops: The use of personal "one to one" approach as the best method for reaching low-income families makes educational work in crop production rather difficult. However, considerable time and effort was devoted to preparing and disseminating useful information on various crops produced by low-income families.

The low-income tobacco growers in the state do a good job with tobacco production, as is evident from high yields of top quality tobacco being produced in South Carolina. Since a high percentage of all tobacco growers are small farmers, Extension strives to keep them aware of current research and Extension recommendations.

Livestock: In the low-income agriculture area, livestock production, especially swine, has increased. Due to Extension's efforts with special feeder pig sales, many small farmers are improving their farm income through corn-hog enterprises. These sales allow small producers to compete on an equitable basis with the larger producers in selling their pigs, because the pigs are penned and sold by grade and weight. Educational efforts are also enhanced through the "show and tell" utilized in grading at these sales.

Horticulture: Low-income families are continually urged and assisted in vegetable production as a means of improving the nutritional level of their diets. Special interest has been given to simplifying literature and program materials relat-

ing to vegetable production, and an educational film has been developed on producing vegetables in a limited area. Attention also was given to low-income families in the early spring on the development of roadside markets.

1890 Extension Program

South Carolina State College, the 1890 Land-Grant College of South Carolina, initiated an Extension program in cooperation with Clemson University Extension Service during 1972. This phase of the overall State Extension Program is, for the most part, directed toward human resource development and upgrading the quality of life for low-income families in rural communities. Chesterfield, Georgetown, and Hampton counties were used as pilot counties in this program.

A program coordinator and two rural development agents housed at South Carolina State College are responsible for the supervision and implementation of the 1890 program. Each county has a staff of nine program assistants working with individual low-income families. The Extension staff initiated and carried out a training program for the 1890 college staff members and assisted with a successful camping program for 200 youths from each county.

Probably the most rewarding collective involvement this year was a six-week summer camping experience. Some 200 low-income youth from each of the three pilot counties spent a two-week cost-free period in competition with peer groups under the supervision of youthful counselors.

Campers participated in group discussions on personal hygiene and sanitation, personal grooming, eating habits and proper nutrition, job opportunities and preparation for meaningful employment and proper use of personal income. Sessions were held on drug abuse, sex education, and motivating interest to achieve a common goal. Instruction was given in simple house repair such as screen doors, windows, and steps. They were taught how to make beds, sweep floors, and keep the grounds clean. Some of the youngsters offered to work in the dining room where they learned to prepare tables for meals. They also participated in athletic activities, singing, and dancing.

Upgrading the quality of home life for the total family was a rewarding experience for leaders involved. Nine program assistants in each of the three counties worked daily with their participants, demonstrating home gardening, food preservation, and producing chickens, eggs, and pigs for home consumption.

One of the most gratifying experiences in this effort was to see several families with small deep freezers filled with frozen food grown in their gardens and orchards. Families are instructed in home site sanitation, and home beautification, both interior and exterior.

Rural community revitalization project, which is now being planned, centers on collective action for the good of the total community.

One of the strongest common bonds that commands the adult interest is the youth program. A county demonstration house is being planned and will serve as the county center for this project. Each community and participating families in each community will meet for intergroup participation.

Some of the neighborhood and community group activities will include (1) voter registration, (2) active participation in adult education, (3) community clean-up campaigns which will include the removal of sawdust piles, abandoned automobile bodies, clean-up burial grounds, church grounds, and other community building sites.

APPROPRIATIONS FOR EXTENSION SERVICE 1971-72

State Appropriation	\$ 2,625,400
Federal Smith Lever	2,536,518
Federal Housing	60,328
Federal Resource Conservation	18,500
Federal Nutrition Fund	1,748,741
Federal Community Development	52,724
Federal AMA	5,108
County Funds	178,959
Other Funds	18,917
1890 College Extension Fund	214,240
Total	\$ 7,459,435

EXPENDITURES BY PROJECTS

1971-72

Administration and Supervision	\$ 295,577
Agricultural Communications	386,212
Plant Sciences	420,045
Animal Sciences	288,770
Agricultural Economics	77,992
Agricultural Engineering	157,802
Conservation	13,058
Marketing	92,415
Home Economics	125,016
Four-H Club	104,777
Community and Resources Development	91,592
Federal Nutrition Program	1,301,200
County Operations	3,222,198
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Total Expenditures	\$ 6,576,654
*Unexpended Balance June 30, 1972	882,781
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Grand Total	\$ 7,459,435

* Includes Federal Nutrition Funds Appropriated After July 1, 1970.

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Annual Report
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